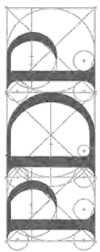


FLOOD MITIGATION GUIDE FOR HISTORIC PROPERTIES

NEW JERSEY HISTORIC PRESERVATION OFFICE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

December 2019





All components of the *Elevation Design Guidelines or Historic Properties* including all text, graphic design, photography and illustrations unless noted otherwise were prepared by Dominique M. Hawkins, FAIA, LEED AP with drafting assistance by Elsa De Leon.

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The Delaware River defines much of the New Jersey's western boundary.

Introduction

The State of New Jersey, from its mountainous northwest, to its low-lying southern edges, is largely bound by water. This includes a tidal shoreline extending approximately 1,800 miles, and the Delaware River, completing the western boundary. The state has three primary coastal regions: the Atlantic Coast that includes the shoreline as well as the land inland of the barrier islands that surrounds bays, harbors, sounds, channels, rivers, and creeks that are subject to tidal flows; the urban coast along the tidal portion of the Hudson River including Jersey City and Hoboken; and along the Delaware Bay. Major New Jersey rivers include the Delaware, which largely defines the state's western boundary; the Hudson, separating New Jersey from New York to the northeast; and a network of rivers that includes the Raritan, Manasquan, Maurice, Mullica, Passaic, Rahway, and Musconetcong rivers. The state is crisscrossed by secondary rivers as well as streams, creeks, and brooks in addition to man-made waterways, such as the Morris canal and the Delaware and Raritan feeder canal, all of which facilitated the transportation of people and goods. The history of settlement along waterways has defined the state's development patterns but has also heightened the vulnerability of large portions of the population to flooding.

Access to water was a key factor for the Lenni Lenape Indians, who fished and gathered clams for food, followed by early European settlers. In addition to providing a potable beverage, waterways provided a source of food, transit, and transportation. Some of New Jersey's earliest European settlements, dating from the 17th century, are located along the Hudson and Delaware rivers including Bergen Township, Perth Amboy, Camden, Burlington, and Trenton. Early Europeans were located close enough to the waterways to allow for easy access, but far



Historically, the canal system provided transport of wheat, rice, livestock, timber, and iron products including tools, nails, and housewares for export. Today, many of the state's canals include recreational trails.

enough away to avoid flooding, steering clear of the most vulnerable areas, those located along the Atlantic Coast. The first settlements along the rivers were followed by expansion along smaller tributaries. Early development patterns were simple with limited environmental impacts, with low populations and nominal building footprints and infrastructure. Some early trails were adapted into roadways, and sometimes paved with oyster shells.

The state's natural resources included agricultural land, iron ore, forests, and coal. The residents were dependent on waterways, with rivers supplemented by canals, for the transport of wheat, rice, livestock, timber, and iron products including tools, nails, and housewares for export. Water-powered mills produced flour, textiles, lumber, and gun powder, and drove late-19th and early-20th century industries in Trenton, Newark, Paterson, and Camden. Over time, the use of ferry boats and barges on rivers and canals for transit and transport declined, supplemented by railroads and later highways, allowing waterways to be repurposed from industrial to recreational purposes.

The Jersey Shore, represents the state's 127 miles of coastal shoreline fronting the Atlantic Ocean. It was explored by Europeans beginning in the 16th century, with small coastal communities settled into the 19th century. Notable coastal resort communities included Cape May, settled in the 17th century and developed through the 19th century, as well as Atlantic City with its 1870 Boardwalk. The construction of the Boardwalk, which was followed by amusement piers in the early 20th century, expanded the development along the length of the Jersey Shore to serve both seasonal and year-round residents, including an influx of factory workers enjoying leisure time and vacations.



1748 New Jersey map. (Lotter, Tobias Conrad. *Pennsylvania, Nova Jersey et Nova York cum regionibus ad Fluvium Delaware in America sitis*. [Aug. Vind. Augsburg, Germany: s.n., ?, 1748] Map. <https://www.loc.gov/item/98688244/>.)



The wide beaches of the New Jersey shore can reduce the impact of storm surge.



Comparing atlases and maps over time can reveal changes in waterways and coastlines. (New Jersey Lakes, Rivers and Water Resources. <https://geology.com/state-map/maps/new-jersey-rivers-map.gif>.)

The need for complex infrastructure expanded with the increasing population and density of cities. This included the supply of water and removal of sewage from households in addition to the collection of storm water from rooftops and along paved roadways and parking lots. Engineering improvements allowed construction on previously undevelopable land, permanently altering the water management at the time of early settlement founding. The increase in developable land was made possible by diverting creeks and streams to underground culverts; infilling marshes and wetlands; and constructing bulkheads to reshape and stabilize shorelines. As development increased, new requirements for zoning, planning, and building codes were established by communities, which continue to be updated to protect the health, safety, and welfare of its citizens.

Across the state, New Jersey’s geological properties, historic settlement patterns, development, industries, and recreation areas are often associated with water. While expanding development and covering large areas with buildings and paving takes the landscape further from its pre-settlement state, severe storms, rising relative sea level, and increasing precipitation has made New Jersey increasingly vulnerable to flooding. Many municipalities continue to depend on their aging infrastructure to meet the needs of their expanding resident population despite insufficient capacity or increased likelihood of operational failure. Today, local planners and preservation advocates in flood-prone historic communities may recognize these issues as cause for concern, but often, they have a limited understanding of the factors that contribute to flooding and how the regulatory framework related to flooding may impact historic properties.

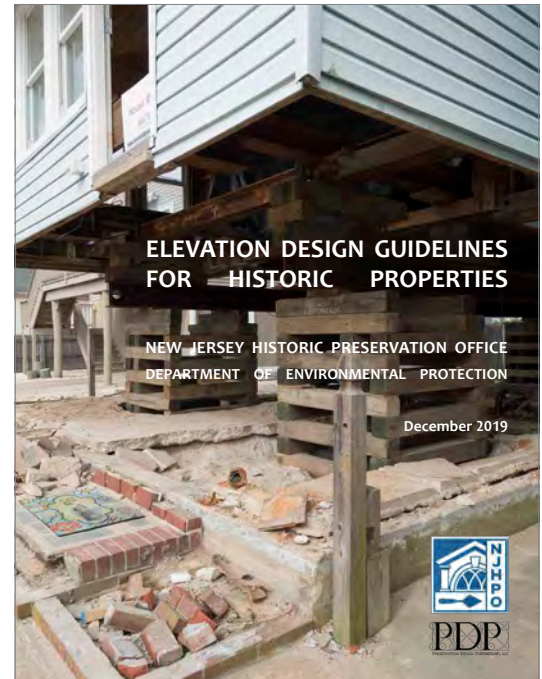
This *Guide* is intended to assist local planners and preservation advocates in flood-prone areas to make informed choices to best protect historic properties from flooding. Although it is understood that archaeological and landscape resources are highly vulnerable to flood damage, this *Guide* specifically addresses flooding at historic buildings.

This *Guide*:

- Introduces some key concepts about flooding;
- Provides a context for loss due to storm events and submersion;
- Clarifies how historic properties fit into floodplain management, including the National Flood Insurance Program;
- Provides guidance for initiatives that can be undertaken by local communities to reduce the potential impact of flooding on historic properties; and
- Clarifies how historic properties fit into the various phases of the Emergency Management Cycle.

Although the presentation of information in this *Guide* builds sequentially, extensive cross-referencing allows readers to begin in any chapter.

Elevation Design Guidelines for Historic Properties, prepared as a companion to this *Guide*, provide additional information for residential property owners addressing the challenges flood mitigation, and more specifically, building elevation.



Elevation Design Guidelines for Historic Properties were prepared as a companion to this *Guide*.

1 Flooding

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Pictures of a snow-and-slush filled flooded river floating through Surf City and other Long Beach Island towns, 2014. (Courtesy of Patch.com)

Flooding

Flooding is devastating, not only in terms of loss of life and property damage, but also because it displaces residents and makes businesses inoperable. Flooding can occur due to any of the following:

- Overflow of inland or tidal waters;
- Unusual and rapid accumulation or runoff of surface waters from any source;
- Mudflow;
- Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion; and/or
- Undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above. (Definitions, 44 CFR 59.1.)

The extent and impact of flooding vary depending on topography, geological conditions, hydrology or stormwater systems, moon phases, a community's physical relationship to water, seasonal variations, and other conditions within the natural or built environment. Some key factors increasing the propensity for flooding are changes in land use, increased development, failed stormwater infrastructure, and elimination or modification of natural ecosystems. The most severe flooding occurs when multiple factors are simultaneously at play.

A. TYPES OF FLOODING

There are two basic types of flooding: persistent flooding and event flooding. Each type of flooding can cause significant damage, but when an area plagued by persistent flooding is struck by an event flood, such as a hurricane or flash flood, the combined effect can be devastating.

A.1 PERSISTENT FLOODING

Persistent flooding, also referred to as nuisance flooding, is typically minor flooding which results in traffic problems, road closures, overwhelmed storm drains, and occasionally infrastructure damage, in addition to public inconvenience and business interruptions. Depending on the frequency of flooding and when the water is brackish, persistent flooding can alter the ecosystem of an area and disrupt its ability to support farming and other activities. As its frequency and severity worsen, persistent flooding can eventually affect the drinking water supply for those relying on well water. Persistent flooding can derive from the sources detailed below.

- **Tidal flooding** responds to high and low tides and moon phases. While nuisance flooding is traditionally associated with spring or king tides, increasingly even “normal” high tides can cause flooding, particularly in certain wind conditions.
- **Groundwater flooding** or high water table takes the form of spongy or soggy soil, particularly along the banks of waterways and low-lying, flatter areas near the Delaware Bay and Atlantic Ocean.

Persistent flooding can be caused or exacerbated by any combination of the phenomena described below.

- **Overdevelopment and impervious surface increase** limit the ability of the soil to absorb stormwater.
- **Subsidence** is the lowering of ground plane elevation that results from geological factors and the compression of land mass following the extraction of groundwater from underground aquifers. Subsidence can exacerbate other types of flooding and increase the frequency of tidal flooding in low-lying areas, particularly when coupled with sea level rise.
- **Sea level rise**, a result of climate change, refers to the increased average elevation of coastal waters. The increased height of the seas can cause low lying coastal areas, such as those along the Hudson River, Delaware Bay, and Atlantic Ocean, to experience more frequent flooding.
- **Stormwater infrastructure failure** often occurs in aging systems or those undersized for current demands.
- **Shoreline modification** often alters natural buffers including oyster reefs, vegetation, and wetlands.



Signage indicating flood vulnerability of roadways is becoming more common in areas of persistent flooding.

August 2016
EPA 430-F-16-032

What Climate Change Means for New Jersey

New Jersey's climate is changing. The state has warmed by about three degrees (F) in the last century, heavy rainstorms are more frequent, and the sea is rising about one inch every six years. Higher water levels are eroding beaches, submerging low lands, exacerbating coastal flooding, and increasing the salinity of estuaries and aquifers. In the coming decades, changing the climate is likely to increase coastal and inland flooding, harm coastal and inland ecosystems, disrupt fishing and farming, and increase some risks to human health.

Our climate is changing because the earth is warming. People have increased the amount of carbon dioxide in the air by 40 percent since the late 1700s. Other heat-trapping greenhouse gases are also increasing. These gases have warmed the surface and lower atmosphere of our planet about one degree during the last 50 years. Evaporation increases as the atmosphere warms, which increases humidity, average rainfall, and the frequency of heavy rainstorms in many places—but contributes to drought in others.

Greenhouse gases are also changing the world's oceans and ice cover. Carbon dioxide reacts with water to form carbonic acid, so the oceans are becoming more acidic. The surface of the ocean has warmed about one degree during the last 50 years. Warming is causing snow to melt earlier in spring, and mountain glaciers are retreating. Even the great ice sheets on Greenland and Antarctica are shrinking. Thus the sea is rising at an increasing rate.

Increasing Temperature and Changing Precipitation Patterns
Rising temperatures and shifting rainfall patterns are likely to increase the intensity of both floods and droughts. Average annual precipitation in New Jersey has increased 5 to 10 percent in the last century, and precipitation from extremely heavy storms has increased 70 percent in the Northeast since 1950. During the next century, annual precipitation and the frequency of heavy downpours are likely to keep rising. Precipitation is likely to increase during winter and spring, but not change significantly during summer and fall. Rising temperatures will melt snow earlier in spring and increase evaporation, and thereby dry the soil during summer and fall. So changing the climate is likely to intensify river flooding during winter and spring, and drought during summer and fall.

Rising Seas and Retreating Shores
Sea level is rising more rapidly along the New Jersey shore than in most coastal areas because the land is sinking. If the oceans and atmosphere continue to warm, the sea is likely to rise eighteen inches to four feet along the New Jersey shore in the next century. As sea level rises, the lowest dry lands are submerged and become either tidal wetland or open water. Many wetlands will be submerged, but not all: the freshwater wetlands along the Delaware River upstream from the Commodore Barry Bridge build their own land by capturing sediments carried by the river, and these wetlands are likely to keep pace with the rising sea during the next century. Nevertheless, most salt marshes between Cape May and the Meadowlands are unlikely to keep pace. If sea level rises three feet, wetlands along Delaware Bay in Cumberland County are even more vulnerable, and likely to be lost if the sea rises two feet. Tidal flats are also likely to become open water. Beaches erode as sea level rises. A higher ocean level makes it more likely that storm waters will wash over a barrier island or open new inlets. The United States Geological Survey estimates that barrier islands of the New Jersey shore from Bay Head to Cape May would be broken up by new inlets or lost to erosion if sea level rises three feet by the year 2100, unless people take actions to reduce erosion. Bay beaches may also be eliminated in some areas. Many of Delaware Bay's beaches are narrow, with wetlands immediately inland. Along parts of Delaware Bay and bay sides of most barrier islands, people have built walls and other shore protection structures that eliminate the beach once the shore erodes up to them.

Rising temperatures in the last century, New Jersey has warmed more than twice as much as most of the nation. Source: EPA, Climate Change Indicators in the United States.

This beach in Pennsville along the Delaware River could be lost as sea level rises. If the shore erodes up to the shore protection wall to the right. © James G. Thack, used by permission.

WHAT CLIMATE CHANGE MEANS FOR NEW JERSEY

New Jersey's climate is changing. The state has warmed by about three degrees (F) in the last century, heavy rainstorms are more frequent, and the sea is rising about one inch every six years. Higher water levels are eroding beaches, submerging low lands, exacerbating coastal flooding, and increasing the salinity of estuaries and aquifers. In the coming decades, changing the climate is likely to increase coastal and inland flooding, harm coastal and inland ecosystems, disrupt fishing and farming, and increase some risks to human health.

Increasing Temperature and Changing Precipitation Patterns: Rising temperatures will melt snow earlier in spring and increase evaporation, and thereby dry the soil during summer and fall. So changing the climate is likely to intensify river flooding during winter and spring, and drought during summer and fall.

Rising Seas and Retreating Shores: Sea level is rising more rapidly along the New Jersey shore than in most coastal areas because the land is sinking. If the oceans and atmosphere continue to warm, the sea is likely to rise eighteen inches to four feet along the New Jersey shore in the next century.

- Environmental Protection Agency, 430-F-6-032, August 2016

A.2 EVENT FLOODING

Event flooding is occasional flooding that has a specific cause, typically a storm or a devastating failure of infrastructure. Event flooding can derive from the sources described below.

- **Flash floods** occur when streams, soils, or stormwater systems are unable to hold or absorb a sudden influx of water.
- **Storm surge** manifests when strong winds along the shores of large bodies of water, such as the Hudson River, Delaware Bay, or the Atlantic Ocean, push high waves inland.
- **Ice jams** occur when openings under a bridge or through a culvert are blocked with ice and snow, preventing water flow. Ice jams can also form as ice dams, where the water surface freezes at locations away from bridges and culverts.

In New Jersey, typical causes of event flooding include one or more of the following phenomena:

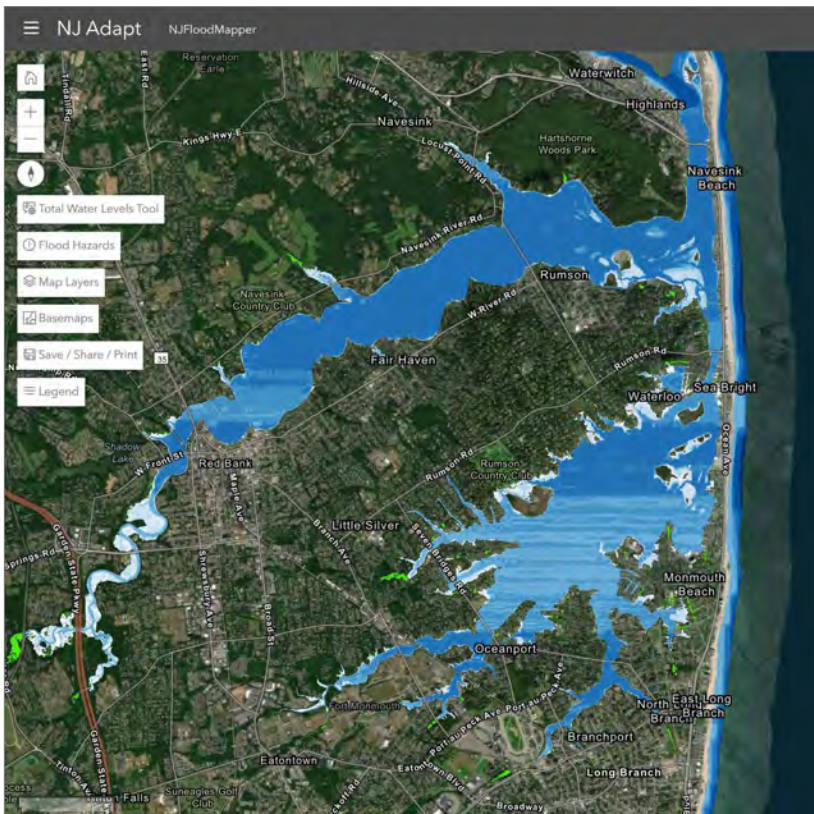
- **Precipitation** in the form of intense rainfall, ice, and snow;
- **Severe storms** such as hurricanes, tropical storms, and Nor'easters, which are often accompanied by high winds; and/or
- **Infrastructure failure**, including burst water mains and storm drains, as well as dam and levee breaches.

B. THE INCREASING THREAT OF FLOODING

Many communities across the state are currently experiencing an increase in flooding over historical trends. Roads that used to weather a storm can now become impassable; temporary ponds form after heavy rains; and property owners have to address new, more frequent, or more severe impacts, such as flooded basements. Increased precipitation attributed to climate change is one of the key contributing factors, while along coastal areas such as the banks of the Delaware Bay the condition is exacerbated by a combination of subsidence and sea level rise. These factors can occur separately or together, and all stress infrastructure systems that, in some cases, have already begun to fail due to age and/or lack of maintenance.

Climate change can cause more frequent and extreme precipitation events. The Northeast has experienced a greater recent increase in extreme precipitation than any other region in the United States; between 1958 and 2010, the Northeast saw more than a 70% increase in the amount of precipitation falling in very heavy events (defined as the heaviest 1% of all daily events). (Groisman, 2013.)

Significant increases in rainfall can overwhelm rivers and stormwater systems and lead to flash flooding. Severe hurricane winds and changing wind patterns can contribute to more frequent coastal flooding and higher storm surge, while drought caused by warming can decrease the soil's ability to absorb a downpour.



The New Jersey Center for Remote Sensing and Spatial Analysis (CRSSA) designed and created an interactive mapping website to allow communities to visualize coastal flooding hazards and sea-level rise. (NJFloodmapper.org)

B.1 SEA LEVEL RISE & SUBSIDENCE

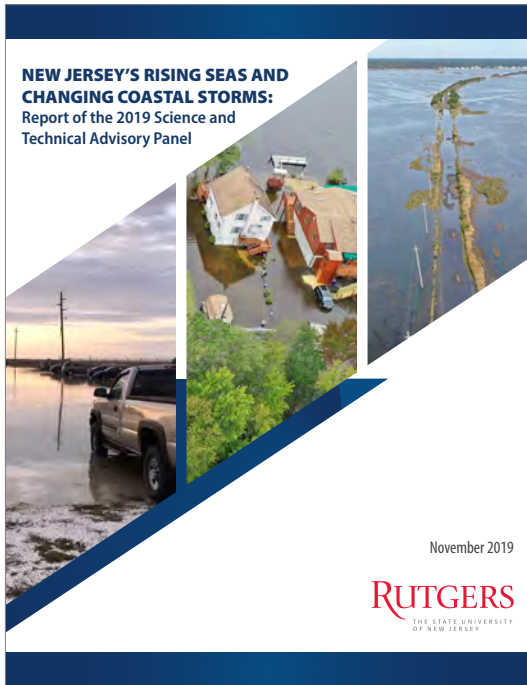
The relationship between the height of the land and the height of the water is changing along New Jersey’s coastlines due to the combined effect of subsidence and sea level rise. This change can manifest as an increase in the groundwater levels in coastal regions resulting in waterlogged soils that are unable to absorb more stormwater and permanent inundation of low-lying areas. As a result, in addition to overwhelming stormwater facilities, pressure from saturated soil puts underground construction at risk, including building foundations, utilities, septic systems, archaeological sites, and burial sites. Although this *Guide* specifically addresses buildings and structures, the vulnerability of historic landscapes and archaeology must be acknowledged.

The narrowing gap between surface grades and water level, combined with an increase in the frequency and intensity of rain and storm events, results in more frequent and more severe flooding and, in some cases, submergence. The effect of these changes may be most apparent in the reshaping of the Delaware Bay shoreline.

Although there is no accepted standard for sea level rise amongst state agencies, in November 2019, the New Jersey Climate Alliance estimated that there is a 66% likelihood that New Jersey coastal

STANDARD RECOMMENDATIONS FOR SEA LEVEL RISE IN NEW JERSEY

New Jersey’s Climate Resiliency Task Force is working to establish standard recommendations for sea level rise. Communities are encouraged to regularly evaluate and update projections to reflect most current data and conditions.



New Jersey's Rising Seas and Changing Coastal Storms: Report of the 2019 Science and Technical Advisory Panel. (<https://climatechange.rutgers.edu/resources/climate-change-and-new-jersey/nj-sea-level-rise-reports>.)

areas will experience 0.9 to 2.1 feet of sea level rise between 2000 and 2050, with 1.4 feet as a central estimate. Extending the projections to 2100, the 66% likely range is from 2.0 feet to 5.2 feet with 3.3 feet being the central estimate. The range of values is dependent on future greenhouse gas emission levels. Therefore, a critical factor in planning for flooding is establishing a timeframe to best understand, and prepare for, how the flood vulnerability may change over time. (Refer to *Establish a Planning Timeframe*, page 4-13.)

B.2 REDUCED STORMWATER CAPACITY

Stormwater systems (e.g., sewers, culverts, and retention ponds) manage surface water runoff from precipitation by guiding runoff to streams and other waterways, via surface or underground channels, or to ponds where the runoff is stored and allowed to infiltrate the ground naturally. These systems are designed to meet the demand of predicted precipitation (typically based on historical patterns) and land use.

Where upgrades and maintenance to stormwater systems have not kept pace with rapid development and increased impervious surface, the system may not be able to handle stormwater loads. Even if stormwater system maintenance and upgrades have kept pace with development, most systems struggle to accommodate changing precipitation patterns, extreme events, and higher tides that are occurring across the state due to shifting climatological conditions and a warmer, more expansive Delaware Bay.

In many communities, tidal outfalls (discharge points for stormwater to flow into a large body of water like a river or the bay), once intermittently covered by high tides, are now semi-permanently covered by fluctuating, higher water levels, which forces water back up through the stormwater system unless the end of the outfall (usually a large pipe) is fitted with a flap valve or another form of backflow prevention. Stormwater system upgrades may be delayed due to expense and buy-in for best practices, including, but not limited to, green infrastructure and lower-impact development in vulnerable areas. Given increasing expense of the status quo, however, it is likely that both stormwater systems and stormwater management policies will have to adapt to changing conditions in the not-too-distant future.

C. FLOODING IN NEW JERSEY

Although major storms, such as hurricanes, are relatively rare in New Jersey, the state's historic relationship with water has resulted in regular flooding along its coastlines, rivers, creeks, and streams. High tides along the coasts and back bays, rivers overflowing their banks, burst water mains, and collapsed storm drains.

The list below is by no means comprehensive. It was derived from New Jersey's 2019 Hazard Mitigation Plan and highlights some of the most severe flooding events in New Jersey since 1999.

- **September 16, 1999:** Hurricane Floyd caused the largest flood on record along the Raritan River. Extensive flooding occurred throughout central and northern New Jersey. Rainfall totals exceeded 12 inches in several locations, with eight to 10-inch totals widespread.
- **August 12 to 13, 2000:** The combination of a weak onshore flow from a nearly stationary low-pressure system off the Delmarva Peninsula and the high tides caused by the full moon led to some minor tidal flooding. A nearly unprecedented torrential downpour (approximately a 1,000-year event) remained stationary for about six hours in eastern Sussex County, resulting in considerable flooding in southeastern Sussex and western Morris counties. The largest rainfall totals exceeded 12 inches.
- **July 12, 2004:** Flash flooding occurred during the late afternoon and evening of July 12, as thunderstorms with torrential downpours kept redeveloping along the Interstate 295 corridor in southern Burlington County. This continued for several hours and resulted in widespread storm totals exceeding six inches across most of the Rancocas Creek Basin. A storm total of 13.20 inches was reported in Tabernacle within a 12-hour period and represented a 1,000-year storm. The excessive rain caused record breaking flash flooding along nearly every stream in the Rancocas Basin and led to the failure or damage of 51 dams in Burlington County.
- **September 18, 2004:** The remnants of Hurricane Ivan interacting with a slowly moving cold front caused widespread, heavy rain to fall in Warren, Sussex, and Morris counties. Storm totals averaged between 3 and 6 inches. This, in combination with even heavier rain in eastern Pennsylvania and southeastern New York State, resulted in the worst flooding along the Delaware River since 1955.
- **March 2005:** Following a major rainstorm at the end of March and another between April 1 and April 3, the Delaware River overflowed its banks, flooding an estimated 3,500 homes and forcing the evacuation of more than 5,500 people.
- **February 10, 2010:** For the second time within one week a major winter storm affected New Jersey. Blizzard conditions occurred at times across the extreme southern part of the state during the afternoon and early evening of February 10. Snowfall averaged 7 to 15 inches across northwest New Jersey, 12 to 20 inches across central New Jersey, and 6 to 12 inches across the southern third of New Jersey. Ice accretions were less than one tenth of an inch. Two storm-related deaths occurred in Burlington and Middlesex counties.
- **March 13 to 21, 2010:** Four days of rain culminated in major flooding in the Passaic and Raritan basins and flooding throughout New Jersey. Storm totals averaged between 2.5 to 6 inches, with the highest amounts in the Raritan and Passaic River basins. It was the worst flooding in the Raritan Basin since April 2007 and the worst flooding in the Passaic Basin since April 1984. Over 1,000 people were evacuated in Morris and Somerset counties. In Morris County, about 1,300 homes and businesses were damaged. New Jersey Governor Chris Christie declared a state of emergency on March 14. The flooding cause over \$81 million in property damage.
- **March 7 to 12, 2011:** A slow moving, low pressure, cold front brought between 1.5 and 4 inches of rain across northern New Jersey from the early morning on March 6 into the early morning of March 7. Melting snow contributed to the runoff. In eastern Morris County, sections of the Pompton and Passaic rivers were still above flood stage when another heavy rain event occurred from the early morning on March 10 into the morning on March 11. An additional 2 to 5 inches of rain fell and caused major flooding on both rivers. Governor Chris Christie declared a state of emergency before the start of the second round of heavy rain on March 9. Throughout the state, 683 homes were affected by both flooding events and 207 homes suffered at least major damage. About 1,500 people were evacuated and 2,000 residents were affected by the flood waters. The flooding caused over \$11 million in property damage.

- **April 16 to 17, 2011:** The strong southeast onshore flow on April 16, combined with the high tides associated with the full moon, produced minor to moderate tidal flooding along the New Jersey coast and moderate to severe flooding of the Delaware Bay in Cape May and Cumberland counties. Tidal flooding departures increased farther up both Delaware and Raritan Bays. In addition, the funneling effect of southeast winds up the Delaware Bay contributed to increasing tidal departures. The high tide at Reedy Point (New Castle County, Delaware) established an all-time record high. One injury was reported from this event. The flooding caused approximately \$2.75 million in property damage.
- **August 13 to 16, 2011:** A series of thunderstorms preceding a cold front brought 3 to 7 inches of rain across a wide portion of New Jersey (less along most of the coast) from overnight on August 13 into the day on August 14. In southern Gloucester, eastern Salem, and western Cumberland counties, rainfall amounts reached 7 to 11 inches. Scattered thunderstorms occurred on August 15 and into the morning of August 16. This slowed the recession of rivers and streams in the state. The combined event caused severe flash flooding with dam breaks in southwestern New Jersey and flash flooding and flooding across central and northern New Jersey. The flooding caused over \$50 million in property damage.
- **August 27 to 28, 2011:** Hurricane Irene moved made its second landfall as a tropical storm near Little Egg Inlet along the southeast New Jersey coast at around 5:35 a.m. On August 28, 2011 Irene brought tropical-storm force winds, destructive storm surge, and record-breaking freshwater inland flooding across northeast New Jersey that resulted in three deaths, thousands of mandatory, and voluntary evacuations along the coast and rivers from surge and freshwater flooding, and widespread power outages that lasted for up to two weeks. The storm surge of three to five feet caused moderate-to-severe tidal flooding along the ocean side and moderate tidal flooding in Delaware Bay and tidal sections of the Delaware River. Major flooding occurred on the Raritan, Millstone, Rockaway, and Passaic Rivers. Overall, Irene brought an average rainfall total of 7.03 inches with a maximum rainfall total of 9.85 inches in Cranford (Union County). Another source indicated a maximum rainfall total of 11.27 inches in Freehold. A maximum wind gust of 65 mph was reported in Cape May (Cape May County). A maximum storm surge of 4.63 feet was reported in Sandy Hook. Irene caused approximately \$1 billion in damages in New Jersey and seven deaths in the State.
- **September 7 to 10, 2011:** Remnants of Tropical Storm Lee brought three to eight inches of rain to many parts of New Jersey. The heavy rain caused flooding, mainly in west and northwest New Jersey. Most of the damage was reported along the Delaware River, where two homes were destroyed, 24 suffered major damage, 249 suffered minor damage, and 28 others were affected. Many roads were closed throughout the State because of flooding. Freshwater surge caused moderate tidal flooding along sections of the Delaware River. The State had approximately \$11.5 million in damage.
- **October 26 to November 8, 2012:** Superstorm Sandy was the costliest natural disaster by far in the State of New Jersey. Record-breaking high tides and wave action combined with sustained winds as high as 60 to 70 mph with wind gusts as high as 80 to 90 mph to batter the State. Statewide, Sandy caused an estimated \$29.4 billion in damage, destroyed or significantly damaged 30,000 homes and businesses, affected 42,000 additional structures, and was responsible directly or indirectly for 38 deaths. A new temporary inlet formed in Mantaloking (Ocean County) where some homes were swept away. About 2.4 million households in the State lost power. It would take two weeks for power to be fully restored to homes and businesses that were inhabitable.

Also devastated by the storm was New Jersey's shellfish hatcheries including approximately \$1 million of losses to buildings and equipment, and product losses in excess of \$10,000 at one location alone. Overall, average rainfall totals were 2.78 inches with a maximum rainfall of 10.29 inches at the Cape May (Cape May County) station. Another source indicated a maximum rainfall total of 12.71 inches in Stone Harbor (Cape May County). A maximum wind gust of 78 mph was reported in Robbins Reef. A maximum storm surge of 8.57 feet was reported in Sandy Hook. Tide gages in Atlantic City and Cape May measured storm surges of 5.82 feet and 5.16 feet, respectively.

Other areas experienced inundations along the coast due to the storm tide, ranging from two feet in Atlantic, Burlington, Cape May, Essex, and Bergen counties to nine feet in Monmouth and Middlesex counties. Superstorm Sandy caused approximately \$30 billion in damages in New Jersey and caused 12 deaths in the State.

NEW JERSEY'S HISTORIC FLOOD INFORMATION

Additional information regarding the history of flooding in New Jersey is available in "The New Jersey Weather Book" (Ludlum, 1983) and the National Oceanic and Atmospheric Administration's (NOAA's) Storm Events Database.



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Note: All references are available online unless otherwise noted. References that are only available as online resources are noted as “online resource.” Refer to Appendix B: Bibliography for web links.

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2 Floodplain Management

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Wide beaches and dunes stabilized with grasses can improve a community's flood resilience.

Floodplain Management

Floodplain management is a local program of corrective and preventative measures that strive to minimize losses from floods and protect natural resources. To protect life, property, and public investment, buildings and infrastructure located in floodplains are managed via a federal-state-local partnership among various agencies, most notably the Federal Emergency Management Agency (FEMA), the U.S. Army Corps of Engineers (USACE), the New Jersey Office of Emergency Management (NJOEM), the New Jersey Department of Environmental Protection (NJDEP), and the local jurisdiction's floodplain administrator. Floodplain regulations affect and influence the treatment of all properties in the floodplain; as a result, it is vital that local preservation planners and others concerned about flood-prone historic buildings understand how floodplain management works.

Municipal floodplain administrators (sometimes referred to as "floodplain managers") typically regulate development in high risk areas through floodplain ordinances, which must meet certain minimum standards to be approved by the state and FEMA. Adoption of an approved floodplain ordinance allows that municipality to participate in the National Flood Insurance Program (NFIP), making insured properties eligible to receive federal funding following a flood event. The State NFIP Coordinator at NJDEP can verify a local government's participation in the NFIP and provide contact information for the local floodplain administrator.

A. NATIONAL FLOOD INSURANCE PROGRAM

Established in 1968, the National Flood Insurance Program (NFIP) offers repair assistance for flood-damaged properties; provides maps of floodplain areas, delineating zones of risk; and makes flood insurance available to property owners. The intent of the NFIP was to:

- Allow property owners to purchase flood insurance from the Federal government where private insurance was unavailable or cost prohibitive;
- Provide a national insurance funding pool to distribute the risk across a larger geographic area, thus reducing premium costs; and
- Provide incentives for flood risk management, thus reducing the overall costs of flooding.

In many ways, flood insurance works like other types of insurance. In exchange for the payment of a premium, the insurance provider guarantees compensation or partial compensation for a covered loss. The cost of premiums varies with risk; for example, less flood-prone properties will have lower premiums than those in more vulnerable locations. With flood insurance, a property owner is eligible to receive funds for recovery following a flood event. Flood insurance typically covers damage to both the property (i.e., buildings) and contents (i.e., furnishings, objects).

To avoid penalizing property owners whose properties were constructed before the adoption of a community's Flood Insurance Rate Map (FIRM) and floodplain ordinance, these properties (known as pre-FIRM structures) were grandfathered into the insurance premiums at a lower rate despite their risk of damage by flood. (*Refer to Pre-Firm Structures sidebar, at right, and Flood Insurance Rate Maps, page 2-5.*) This contributed to a situation where, over time, claims greatly exceeded premiums, requiring the Federal government to borrow money with interest to be able to pay claims. This ran contrary to Congress's intent that the NFIP be self-supporting (e.g., the funds from the premiums should cover the costs associated with claims from flood events) and had the unintended effect of the federal government subsidizing property owners living in high risk areas. As a result, Congress passed the Biggert–Waters Flood Insurance Reform Act of 2012 and the Homeowners Flood Insurance Affordability Act of 2014 to gradually increase premiums for higher-risk properties, including many historic buildings defined as “pre-FIRM structures.” These laws allow NFIP premiums to more accurately reflect the real risk of flooding and loss, while making it more expensive to insure properties which were previously effectively subsidized.

NFIP insurance is currently available to almost all owners of eligible residential and commercial properties throughout the entire state, regardless of the property's flood risk. ***Flood insurance is required for some properties, such as mortgaged properties located within high-risk areas, but it should be considered by owners of all properties at risk for flooding. In cases where flood insurance is not required, each***



Buildings constructed prior to the issuance of Flood Insurance Rate Maps are referred to as pre-FIRM and are often vulnerable to flood damage if located within the Special Flood Hazard Area (SFHA).

PRE-FIRM STRUCTURES

Buildings constructed or substantially improved prior to the community's initial FIRM are called “pre-FIRM structures” and were likely not built to avoid or reduce flood damage. Buildings constructed or substantially improved after the community's initial FIRM should have been constructed in compliance with the municipal floodplain ordinance. Most historic buildings are pre-FIRM structures.

FLOODSMART

FloodSmart, administered by FEMA, is the official website of the National Flood Insurance Program (NFIP). It is a valuable resource for property owners and includes information regarding flood risk, flood insurance, and reducing flood risk. ([https://www.floodsmart.gov/.](https://www.floodsmart.gov/))

NJ COMMUNITIES NOT PARTICIPATING IN THE NATIONAL FLOOD PROGRAM

As of October 19, 2019, the following non-participating communities are ineligible to purchase flood insurance through the National Flood Insurance Program:

Bergen County

- Borough of Alpine

Burlington County

- Borough of Fieldsboro

Camden County

- Borough of Audubon Park
- Borough of Hi-Nella

Gloucester County

- Borough of Newfield
 - FEMA, *Community Status Book Report: New Jersey*

property owner must assess their property's level of risk and their ability to financially recover from a flood event when considering forgoing coverage. In the event of a flood, any flood-related damage not covered by insurance is largely the responsibility of the owner.

The federal government provides financial assistance only in the event of a Presidential Disaster Declaration. However, most incidents of flooding do not warrant the declaration, in which case the property owner would be financially responsible for necessary repairs through flood insurance or other means. (Refer to Chapter 6, *Recovery: Hazard Mitigation for Historic Resources, and Funding for Recovery, page 6-8.*)

The following federal funding is available following a Presidential Disaster Declaration:

- **Individuals and Households Program (IHP):** Administered by FEMA, IHP provides financial and direct services to eligible individuals and households affected by a disaster who have uninsured or under insured necessary expenses and serious needs. In 2018, the IHP program grant limit was increased to \$34,900. (www.fema.gov.)
- **U.S. Small Business Administration (SBA):** The SBA makes long-term, low-interest loans for both residential and commercial use through its Disaster Loan Assistance program to address both physical and economic damage from a declared disaster.
- **U.S. Department of Housing and Urban Development (HUD):** HUD can provide funding through its Community Development Block Grant Disaster Recovery (CDBG-DR) Program. To be eligible for funding, the proposed project must be a CDBG eligible activity and meet a CDBG national objective. (www.hudexchange.info/programs/cdbg-dr/.)

Unfortunately, alterations required to protect a property from flooding (e.g., elevation, or raising the property on a new, higher foundation) and to achieve lower insurance premiums are frequently at odds with best practices for preservation. (Refer to *Building Elevation, page 9-4.*) Alterations can jeopardize the historic character and integrity of a building, property, and setting. For instance, elevation changes the appearance of a building and its relationship to its setting, while replacing plaster with tile or other water-resistant finishes changes the character of an interior space. FEMA has attempted to address this tension by providing flexibility for historic properties in meeting floodplain regulations. (Refer to *Floodplain Regulations & Ordinances, page 2-6.* To consider specific options for reducing flood vulnerability at historic properties, refer to *Identify, Evaluate & Prioritize Mitigation Options for Historic Properties, page 4-24, and Chapter 7, Mitigation: Hazard Mitigation for Historic Resources.*)





The pale blue dots on this Flood Insurance Rate Map of Hoboken, NJ indicate the Special Flood Hazard Areas (SFHAs). The SFHA (also known as the 1% annual chance flood, 100-year flood, and base flood zone), has historically been subject to a 1% chance of flooding during any given year. In this case, the SFHA is defined as Zone AE, in which the base flood elevations are determined. The areas with the black dots represents areas of historically 0.2% annual chance flood (also known as the 500-year flood zone). Areas without dots have been determined to be outside of the historically 0.2% annual chance floodplain. It is important to highlight that these categories do not include future conditions due to climate change or other factors. (Map obtained through FEMA's Map Service Center, <https://msc.fema.gov/portal/home>.)

“100-YEAR FLOODPLAIN”

The term “100-year floodplain” implies, inaccurately, that a flood is likely to occur only once in a 100-year period. (Likewise, “500-year floodplain” implies one flood every 500 years.) What “100-year floodplain” actually means is that the area within that boundary has a 1% chance or 1-in-100 chance of flooding in any given year: therefore the 100-year floodplain is also referred to as the 1% annual chance floodplain. In fact, properties could experience a “100-year flood” in two consecutive years, just as it is possible for properties located in minimal flood hazard areas to flood, particularly in a severe weather event such as a hurricane.

For these reasons, and because FIRMs do not include climate change projections, it is recommended that local planners and preservation advocates use “1% annual chance floodplain” or “Special Flood Hazard Area” (SFHA) and that they account for climate change projections in any evaluation of flood vulnerability. However, they should be prepared to explain the term “100-year floodplain,” particularly in public outreach. (Refer to *Establish a Planning Timeframe*, page 4-13.)

B. FLOOD INSURANCE RATE MAPS

FEMA develops and publishes maps, called Flood Insurance Rate Maps (FIRMs), which show the horizontal and vertical extent of the floodplain. FIRMs serve as the basis for floodplain regulation and management, as well as for determining flood insurance premiums. In the FIRMs, FEMA delineates three main areas to graphically depict flood risk: Special Flood Hazard Area (SFHA), which refers to the area predicted to have a 1% chance of flooding each year; the 0.2% annual chance floodplain; and minimal flood hazard areas outside the floodplain. Properties located within the SFHA are considered high risk, while properties at an elevation higher than the 0.2% annual floodplain fall within minimal flood hazard areas and, consequently, have lower insurance premiums. *Because FIRMs are based on modelling past storm events and/or present conditions, they do not address future threats such as sea level rise.* To best plan for properties threatened by flooding, this Guide recommends that floodplain administrators and planners conduct additional analyses to accommodate climate projections and address future flood risks. (Refer to *Establish a Planning Timeframe*, page 4-13.)

The SFHA includes two different flood zones on the FIRMs: A Zones and V Zones. The difference between the two zones is that V Zones are subject to storm-induced velocity wave action (for example, a beach house that could be inundated in a storm), while A Zones are not. Therefore, buildings in V Zones must meet more stringent standards because of the forces they must withstand. Understanding the different requirements for each flood zone can be confusing; it is therefore recommended that planners meet with the local floodplain administrator prior to developing projects or plans to see how the floodplain ordinance may affect the project.

FIRMs also depict the computed elevation to which floodwater is expected to rise during the 1% annual chance flood event (also known as the base flood). This height, *the Base Flood Elevation (BFE), is the regulatory requirement for the elevation or floodproofing of structures.* VE Zones (depicted on older FIRMs as V1-30), and AE (depicted on older FIRMs as A1-30) both have BFEs delineated on the FIRMs. These elevations are determined by detailed hydraulic analyses based on flood models and information from past storm events.

FEMA maintains the regulatory FIRMs, which are available from the local floodplain administrator and online through FEMA’s Map Service Center. *Rutgers University’s New Jersey Flood Mapper is an interactive, user-friendly, GIS-based mapping program that combines sea level rise with tides and storm surge data to create a “Total Water Level” provides information to local communities to inform planning and decision making.* ([http://njfloodmapper.org/.](http://njfloodmapper.org/)) To provide a fuller picture of flood vulnerability, the mapping platform includes:

- FEMA’s Preliminary Flood Insurance Rate Maps (FIRMs);
- High resolution of land surface elevations;
- Coastal evacuation routes;
- State and municipal infrastructure; and

- Social and economic demographic information.

When combined with a GIS layer identifying the locations of historic resources, preservation planners and advocates can serve as a useful tool for understanding which historic properties fall in within the regulated floodplains.

C. FLOODPLAIN REGULATIONS & ORDINANCES

To participate in the NFIP and allow property owners to take advantage of federal flood insurance, a municipality must adopt and enforce a floodplain management ordinance which restricts new construction and improvements to existing construction in the SFHA. (Refer to Flood Insurance Rate Maps, page 2-5.) Although FEMA develops the FIRMs, which identify areas vulnerable to flooding, and offers information and strategies for floodplain management, much of the responsibility for floodplain management occurs at the municipal level, with standards, assistance, and guidance from state and federal governments. *(Refer to Community Rating System, page 2-13, and Participate in the Community Rating System, page 3-16.)*

The New Jersey Department of Environmental Protection (NJDEP) establishes state standards and works with local communities to regulate construction in flood-prone areas through zoning, planning, and building codes. Although all development projects within the SFHA must be reviewed for permitting at the local level, some projects also require state and potentially federal approval, especially regarding construction permits in state waterways, activities near non-tidal wetlands, and activities that may change tidal wetland boundaries. NJDEP helps communities conduct outreach related to floodplain management and flood insurance, quantify the risk of flooding, and identify mitigation actions to reduce the community's vulnerability to flood hazards. Many of these activities take place as part of the hazard mitigation planning process. *(Refer to Chapter 4, Planning: Hazard Mitigation for Historic Resources.)*

The Bureau of Flood Control through the NJDEP also has developed a series of Model Flood Damage Prevention Ordinances, which integrates NFIP and state permitting requirements and contains additional provisions and suggestions that are more stringent than the federal regulations. (<https://www.nj.gov/dep/floodcontrol/modelord.htm>.) Each community in New Jersey can select the model ordinance that best suits its conditions and adopt more stringent requirements to both improve its resilience and potentially achieve an insurance premium discount for property owners through the Community Rating System (CRS). *(Refer to Community Rating System, page 2-13.)* The municipal floodplain ordinance is codified in different places: for example, as its own article in the jurisdiction's code or under another article in the code, such as planning and zoning.

The local floodplain administrator ensures compliance with the floodplain ordinance; conducts outreach and education regarding the requirements of the NFIP and the municipality's floodplain regulations; reviews, approves,

or denies updates to the community's FIRM; issues permits; participates in hazard mitigation planning activities; manages mitigation activities to protect vulnerable resources; and manages activities related to participation in the CRS. (Refer to Community Rating System, page 2-13.) It is important for preservation planners and others interested in flood-prone historic properties to understand their local floodplain regulation and how it might impact historic properties.



If a property is historically designated, the applicability of municipal floodplain ordinances will vary. (Photograph courtesy of the NJ HPO.)

C.1 LOCAL FLOODPLAIN ORDINANCES & HISTORIC PROPERTIES

Floodplain management ordinances focus on the protection of property. With regard to historic resources, floodplain management ordinances typically err on the side of preservation rather than flood protection in their treatment of historic properties. Some jurisdictions adopt more restrictive floodplain ordinances to account for changes in local conditions (for example, more frequent nuisance flooding), to improve resiliency to flood events, or to lower insurance premiums for property owners. (Refer to Community Rating System, page 2-13, and Participate in the Community Rating System, page 3-16.)

Both NFIP's and New Jersey's model ordinances require existing buildings to meet the ordinance's flood protection standards. The requirement to comply with the ordinance is triggered when the municipal floodplain administrator determines, via the permitting process, that a proposed alteration to a building is a "Substantial Improvement" or that the proposed alterations to repair a building to its pre-damage condition indicate that the building has been "substantially damaged." (NJDEP, 2019.) Compliance means that buildings determined to be "substantially improved" or "substantially damaged" must be protected against flooding up to the Base Flood Elevation (BFE) plus any additional height (or "freeboard") required by the local floodplain ordinance. (The total height of the BFE plus freeboard is often referred to as the Design Flood Elevation (DFE) in municipal ordinances.)

When referring to historic properties, the NFIP and state model floodplain ordinances use FEMA's definition of "historic structure," which is not equivalent to definitions used by the National Park Service or the New Jersey Historic Preservation Office (NJ HPO) to describe historic and cultural properties (based on, but not limited to, the criteria for listing in the National Register of Historic Places). **In New Jersey, municipalities may set their own criteria defining what properties are or are not "historic" as part of floodplain regulations. This means that properties designated "historic" under municipal historic preservation ordinances may or may not qualify for special treatment under local floodplain ordinances** unless the property is located in a municipality that is a Certified Local Government under the Certified Local Government Program (CLG), jointly administered by the National Park Service and the NJ HPO.

NATIONAL FLOOD INSURANCE PROGRAM REGULATIONS (NFIP) & NEW JERSEY MODEL FLOOD DAMAGE PREVENTION ORDINANCE (NJFDPO)

The language defining regulatory requirements for historic properties is the same under the NFIP and New Jersey's Model Flood Damage Prevention Ordinances, with the exception of the definition of "Substantial Improvement," which is more restrictive in the New Jersey Model Ordinance. (*Emphasis added below. Refer to Appendix A: Glossary.*)

"Historic Structure" means any structure that is:

- (a) Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
- (b) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
- (c) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior; or
- (d) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:
 - (1) By an approved state program as determined by the Secretary of the Interior or
 - (2) Directly by the Secretary of the Interior in states without approved programs.

NFIP:

"Substantial Improvement" means any reconstruction, rehabilitation, addition, or other improvement of a structure, *the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage," regardless of the actual repair work performed.* The term does not, however, include either:

- (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or
- (2) Any alteration of a "historic structure," provided that the alteration will not preclude the structure's continued designation as a "historic structure."

NJFDPO:

"Substantial Improvement." Any reconstruction, rehabilitation, addition, or other improvement of a structure *during a 10-year period the cost of which equals or exceeds fifty (50) percent of the market value of the structure before the "start of construction" of the improvement. Substantial improvement also means "cumulative substantial improvement." This term includes structures which have incurred "substantial damage," regardless of the actual repair work performed or "repetitive loss."* The term does not, however, include either:

- (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or
- (2) Any alteration of a "historic structure," provided that the alteration will not preclude the structure's continued designation as a "historic structure."

Variations and Exceptions. ...Variations may be issued for the repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.

On its face, “historic structure” designation may appear to be a benefit in that it does not mandate compliance with flood-related building regulations, thus limiting potential change and providing greater protection of the property’s historic integrity. However, not requiring compliance:

- Leaves buildings vulnerable to flooding and damage;
- Does not relieve property owners from obtaining flood insurance if otherwise required; and
- May foster a false belief that the flood risk is somehow reduced or eliminated.

Without guidance for how to reduce a property’s vulnerability to flooding, “historic structure” designation may also place property owners who seek to reduce risk or lower their flood insurance premiums at odds with local historic preservation commissions, which strive to limit alterations to historic properties that are not otherwise mandated.

The passage of the federal Homeowners Flood Insurance Affordability Act (FEMA, 2014), which allows for flood insurance premiums to increase to meet the actuarial rate for a property, may provide an impetus for property owners to alter historic structures to avoid rising flood insurance premiums, regardless of whether the changes to the properties affect their continued designation as historic. This Act, in effect, promotes property protection over historic integrity. This shift towards mitigating historic structures conflicts with the prevailing direction of floodplain regulations, which emphasize historic integrity over flood protection.

NFIP DEFINITIONS

Repetitive Loss Property: An NFIP-insured structure that has had at least 2 paid flood losses of more than \$1,000 each in any 10-year period since 1978.

Severe Repetitive Loss Property: Any building that:

1. Is covered under a Standard Flood Insurance Policy made available under this title;
2. Has incurred flood damage for which:
 - a. 4 or more separate claim payments have been made under a Standard Flood Insurance Policy issued pursuant to this title, with the amount of each such claim exceeding \$5,000, and with the cumulative amount of such claims payments exceeding \$20,000; or
 - b. At least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss.

C.2 REPETITIVE LOSS & SEVERE REPETITIVE LOSS PROPERTIES

A history of flood loss likely indicates a building has a higher flood risk. FEMA tracks flood insurance policies and claims through a central database, using this data to identify properties that experience frequent or profoundly damaging flooding. These properties fall under two definitions established by the NFIP: “repetitive loss property” or “severe repetitive loss property.” (Refer to *NFIP Definitions sidebar, at left.*)

Properties that fit the repetitive loss or severe repetitive loss definitions are the greatest burden to the NFIP; those few properties comprise roughly one quarter of all NFIP payments since the inception of the program in 1978. State and local hazard mitigation plans, therefore, often prioritize repetitive loss and severe repetitive loss properties for mitigation, usually in the form of elevation or acquisition and demolition. However, the database only tracks insured properties (or properties that were at one time insured) where owners have submitted and been paid a flood insurance claim for building and/or contents damaged by flooding; this means that uninsured properties or properties without claims that experience routine flooding may not appear in



FEMA's database. The municipal floodplain administrator should have a list of repetitive loss and severe repetitive loss properties in the community.

Properties are identified as repetitive loss and severe repetitive loss regardless of whether they meet the regulatory definition of "historic structure" in the municipality's floodplain ordinance.

Although "historic structures" may not be required to comply with floodplain regulations, if a historic structure is also a repetitive loss or severe repetitive loss property, the local floodplain administrator may still decide to pursue mitigation. Repetitive loss properties are usually targeted for elevation or floodproofing, which reduce risk but can negatively affect a historic property's integrity and continued federal or local designation. Acquisition by a government agency and demolition are other typical mitigation actions for severe repetitive loss properties with similarly negative impacts on historic properties. (Refer to Blue Acres Floodplain Acquisition Program sidebar, at right)

If funded in part or in whole with state or federal dollars, a flood mitigation project will trigger historic preservation project review. (Refer to Historic Property Project Review sidebar, page 3-19.) However, flood protection, rather than preservation, is likely to prevail. In these cases, where protection and not preservation is emphasized, local preservation planners should review the list of repetitive loss and severe repetitive loss properties in the municipality to determine:

- Whether any buildings meet the local floodplain ordinance's definition of "historic structure;"
- Whether any of the properties are locally recognized as historic, but do not meet the local floodplain ordinance's definition of "historic structure;" and
- Whether there may be buildings 50 years of age or older which have not been studied to assess their architectural or historical importance.

Ideally, preservation planners will work with floodplain administrators to develop flood mitigation projects that will provide the best outcome in terms of protection and preservation for these properties. Where compromise is not possible, preservation planners should offer options to offset the detrimental effect that flood mitigation will have on the historic property (e.g., architectural and historical investigation or documentation and/or local designation of similar properties within a local jurisdiction). (Refer to Historic & Cultural Resource Documentation, page 10-6.)

BLUE ACRES FLOODPLAIN ACQUISITION PROGRAM

The Blue Acres program, as administered by the New Jersey Department of Environmental Protection (NJDEP), provides funding for acquisition of lands in the floodways of the Delaware River, Passaic River, or Raritan River, and their respective tributaries, for recreation and conservation purposes. Buildings and properties eligible for acquisition have been damaged by, or may be prone to incurring damage caused by, storms or storm-related flooding, or that may buffer or protect other lands from such damage. (https://www.nj.gov/dep/greenacres/blue_flood_ac.html)

D. EVALUATING A PROPERTY'S FLOOD RISK

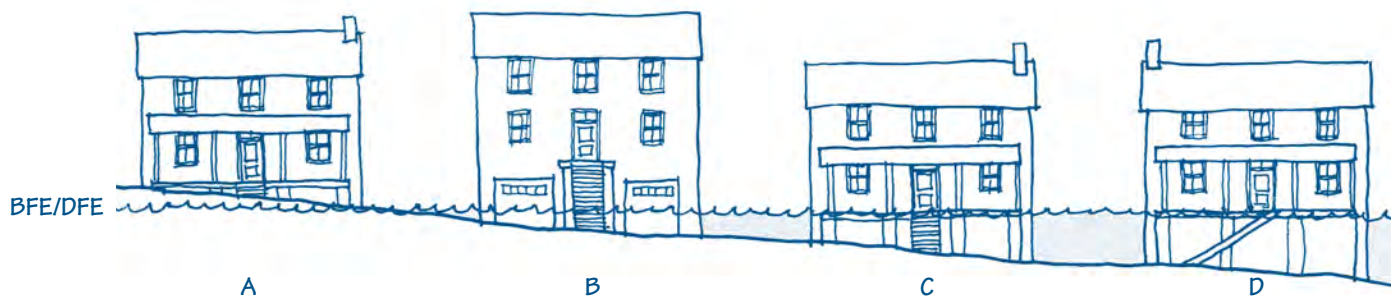
The most accurate way to evaluate flood risk is to have a licensed land surveyor, registered professional engineer, or registered architect prepare an Elevation Certificate for an individual property. **An Elevation Certificate is an NFIP form used to provide elevation information (e.g., the height of the building's lowest floor in relation to the Base Flood Elevation (BFE) and other measurements related to the flood risk) to ensure compliance with floodplain regulations and to aid in determining the insurance rate for a specific property.** For a building whose lowest floor is below the BFE, the Elevation Certificate will determine the height to which the building must be protected or elevated to mitigate that property's flood risk and comply with floodplain regulations. Municipalities may require preparation of Elevation Certificates as part of their permitting process; these certificates are kept on file by the local floodplain administrator. There are two important factors to consider when determining flood risk: a building's horizontal and vertical location.

D.1 HORIZONTAL & VERTICAL LOCATION WITHIN THE FLOODPLAIN

Different areas of flood risk are depicted on the FIRMs. In the SFHA, flood zones (AE, A1-30, VE, and V1-30) also depict the BFE, the height to which floodwater is expected to rise during



Flood vulnerability is largely based upon a building's location. A house at the bottom of a hill will be more vulnerable than a similar one at the top of the hill.



House A is above the BFE/DFE and elevation is not required, although it may be prudent to abandon the basement. Houses C and D were elevated to the BFE/DFE with the increased elevation of D requiring reorientation of the stair. House B was elevated well above the BFE/DFE to allow for parking at the ground level and both the front porch and chimney were eliminated, significantly impacting the historic integrity.

a 1% annual chance flood event. A building's vertical location in the floodplain is determined by comparing the height of the building's lowest occupied floor to the BFE. (Refer to *Location Definitions sidebar, at right.*) For the purposes of this evaluation, the "lowest occupied floor" means the lowest floor that contains areas useable by the occupants (including a basement recreational room) or contains building systems, such as heaters and electric meters (including crawlspaces). In cases where there is no basement, the lowest floor may be a building's first floor (e.g. slab-on-grade). If a property's basement falls below the BFE, that property might have a higher flood risk, even if it lies outside the SFHA, particularly from groundwater or through water entry into window and door openings close to or below grade. Conversely, where the lowest floor of a property within a SFHA is raised above the BFE, the risk of damage to property and contents is reduced, potentially resulting in lower insurance premiums.

Some communities, particularly those that experience regular and severe flooding or which seek to lower premiums for greater numbers of property owners, can impose more stringent requirements by establishing a Design Flood Elevation (DFE), a height generally one to two feet above the BFE. (Refer to *Community Rating System, page 2-13, and Participate in the Community Rating System, page 3-16.*) This extra height requirement is called "freeboard." In New Jersey, municipalities often differ in their floodplain ordinances as to the amount of freeboard they adopt. A few have no freeboard requirement, while most require one to two feet of freeboard, and Sea Isle City has a freeboard requirement of up to six feet. (Refer to *Sea Isle City - Community Rating System, page 2-15.*) **Freeboard requirements can help protect properties from increased flooding in the future due to factors such as climate change, which is otherwise not a required consideration.**

LOCATION DEFINITIONS

Base Flood Elevation: The Base Flood Elevation (BFE) represents the height that water is expected to reach or exceed during the 1% annual chance (100-year) flood event. The BFE is measured at the lowest floor of a structure, including the basement.

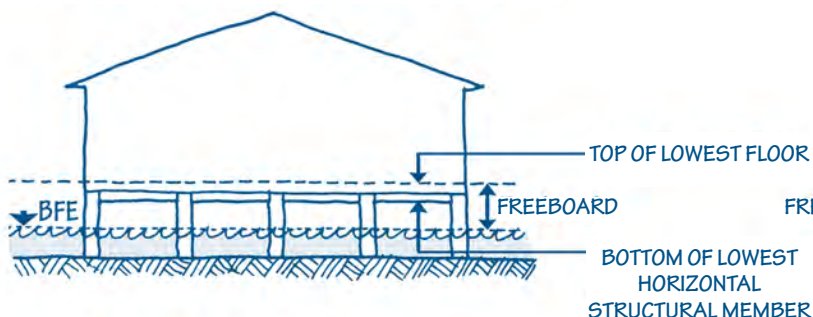
Freeboard: An additional amount of height above the Base Flood Elevation (BFE) used as a factor of safety (e.g., 2 feet above the Base Flood) in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with state or community floodplain management regulations.

Design Flood Elevation: (DFE) Regulatory flood elevation adopted by a local community. If the community regulates to minimum NFIP requirements, the DFE is the BFE. Typically, the DFE is the BFE plus any freeboard adopted by the community.

Lowest Floor: This is defined as the vertical location of the top of the lowest floor of the structure (in "A" type Zone) or the bottom of the lowest horizontal structural member (in "V" type Zones and recommended for Coastal A Zones) in relation to the Base Flood Elevation (BFE) and of building servicing systems in relation to the BFE.

A ZONES IN COASTAL AREAS:

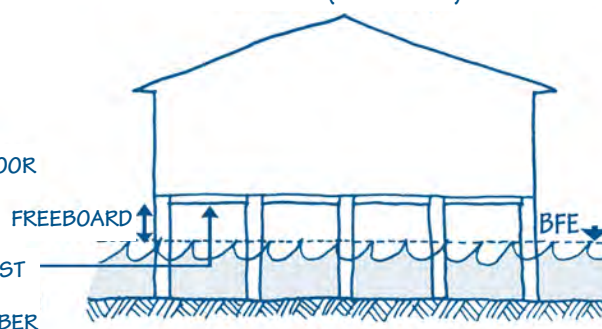
SUBJECT TO BREAKING WAVES AND EROSION DURING THE BASE FLOOD LOWEST HORIZONTAL MEMBER ABOVE BFE



A ZONE BUILDING (OPEN FOUNDATION)

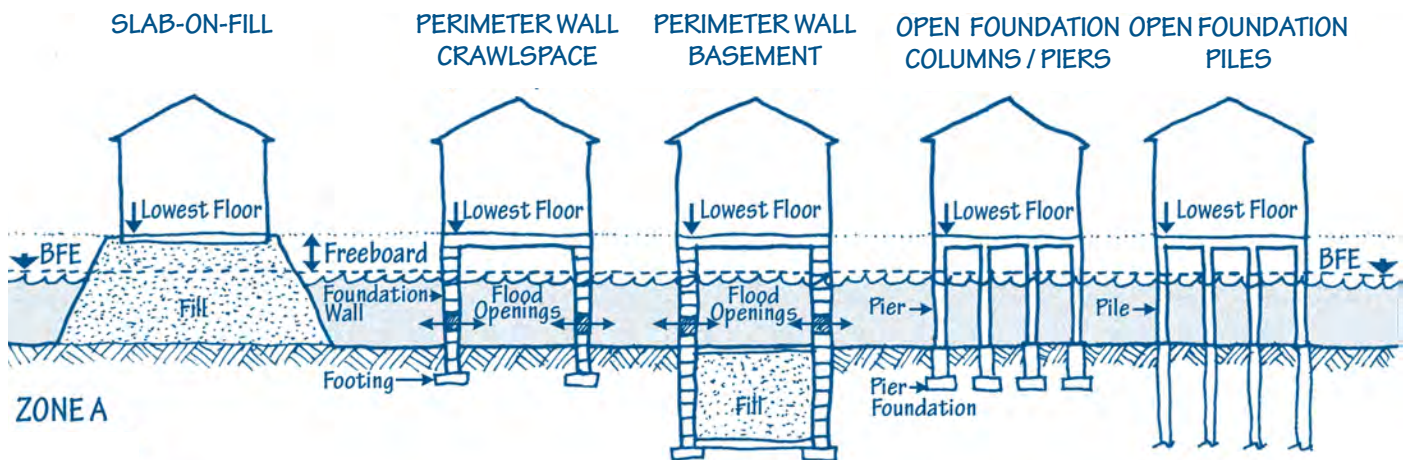
V ZONES:

BOTTOM OF LOWEST HORIZONTAL MEMBER ABOVE BFE (FREEBOARD)



V ZONE BUILDING (OPEN FOUNDATION)

NFIP minimum elevation requirements: A Zones – elevate top of lowest floor to or above BFE; V Zones – elevate bottom of lowest horizontal structural member to or above BFE. In both V Zones and A Zones, many people have decided to elevate a full story to provide below-building parking, far exceeding the elevation requirement. See FEMA Technical Fact Sheet No. 1.2, *Summary of Coastal Construction Requirements and Recommendations*, for more information about NFIP minimum requirements in A Zones and V Zones. (Refer to https://www.fema.gov/media-library-data/20130726-1537-20490-0596/fema499_1_2.pdf. Base diagram obtained at FEMA.gov.)



Examples of NFIP-compliant homes in Zone A where the top of the lowest floor is located above the BFE. (Base diagram obtained from FEMA.)

D.2 BUILDING FOUNDATION TYPE

Properties located within a FIRM's V Zones should be constructed on foundations of piers, posts, or piles set deep enough to resist the effects of scour and erosion and strong enough to withstand the forces from waves, currents, flood loads, and flood-borne debris. (Refer to *Flood Insurance Rate Maps*, page 2-5.) New basements are prohibited in V Zones but may be present in pre-FIRM structures.

In A Zones, buildings should be constructed on crawlspaces or continuous foundation walls with openings that allow floodwaters to enter and exit without restriction. (Refer to *Wet Floodproofing*, page 9-6.)

It is recommended that buildings in Coastal A Zones also be constructed to the same requirements as buildings in V Zones, since buildings in Coastal A Zones are also subject to breaking waves, scour, and erosion. (Refer to *companion Elevation Design Guidelines for Historic Properties*.)

E. COMMUNITY RATING SYSTEM

Just as flood insurance rates can be reduced by lowering the risk of flood damage at individual properties, rates can also be dramatically reduced for municipalities participating in the NFIP's Community Rating System (CRS). **The CRS is a voluntary incentive program that recognizes and encourages community floodplain management efforts that exceed the minimum NFIP requirements.** The CRS uses a rating system from Class 9 to Class 1, with Class 9 being the lowest rated classification and Class 1 being the highest rated classification. Flood insurance premiums in SFHAs can be reduced by up to 45% for Class 1 communities (the highest rating in CRS) down to 5% for Class 9 communities. The reduction in flood insurance is commensurate with the actions, policy, and other steps the community has taken to reduce their potential for damage from flooding.

The goals of the CRS are to:

- Reduce property flood damage;
- Reinforce and support the insurance aspects of the NFIP; and
- Promote a community-wide, comprehensive approach to floodplain management.

Communities generally enter the CRS as a Class 8 or 9. In the CRS program, communities earn credits for taking specific initiatives that exceed the minimum requirements of the NFIP. For every 500 credits, flood insurance rates in a SFHA can be reduced by 5%. Examples of how communities can earn credits under the CRS include:

- Providing public information regarding flood hazards, flood insurance, and reduced flood damage;
- Mapping flood-prone areas and instituting regulations that limit new development in those areas;
- Reducing flood damage and flood risk at existing developments; and
- Providing flood preparedness through flood warning and levee and dam safety projects.

Participation in the CRS will generally improve the ability of a community and its property owners to recover from flooding. As indicated above, communities can increase their CRS classification by requiring a reduction in flood risk at existing developments. **Although large-scale flood mitigation options can be considered, achieving the best classification will likely require the modification of individual properties. For historic properties, this could require more extreme alterations and impact the historic integrity of existing buildings and their settings.** Examples of more extreme compliance which would affect historic structures include:

- Requiring higher Design Flood Elevations (DFEs);
- Sealing lower window and door openings; and/or
- Eliminating residential use of lower building levels.

Although the CRS provides improved flood resilience and discounted flood insurance rates, each community will need to evaluate options in terms of implementation, feasibility, cost/benefit (in losses avoided), and financial savings in insurance premiums. Some communities adopt higher floodplain regulations for historic properties than the NFIP or the state require.

In many cases, the physical alterations required at some historic properties to meet the goals of CRS compliance may negatively impact their historic integrity. Historic preservation planners should work with the floodplain administrator in the CRS application process to seek a balance between protection and preservation. If the affected properties are locally designated, proposed mitigations may need to be coordinated with the local historic preservation commission (HPC). Similarly, if the property has received or anticipates receiving funding or permits from state or federal governments, it is best to contact the NJ HPO prior to undertaking any work to verify review requirements. (Refer to *Historic Property Project Review sidebar, page 3-19, and Sea Isle City - Community Rating System, page 2-15.*)

NJ COMMUNITY RATING SYSTEM

Effective May 1, 2019, 97 of 567 (17%) New Jersey communities were determined to be eligible to participate in the Community Rating System (CRS). Of those, the following 20 communities have achieved Class 5 status in the NFIP's CRS, making properties located within the SFHAs eligible for a 25% discount on flood insurance:

- Borough of Avalon
- Township of Barnegat Bay
- Borough of Beach Haven
- City of Brigantine
- Township of Egg Harbor
- Borough of Lincoln Park
- Township of Long Beach
- Borough of Longport
- Borough of Manasquan
- Borough of Mantoloking
- Margate City
- Ocean City
- Township of Pequannock
- Borough of Pompton Lakes
- City of Somers Point
- Borough of Spring Lake
- Borough of Stone Harbor
- Township of Upper
- City of Ventnor
- City of Wildwood

SEA ISLE CITY - COMMUNITY RATING SYSTEM

From being considered for suspension from the National Flood Insurance Program (NFIP) in 1993, Sea Isle City joined the Community Rating System (CRS) in 2000 with a Class 6 ranking, and today is a leader in floodplain management in the State of New Jersey, having achieved a Class 3 under the Community Rating System in 2018. The Class 3 ranking allows property owners located with the SFHA to receive a 35% discount on flood insurance premiums, and those low-risk properties located outside of the SFHA, a 10% discount. (<http://www.sea-isle-city.nj.us/>)

Improving the City's attitude towards flooding, flood prevention, and floodplain management required 100% support from the Mayor and the City Council. This included early efforts to bring all non-compliant structures in the City into compliance with the NFIP, without exception. To achieve their Class 3 rating, Sea Isle City adopted more stringent strategies than required for compliance with the NFIP. Some of those include:

Higher Regulatory Standards:

- No breakaway walls, latticework, or storage rooms are allowed in V Zones. Only parking and crawl space are permitted below a building.
- All entrances to a building (including foyers) have to be at or above the Base Flood Elevation (BFE).
- The Design Flood Elevation (DFE) is 11 feet in A zones and 14 feet in V zones—above the levels shown in the latest FEMA preliminary flood maps.
- A safety margin of freeboard is added to make new and rebuilt structures even better protected. The freeboard ranges from 3 feet to 6 feet above the Base Flood Elevation (BFE), depending on the map and zone.
- The new City Municipal Complex was built to the 500-year standard of 13 feet elevation plus an additional 5 feet for a total elevation of 18 feet.
- No fill is allowed in the A Zones or V Zones. No variances are issued for fill.
- Before a building in an A Zone changes hands, a certification must be issued that the foundation has appropriate venting. These openings in the foundation walls allow flood waters to enter the lower area, preventing the buildup of water pressure.
- “Substantial Improvement” considers the value of all improvements made within a ten-year period prior to a proposed project.

Open Space Requirements:

- The marshland and beaches surrounding the community are designated as open space. No construction is allowed.
- As they become available, the city is buying up A Zone lots, and adding them to the ongoing open space project.

Adoption of Planning Studies:

- The City adopted the “Watershed Management Area 16 Master Plan of the City of Sea Isle City” (2016) and the First Amendment (2017).
- The City adopted the “Floodplain Management Plan of the City of Sea Isle City” (2017).

The City's Flood Damage Prevention ordinance incorporates the potential of a variance for compliance for historic properties, although there are few properties in Sea Isle City that meet the designation criteria as a “historic structure.”



REFERENCES

Note: All references are available online unless otherwise noted. References that are only available as online resources are noted as “online resource.” Refer to Appendix B: Bibliography for web links.

44 C.F.R. § 59.1. *Definitions*, National Flood Insurance Program (NFIP) Regulations.

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Sea Isle City, New Jersey, *Floodplain Management* (2019), online resource.

3 Local Tools: Preservation & Flood Mitigation

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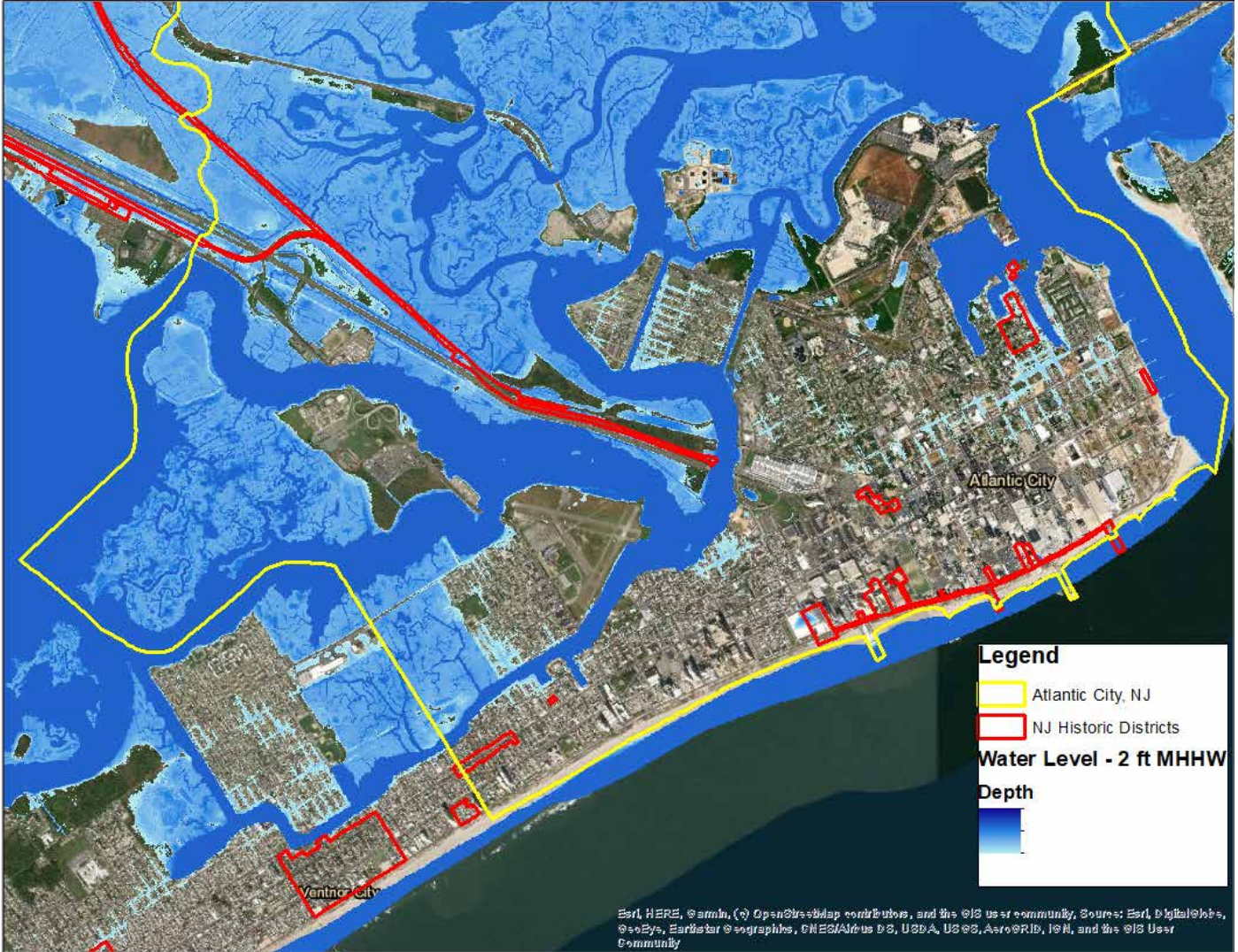
Aeroplane view of Asbury Park, N.J., c.1910. Pettit, H. M., Barton & Spooner Co., NY. (Image Courtesy of the Library of Congress.)

Local Tools: Preservation & Flood Mitigation

The level to which communities are impacted by flooding varies widely across New Jersey. Those who have experienced repeated flooding may be more likely to have a more robust hazard mitigation or floodplain management plan and dedicated resources addressing flooding. By contrast, those communities that have not experienced flooding or whose experience is limited to an extreme event, such as Superstorm Sandy, may not currently have dedicated resources to address flooding, but may be seeking to protect their historic commercial and residential properties to retain their unique sense of place.

Communities seeking to protect their historic properties from flooding should evaluate their current policies, programs, resources, information, and threats. This analysis will identify the community's starting point and guide in:

- Revealing deficiencies in current information, processes, and resources;
- Redirecting local funding and personnel resources towards the protection of historic resources;
- Raising awareness about the flood vulnerability of historic resources;
- Establishing parameters for planning including identifying the most appropriate type of plan as well as the potential funding and mitigation opportunities;
- Identifying potential partners who can assist in aspect of the work, such as the NJ HPO, who can prioritize data collection and provide guidance in local planning efforts; and



New Jersey Historic Districts Exposed at 2 ft Mean Higher High Water (MHHW) in Atlantic City, NJ. 2 ft of sea-level rise by 2050 above the year 2000 (1991-2009 average) baseline falls within the likely range of future projections under a moderate emissions scenario [0.9 – 2.1ft] (Kopp et al., 2019). 2 ft of sea-level rise by 2070 above the year 2000 (1991-2009 average) baseline falls within the likely range of future projections under a moderate emissions scenario [1.4 – 3.1 ft] (Kopp et al., 2019). There is a greater than 83% chance that 2 ft of sea-level rise occurs by 2100 above the year 2000 (1991-2009 average) baseline under a moderate emissions scenario [2.0 – 5.1ft] (Kopp et al., 2019). The current High-Tide Flood Threshold for Atlantic City, NJ is 1.8 ft MHHW (Sweet et al., 2018). Figures and images provided courtesy of Rutgers, The State University of New Jersey.

[See Kopp et al, 2019 – Appendix Table B2. Atlantic City, NJ High Tide Flood Days – Moderate-Emissions Scenario for corresponding projections of High-tide flood frequency.]

Sweet, W., Dusek, G., Obeyserka, J., & Marra, J. J. (2018). Patterns and Projections of High Tide Flooding Along the U.S. Coastline Using a Common Impact Threshold. Silver Spring, MD: National Oceanic and Atmospheric Administration. Available at: https://tidesandcurrents.noaa.gov/publications/techrpt86_PaP_of_HTFlooding.pdf.

Kopp, R.E., C. Andrews, A. Broccoli, A. Garner, D. Kreeger, R. Leichenko, N. Lin, C. Little, J.A. Miller, J.K. Miller, K.G. Miller, R. Moss, P. Orton, A. Parris, D. Robinson, W. Sweet, J. Walker, C.P. Weaver, K. White, M. Campo, M. Kaplan, J. Herb, and L. Auermuller. (2019). New Jersey’s Rising Seas and Changing Coastal Storms: Report of the 2019 Science and Technical Advisory Panel. Rutgers, The State University of New Jersey. Prepared for the New Jersey Department of Environmental Protection. Trenton, New Jersey. (Available at: <https://climatechange.rutgers.edu/resources/climate-change-and-new-jersey/nj-sea-level-rise-reports>.)

- Integrating historic preservation into the local emergency management process.

Some of the activities that can be completed by local governments include:

- Identifying historic properties within flood-prone areas;
- Addressing historic preservation and flood vulnerability in local planning efforts;
- Modifying the local zoning ordinance;
- Modifying the local building code requirements;
- Modifying the local floodplain regulations;
- Developing design guidelines for flood mitigation of historic properties;
- Developing incentives to encourage sensitive mitigation of historic properties;
- Participating in the Community Rating System;
- Encouraging property maintenance; and
- Planning for flood response and recovery tailored to the protection of historic properties.

A. IDENTIFY HISTORIC PROPERTIES WITHIN FLOOD-PRONE AREAS

As with any preservation planning activity, the identification of historic and/or locally significant properties is one of the first steps in the hazard mitigation planning process. In addition to enriching local knowledge, the process provides a valuable opportunity for the community to provide feedback and share knowledge about places that are important to them. Engaging the public in the effort may help to identify significant properties that meet the criteria for listing in the National Register of Historic Places or for local designation, or that are culturally valuable to the community, with or without designation. (*Refer to Engage the Public, page 4.11.*)

To accurately assess the impact of flooding on historic properties, it is necessary to develop baseline survey documentation to establish municipal preservation goals and flood mitigation strategies. Unfortunately, many municipalities in New Jersey have little or outdated information regarding their historic resources, necessitating additional documentation to inform the understanding their flood vulnerability. Where historic documentation is available, it is often filed in paper form rather than in a manner that can be easily utilized by municipal planners in floodplain management and other local decision processes.

To enhance a community's ability to incorporate historic preservation considerations in their decision-making process, historic resource data should be linked to GIS (Geographic Information System) mapping



HISTORIC RESOURCE DOCUMENTATION

As a starting point, existing historic resource documentation should be collected from various entities, such as the following:

- **Local Historic Preservation Commissions:** Local historic preservation commissions (HPCs) often maintain inventories of individual properties and historic districts in their jurisdiction, supplemental information about properties included in state or federal records and information about the type and level of regulation of each property. The regulation of properties for design review, including those applicable to flood regulation, or other purposes, requires their designation under local criteria. Local historic resource inventories are maintained by local municipalities and not the NJ HPO. Note: Local preservation are not required under state law and, if established, serve a single jurisdiction. A municipality working on a hazard mitigation plan will have (at most) a single commission in its jurisdiction and the county commission should also be included, if one exists. For a county plan, it is important to consult with all HPCs within the county's boundaries, as well as the county commission. (*Refer to Chapter 4, Planning: Hazard Mitigation for Historic Resources.*)
- **State Historic Preservation Office (SHPO):** As SHPO, the New Jersey Historic Preservation Office (NJ HPO) maintains the Statewide Inventory of Historic Places, a repository of information on districts, sites, buildings, structures, and objects of known or potential value to the prehistory and history of the state. (http://www.nj.gov/dep/hpo/1identify/nrsr_lists.htm.) Information and data about New Jersey's cultural resources is available through the NJ SHPO's map viewer known as LUCY. (<https://www.nj.gov/dep/hpo/1identify/gis.htm>.) Additionally, many New Jersey's National Register nominations are available from the National Park Service. (<https://www.nps.gov/subjects/nationalregister/database-research.htm>.) These records are merely informational but often serve as the basis for local preservation planning and inventories. To regulate properties for design review or other purposes, local preservation commissions must designate properties according to local criteria; the state Inventory does not track which properties are locally designated. The NJ HPO also maintains records for New Jersey properties listed in or eligible for listing in the National Register of Historic Places. In the event of a state or federal undertaking, including mitigation efforts funded by FEMA, NJ HPO consults with the state or federal agency to avoid, minimize or mitigate harm to these historic properties through the Section 106 process.
- **New Jersey Cultural Alliance (NJCAR):** Represented by a network of organizations, agencies and individuals, NJCAR is dedicated to protecting the state's cultural heritage. NJCAR supports the preservation of assets and sustained operations of the state's cultural community before, during, and after disasters. (<https://njculturalalliance.wixsite.com/njcar>.)
- **Local and Regional Planners:** Many communities without a formal historic preservation commission maintain information about and plans for historic properties. Historic resources valued by the community are sometimes identified in master plans, small area plans governing specific sites, or similar planning initiatives. (*Refer to Addressing Preservation & Flooding in Local Planning Initiatives, page 3-5.*)
- **Local Historical Societies and Museums:** Many local historical societies and some regional museums maintain archives, photographs and other records about historic sites and properties, as well as oral histories and documents related to storm and flooding events.
- **New Jersey Statewide Programs:** Statewide resources, such as the Crossroads of the American Revolution in New Jersey and the Women's project of New Jersey can provide valuable information about the people and places that helped shaped the State's history.
- **Local, State, and Federal Agencies with Community Cultural Resources:** A variety of agencies collect and maintain information regarding historical and cultural resources. For example, New Jersey's Department of Transportation (NJDOT) runs the state's Scenic Byways Program. (www.state.nj.us/transportation/community/scenic/.) The state's 8 scenic byways encompass landscapes, viewsheds and historically and culturally significant places that may not be documented elsewhere.

(*Refer to Historic & Cultural Resource Documentation, page 10-6.*)

to facilitate its use in both municipal planning and mitigation. As an alternative, historic properties can be manually located on a Flood Insurance Rate Map (FIRM) with the understanding that this approach is prone to transcription errors as property designation statuses change or FIRMs are updated. The flood vulnerability of individual properties can be supplemented by Elevation Certificates as they become available. (Refer to Chapter 1, *Flooding, and Evaluating a Property's Flood Risk*, page 2-11.)

When identifying flood vulnerability, all known historic properties should be identified, including those on or determined eligible for listing in the National Register of Historic Places; properties documented in the Statewide Inventory of Historic Places and local inventories; and properties identified as culturally or historically significant in planning documents. **Designation as a “historic resource,” locally, on the Statewide Inventory of Historic Places, or on the National Register of Historic Places has the potential to impact how a property will be treated vis a vis floodplain requirements and in the recovery process. Therefore, an accurate list is critical.** (Refer to *Floodplain Regulations & Ordinances*, page 2-6.)

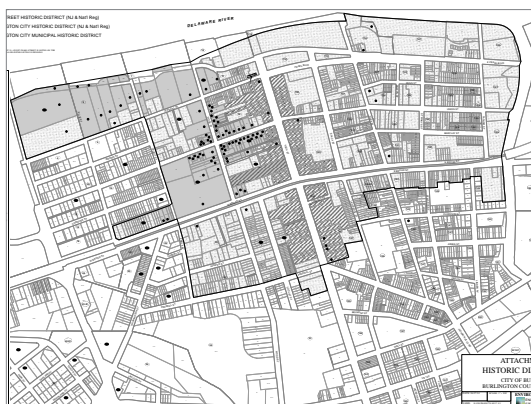
When sufficient municipal resources are not available, volunteers or partnerships with other groups, including non-profit entities, can assist in documentation efforts. If necessary, these efforts can start small and documentation can be built on over several years. In some cases, funding to conduct cultural resources surveys may be available through the hazard mitigation planning process if those surveys identify hazard risks and recommend mitigation measures.

Such surveys provide additional advantages in facilitating regulatory reviews by the historic preservation commission and informing master plans and historic preservation elements. (Refer to *Addressing Preservation & Flooding in Local Planning Initiatives*, page 3-5.)

B. ADDRESSING PRESERVATION & FLOODING IN LOCAL PLANNING INITIATIVES

Community planning is a process by which local goals and objectives are established, and a plan of action is identified by targeting investment based upon existing conditions and available resources. Locally, planning can address a variety of issues including city or regional planning, land use, development and redevelopment issues, in addition to open space, transportation, and historic preservation.

Protecting historic and cultural resources while planning for and adapting to potential flooding is an ongoing challenge for New Jersey's communities. Although planning for flooding and historic properties should ideally occur through hazard mitigation plans, which are the best tool for integrating historic resources into a community's flooding response, local governments can also develop other materials to foster



City of Burlington Historic District Map.

preparedness. Master plans, historic preservation elements, and several smaller but nonetheless important initiatives, such as design guidelines for flood mitigation, offer ways to augment an existing hazard mitigation plan. (Refer to *Develop Design Guidelines for Flood Mitigation*, page 3-13, and Chapter 4, *Planning: Hazard Mitigation for Historic Resources*.)

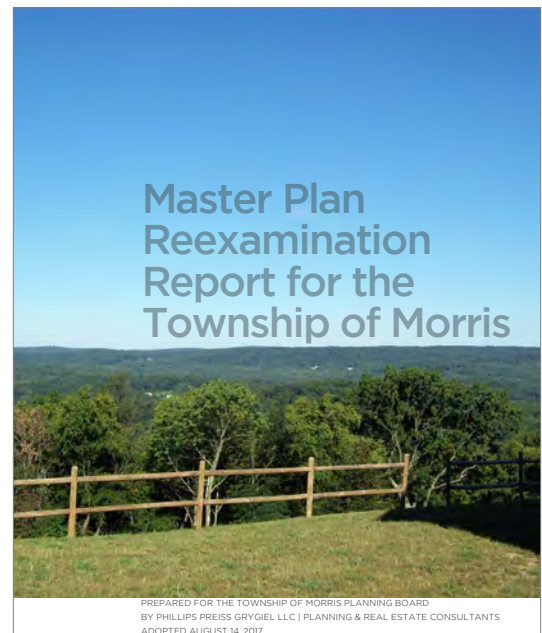
It is critical that all plans share consistent goals and strategies and recognize a community's current and anticipated flood risk, which will establish a time frame for planning and implementation. In the context of flooding, this will largely be defined by the community's existing level of preparedness related to its level of flood vulnerability. (Refer to *Assess & Document Historic Property Flood Risk*, page 4-13.) However, establishing a planning time frame is uniquely challenged in the context of climate change. (Refer to *Establish a Planning Timeframe*, page 4-13.) Current flood risk can be assessed by reviewing the Flood Insurance Rate Maps (FIRMs) and information regarding the impacts of anticipated sea level rise is available through the New Jersey Climate Adaptation Alliance. (Refer to *Flood Insurance Rate Maps*, page 2-5, and *New Jersey Climate Adaptation Alliance*, page 3-8.)

B.1 MASTER PLANS

Through master plans and plan updates, counties and municipalities develop a framework for future growth and development, illustrating current and potential land use and demographics. Although historic preservation is not a mandated element, local governments can utilize master plans as a tool for guiding how communities and historic properties can adapt to natural hazards, climate change, and increasing vulnerability to flooding. ***Like hazard mitigation plans, master plans set goal, objectives, and actions related to floodplain management and, when included, historic properties.***

When possible, historic resources should be identified as valuable community assets and identify actions towards their long-term protection with specific attention to flood vulnerability. Including specific recommendations such as updating regulations; creating streamlined review processes to expedite response and review of historic properties impacted by flooding; or completing research and survey documentation of historic properties threatened by flooding can provide the strategic framework to meet a community's goal of protecting their historic resources.

The master planning process may provide a more accessible forum for community participation in the planning for flooding. To the degree possible, the planning team should follow the hazard mitigation planning process framework to ensure uniformity in the municipality's approach. (Refer to Chapter 4, *Planning: Hazard Mitigation for Historic Resources*.) ***Because both master plans and hazard mitigation plans establish the framework for a municipality's future historic property and floodplain management, the goals, objectives and strategies in both documents should be consistent and reinforce each other.*** The varying cyclical updates, five years



Master Plan Reexamination Report for the Township of Morris, 2017.

for hazard mitigation plans and ten years for master plans, allows a municipality to regularly evaluate and anticipate future goals. (Refer to Write, Adopt & Implement the Plan, page 4-28.) These goals should include working with adjacent communities who share similar flood risks to develop recommendations for shared, large-scale mitigation projects, such as shoreline protection. Working together will reduce the likelihood that mitigation in one community will exacerbate flooding in an adjacent community.

B.2 HISTORIC PRESERVATION ELEMENTS



Historic Preservation Element, City of Paterson Master Plan, 2014.

Typically developed by preservation planners and/or historic preservation commissions (HPCs), historic preservation elements, including in a municipality’s master plan, describe a local government’s historic and cultural resources; identify preservation goals; and recommend actions. Historic preservation elements are not mandated in a master plan nor do they have specific content requirements. Like master plans, historic preservation elements generally describe the existing conditions and regulatory framework and identify preservation goals and strategies to achieve those goals. As such, they are flexible and can be adapted to address local needs and recommendations. If adopted by a municipality or county. Historic preservation elements can have similar regulatory authority as master plans.

As with master plans, historic preservation elements should be used to set goals, objectives, and actions specifically related to flood vulnerability and management; hazard mitigation; and historic properties. The preservation planning team should utilize the hazard mitigation planning process framework to the degree that makes sense for the community and its resources. Counties and municipalities without a separate historic preservation element should rely on their master plan to address local historic preservation concerns, either via a preservation element or integrated into the plan. (Refer to Master Plans, page 3-6.)

B.3 EMERGENCY OPERATIONS PLANS

An Emergency Operations Plan describes the strategies and procedures for coordinating recovery efforts across all departments and agencies and guides the operation. Emergency Operations Plans (EOPs) establish a framework that describes how to respond to disasters and emergency events. The plans are prepared for all levels of government, in addition to critical facilities, such as hospitals. The EOP:

- Defines the preparedness and emergency management activities necessary for a jurisdiction to respond to specific hazards or threats;
- Assigns responsibility to individuals and organizations for accomplishing actions during the emergency;

- Sets forth lines of authority and defines organizational relationships; lays out how all actions will be coordinated during the response; describes how people and property are protected;
- Identifies resources available within the jurisdiction and by agreement with other jurisdictions; and
- Reconciles requirements with other jurisdictions who may also be responding to the hazard or threat.

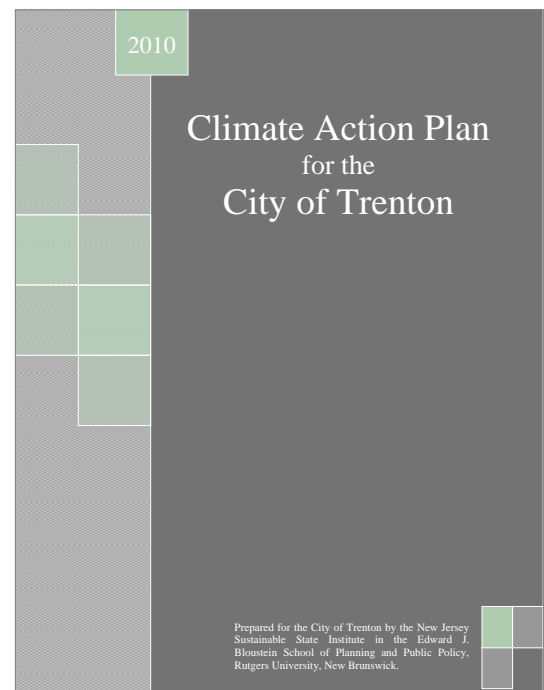
The plans also contain a series of annexes that describe the methods that should be followed for critical operation functions during emergency operations and assigns responsibility for those methods to governmental agencies and departments. The terminology for these annexes is Emergency Support Annex at the federal level, State Coordinating Function at the state level, and Recovery Support Function at the local level. Historic buildings, other cultural resources, and natural resources are typically addressed jointly in a single annex. (Refer to Chapter 5, Response: Hazard Mitigation for Historic Resources.)

B.4 CLIMATE ADAPTATION PLANS

Local governments can develop climate adaptation plans to provide a framework for their decision-making processes. New Jersey has several agencies and organizations who guide the State’s adaptation efforts. These include:

- **New Jersey Department of Environmental Protection, Office of Air Quality, Energy and Sustainability (AQES):** Evaluates, develops, and implements clean, secure, and resilient energy systems and sustainable environmental practices to ensure clean, reliable, safe, and affordable power without sacrificing clean air and a protected environment. (<https://www.state.nj.us/dep/aqes/>)
- **Rutgers Climate Institute:** Addresses climate change through research, education and outreach, by facilitating collaboration across a broad range of disciplines in the natural, social and policy sciences. (<https://climatechange.rutgers.edu/about-us/>)
- **New Jersey Climate Adaptation Alliance:** Addresses climate change preparedness and its impact on various sectors in New Jersey. (<https://njadapt.rutgers.edu/>)

The understanding of climate change and predictions of its impact are continuing to evolve. The potential impacts on flooding, including sea level rise, storm surge, and increased precipitation, should be considered as part of the hazard mitigation planning process. (Refer to Chapter 4, Planning: Hazard Mitigation for Historic Resources.) The New Jersey Department of Environmental Protection (NJDEP) is available to assist municipalities in addressing the impacts of climate change relative to flooding. The “State of the Climate: New Jersey 2013,”



The City of Trenton developed a Climate Action Plan in 2010. (<http://sj-site-legacy-migrate.s3.amazonaws.com/m11114!11.pdf>)

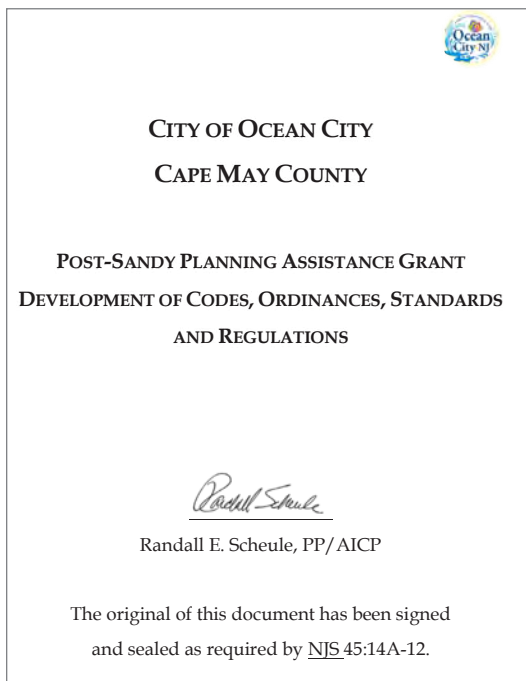
prepared by the Rutgers Climate Institute, provides an overview of recent climate events and trends and their impact on the state. (<https://climatechange.rutgers.edu/resources/state-of-the-climate-new-jersey-2013>.) In addition, there are a number of federal, state, and county entities with resources that can provide valuable, localized information regarding the potential impacts of climate change. (Refer to Chapter 11, *Flood Mitigation Partners*.)

C. MODIFY ZONING ORDINANCE

Community-wide zoning modifications can control significant changes to individual properties to protect the existing historic character of an area.

This means of protection can occur outside of the hazard mitigation planning process. If protecting historic character is a goal, a community can monitor and limit extreme elevations, new construction, and significant additions by adopting the following measures.

- **Zoning code heights:** Municipal zoning codes typically include maximum allowable heights within defined areas. In flood-prone historic neighborhoods, maximum heights can be defined in a manner that is compatible with existing buildings, while limiting first floor elevation to the Base Flood Elevation (BFE) or the Design Flood Elevation (DFE) as locally mandated.
- **Streetscape rhythm:** Buildings and side yards; porches and stoops; and windows and doors collectively establish patterns along a streetscape. By identifying these patterns and promoting conformance with existing conditions, the historic preservation commission (HPC), or similar review process, can recommend and approve designs sympathetic to surrounding conditions while meeting floodplain regulation requirements.
- **Limit lot coverage or impervious surface ratio:** These limitations help to restrict inappropriately sized additions or alterations that can affect a historic building's integrity. They also aid in decreasing the square footage of impervious surfaces and promoting the use of pervious surfaces allows for stormwater to be absorbed and filtered through the ground, which reduces runoff, thereby reducing the volume of water that must be handled by the storm sewer system and improving water quality.
- **Implement low-impact development standards:** Low impact development standards manage stormwater through a variety of methods that mimic or preserve natural drainage processes to reduce stormwater runoff, which can help reduce nuisance or tidal flooding in a community. Because these standards promote the restoration of green and aquatic habitat in a community, they can help to blunt the effects of inappropriate fill-in by encouraging the restoration of community features, such as parks, that may have been altered or destroyed.



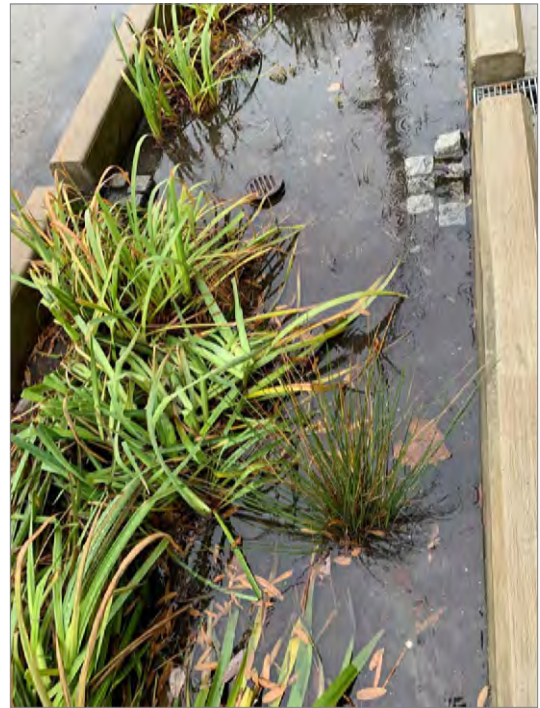
The City of Ocean City has developed strategies to address stormwater management and green infrastructure following Superstorm Sandy, which includes modifications to the municipal stormwater management ordinance. (https://imageserv11.teamlogic.com/mediaLibrary/242/Codes__Ordinances__Standards__Regulations__Signed_Final.pdf)

- **Limiting stormwater runoff from a property:** Capturing rainwater and preventing runoff on a property-by-property basis can help to reduce the amount flooding at a specific property. Where these limitations prescribe the use of rain barrels, rain gardens, pervious paving, and other methods, a historic community’s design guidelines can be used to address the use of these methods in ways that minimize impacts to the integrity of the historic district.
- **Limiting parking under single- and two-family residential buildings:** Another way to restrict extreme elevations is to place limitations on parking beneath residential structures. Limiting parking underneath small occupancy residential buildings helps to protect the sidewalk culture of a historic district and preserve the streetscape’s historic appearance and rhythm.
- **Encouraging character-defining elements like front porches in residential construction in lieu of garage doors:** Garage doors along a streetscape present a uniform, blank wall, and increases a feeling of emptiness along the streetscape. Front porches and other character-defining features such as landscaping, increase the visual interest of the streetscape, while providing areas for social interaction and create a lively pedestrian experience.

By their nature, zoning ordinances are unique to each municipality. **Existing zoning ordinances should be reviewed through the lens of flood mitigation to uncover specific issues that, if modified, promote increased resilience while protecting the historic integrity of properties.** They can also be modified to address stormwater runoff. (Refer to *Zoning Options*, page 8-8.) However, **zoning ordinance modifications typically will not include recommendations which are sympathetic to historic properties or to historic materials. These issues can be addressed through design guidelines for flood mitigation.** (Refer to *Develop Design Guidelines for Flood Mitigation*, page 3-13.)

D. MODIFY BUILDING CODE REQUIREMENTS

As with zoning codes, building code compliance is typically triggered upon submission of a building permit application to construct a new building or modify an existing building. Municipalities can impose building code regulations stricter than state requirements for flood resistance for new or substantially improved buildings. (Refer to *Building Code Options*, page 8-8.) As a baseline, building codes should require compliance with the National Flood Insurance Program (NFIP) for new construction in a flood-prone area. (Refer to *National Flood Insurance Program*, page 2-2.) The International Code Council and FEMA developed *Reducing Flood Losses Through the International Codes: Coordinating Building Codes and Floodplain Management Regulations*, 5th Edition (2019) to provide guidance to municipalities considering code modifications. (www.fema.gov/media-library/assets/documents/96634)



Rain gardens can limit stormwater runoff from a property into municipal stormwater management systems.

NJ UNIFORM CONSTRUCTION CODE

The New Jersey Uniform Construction Code requires that new construction, substantial improvement, or substantial damage in Special Flood Hazard Areas (SFHA) and coastal high hazard areas (Coastal V or Coastal A Zones) comply with the following elevation requirements:

- Residential dwellings: BFE + 1 feet
- Essential facilities and buildings with high occupancy (schools, theaters, museums): BFE + 2 feet or 0.2% flood elevation

Local municipalities can elect to require more stringent requirements, including higher elevation standards.

More stringent building code requirements will also benefit municipalities who participate in the Community Rating System (CRS). (*Refer to Participate in the Community Rating System, page 3-16, and Modify Local Floodplain Regulations, page 3-11.*) Possible building code requirements to reduce potential flood-related damage include:

- Designing a building's structural system to withstand flood impacts;
- Locating all living space above the BFE/DFE;
- Limiting allowable use of building below the BFE/DFE;
- Locating building systems above the BFE/DFE;
- Requiring flood-resistant materials below the BFE/DFE; and
- Providing floodwater evacuation pathways for areas below the BFE/DFE.

Building code modifications written with flood issues in mind promote greater resilience; however, such modifications are typically only required as part of a larger renovation project. For example, either wet floodproofing, elevation, or relocation is typically required for substantially improved or substantially damaged buildings to comply with NFIP requirements. (*Refer to Local Floodplain Ordinance & Historic Properties, page 2-7, and Wet Floodproofing, page 9-6.*)

Although some building code-required modifications may be appropriate for most properties, such as elevating building systems, others may be at odds with the preservation of historic resources. Requirements that affect portions of buildings below the BFE/DFE can be particularly contentious. For example, by limiting the use of lower floor levels, there may be an unintended consequence of property owners seeking to elevate their buildings, build an addition or extra story, or modification of interior floor heights and, consequently, window heights. Care should be taken to balance the resilience code modification, requirements for compliance and the preservation of historic properties. (*Refer to Repair & Rebuilding, page 6-3, and Chapter 9, Property Mitigation Strategies.*) Additionally, the construction of a new code compliant building, with its increased first floor height, in a historic context can have a negative impact on a streetscape and the surrounding district.

E. MODIFY LOCAL FLOODPLAIN REGULATIONS

Much of the responsibility for floodplain management occurs at the municipal level with standards, assistance, and guidance from the state and federal governments. To allow residents to have access to flood insurance through the National Flood Insurance Program (NFIP), a floodplain regulation must be locally adopted and enforced to restrict development within the Special Flood Hazard Area (SFHA). In some municipalities the local floodplain regulations may be codified as an independent ordinance, or it be a subset of another ordinance, such as planning and zoning.



One of the critical elements in floodplain regulations as they relate to preservation is the definition of a “historic structure.” When referring to historic properties, the NFIP model ordinance, which serve as the basis for many local ordinances, uses FEMA’s definition of a “historic structure.” (Refer to *National Flood Insurance Program Regulations & New Jersey Model Flood Damage Prevention Ordinance*, page 2-8.) FEMA’s definition varies from those utilized by the National Park Service or the NJ HPO to describe properties of historic and cultural importance based upon the criteria for listing on the National Register of Historic Places. Further complicating measures, local governments will often set their own criteria for identifying what is “historic,” which will be accepted by the NJ HPO if the municipality is a Certified Local Government (CLG) under the Certified Local Government Program, jointly administered by the National Park Service and the NJ HPO.

Depending on how “historic” is defined in municipal floodplain regulations, compliance requirements are often relaxed for historic properties. Although it may appear to be beneficial, not mandating compliance:

- Maintains the vulnerability of historic buildings to flooding and associated damage;
- May foster a belief that the flood risk is somehow reduced or eliminated;
- Does not relieve property owners from the responsibility of obtaining flood insurance, if required;
- May place property owners seeking alterations to reduce insurance costs at odds with local historic preservation commissions that strive to minimize alterations not otherwise required; and
- May reduce the municipality’s potential classification under the Community Rating System (CRS), impacting the ability for discounted flood insurance rates for all property owners. (Refer to *Community Rating System*, page 2-13, and *Participate in the Community Rating System*, page 3-16.)

One of the factors that may dissuade local governments from waiving floodplain requirements for historic structures is the federal Flood Insurance Affordability Act (FEMA, 2014). The Act allows flood insurance premiums to increase to meet the actual actuarial rate for a property, thus incentivizing compliance by property owners seeking to avoid rising flood insurance premiums. (Refer to *Floodplain Regulations & Ordinances*, page 2-6.) The Department of Environmental Protection’s Community Assistance Program Unit is available to help local governments seeking assistance with floodplain regulations. (<https://www.state.nj.us/dep/floodcontrol/about.htm>.)



Pervious paving reduces stormwater runoff by encouraging absorption into the soil.

F. DEVELOP INCENTIVES FOR SENSITIVE MITIGATION

To encourage historic property owners to implement sensitive hazard mitigation actions, local governments can develop incentives ranging from financial to zoning bonuses. Financial incentive programs can be implemented in a comparable manner as preservation tax credits with municipality’s defining appropriate mitigation options for their historic properties and providing local tax credits for compliant modifications, tax rebates, or perhaps more simply, waiving of permitting fees. These modifications can include improving the flood resilience of buildings or reducing impervious surface coverage to diminish storm water runoff.

Non-financial incentives at individual properties, can include expediting reviews, relaxation of bulk area requirements and setbacks, such as permitting a rooftop addition or allowing a free-standing garage without a side yard setback to prevent extreme elevations that permit under-building parking.

There are also non-preservation incentives that may be eligible for grant funding to encourage more appropriate mitigation if tailored to local conditions. Non-preservation incentives with community-wide impact in the reduction of stormwater runoff could include landscape enhancements, like the purchase and planting of shade trees, installation of pervious pavers, and landscaping improvements that restore native plantings in public space. (*Refer to Landscape Options, page 8-7.*) Private property owners could be similarly encouraged with the community distribution of free trees and rain barrels as well as promotion of native plantings.

Whether financial or non-financial, the mitigation measures and incentives should be carefully developed in a manner that minimizes the effect on the historic integrity of the property and its surrounding context, otherwise, the property’s eligibility for historic preservation financial incentives outside of the community, i.e. at the state and federal level, may be compromised. In addition, if the property was benefiting from waivers related to full compliance with the floodplain ordinance or building code based upon its designation as a historic building, the loss of historic designation may trigger the requirement for full floodplain regulation compliance.

G. DEVELOP DESIGN GUIDELINES FOR FLOOD MITIGATION

When faced with increased flood threat and insurance premiums, historic property owners should be empowered to “do something” to protect their resources from flood-related damage. As is often the case, many off-the-shelf solutions are not sensitive to the unique characteristics of historic resources.

Local preservation planners and advocates will often be the “front line” in addressing flood mitigation at historic properties, particularly in those

FINANCIAL INCENTIVES FOR FLOOD MITIGATION

Annapolis, Maryland

- Historic preservation tax credits are an effective financial incentive for the rehabilitation and restoration of historic properties. The City of Annapolis recently revised its historic preservation tax credit to include a tax credit for 25% of qualified preservation, restoration, and/or rehabilitation on income-producing properties that include hazard mitigation. Mitigation work must meet the criteria set forth in the City's Code of Ordinance, the Historic Preservation Commission Design Manual, and *The Secretary of the Interior's Standards for Rehabilitation*. Inclusion of hazard mitigation in the historic preservation tax credit purposefully coincides with the completion of the Weather It Together Plan, an annex to the City's Hazard Mitigation Plan that specifically addresses historic properties and cultural resources. The tax credit and Weather It Together mutually support each other and reinforce the City's commitment to protecting its cultural resources from the effects of natural hazards and climate change. (<https://www.annapolis.gov/885/Weather-It-Together>.)

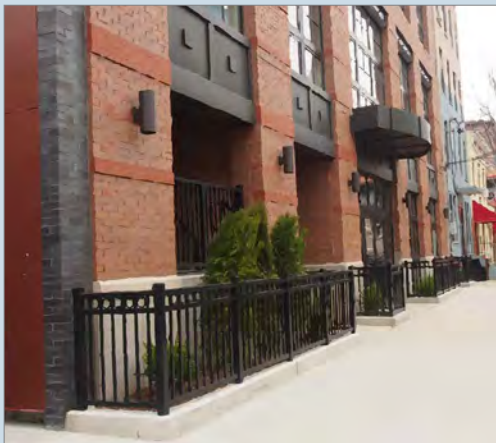
Washington, DC

- The District of Columbia's RiverSmart Program is a suite of financial incentives for residential property owners, multifamily residents, building managers, non-profit organizations, houses of worship, and schools that includes small grants and rebates for projects that reduce stormwater runoff. Programs offer grant funding with 10% cost share by the property owner for landscape improvements and other stormwater capture best practices. Teachers also receive special training when the program is used to add nature conservation areas to school grounds. In addition to grants, the program offers rebates for the installation of green roofs, for the purchase and planting of trees, for capturing water in rain barrels, for installing rain gardens, and for removing impervious surface and replacing it with permeable pavers or vegetation. (<https://doee.dc.gov/node/9492>.)

Beach Haven, New Jersey

- In the aftermath of Super Storm Sandy, historic property owners in the Borough of Beach Haven were elevating their homes to reduce potential damage from future storms. To achieve an additional benefit from the elevation, owners often seek to raise the first-floor level well above the Base Flood Elevation (BFE) to allow parking and greater storage beneath their homes. To minimize what was locally perceived as extreme elevations, the local historic preservation commission (HPC) worked with the local Construction and Zoning Office to limit building elevations greatly in excess of the BFE, but provided owners elevating their homes the opportunity to build a free-standing, one car garage that is compatible with the character of their home. By limiting the building elevation height, the historic character of the streetscape is retained. (<https://beachhaven-nj.gov/public-safety/crs-flood-information/>.)





Resilient Building Design Guidelines

October 19th 2015

RESILIENT BUILDING DESIGN GUIDELINES - CITY OF HOBOKEN

The City of Hoboken's *Resilient Building Design Guidelines* provide an overview of the laws and regulations governing the rehabilitation of existing buildings and new construction within Hoboken's flood-prone areas. The *Guidelines* also address the approval process for repairs, improvements, and new construction and provides flood resilience strategies for residents, property and building owners, developers, and businesses. (<https://betterwaterfront.org/wp-content/uploads/2016/05/Resilient-Buildings-Design-Guidelines.pdf>.)

Elevation Design Guidelines for Historic Properties are available as a companion to this *Guide* and can be used as a starting point for municipalities seeking to prepare design guidelines for flood-prone historic buildings.

municipalities with a formal HPC review process. **To the extent possible, flood mitigation planning should proactively identify community-preferred mitigation alternatives appropriate to local resources based upon the type and level of flood risk to provide guidance to property owners exploring individual solutions.**

As a starting point, preservation planners, advocates, stakeholders, and HPCs should identify clear policies that address flood mitigation in their community. Policies should include statements that aim to:

- Identify historic adaptations for flooding in the community for specific building types and their appropriateness within today's context (*refer to Community's Relationship to Water, page 4-14*);
- Define acceptable building elevation heights relative to the Base Flood Elevation (BFE) or Design Flood Elevation (DFE) (*refer to Evaluating a Property's Flood Risk Locations Definitions sidebar, page 2-12, and companion Elevation Design Guidelines*);
- Identify appropriate materials and design considerations for higher foundations, extended stairs, flood openings, and flood barriers; and
- Identify acceptable damage-resistant materials or treatments for flood-prone areas.

Municipalities should include these statements in master plans and historic preservation elements to increase their impact on the local decision-making process. (*Refer to Addressing Preservation & Flooding in Local Planning Initiatives, page 3-5.*)

Historic preservation commissions (HPCs) often have another tool in their arsenal that can be adapted to address flood mitigation at historic properties: design guidelines. As part of the historic preservation review process, many HPCs prepare design guidelines to provide both information and guidance to property owners, architects, and contractors for proposed exterior alterations to designated properties. These guidelines often include explanations in plain-English; photographs and drawings to clarify and illustrate the review process; and building and zoning code requirements, as well as appropriate and inappropriate design approaches and materials.

A similar guidelines strategy can be employed to address flood mitigation options and recommendations. To be meaningful, the following should be considered:

- Types of historic resources in the community;
- Location of historic properties relative to the 1% and 0.2% floodplains;
- Relative height of the floor levels to the ground plane (BFE/DFE);
- Type of flooding (coastal with driving wind, tidal, flash floods, or ground water);
- Duration of flooding (regular cycles, sudden and fast draining, or prolonged water exposure);
- Local floodplain, zoning, and design requirements;
- Flood design requirements (some municipalities impose more stringent requirements than the National Flood Insurance Program (NFIP) often as part a goal for participation in the Community Rating

System (CRS)) (refer to *Participate in the Community Rating System*, page 3-16);

- Maintenance recommendations (refer to *Encourage Property Maintenance*, page 3-17);
- Recommendations for building systems and equipment (refer to *Basic Improvements*, page 9-2);
- Site mitigation options (refer to *Landscape Improvements*, page 9-2);
- Building mitigation options (refer to *Building Mitigation*, page 9-3); and
- Variation in appropriate mitigation options based upon level of historic significance, if applicable.

Flood mitigation design guidelines can be a stand-alone document or a chapter in an existing design guidelines document. If a municipality has existing design guidelines, the **existing guidelines should be reviewed and updated so that existing recommendations and requirements are current and do not conflict with flood mitigation recommendations.**

Like all design guidelines, those prepared for flood mitigations should reflect the most recent version of *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating and Reconstructing Historic Buildings*. The recently published 2017 update includes several sections that address resilience to natural hazards. The National Park Service is regularly updating guidance on hazard mitigation, including flooding, and has recently released the November 2019 *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings*. Design guidelines should incorporate current information at the time of preparation.

Design Guidelines can be funded through the Certified Local Government (CLG) competitive grant program. (<https://www.nj.gov/dep/hpo/3preserve/local.htm>.) **If the municipality is a CLG, it is recommended that NJ HPO be provided the opportunity for review to confirm that the proposed recommendations will not negatively impact the integrity of the resources prior to local adoption or use. The NJ HPO review will confirm that proposed recommendations will not negatively impact the integrity of the resources or result in their de-listing or ineligibility for financial incentives such as tax credits or grants.**

H. PARTICIPATE IN THE COMMUNITY RATING SYSTEM

Just as flood insurance rates can be reduced by lowering the flood damage risk at individual properties, rates can also be dramatically reduced for communities participating in the NFIP's Community Rating System (CRS) (FEMA, 2018). (Refer to *Community Rating System*, page 2-13.) The CRS is a voluntary incentive program that recognizes and encourages community floodplain management efforts that exceed the minimum National Flood Insurance Program (NFIP) requirements. Flood insurance premiums in Special Flood Hazard Areas (SFHAs) can



U.S. Department of the Interior
National Park Service
Cultural Resources, Partnerships & Science
Washington, D.C.

Guidelines on Flood Adaptation for Rehabilitating Historic Buildings

Jenifer Eggleston
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November 2019

The National Park Service continues to update its flood mitigation guidance as reflected in the recently released "Guidelines on Flood Adaptation for Rehabilitating Historic Buildings." (<https://www.nps.gov/tps/standards/rehabilitation/flood-adaptation-guidelines.pdf>)

be reduced by up to 45% for Class 1 communities that have substantially reduced their potential damage from flooding. (Refer to Chapter 2, *Floodplain Management, and National Flood Insurance Program, page 2-2.*)

The New Jersey Association for Floodplain Management is available to assist those seeking to get more information and the Department of Environmental Protection's Community Assistance Program Unit is available to assist with the application process. (<https://www.state.nj.us/dep/floodcontrol/about.htm>.) In addition, FEMA has several publications available regarding the CRS program, including *Small Communities in the CRS*, which outlines common issues for local governments seeking to participate in the program. (<https://crsresources.org/files/200/small-communities-in-the-crs.pdf>.)

Participation in the CRS will generally improve the ability of a community and its property owners to recover from flooding, including historic properties. As indicated above, communities can increase their CRS classification by requiring a reduction in flood risk at existing developments. ***Although many large-scale flood mitigation options can be considered, achieving the best classification will likely require the modification of individual properties. For historic properties, this could require more extreme alterations and impact the historic integrity of existing buildings.***

In many cases, the physical alterations required at some historic properties to meet the goals of CRS compliance may negatively impact their historic integrity. Historic preservation planners should work with the floodplain administrator in the CRS application process to seek a balance between protection and preservation. If the affected properties are locally designated, proposed mitigations may need to be coordinated with the local HPC. Similarly, if the property has received or anticipates receiving state or federal governmental funding, it is best to contact NJ HPO prior to completing any work to verify review requirements. (Refer to *Historic Property Project Review sidebar, page 3-19.*)

I. ENCOURAGE PROPERTY MAINTENANCE

In many ways, a well-maintained property and building provides the best investment in reducing the potential damage from hazards such as flooding. All materials deteriorate over time, but without regular repair deterioration can accelerate. ***Maintenance can slow down natural deterioration and mitigate potential risks associated with hazards, providing the basis for protecting historic properties and collections, and, more importantly, human life. Fostering long-term preservation of a historic property is a critical aspect of good stewardship.***

The primary hazard of flooding is often accompanied by secondary hazards such as high winds and followed by fire. There are simple maintenance measures that can reduce the vulnerability of historic properties to primary and secondary hazards that should be completed at all vulnerable properties, including:

- Grading land to promote positive drainage away from historic buildings (municipal approval should be sought for potential impact on neighboring properties, sidewalks, or roadways, as required);
- Trimming overhanging tree limbs that might crash through a roof or take down electric and telephone lines in a wind storm;
- Clearing site debris that might become waterborne or airborne (if high winds accompany the flood), clog storm drains, provide fuel for a fire, and harbor pests or cause damage to the historic building or surrounding buildings;
- Ensuring oil and propane tanks, including barbecue grills, and associated connections are well maintained and anchored to prevent flotation;
- Removing clutter and unnecessary storage in a building, particularly if items are hazardous, highly flammable, or located in a flood-prone area, such as basements;
- Maintaining roofing, flashing, gutters, and downspouts to direct stormwater away from buildings;
- Reinforcing roof framing to support wind and snow loads;
- Repointing masonry, including chimneys, walls, foundations, and piers, to prevent collapse and stormwater infiltration;
- Replacing or securing missing or dislodged siding to prevent stormwater infiltration and potential wind-borne debris;
- Replacing cracked window glass that can shatter in a wind storm and allow water infiltration;
- Sealing openings between building components or around penetrations such as hose bibs;
- Maintaining shutters in an operational condition to protect windows from airborne debris in a wind storm;
- Replacing cracked pipes to prevent plumbing leaks or sewer failure; and
- Replacing batteries in smoke and carbon monoxide detectors to provide notification of a fire or gas leak.

A poorly maintained building, particularly one that is structurally compromised, is a poor candidate for elevation or relocation because the act of elevation can further destabilize its structure.



A poorly maintained building is less likely to withstand flood damage than a well maintained building. If the structural system is compromised, it will be more difficult and more costly to elevate or relocate.

J. PLAN FOR HISTORIC RESOURCE FLOOD RESPONSE & RECOVERY

Just as emergency management teams plan to address the protection of life and property after a flood, historic and cultural properties can also benefit from advanced planning that facilitates response and recovery efforts. The inclusion of historic preservation in emergency response and disaster planning can help to protect the municipality's resources and avoid the unnecessary loss of historic materials. This includes the

HISTORIC PROPERTY PROJECT REVIEW

Prior to undertaking any improvements, it is important to understand whether alterations to a property are subject to historic review. Municipalities must provide property owners with clear direction as to whether they are subject to historic review through their HPC. When recovering from a flood, it may be beneficial to waive local formal review to expedite recovery. Regardless of local review procedures, NJ HPO review may be required pursuant to Section 106 of the National Historic Preservation Act, the New Jersey Register of Historic Places Act, or other applicable rules and regulations.

Project review will ensure that, to the degree possible, proposed alterations do not affect the property's historic integrity, and, consequently, its funding eligibility.

Although immediate stabilization repairs, including the installation of temporary shoring and roof tarps, should be undertaken as soon as possible to reduce the potential for additional damage, property owners should consult with NJ HPO in advance for mitigation projects and long-term repairs in the aftermath of a disaster.

development of resources and procedures to expeditiously respond to hazards at historic properties in a manner that preserves historic fabric and character. To ensure that historic and cultural resources are considered, it is important to work with the local emergency management office and first responders to provide them with information on the location of historic resources and how to treat those resources during response operations, as well as to develop a protocol for engagement by historic preservation professionals in the response and recovery phases of an incident.

J.1 CREATE AN EXPEDITED REVIEW PROCESS FOR DISASTER RESPONSE

In the aftermath of a disaster, decisions must be made quickly to protect people and property. Consequently, historic preservation concerns must follow life-safety priorities and cannot be at the forefront of the decision-making process. Although municipalities will often establish a process for expedited permit reviews, preferably in advance of a disaster, they will not necessarily have the capacity for historic preservation review in the wake of an emergency. To better protect historic resources, it is necessary that building code staff be familiar with historic preservation requirements and be able to access preservation representatives in a crisis.

An expedited historic property review process can include the identification of stabilization measures and minor repairs that can be completed without formal HPC review. Similarly, planning or building department staff can be authorized to approve certain changes utilizing the previously approved design guidelines when available. (*Refer to [Develop Design Guidelines for Flood Mitigation](#), page 3-13.*) This could expedite stabilization and provision of a weather-tight building enclosure while reducing the administrative burden on property owners during the recovery process.

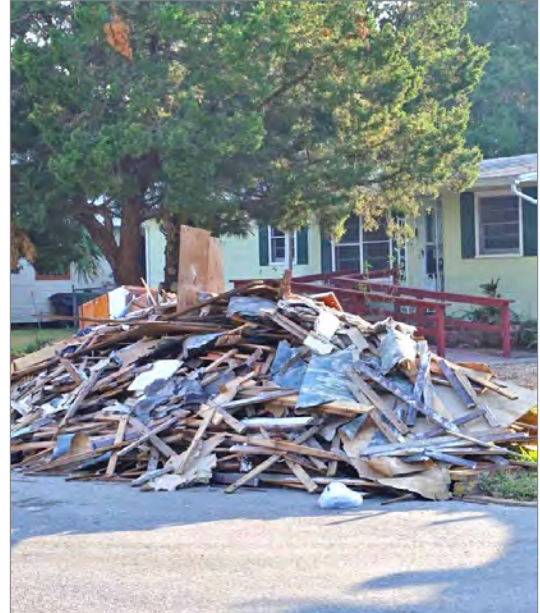
J.2 IDENTIFY PRESERVATION PARTNERS TO ASSIST IN POST-FLOOD REVIEW PROCESS

Prior to a flood event, it is important to identify preservation partners from adjacent communities and the county who will be able to assist in the review of preservation issues and provide information regarding preservation assistance programs. Preservation partners who are not personally affected by the flood event can assist in providing a more immediate response to a large number of property owners. These partners can include representatives from adjoining communities as well as NJ HPO and FEMA.

J.3 ESTABLISH A DEBRIS SALVAGE PLAN

Flooding and high winds disburse debris comprised of building components and interior features. Some of the more vulnerable construction components include porches, railings, windows, shutters, fences, etc. If lost, historic materials and components can be costly and difficult to replace and, if replacement in kind is not the priority of the owner, the historic character of a building or structure can be compromised by an insensitive alteration or an off-the-shelf alternative.

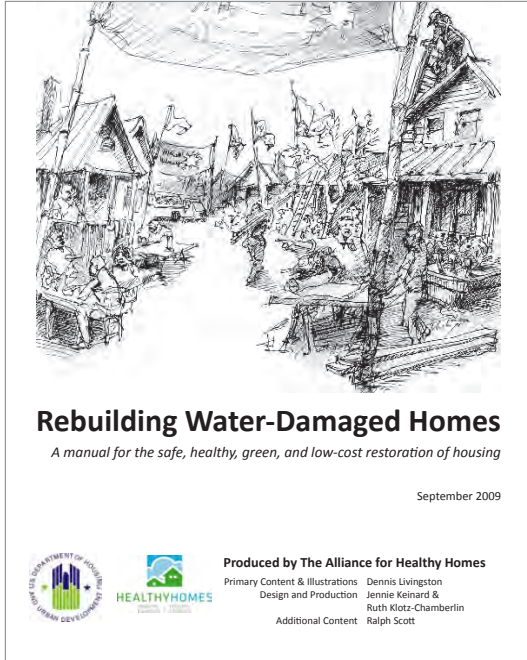
One of the best tools for minimizing the loss of historic materials is to develop a salvage plan. This can also be promoted as a sustainable alternative to disposal. To be effective, a plan should include training personnel to sort debris and salvage historic materials and components rather than discarding all debris in a landfill. In the aftermath of a disaster, the salvaged items can be identified by property and made available to owners seeking to complete repairs.



Building debris is often discarded after a flood. An established salvage plan can help save dislodged building components for potential reinstallation.

J.4 DEVELOP INFORMATION FOR PROPERTY OWNERS

Immediately after a disaster, property owners will seek guidance about recovery, including what they should and can do to protect their properties and return to “normal.” This includes everything from who should verify structural stability to how to document damage and prevent secondary damage, such as mold, in the aftermath of a flood. While general information related to property owner response is available from the local emergency management office, owners of historic properties will have additional questions related to whether specific reviews are required, or if historic preservation assistance is available in the form of technical expertise or grant funding. Specifically, information recommended strategies for mitigation and repairs of historic resources must be provided to encourage property owners to conduct sensitive repairs and reduce the unnecessary loss of historic materials. Website information should be available, and brochures or pamphlets should be printed and ready for distribution to owners considering mitigation projects in the aftermath of an event. This will allow the information to be made available to historic property owners immediately after a flood to streamline the review process and facilitate the recovery effort. These materials should clarify that careful consideration must be given to properties receiving preservation financial incentives such as easements, grants, and tax credits when evaluating flood stabilization and mitigation measures. (*Refer to Historic Property Project Review sidebar, page 3-19.*) While municipalities are encouraged to develop information specific to their circumstances, the National Park Service continues to develop resources that specifically address the relationship between flooding and historic



A lot of helpful information is available online to supplement local publications. (https://www.hud.gov/sites/documents/AFHH_WATER_DAMAGED.PDF) Refer to Appendix B: Bibliography for additional resources.

properties and makes those available on their website. (www.nps.gov/tps/about.htm.) Their recently published *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings* (November 2019) provides a framework for sensitive flood adaptation strategies.

Preservation-specific, flood recovery information that can be prepared in advance of flood. Information can include:

- Floodplain ordinance definition for a “historic structure” and how the definition relates to local resources;
- Local code requirements that may be waived or triggered for a designated “historic structure” (*Refer to Local Floodplain Ordinances & Historic Properties, page 2-6.*);
- Identification of activities that may impact eligibility for listing on the Statewide Inventory or National Register of Historic Places;
- Procedures for documenting flood damage at historic properties;
- Options for protecting historic materials from mold and for “drying-out” without causing further damage;
- Design guidelines with options for improved flood resiliency (*Refer to Develop Design Guidelines for Flood Mitigation, page 3-13*);
- Review requirements and processes for historic properties locally, if applicable, and Section 106 review from NJ HPO (*Refer to Historic Property Project Review sidebar, page 3-19*); and
- Contact information and websites for departments and agencies that may provide assistance or be required for permit approval.

Although the administrative requirements can be daunting, property owners should be encouraged to work with officials at all levels to ensure that requirements are understood and approvals are in place prior to commencing rebuilding efforts. In the long run, this can save them both time and money and get their building back into service faster.

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The Emergency Management Cycle.

Hazard mitigation planning is the process by which states and municipalities identify and implement policies and actions to reduce their vulnerability to hazards and establish a framework to respond to a disaster. Hazard mitigation plans identify an area's vulnerability to the effects of the natural and man-made hazards, including flooding, as well as the goals, objectives, and actions required for minimizing future loss of life, injury, property damage, and economic disruption because of hazard events. **Although municipalities may not prioritize historic and cultural resources in their flood mitigation planning, the protection of these resources can be integral to a community's economic success and recovery in the aftermath of a flood event.**

The State of New Jersey's Hazard Mitigation Plan (HMP) captures historic disaster experiences, and reflects the natural and human-caused hazards New Jersey faces, based on current science and research. The State HMP outlines a strategy to reduce risks from hazards, and serves as the basis for prioritizing future project funding.

-- New Jersey Hazard Mitigation Plan, 2014

The framework for the hazard mitigation planning process follows the Emergency Management Cycle, as established by the federal government, to protect life and property as well as reduce the impacts of hazard events by encouraging states and local communities to understand and mitigate risks in advance of an event. (44 CFR 201; Title 44: Emergency Management and Assistance; Code of Federal Regulations; Part 201: Mitigation Planning.) The Emergency Management Cycle is a constant, cyclical process comprised of four phases: planning/preparedness, response, recovery, and mitigation. To improve a community's ability to withstand a flood, planning and preparation coupled with mitigation projects can facilitate flood recovery. When a flood occurs, response and recovery are followed by mitigation measures to improve flood resilience and adapt to changing threats. With the increases in severe precipitation and sea level rise, climate adaptation should also be considered as part of the planning process.

The preparation of local hazard mitigation plans is guided by county emergency management personnel, often supplemented by experienced, outside, professional consultants with expertise in plan preparation. The county emergency management personnel and their planning team work on behalf of municipalities and smaller communities without the resources to complete individual plans. The planning team relies on representation from all levels of government, including planning, infrastructure, transportation, health and human safety, and housing and community development. ***Although preservation planners and advocates are typically not involved in the preparation of hazard mitigation plans, with community support, they can participate in the process and help identify and protect significant historic and cultural resources.***

A. PLANNING & PREPAREDNESS

Planning is the starting point of the Emergency Management Cycle and the first step in protecting historic properties from flooding. The planning process allows a community to evaluate their level of flood vulnerability and ways to reduce damage from flooding (flood mitigation), consider their efficacy and potential impact on historic integrity; select appropriate measures for their community; and develop a prioritized plan for their implementation within a specific timeframe. This can be completed through the hazard mitigation planning process as well as through other local planning efforts. *(Refer to Addressing Preservation & Flooding in Local Planning Initiatives, page 3-5.)*

Recognizing the importance of historic properties, FEMA produced *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning (Publication 386-6)*, on which this chapter is based. While not intended to replace FEMA's guidance, this *Guide* contains information based on the planning experience of the New Jersey Historic Preservation Office (NJ HPO), as well as New Jersey-specific resources. Users should consult both documents.

The hazard mitigation planning process also provides the opportunity for communities to evaluate their historic preservation, zoning, and building regulatory framework and implement improvements to better protect their historic resources. Protection can be preventative, such as developing design guidelines and parameters for property owners to improve their flood resilience in a manner that is sensitive to the historic integrity, as well as responsive in establishing protocols to address the protection of historic resources following a flood event. *(Refer to Develop Design Guidelines for Flood Mitigation, page 3-13, and Plan for Historic Resource Flood Response & Recovery, page 3-18.)*

A municipality may initiate the planning process in response to known threats, often brought to light through disaster and subsequent recovery, or proactively as part the mandated hazard mitigation plan update. ***Although proactively working in the framework of the hazard mitigation planning process is the best way to ensure historic property protection is viewed within the larger context of a community's disaster preparedness, municipalities should consider all options for planning and select the best option for their needs.***



Integrating Historic Property and Cultural Resource Considerations Into Hazard Mitigation Planning

State and Local Mitigation Planning How-To Guide

FEMA 386-6 / May 2005



FEMA 386-6 is a useful tool for integrating historic and cultural resources into the hazard mitigation planning process. However care should be used to ensure the requirements of recent legislation are considered as part of the implementation process, including the Biggert-Waters Flood Insurance Reform Act of 2012 and the Homeowners Flood Insurance Affordability Act of 2014. (Refer to National Flood Insurance Program, page 2-2.)

B. HAZARD MITIGATION PLANNING FOR HISTORIC PROPERTIES

Although historic properties and cultural resources may not be an initial priority in flood mitigation planning, their significance to a community's sense of place can serve as a key motivation for recovery. In addition, historic resources are often integral to a municipality's economic success, fueling heritage tourism, housing Main Street commercial districts, or representing a significant number of residential properties. One of the most effective ways to make the protection of historic resources a priority in the hazard mitigation process is for historic preservation advocates to work with their community planners and emergency management personnel to convey the importance of historic preservation to the community and ensure that these authorities include recommendations in support of their protection in hazard mitigation plans.

One of the challenges local governments face in efforts to provide protection to their historic resources is that many hazard mitigation plans are prepared by counties rather than local governments. Because of the breadth of the area they cover, county-wide plans should identify similar flood risks shared by adjacent communities with the goal of promoting an integrated approach to large-scale, cross-community, mitigation projects. **However, county-wide plans may fail to acknowledge or provide special protection for those areas that give a community its sense of place, such as historic neighborhoods, particularly if historic resource survey documentation is unavailable.** Local planners, and where available, preservations planners, should participate in the county-wide hazard mitigation planning process to ensure their distinctive resources are considered in the preparation of the plan. (Refer to *Identify Historic Properties Within Flood-Prone Areas*, page 3-3, and *Gather Information*, page 4-8.)

C. EVALUATE OPTIONS FOR PLANNING

Local governments have the ultimate responsibility to plan for their own futures, making decisions regarding where to invest their resources, and in the case of historic properties, identify those properties that will receive the greatest resources towards their protection. Communities have several options for planning that may address the subject of flooding and historic resources. The types of local plans can include:

- Hazard mitigation plans;
- Master plans;
- Historic preservation elements;
- Emergency operations plans; and
- Climate adaptation plans.

The hazard mitigation planning process is the best way to integrate the protection of historic resources into the emergency management framework, while other local plans can expand upon a community's



goals in a specific topic area beyond hazard mitigation but should have consistent recommendations and support the community's flood resiliency goals. For example, a municipality's historic preservation element may address administrative procedures with the application review process, which would not be appropriate in a hazard mitigation plan, while recommendations for design guidelines addressing flood mitigation should be consistent in both documents. (Refer to *Addressing Preservation & Flooding in Local Initiatives*, page 3-5, and *Develop Design Guidelines for Flood Mitigation*, page 3-13.) However, municipalities may find that the intensive planning and public outreach required for the hazard mitigation planning process provides a good opportunity to obtain the necessary input to comprehensively update other local plans.

Although the hazard mitigation planning process can be challenging to navigate due to the involvement of multiple agencies, it is the most effective tool for a community's preservation planners and historic preservation commissions (HPCs) to best prepare for and respond to natural disasters. The recommendations of local hazard mitigation plans are utilized to inform the recommendations for the State Hazard Mitigation Plan and have the potential to focus resources on the protection of historic properties.

The State of New Jersey and all its twenty-one counties, as well as the City of Elizabeth, have FEMA approved hazard mitigation plans. To maintain FEMA compliance, local governments must prepare, and update hazard mitigation plans every five years. Local hazard mitigation plans are prepared by a team that includes a team of paid consultant working with county or municipal staff, with local jurisdictions having representation on the team. Through the process, the team identifies vulnerable properties, infrastructure and populations, and prioritizes mitigation projects to reduce those vulnerabilities. The New Jersey State Hazard Mitigation Plan (2019) includes funding opportunities for projects related to historic properties which can be revised to fit local needs and included in a hazard mitigation plan.

At a minimum, local hazard mitigation plans in New Jersey must address risks from flooding, coastal hazards (coastal storms, storm surge, hurricanes, tropical storms, Nor'easters, sea level rise, and coastal erosion, where applicable), winter storms, tornadoes, and wind. Local plans can address additional issues such as earthquakes and wildfires as conditions warrant. For the purposes of this document, the focus will be on flood hazards, although many of the tools and processes can be adapted to address other hazards. It should also be noted that flooding is often accompanied by secondary hazards such as high wind, particularly in areas vulnerable to hurricanes, and fires.

If the planning team works in the hazard mitigation planning framework, information can be prepared as an annex, or standalone component, of the larger hazard mitigation plan, or as a chapter within a plan. There are advantages and disadvantages to each option. The annex approach is recommended as it allows greater focus on the protection of historic resources and provide an opportunity for the preservation planner and the public to provide the greater opportunities for input. However, the chapter approach ensures the integration of historic resource protection in the larger community planning process, allowing



New Jersey State Hazard Mitigation Plan 2019.

the preservation-friendly recommendations to be considered within the context of a municipality's mitigation framework, potentially providing greater community buy-in. Although the annex approach is preferable, it is critical to ensure that whichever option is selected, the recommendations are supported within the larger planning process, reinforcing and not conflicting with actions identified in the remainder of the hazard mitigation plan.

Draft plans must first be reviewed by the New Jersey Office of Emergency Management (NJOEM) for fulfillment of submission requirements and consistency with the New Jersey Hazard Mitigation Plan. Following NJOEM approval and prior to local adoption, plans are submitted to FEMA for review. Approval by FEMA confers eligibility for Hazard Mitigation Assistance Program (HMA) funding for projects included in the plan.

Recognizing that communities are continuously evolving, with changes in development, infrastructure, industry, and potential impacts from emergency events, local communities are required to update their FEMA-approved hazard mitigation plans every five years to remain eligible for funding. Advocates for historic preservation should take the opportunity to participate in the planning process on this cyclical basis. (*Refer to Write, Adopt & Implement the Plan, page 4-28.*)

While participating in the planning process, it is important to keep in mind that there is often tension, and in some cases conflict, between guidance for preservation and floodplain management, and that neither framework has caught up to climate change. (*Refer to What Climate Change Means for New Jersey, page 1-3, Level of Flood Vulnerability, page 4-9, Establish a Planning Timeframe, page 4-13, and Consider Sea Level Rise in Hazard Mitigation Planning sidebar, page 4-16.*) In many regards, this Guide is intended to help bridge those gaps; however, it should be noted that the integration of climate change into planning is continuing to evolve as more information is learned.

D. RECRUIT A TEAM

Flood mitigation and historic preservation are specialized fields with little overlap in their purpose and daily function. ***Historic preservation professionals or advocates are rarely represented in the typical hazard mitigation planning process, led by the local emergency management office.*** Until integration of these disciplines becomes more widespread, planners and emergency managers must collaborate and seek specialized individuals to identify issues and develop creative solutions to meet a community's needs. Although it is ideal to have a full team in place at the beginning of the process, it is more likely that the process will begin with a small group that will expand as goals are formalized and progress made.

To engage in the process, preservation planners, members of historic preservation commissions (HPCs) and/or representatives of local preservation group should request to participate as a member of the technical team for the next hazard mitigation plan update. (*Refer to*

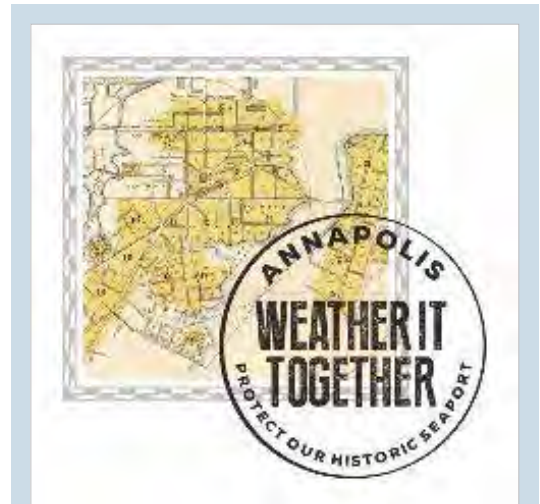
Write, Adopt & Implement the Plan, page 4-28.) It may not be logistically possible for the local emergency management office to include all interested parties on the technical team, and participants that are included should be aware of the significant time commitment required. The preservation advocates(s) on the technical team should ensure that they coordinate with and share information with groups that are interested but unable to participate.

As an alternative, HPCs, preservation planners, or advocacy groups should consider developing a separate hazard mitigation plan for cultural resources, either as an official addendum to the local hazard mitigation plan or as a guiding document for future planning. (Refer to *Addressing Preservation & Flooding in Local Planning Initiatives, page 3-5, and Annapolis Hazard Mitigation Plan for Cultural Resources sidebar, at right.*) This approach allows the organizing group to establish a preservation-friendly team with a breadth of expertise in cultural resources.

Valuable team members should hail from many different disciplines, experiences, and points of view. Although each community will have varying needs and available expertise, the range of experts and advocates for the preservation team can include (in no particular order):

- Elected officials with an interest in historic preservation;
- Historic preservation commission (HPC) members;
- Preservation planners or planners with an interest in preservation;
- Local building, planning, and zoning personnel;
- Floodplain administrators;
- Emergency managers;
- GIS Mapping specialists;
- Professional preservation architects, landscape architects, and archaeologists;
- Representatives of local historical and archaeological societies, private museums, and archives;
- Business representatives from historic commercial districts;
- Representatives from public historic sites, parks, and “friends” groups;
- Civic association representatives from designated residential districts – making a special effort to include traditionally marginalized communities;
- Preservation advocacy organizations;
- Tourism bureau representatives;
- New Jersey Historic Preservation Office (NJ HPO) representatives;
- Local Heritage Area representative;
- Main Street managers, staff, or volunteers; and
- Local colleges and universities with programs related to historic preservation or cultural heritage.

Ideally, the team will represent all parties essential to local preservation planning. However, logistics and competing priorities can make



ANNAPOLIS HAZARD MITIGATION PLAN FOR CULTURAL RESOURCES

As part of its hazard mitigation plan for cultural resources, the City of Annapolis created the Weather It Together brand and logo to help raise awareness about the threats of flooding to historic properties in the Colonial port and encourage public participation in the planning process. The plan – a national model for the protection of historic resources from sea level rise, subsidence, and flooding – has utilized surveys, town hall meetings, charrettes, tours, and other forms of public engagement under the Weather It Together logo. When completed, the plan will identify and recommend mitigation measures to protect the historic and architectural integrity of the capital city.

Annapolis invites other jurisdictions to learn from its experience and to adapt the *Weather It Together* logo and branding as part of their own planning efforts. The Maryland Historic Trust (MHT), the State’s Historic Preservation Office, has adapted the tagline and logo for its statewide programs related to historic preservation and emergency management. (www.annapolis.gov/885/Weather-It-Together.)

coordination difficult. The organizer may wish to establish a core team as a subset of the larger preservation planning team to participate regularly and engage in planning meetings. A representative of the core team would provide the preservation team with regular reports and solicit feedback.

In addition to participating in the hazard mitigation planning process, the local team members can assist in developing tools and mechanisms to address flood mitigation of historic properties through municipal regulatory and planning processes ranging from zoning and building code modification to developing a local historic resource response plan. *(Refer to Chapter 3, Local Tools: Historic Preservation & Flood Mitigation.)* They can:

- Evaluate the current regulatory framework and support for historic properties and floodplain management;
- Identify ways to integrate flood mitigation for historic properties in community planning goals;
- Review existing historic resource documentation and flood vulnerability and identify areas for additional evaluation and documentation;
- Evaluate potential implementation of identified goals in the community rating system and potentially revise local zoning and building codes to reduce floodplain development and potential impacts from a flood event;
- Develop a framework of preferred options for landscape improvements appropriate to local conditions to mitigate flooding;
- Develop design guidelines for flood mitigation appropriate to the local character;
- Prepare information on protective measures for historic properties for owners in advance of a flood and response; and
- Develop a coordinated local response to protect historic resources and fabric following a flood event.

As part of the hazard mitigation planning process, the local team members can play an important role in developing and implementing a public engagement strategy, in addition to promoting the plan as advocates within their organizations or within their constituent groups.

Since the hazard mitigation planning process is cyclical, completed every five years, the planning team can be formed at any time in conjunction with or prior to a hazard mitigation plan update. The planning process can take a significant amount of time and ideally, when it is time for the next plan update, the planning team will have the needed information and public support to include historic and cultural properties in the hazard mitigation plan whether or not they had been previously included.

E. GATHER INFORMATION

Each community has the responsibility of making difficult choices regarding their priorities and how to best utilize available funding and personnel in support of their fellow citizens. ***To get a better sense of how to prioritize their efforts, communities seeking to protect their historic resources from flooding will need to begin with an analysis and assessment of their current programs, initiatives and resources that can be thought of as the “starting point” for the hazard mitigation planning process.***

A community’s starting point should be identified to:

- Establish parameters for planning, including the type of plan(s) in addition to available mitigation and funding options;
- Direct available energy and resources towards the overall goal of protecting historic resources;
- Reveal deficiencies in current information, processes, and resources as well as indicate opportunities for improvement; and
- Identify potential partners who can assist in various aspects of the work – such as seeking guidance from NJ HPO – on the prioritization of historic resource data collection or funding for evaluating flood vulnerability.

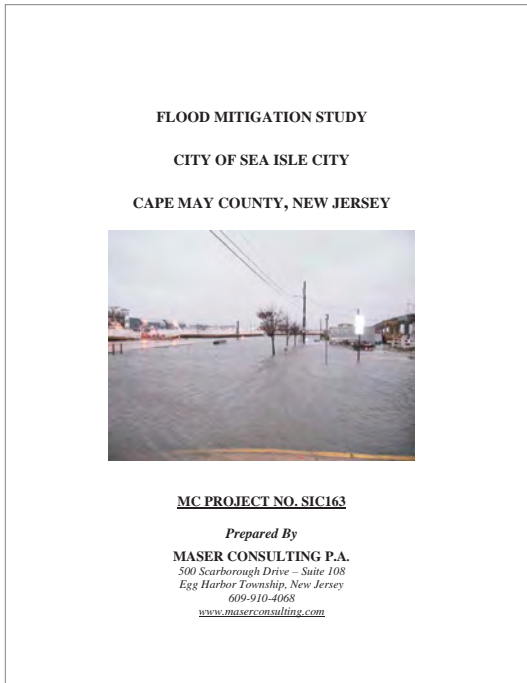
The analysis will identify strengths that will assist them in the process and weaknesses that may challenge their progress. Communities that have experienced flooding might have a robust emergency management plan and dedicated resources towards flood mitigation. Other communities that have not experienced damaging floods may have a heightened interest in protecting historic districts that fuel their tourism economy and define their sense of place. By gathering initial information, community funding and personnel can be directed toward areas in which improvement can be made and develop a process for integrating historic resources into hazard mitigation planning process.

Some of the information that should be collected is identified in the subsections below.

E.1 EXISTING PLANS

As part of outreach to state and local partners, the preservation hazard mitigation planning team should collect municipal planning documents and maps to understand what their community has already established regarding the identification and protection of historic properties. (*Refer to Addressing Preservation & Flooding in Local Planning Initiatives, page 3-5.*) These documents include, but are not limited to:

- State and local hazard mitigation plans;
- Floodplain management plans;
- Disaster response and recovery plans;
- Emergency operations plans;



Flood Mitigation Study, City of Sea Isle City, Cape May County, New Jersey, 2019. (<http://www.seaislecitynj.us/LinkClick.aspx?fileticket=-Tt8slVzH7Y%3d&tabid=2389>.)

- State preservation plans and preservation elements within master plans;
- Heritage area management plans;
- Master plans;
- Community or site-specific master plans;
- Economic development plans, including Main Streets and arts and entertainment districts; and
- State and local transportation plans, including scenic byways.

E.2 LEVEL OF FLOOD VULNERABILITY

The level and immediacy of a community's historic resources flood vulnerability will vary based upon geographic location, geology, hydrology, and the specific types and relative locations of those historic properties. In addition to assessing the impact on buildings, a community's infrastructure should be evaluated for stability and capacity including transportation, utilities, water supply, sewage treatment, and storm water management, all of which can impact risk and recovery. To understand the starting point, each community should gather information to evaluate the flood risk, with the understanding that levels of risk may be unique to each resource. (Refer to *Evaluating a Property's Flood Risk*, page 2-11, and *Identify Historic Properties Within Flood-Prone Areas*, page 3-3.)

Although not required, FEMA and the State of New Jersey encourage local communities to consider risks with respect to a timeframe that incorporates long-term climate projections for sea-level rise, increased precipitation and other factors, depending on the location and timeframe for planning. The New Jersey Climate Alliance estimated that there is a 66% likelihood that New Jersey coastal areas will experience 0.9 to 2.1 feet of sea level rise between 2000 and 2050, with 1.4 feet as a central estimate. (Kopp, 2019.)

The municipal floodplain administrator may be able to provide more specific GIS mapping that identifies the limits of current floodplain, and predictive models that indicate the potential effects of storm surge, sea level rise, coastal erosion, increased precipitation, and other natural hazards associated with flooding. (Refer to *Sea Level Rise & Subsidence*, page 1-4.)

E.3 IDENTIFY HISTORIC PROPERTIES VULNERABLE TO FLOODING

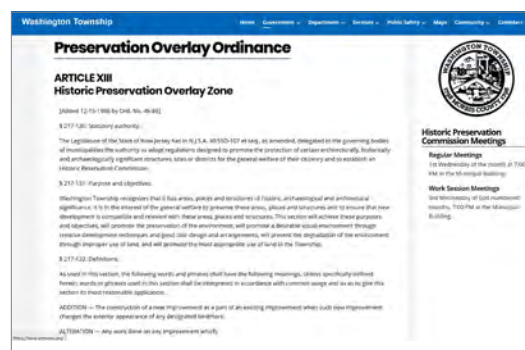
As a first step, the planning team should overlay a map of known historic properties on a map of the areas determined to be vulnerable to flooding. Known historic properties include those determined eligible to for listing on, or listed on, the National Register or Statewide Inventory of Historic Places, properties identified in local inventories (via local preservation planners

or HPCs), and properties identified as culturally or historically significant in existing planning documents. Unfortunately, many communities in New Jersey have incomplete or outdated information regarding historic properties, so additional documentation is often necessary as part of the planning process. (Refer to *Assess & Document Historic Property Flood Risk*, page 4-13.)

Traditionally, historic resource surveys covered limited geographic areas and were limited to difficult to access paper files. **Ideally, survey data should be comprehensively linked to Geographic Information System (GIS) mapping software to be most useful for both cultural resource and flood management and facilitate its use in both community planning and mitigation.** GIS mapping has the added benefit of facilitating regulatory reviews by the historic preservation commission (HPC) and the preparation of master plans and historic preservation elements in establishing community goals pertaining to historic properties. (Refer to *Addressing Preservation & Flooding in Local Planning Initiatives*, page 3-5.) Documentation assessing individual property’s flood vulnerability may or may not be available but should be collected as part of the documentation process. Ideally, this would include property Elevation Certificates, typically prepared as part of a new construction or renovation project, or by property owners seeking to reduce their flood insurance premiums. (Refer to *Identify Historic Properties Within Flood-Prone Areas*, page 3-3, and *Evaluating a Property’s Flood Risk*, page 2-11.)

E.4 PRESERVATION REGULATORY FRAMEWORK

Some communities have a strong preservation regulatory framework, supported by its citizens and local authorities, while other jurisdictions have limited local recognition of and support for their historic and cultural properties. **Starting from a position where preservation is locally valued facilitates the prioritization of mitigation efforts directed toward historic resources.** A strong, local, regulatory framework may include participation in the Certified Local Government (CLG) process; an active historic preservation commission (HPC) with a robust historic district ordinance; a historic preservation component; the identification of preservation as goal in a master plan; as well as supporting directive such as preservation design guidelines. (Refer to *Addressing Preservation & Flooding in Local Planning Initiatives*, page 3-3, and *Develop Design Guidelines for Flood Mitigation*, page 3-13.)



Municipalities with strong preservation ordinances will be in a better position to integrate historic properties into floodplain management.

E.5 AVAILABILITY OF PERSONNEL & FINANCIAL RESOURCES

Financial resources as well as knowledgeable, committed preservation personnel are equally necessary for the successful protection of historic resources. ***Advocacy is crucial to securing funding in the context of competing local interests. Authorities will be more inclined to dedicate financial resources if the preservation of historic properties is visibly supported by a dedicated team of community leaders and volunteers.*** Ideally, preservation-friendly municipal officials can participate in the local planning team or serve in an advisory role. (Refer to *Recruit a Team*, page 4-5.)

E.6 DEGREE OF COMMUNITY SUPPORT

Political will often reflects the degree of community support for an issue and can make the difference between the protection or loss of historic properties. The level of existing community support will be a key factor in determining the public engagement strategy. At the beginning of the planning process, the team should ascertain community sentiment and consider opportunities for engagement with special efforts aimed at marginalized or vulnerable communities that may be difficult to reach. (Refer to *Engage the Public*, page 4-11.)

F. ENGAGE THE PUBLIC

Successful plans require robust public input and support. ***Public outreach strategies should attempt to engage the widest range of citizens. Special consideration should be given to communities that may be particularly vulnerable to flooding and may have historically or culturally significant properties that have not been adequately documented, such as low-income or elderly communities.***

Ongoing outreach can educate citizens about the potential effects of flooding and the potential effects of mitigation measures on the historic properties that matter to them. It can extend beyond the hazard mitigation planning process to address initiatives, planning, and preparedness issues relevant in the community. It can also serve as a forum for citizens to identify places that they consider to be significant that might not be included in any historic inventories. This feedback might identify significant properties that could be eligible for inclusion on the Statewide Inventory or National Register of Historic Places, or a local register, or may not be listed, but are identified as culturally valuable to the community.

When developing the public engagement strategy, the planning team should clearly define goals and structure outreach to inform stakeholders and citizens of the process on a regular basis. The planning team should identify the key moments in the hazard mitigation planning

process in which public input would be valuable, which may include the identification of local priorities, and when public updates are appropriate. The planning team can develop an overall schedule that includes meeting dates, allowing community members to plan ahead. (*Refer to Establish Local Preservation Priorities, page 4-18.*)

The public engagement process can include meetings, events, print media, websites, e-mail blasts, social media, news articles, video streaming, pamphlets, list-serves, workshops, and conferences. To maximize participation, strategies should be considered to increase attendance include holding meetings in various locations and outside of standard work hours; ensuring adequate access by public transportation; providing interpretation for non-English speakers; including child-friendly activities, and/or providing food or child care. There may be dedicated funding opportunities for the public engagement portion of the hazard mitigation plan.

Some issues to consider in a community engagement forum include:

- What are the characteristics of the typical flooding in the community? Is it getting worse? Are adjacent communities addressing similar issues? Is there an opportunity to work together?
- Have historic resources been identified? Are historic resources vulnerable to flooding? Have the citizens been given the opportunity to designate what is locally important?
- What is the community's threshold for risk? What is the relationship to water?
- What defines/maintains sense of place? How can the community change and still protect what's meaningful? Are all neighborhoods/citizens represented in the evaluation?
- Is the community willing to compromise in terms of historic integrity and how does that influence preferences for mitigation actions and to what extent? What can be compromised and what cannot be compromised to maintain sense of place?
- Are individual property owners implementing mitigation projects? How are they making their choices? Is there information to assist them? What are the impacts on the property's historic integrity? Are there impacts on neighboring properties?
- Should both community-wide and building-specific mitigation be considered separately? Is there a benefit in encouraging specific property mitigation projects to supplement or enhance community-wide projects?

After reviewing responses to these questions, a community will be in a better position to develop mitigation goals, strategies, and actions that balance preservation and protection of historic resources through the hazard mitigation planning process as well as local planning and preparedness efforts. Ideally, the engagement process extends beyond the hazard mitigation process and becomes a part of the local decision-making process. Community updates can also be a regular agenda item in a regularly held meeting, such as a historic preservation commission, historical society, business or civic association meeting, or incorporated into a public gathering or event.

G. ESTABLISH A PLANNING TIMEFRAME

Each community must identify flood hazards, including where floods are likely to occur; assess the vulnerability of the community and in some cases, specific properties; and identify mitigation goals, strategies, and actions to reduce the impact of flooding. Although periodically updated, FEMA's Flood Insurance Rate Maps (FIRMs), the most important baseline for flood management, provide information about the most vulnerable areas within a community's floodplain based only upon historical data. (Refer to *Flood Insurance Rate Maps*, page 2-5.)

However, in 2019, the New Jersey Climate Alliance estimated that there is a 66% likelihood that New Jersey coastal areas will experience 0.9 to 2.1 feet of sea level rise between 2000 and 2050, with 1.4 feet as a central estimate. In addition to coastal communities, the anticipated sea level rise will impact low-lying inland areas including floodplains and those adjacent to waterways such as creeks, streams, and rivers. (Kopp, 2019. Refer to <https://njadapt.rutgers.edu/resources/nj-sea-level-rise-reports>.)

Because of the anticipated change in flood risk over time, a community should establish timeframe(s) for planning that are accepted by both governmental officials and citizens, and allow for realistic, achievable implementation goals. If the planning timeframe is too long, it may be perceived as a problem for future property owners or generations. If too short, the timeframe may not allow for adequate long-term protection, thereby requiring additional ongoing planning and implementation of mitigation to reduce future threats. To encourage the implementation of mitigation measures by private property owners, communities might consider a timeframe of thirty years, the length of most homeowners' mortgages. A thirty-year timeframe would also allow communities to utilize anticipated sea level rise predictions for the year 2050. (Refer to *Assess & Document Historic Property Flood Risk*, page 4-13.)

CONSIDERING SEA LEVEL RISE IN HAZARD MITIGATION PLANNING

New Jersey's Hazard Mitigation Plan incorporates sea level rise into the Coastal Erosion section. The 2019 Plan estimates that 32,381 people and an estimated \$10 billion dollars in building replacement costs are potentially vulnerable to coastal erosion in New Jersey. (NJOEM, 2019.)

H. ASSESS & DOCUMENT HISTORIC PROPERTY FLOOD RISK

For a community's historic properties to be accounted for in the planning process, all vulnerable historic and cultural resources should be identified and included in the hazard mitigation plan. The understanding of flood risk includes an understanding of the impacts of flooding in a community, each historic property's location, and is physical characteristics. When this information is coupled with the potential economic impacts from flooding, the planning team, informed by feedback from stakeholders and the public, will be in a better position to informed choices for the protection of a community's historic properties.

H.1 COMMUNITY'S RELATIONSHIP TO WATER

It is important to consider the complexity of historic and contemporary relationships to water on the community, district, or neighborhood level. Layered with social, cultural, historical, and physical dimensions, these relationships can inform an understanding of historic resources in context. It is important to acknowledge that although the information below focuses on historic buildings, many kinds of historic and cultural resources reflect a community's relationship to water. These physical resources can include historic landscapes and archaeological sites as well as water features such as ferry terminals, wharves, docks, and lighthouses. *In addition, there may be intangible heritage in a community associated with water-based recreation, industry, or other activities.* To the extent possible, all aspects should be considered both in the planning process and in evaluating mitigation options. To better understand how to protect historic properties for the future, it may be beneficial to review the factors below.

- **Past Flood and Storm Events:** With many of New Jersey's historic communities located adjacent to waterways, it may be beneficial to gather information about previous flood or storm events, specifically noting the physical effects of these events on the landscape and buildings over time. During the public engagement and documentation process, communities may wish to solicit "storm stories" or compile oral histories from the public about flooding and storm events and resulting community changes. (Refer to *Flooding in New Jersey*, page 1-6.)
- **Flooding Source:** In assessing a community's physical relationship to water, it is important to keep in mind that waterways were often altered over time by a change in course or by being covered over. In many cases, historic streams and former wetlands, now covered over or developed, contribute to current flooding, and restoring these areas can contribute to mitigation efforts. (Refer to *Reduced Stormwater Capacity*, page 1-5.) Historic maps and atlases can provide clues to how development responded to those changes, and how this evolution is (or is not) visible in the current environment. It is also prudent to understand the potential future impact of flooding whether by increased development in a floodplain or sea level rise.
- **History of Adaptation:** *An understanding of past historic mitigation or adaptation measures can suggest options for the future.* Through history, owners of properties in vulnerable locations have made unofficial adaptations to minimize the impact of flooding. These adaptations can inform workable solutions for mitigation options. (Refer to *Selecting Preservation-Friendly Mitigation*, page 7-2.)



Historic atlases can identify the locations of former streams, creeks, and wetlands. New Jersey Geological Survey, Atlas sheet no. 19, 1889. (Atlas courtesy of Princeton University.)

- **Community Infrastructure:** In any given community, an infrastructure issue or another community-wide issue affecting numerous properties may guide the mitigation timeline. For example, access to fresh water, sewage treatment, electricity, and roadways are critical for human life. If access to these resources is compromised long-term, it will be unlikely that people will choose to remain in the community. Understanding when these systems will probably be affected by an adverse event and the likelihood of their restoration to functionality may dictate a timeframe in which an infrastructure must be restored for a community's remaining in its location to be tenable. (Refer to Chapter 10, *Adaptation*.)

H.2 FLOOD VULNERABLE HISTORIC PROPERTY DOCUMENTATION

Baseline survey documentation is essential in establishing community preservation goals and strategies. As a first step, the planning team should overlay a map of historic properties, identified from the sources described above, on a map of the area determined to be vulnerable to flooding. (Refer to *Identify Historic Properties Within Flood-Prone Areas, page 3-3.*) Ideally, for the purposes of hazard mitigation planning, a consultant team will document historic properties and assess flood vulnerability at the same time. Not only does this streamline the planning process: local planners rarely have the time and/or expertise required to undertake this step on their own. Hazard mitigation planning funds can support surveys of historic properties if those surveys also identify hazard risks and recommend mitigation measures, or if they include completing Elevation Certificates for historic structures. (Refer to *Evaluating a Property's Flood Risk, page 2-11.*) Likewise, preservation planning funds, such as those available through the Certified Local Government (CLG) program administered by the NJ HPO, can be used to conduct vulnerability assessments in tandem with historic property documentation.

In addition to location within a flood-prone area, other factors can influence a property's degree of risk and possible level of flood damage including a building's horizontal and vertical location within the floodplain and its foundation type, both factors in determining a property's flood insurance rate and premium. (Refer to *Evaluate a Property's Flood Risk, page 2-11.*) **For the purposes of hazard mitigation planning, a property-by-property survey will form a more complete understanding of a community's historic property flood hazard.** (Refer to *Identify Historic Properties Within Flood-Prone Areas, page 3-3.*) If possible, separate records should be created for each historic resource on a property, such as a main house or individual outbuilding. FEMA also provides guidance on conducting a risk assessment for historic properties and cultural resources in its publication *Integrating Historic Property and*

Cultural Resources Considerations into Hazard Mitigation Planning (FEMA 386-6, 2005).

In completing hazard assessments for individual historic properties, there are several areas which call for attention:

- **Elevation of Habitable Space:** The most useful assessments evaluate flood vulnerability on a structure-by-structure basis, not just via FIRMs and other generalized mapping tools. One of the best ways to accurately determine an individual building's flood risk is by commissioning an Elevation Certificate. *An Elevation Certificate identifies a property's specific vulnerability to flood risk by analyzing the height of the lowest occupied floor of a building, including basements, relative to the Base Flood Elevation.* Basements often include building systems and appliances, which tend to be highly vulnerable to water damage, resulting in a higher level of risk during a flood event. Not all buildings in a flood-prone community or within the SFHA will have completed Elevation Certificates, with those that are available likely retained by the local floodplain administrator. It likely that the community will also need to conduct vulnerability assessments for historic structures as part of its planning process.
- **Building Condition:** A building's condition is a key factor in assessing its vulnerability and mitigation options. *Buildings that are in poor to fair condition will be less likely to withstand a flood event or the implementation of mitigation measures than a well-maintained building.* This is particularly true if building mitigation includes elevation or relocation. Maintenance needs should be identified since a well-maintained property can provide the most cost-effective investment in reducing the potential flood damage. (Refer to *Encourage Property Maintenance*, page 3-17.)
- **Building Foundation Design and Materials:** Historically, wood framed buildings in flood prone areas were supported by brick piers, elevating the building's structure and contents above flood level and allowing ventilation and drying of the soil below. Similarly, basements and crawlspaces were constructed with unfinished rubble walls and dirt floors to allow slow, outward water seepage and promote drying after a flood. *Flood vulnerability can increase with changes to building historic building materials and construction techniques, such as the solid infilling of the area between piers and the finishing of basements.* This can be exacerbated with the replacement of historic materials with newer materials, many of which are more susceptible to flood damage.

The hazard assessment should also note the presence of potentially damage-resistant historic materials such as wood, plaster, stone, and brick, as well as non-historic materials. Material and equipment damage can result from direct water contact or develop as a secondary effect in the form of mold, mildew, and rust. (www.fema.gov/flood-resistant-material.) (Refer to *Wet Floodproofing*, page 9-6.)



An understanding of building's condition as well as foundation design and materials is necessary to determine flood risk. Basement finishes, such as a basement floor slab, can prevent stormwater or ground water drainage.

- **Prior Flood History:** Documentation of prior flood history may be available from several sources. These can include reports or records from FEMA (NFIP) or a local floodplain administrator; published and unpublished local histories; building department records; historical photographs; and newspaper, newsletter, or magazine accounts of flooding. In addition, meeting minutes or treasurer’s reports from local organizations, such as religious institutions, house museums, or clubs. (*Refer to Community’s Relationship to Water, page 4-14.*)
- **Secondary Hazards and Risks:** In locations where flooding might be a primary risk, there are often secondary risks associated with an event. Coastal storms are often accompanied by high winds, which can result in toppled trees and flying debris. Downed electrical lines can result in loss of power and increased fire threat. Fire can also be caused by ruptured gas lines as well as disconnected or damaged appliances and propane tanks.

The assessment and documentation process can provide the framework for a future National Register historic district nomination, should one be desired. (*Refer to Identify Historic Properties Within Flood-Prone Areas, page 3-3, and Historic & Cultural Resource Documentation, page 10-6.*) Recording survey districts also helps identify resources that may be individually eligible for inclusion in the National Register of Historic Places. While NJ HPO must concur on formal eligibility, this information can be used when developing hazard mitigation priorities and as part of the historic preservation review process for federal or state undertakings.

Not every historic property surveyed will meet the criteria for federal or local designation, and in some cases, designation is not desirable. ***Without a formal designation or determination of eligibility for the National Register, or local designation by a Certified Local Government, a property will be treated as “non-historic” and will be required to meet the floodplain regulations if alterations fall under the local government’s definition of “substantial improvements” or “substantial damage.”*** (*Refer to Floodplain Regulations & Ordinances, page 2-6.*)

To access the greatest potential benefits, including relaxation of floodplain and building code requirements as well as financial support, a property should be listed on the National Register of Historic Places, either individually or as a contributing resource within a historic district. Depending on the local regulatory framework, National Register designation and local designation may provide:

- Recognition of what is locally significant and potential higher consideration for protection through the hazard mitigation planning process;
- Access to historic preservation funding; and
- Protection through historic preservation project review to minimize historically inappropriate alterations.

Some local governments, via their local floodplain ordinances, do not require historically designated properties to meet all flood-related code requirements. Although this allows the property to retain – at least for the time being – its historic integrity, appearance, materials, and relationship to its context, the property will remain vulnerable to flooding. The exemption also requires property owners to balance the competing needs of preservation and resiliency. (Refer to Floodplain Regulations & Ordinances, page 2-6.)

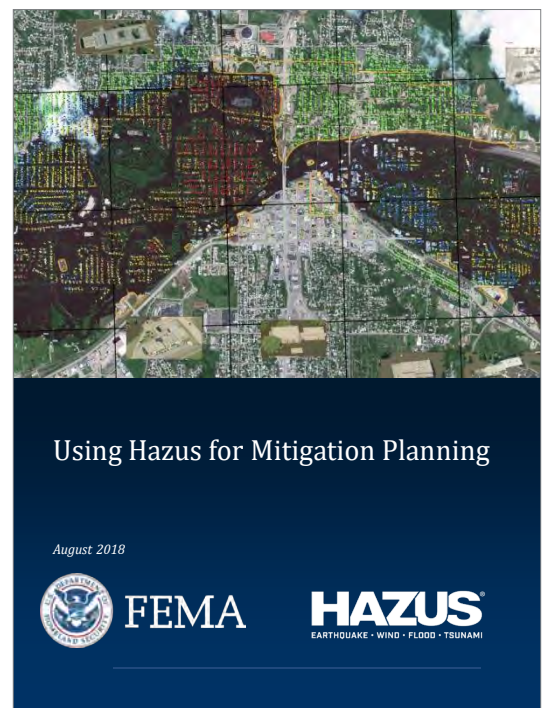
H.3 ESTIMATE ECONOMIC IMPACT

One tool that can be utilized to calculate financial impact is FEMA’s HAZUS software, which provides models for estimating potential losses for physical damage to buildings and infrastructure, economic losses, and social impacts from earthquakes, tsunamis, floods, and hurricanes utilizing GIS technology. (<https://www.fema.gov/hazus/>.) HAZUS estimates are generally provided during the update of a hazard mitigation plan by the contractor who is updating the plan, but they may also be developed by a municipality’s GIS staff. **Keying historic and cultural property information to a GIS database through a historic resources inventory facilitates the HAZUS documentation process.** It should be noted that the HAZUS software is limited in that it treats all buildings as the same, without accounting for the unique nature of the design, construction, and materials of historic buildings. Building cost data references can be used to calculate a replacement cost; however, a multiplier should be used to account for the uniqueness of historic buildings (e.g. custom construction; custom fixtures such as built-in cabinetry; unusual, rare, or superior building materials).

In addition to the replacement cost for a building or portion thereof, the cost estimate should also include displacement time, functional downtime, and replacement of contents. Guidance for estimating these costs and different methodologies for estimating the replacement cost for a building can be found in FEMA 386-6, *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning* (2005).

I. ESTABLISH LOCAL PRESERVATION PRIORITIES

It is logistically and financially unfeasible to protect all the historic resources within a community from flooding; therefore, it is necessary for the planning team to identify which resources are the most important to its citizens, and the feasibility of mitigation for those properties. Each historic place has certain resources that are intrinsically linked to the sense of the place and community. **The process of prioritizing which**



FEMA’s 2018 *Using Hazus for Mitigation Planning* can be used to estimate potential damage, economic loss, and social impacts from earthquake, flood, tsunami, and hurricane wind hazards. (https://www.fema.gov/media-library-data/1540479624999-ab1eca852448e271f0de82cf2031a01b/Using_Hazus_in_Mitigation_Planning_20180820_Final_508_Compliant.pdf)

**GUIDELINES ON FLOOD ADAPTATION FOR REHABILITATING HISTORIC BUILDINGS
PLANNING AND ASSESSMENT FOR FLOOD RISK REDUCTION (NPS, 2019)**

RECOMMENDED	NOT RECOMMENDED
Identifying historic materials, features, and spaces that are important in defining the historic character of the property when planning and undertaking flooding adaptation treatments.	
Developing and implementing a plan to reduce the risk of damage or destruction to the historic building.	Failing to proactively analyze and address a flooding risk.
Identifying and evaluating the vulnerabilities of the historic property to the impacts of flooding using the most current climate information and data available.	Failing to identify and periodically reevaluate the potential vulnerability of the building, its site, and setting to the impacts of flooding.
Assessing the potential impacts of known vulnerabilities on character-defining features of the building, its site, and setting. Reevaluating and reassessing potential impacts on a regular basis.	
Documenting the property and character defining features as a record and guide for future repair work, should it be necessary, and storing the documentation in a weatherproof location with at least one duplicate at a secure site.	Failing to document the historic property and its character-defining features with the result that such information is not available in the future to guide repair or reconstruction work.
Maintaining the building, its site, and setting in good repair, and regularly monitoring character-defining features.	Failing to regularly monitor and maintain the property and the building systems in good repair.
Using and maintaining existing historic and non-historic characteristics, features, and materials of the historic building, its site, setting, and larger environment (such as a site wall that keeps out flood waters) that may help to avoid or minimize the impacts of flooding.	
Undertaking work to prevent or minimize the loss, damage, or destruction of the historic property while retaining and preserving significant features and the overall historic character of the building, its site, and setting.	Carrying out adaptive measures intended to address the impacts of flooding that are unnecessarily invasive or will otherwise adversely impact the historic character of the building, its site, or setting.
Ensuring that, when planning work to adapt for flooding, all feasible alternatives are considered, and that the options requiring the least alteration are considered first.	
Replacing damaged or deteriorated historic materials in kind where the traditional material is flood-damage resistant. Replacing damaged or deteriorated historic materials that are not resilient to flooding with proven flood-damage resistant substitute materials that match the appearance and design.	



GUIDELINES ON FLOOD ADAPTATION FOR REHABILITATING HISTORIC BUILDINGS PLANNING AND ASSESSMENT FOR FLOOD RISK REDUCTION (NPS, 2019)

RECOMMENDED	NOT RECOMMENDED
Utilizing local and regional traditions (such as elevating residential buildings) for adapting buildings in response to flooding when compatible with the historic character of the building, its site, and setting.	Utilizing an adaptation treatment traditionally used in another region or one typically used for a different building type or architectural style which is not compatible with the historic character of the property.
Using special exemptions and variances when prescribed adaptive treatments to protect buildings from flooding would otherwise negatively impact the historic character of the building, its site, and setting, while still taking steps to address or help minimize flood risk as much as possible.	Using a special exemption or variance to avoid taking any steps to address or help minimize the impacts of flood risk on a historic property.
Considering adaptive options, whenever possible, that would protect multiple historic resources, if the treatment can be implemented without negatively impacting the historic character of the overall historic property, district, or archaeological resources, other cultural or religious features, or burial grounds.	Failing to consider other properties nearby in planning flood adaptations, therefore increasing the risk or exposure to neighboring properties.

historic resources to protect from flood hazards requires thoughtful consideration and engagement with the public about what is important in conveying the history of the community; what really makes it feel like home; and how those historic resources contribute to the area's economic vitality. (Refer to *Selecting Preservation-Sensitive Options*, page 7-2.)

Establishing preservation priorities for flood protection do not exist in a vacuum. Other state and local planning documents may contain priorities related to historic resources that should be consulted and considered. (Refer to *Addressing Preservation & Flooding in Local Planning Initiatives*, page 3-5.) Aligning priorities across planning documents will help develop mitigation actions for historic resources that are integrated with existing planning programs and initiatives and may also help to identify potential sources of funding for mitigation actions beyond the traditional hazard mitigation project funding sources. **Because these other plans have gone through a similar vetting process with the state and local government and the public, it may be easier to garner support for the mitigation actions developed based on a previously prioritized list of historic resources. The more community support there is behind preservation flood mitigation projects, the more likely those projects will be successfully implemented.** (Refer to *Engage the Public*, page 4-11.)

To establish local preservation priorities, it is recommended that the following four factors be used to evaluate historic resources to determine their overall importance to the community:

- Critical to sense of place;
- Vulnerable to flood hazards;
- Economic contribution; and

- Other considerations.

This four-factor method also shifts the prioritization decisions from a top-down approach, focused on planners and preservationists, to a more balanced approach that can facilitate meaningful community input, potentially challenging established preservation priorities.

I.1 CRITICAL TO SENSE OF PLACE



A favored commercial or residential street can be both historically important and critical to a community's sense of place. (Lambertville, 1910.)

What resources resource contribute to the community's sense of place, identity, and cultural heritage? **The public response may not agree with a traditional preservation professional's definition of a historic or cultural resource, but should be considered.** Examples of critical resources could include:

- A Main Street or residential streetscape;
- A historic neighborhood;
- A town plan;
- Historic community gathering places such as houses of worship, schools, and community centers;
- A historic park; and
- Historic civic buildings.

I.2 VULNERABLE TO FLOOD HAZARDS

Using information from the risk assessment, identify the level of risk faced by the resource. Risk should be defined prior to the prioritization process, and the definition for risk should be consistently applied to each resource that is evaluated. The risk could be defined as a range of possibilities from high risk being equal to 50% to complete destruction of the building (where the cost to return the building to its pre-damaged condition would equal or exceed 50% of the property's pre-damaged market value); moderate risk equal to less than 50% damage; and low risk equal to little or no damage.

High risk could also be defined as all resources in Special Flood Hazard Areas (SFHAs); moderate risk as all resources in the 0.2% annual flood zone; and low risk as all properties beyond the 0.2% annual flood zone. A third definition might be that high risk is all properties in V zones (SFHA, but subject to wave action where waves are 3-feet high or greater) and within the limit of moderate wave action (also referred to as the Coastal A Zone, the portion of the SFHA that is subject to breaking waves of 3 to 1.5 feet high); moderate being properties located in the portions of the SFHA subject to waves that are one and half feet high or less; and low risk being properties in the 0.2% annual flood zone. **For any evaluation of risk, communities should integrate predictive flood modeling, including increased precipitation, sea level rise and storm surge, which are not reflected in FIRM mapping.** (Refer to *Flood Insurance Rate Maps*, page 2-5.)



Cape May's historic character is critical to the sense of place and economic recovery following a disaster.

I.3 ECONOMIC CONTRIBUTION

Does the resource contribute to the economy of the community? Is the resource an economic driver in the community, such as a tourist destination, historic neighborhood or downtown where revitalization is occurring? Examples of resources that contribute economically to a community are a historic marketplace or Main Street, a destination like Liberty State Park, Atlantic City's Boardwalk Hall, oystering in Bivale and Shell Pile, and the historic waterfront of Cape May.

I.4 OTHER CONSIDERATIONS

This factor is meant to be user-defined and adapted to local circumstances based upon community input to provide flexibility in evaluating the attributes of resources that are not captured by the other three evaluation factors. For example, 'Other Considerations' could be used to assign value to un-surveyed properties without documented historic and architectural significance to prevent bias in favor of properties that are listed in the National Register or a local inventory. This factor could also be used to evaluate resources which lack integrity or are otherwise ineligible for listing in the National Register or for local designation but are important to the intangible culture of the community (i.e. a working waterfront or crab processing sheds that may not meet the traditional definition of "historic," but may be culturally significant). Conversely, 'Other Considerations' could be used to evaluate the level of significance of a property: is the resource National Register-designated, locally designated or was it evaluated and not designated because it did not meet the required criteria; or does the property contribute/not contribute to a National Register or locally designated historic district?

RANKING HISTORIC RESOURCE VALUE TABLE

Resource	Critical	Vulnerable	Economic	Other	Priority Score

A table can be a useful tool to establish preservation priorities in the protection of historic resources in a community.

Public engagement will help rank and identify a prioritized list of resources to be protected. (*Refer to Engage the Public, page 4-11.*) The evaluation process begins with determining the ranking value. A basic ranking system such as high/medium/low might be easiest to communicate to the public; however, it may be desirable to have a more nuanced ranking system to weigh the different factors based on what the planning team and/or public feel are most important. This can be done by using a numerical value, such as 1 to 10 for each of the four factors, generating a cumulative score for each resource. The information can be compiled in a table, providing a clear comparison between resources. The resources that receive the highest rank or score represent a community's top priorities for protection. This type of community-based prioritization fosters public support for historic resource protection.

FEMA presents an alternate prioritization approach in *Integrating Historic Properties and Cultural Resources Considerations into Hazard Mitigation Planning* (FEMA 386-6) focusing on professional preservation evaluation factors. FEMA's cultural resource prioritization factors are: geographic context of significance (national, tribal/state, local), level of significance, degree of integrity, economic importance and public sentiment. This method has the advantage of being vetted by FEMA, however, the disadvantages include:

- Requiring leadership by a historic preservation professional or someone with experience in historic preservation;
- Prioritizing National Register designated properties over those that are locally designated and unstudied cultural resources; and
- Shifting resource prioritization heavily towards the planning team and away from the public.

Each community should develop their own approach to establishing their preservation priorities. There is no “right” or “wrong” answer. Whatever approach is utilized, it should be applied consistently to be representative of the over-arching community goals.

J. DEVELOP MITIGATION GOALS & OBJECTIVES

An understanding of the community’s timeframe for planning goals, flood-vulnerable historic resources and the local priorities provide the basis for developing a flood mitigation strategy for historic properties.

Mitigation goals related to the protection of historic resources should be broad statements that describe what the plan is trying to achieve. Examples of goals include:

- Enhance the ability of historic resources to withstand a flood event;
- Identify a way to protect historic resources located along a waterfront or in the commercial downtown; and/or
- Ensure continued heritage tourism by developing a plan to protect significant structures.

Once goals are established, they should be checked against the local planning documents to ensure that the recommendations are consistent with other community goals. *(Refer to Addressing Preservation & Flooding in Local Planning Initiatives, page 3-5.)* If the goals are consistent, the preservation perspective will reinforce the community’s larger goals. If complementary goals are not identified or there is a conflict, engagement is required to establish common goals between local regulators and the community at large.

Unlike goals, which are broad statements, objectives are specific measurable strategies for protecting historic properties. Examples of objectives to enhance the ability of historic resources to withstand a flood event can include:

- Educate the public regarding flood threat to private property *(Refer to Engage the Public, page 4-11);*
- Promote regular maintenance to reduce vulnerability *(Refer to Encourage Property Maintenance, page 3-17);*
- Assess appropriate mitigation options for individual properties *(Refer to Chapter 9, Property Mitigation Strategies);*
- Develop design guidelines to clarify appropriate mitigation options *(Refer to Develop Design Guidelines for Flood Mitigation, page 3-13);* and/or
- Provide property owners with information about existing financial programs to assist in mitigation implementation. *(Refer to Develop Information for Property Owners, page 3-20, and Funding for Recovery, page 6-8.)*

As in other stages of the planning process, the planning team should seek and incorporate community input to ensure that the preservation goals and objectives fit within the larger hazard mitigation plan, as well as the objectives of the local population. Public engagement also provides an opportunity to address differences of opinion prior to investing time developing appropriate historic preservation options. (Refer to *Engage the Public*, page 4-11.)

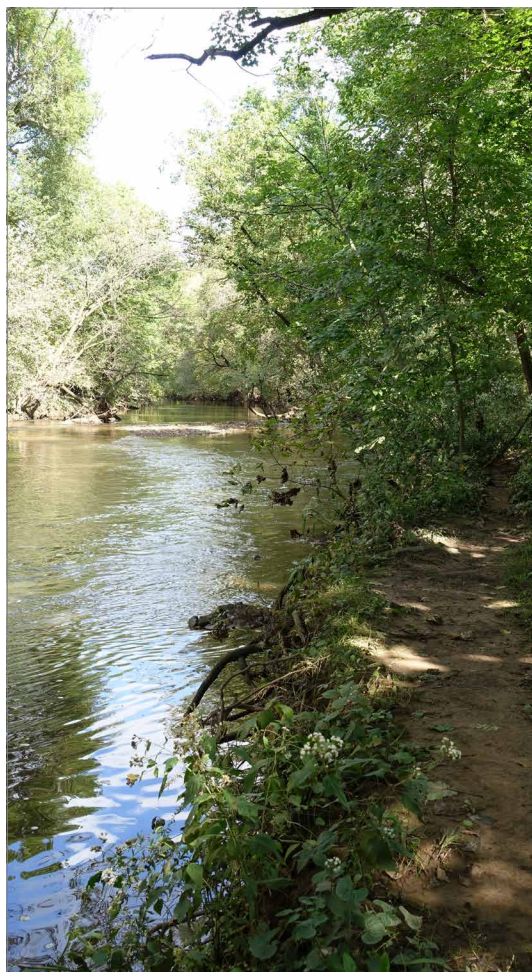
K. IDENTIFY, EVALUATE & PRIORITIZE HISTORIC PROPERTY MITIGATION OPTIONS

In developing preservation mitigation priorities, it is important to understand which community resources are most important to protect, the cost implication of providing that protection, and how the preservation priorities fit into the larger context of the local overall hazard mitigation plan. Flood mitigation options can range from large-scale community projects to smaller property-specific mitigations. **Preservation professionals or advocates participating in hazard mitigation plan development can help articulate potential impacts of different treatments to historic properties on a community-wide basis as well as at individual properties.** (Refer to *Selecting Preservation-Sensitive Options*, page 7-2.) Each strategy will have a different ease of implementation, level of support, financial requirements, and implementation timeline.

Balancing mitigation options with the traditional approach to historic preservation can be a challenge. From the preservation perspective, each flood mitigation option must be considered based on its potential impact on the historic integrity of the individual property as well as on its surroundings. Actions on an individual property may affect the integrity of a historic district. Similarly, community-wide mitigation strategies will have effects on both the district as a whole and on individual properties.

In reviewing mitigation options, the planning team should give special consideration to the factors listed below.

- **Community-wide mitigation strategies.** Community-wide mitigation projects, such as infrastructure improvements, typically benefit of community support and protect multiple properties, both historic and non-historic. They can also protect vulnerable populations and their cultural heritage, particularly in communities where financial means for implementing individual property mitigation projects. Community-wide mitigation projects may allow a local government to capture additional credits in the Community Rating System (CRS), if the community participates in the program, which may help the community to achieve a higher classification. **However, some community-wide options can alter or destroy historic and cultural resources and their context, requiring careful consideration and evaluation.** (Refer to *Community Rating System*, page 2-13, *Selecting Preservation-Sensitive Options*, page 7-2, and Chapter 8, *Community Mitigation Strategies*.)



Community-wide mitigation can include stream bank restoration.

- **Added community benefit:** A community-wide mitigation project might include the construction of structural features, such as a levee or a seawall, which could be designed to double as a linear park or bike trail. This allows flood resilience to be improved while adding a community benefit for its residents. At an individual property, this can include the sensitive integration of parking in lieu of flood-vulnerable inhabited space; thus, allowing for a reduction in impervious surface coverage if surface parking is replaced with landscaping. *(Refer to Chapter 7, Mitigation: Hazard Mitigation for Historic Resources.)*
- **Scalability:** Given financial constraints and long-term changes in vulnerability due to climate change, communities should consider the degree to which mitigation options are scalable and can be built upon as time passes and flood conditions worsen. As an example, the construction of shoreline protection should anticipate enhancement to mitigate future sea level rise.
- **History of adaptation.** Communities with a long history of flood vulnerability may also have a history of flood adaptation of buildings, including elevation or relocation. Continuing this traditional adaptation approach in a manner that is consistent with the historic precedent may minimize the impact of the proposed mitigation and provide a good option for property-specific mitigation. *(Refer to Flood Vulnerable Historic Property Documentation, page 4-15.)* As an example, the development of the Borough of Beach Haven's Design Guidelines for their Historic Preservation Advisory Committee incorporated research and analysis of historic precedents.

In evaluating mitigation options, it is important to keep in mind that it is unlikely that resources will be available to treat all historic properties equally, and that some historic properties will not be adequately protected. The planning team should consider multiple options simultaneously, from large-scale community-wide projects to readily achievable short-term options that can be implemented faster or incrementally. (Refer to Chapter 7, Mitigation: Hazard Mitigation for Historic Resources.)

Some mitigation options can be implemented with limited resources, while others will require significant planning, personnel, and funding. In the evaluation process, mitigation options should be prioritized to include long-term, intermediate, and more readily-achievable short-term goals. The long-term goals typically include community-wide options, while the short-term goals will rely more heavily on municipal planning and preparedness activities such as the preparation of flood mitigation design guidelines, modification of building and zoning codes, and the development of information for historic property owners. *(Refer to Chapter 3, Local Tools: Historic Preservation & Flood Mitigation.)*

The following criteria can be used to evaluate the best mitigation options for a community:

- **Local preservation priorities:** In selecting mitigation options, it is important to evaluate whether those options meet local preservation priorities and protect historic resources with the least intrusive mitigation measures. *(Refer to Establish Local Preservation Priorities, page 4-18, and Selecting Preservation-Sensitive Options, page 7-2.)*



The protection of a historic residential neighborhood may be a local preservation priority.

- Cost effectiveness:** Mitigation options must be cost-effective. The planning team can illustrate cost-effectiveness by comparing the cost of implementation to the cost of the potential damage if nothing were done. If the value associated with the implementation equals or is lower than the potential flood loss, FEMA considers the mitigation option to be cost-effective, qualifying the option for possible FEMA funding. The cost associated with the do-nothing approach includes:
 - The values calculated as part of a Historic Property Hazard Assessment (*refer to Establish Local Preservation Priorities, page 4-18*); and
 - The reduction of the tax base for significantly damaged, relocated or demolished properties.
- STAPLEE evaluation:** The STAPLEE analysis, a tool developed by FEMA, can be used to evaluate mitigation options for historic resources in a community. It utilizes the following criteria: Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) favorability. The STAPLEE Action Evaluation Table is included in FEMA publication 386-6, *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning: State and Local Planning How-To Guide*. (May 2005). Each potential mitigation option is evaluated by ranking it for multiple factors in a STAPLEE table devoted to that option.

Evaluating mitigation options using these three criteria will narrow potential mitigation options to those most appropriate and feasible to implement in a given community. NJ HPO is available for consultation during the STAPLEE review process to assist in the evaluation as to whether proposed mitigation options are consistent with historic preservation review criteria. (*Refer to Historic Property Project Review, page 3-19.*)

Ultimately, the hazard mitigation planning team, under the guidance of the municipal emergency management office, will identify the mitigation options that are best for the community, which can include preservation. Selected mitigation options should be clear, achievable and consistent with the municipality's overall hazard mitigation plan goals.

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)			E (Environmental)					
	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Environmental Goals	Consistent with Federal Laws
Considerations → for Alternative Actions ↓																							

FEMA's STAPLEE criteria can be used to evaluate mitigation options for historic properties.

L. WRITE, ADOPT & IMPLEMENT THE PLAN

The municipal hazard mitigation plan implementation strategies detail how and when a community will advance mitigation options, including realistic budgets and schedules. Developing sound strategies will include consulting with stakeholders to identify potential funding sources and partnership opportunities. **Preservation professionals and advocates, including the NJ HPO, can provide feedback on whether the proposed mitigation options could negatively impact the historic integrity of historic resources and suggest ways to minimize that impact. In addition, a review of mitigation options by the NJ HPO can establish community-wide criteria for state review of individual applications, such as building elevation heights.** It can also assist in NJ HPO approval of applications for historic preservation tax credits. (Refer to companion document, *Elevation Design Guidelines for Historic Properties*.)

The municipal hazard mitigation plan will be prepared under the guidance of the local emergency management office. The role of preservation planners in the preparation of the plan will vary from consulting the larger group to writing the chapter or annex devoted to the protection of historical and cultural resources, depending on the planner's level of participation in the process. However historic properties are addressed, hazard mitigation plans for cultural resources should include:

- A summary of the planning process itself, including the sequence of actions taken and a list of team members and stakeholders who participated;
- A description of hazards considered and cultural resources identified;
- The results of the risk assessment and estimation of loss;
- Local preservation priorities;
- Mitigation goals and objectives;
- Mitigation actions that will help accomplish the established goals and objectives;
- Strategies that detail how the mitigation actions will be implemented and administered; and
- Documentation of the public engagement conducted for the preservation component of the plan.

The emergency management office team must ensure the support of partners and local leaders; shepherd the plan through to adoption by the local jurisdiction and approval by NJOEM and FEMA; and communicate the final plan to the public. **It is important to ensure that the defined strategies are consistent with other local planning documents including master plans and historic preservation elements. Updates of other planning documents should be completed as needed.** (Refer to *Addressing Preservation & Flooding in Local Planning Initiatives*, page 3-5.)

Prior to submission to FEMA, the plan must go to NJOEM for an initial review and approval. This ensures that local hazard mitigation plans are consistent with the state's mitigation goals and objectives and that the plan meets FEMA's requirements. Following FEMA approval of the plan,

it is adopted by the local municipality, or in the case of a county-prepared plan, each municipality by ordinance. With adoption, the mitigation strategies within the plan are eligible to receive Hazard Mitigation Assistance Program (HMA) funding. (Refer to *Fiscal Year 2015 Hazard Mitigation Assistance Guidance and Addendum*, <https://www.fema.gov/media-library/assets/documents/103279>.)

Hazard mitigation planning is a cyclical process that is never “done.” Local hazard mitigation plans must be approved by FEMA and updated at least every five years to be current, thus allowing a community to remain eligible for funding under FEMA’s Hazard Mitigation Assistance programs. ***The time between updates can be used to lay the framework for enhancing historical and cultural resource protection in future updates and to build local support. It can also be used to improve local planning and preparedness to reduce the impacts of future flooding.*** (Refer to Chapter 3: Local Tools: Historic Preservation & Flood Mitigation.)

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5

Response: Hazard Mitigation for Historic Resources

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RESPONSE

“Conducting emergency operations to save lives and property, including positioning emergency equipment and supplies; evacuating potential victims; providing food, water, shelter, and medical care to those in need; and restoring critical public services.”

-- FEMA, A Nation Prepared

Emergency response focuses on life safety and, secondarily, limiting property damage. As a result, historic preservation ranks lower among the responder’s priorities. **Response is always a local effort and the activities included in a response are typically guided by the local emergency manager and will include the mobilization of different departments and agencies; the allocation of resources; and the direction of damage assessments tailored to the specific nature and extent of the emergency.**

The immediate response can include:

- Establishing communications between the municipal, state, and federal government agencies;
- Gathering information regarding impacted properties;
- Executing an assessment strategy;
- Facilitating first responders (police, fire, medical personnel), conducting search and rescue operations;
- Conducting fire suppression;
- Clearing debris to facilitate evacuation and first responder activities;
- Identifying of structurally unsound buildings;
- Providing a safe location to meet basic human needs for food, water, shelter, and medical care; and
- Restoring essential community services.

The response for smaller scale emergencies may be addressed through local policies, plans, procedures, and plans as outlined in the local

emergency management plan. If the scale or severity of the emergency warrants, the local emergency manager can declare a State of Emergency, either in advance or following a flood, to facilitate operations outside of normal activities. This can include activating existing Memoranda of Understandings with neighboring jurisdictions to supplement their own resources or requesting assistance from New Jersey Office of Emergency Management (NJOEM) for response and recovery efforts when the local resources are exhausted or insufficient.

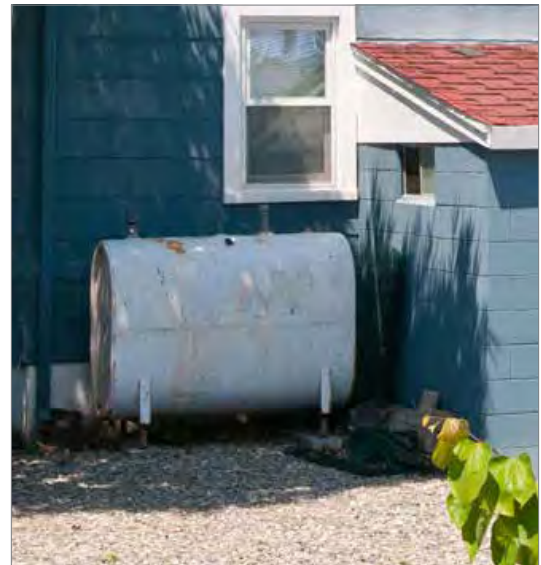
If there is adequate notice in advance of a flood event, such as an anticipated severe storm, community response can include mobilization to protect buildings prior to evacuation of the threatened area. When considering actions to minimize damage from flooding, property owners should be encouraged to assess and mitigate potential secondary damage associated with high winds, often associated with hurricanes, and fire, which could result from electrical or fuel system damage. Proactive activates that can be taken by property owners in advance of a flood emergency may include:

- Relocating possessions and equipment to the upper floors of a building or to higher ground;
- Relocating or securing outdoor furnishings and equipment;
- Clearing gutters, downspouts, and storm drains;
- Ensure that sump pumps are functional and power supply is above projected flood water height;
- Clearing and securing floor drains;
- Disconnecting electrical appliances;
- Securing fuel and propane tanks and shut off valves;
- Installing window protection if high winds are anticipated; and/or
- Placing sandbags and/or activating flood barriers.

In the event of sudden incidents in which there is little to no warning, such as a flash flood, response is activated at the initiation of the incident.

Depending on the nature and severity of the emergency, coordination with multiple entities may be required. For response to larger-scale events, an emergency response center may be established to facilitate the allocation of information and resources to address the community's needs. The emergency response center is typically coordinated by the local emergency manager and ideally, a preservation planner would be available once it is activated. If the municipality is overwhelmed by the response, the emergency manager can request assistance from NJOEM. If warranted by the severity of the situation, New Jersey's governor can request a Disaster Declaration from the President, which initiates FEMA's involvement in the response effort. (www.fema.gov/disaster-declaration-process.)

The New Jersey Department of Environmental Protection (NJDEP) serves as the lead agency in the State's emergency management activities that relate to cultural resources. The New Jersey Historic Preservation Office (NJ HPO), a part of DEP, works directly with federal, state, and local partners to provide preservation information including inventories of potentially affected historic resources during response



Propane tanks should be secured to prevent floatation in a flood event.



Response includes performing initial inspections of properties to assess building stability and level of damage.

and recovery operations. **Municipalities may also appoint a preservation representative, either from the local jurisdiction or the county, to serve in the emergency response center and assist in identifying resources to protect historic properties.**

In the immediate aftermath of a flood, response activities focus on life safety operations including rescue and providing medical care. After life safety operations cease, response activities shift to meeting basic human needs, such as food and shelter, and restoring critical infrastructure such as providing electricity and clearing debris from roadways. **Historic preservation involvement in the response effort commences when activities shift towards damage assessment and debris clearance.** Some of the functions that can be performed by historic preservation professionals and advocates include:

- Performing initial inspections and damage assessments of historic properties – this can utilize newer technologies including drones and laser scanning;
- Prioritizing resource allocation for building protection – determining high priority (requiring stabilization); medium priority (requiring protection from the elements and building security such as roof tarps and plywood window coverings); and low priority (requiring little to no action during response and recovery phases); and/or
- Assisting with debris sorting to ensure that historic building components and other cultural resources are retained and not disposed of as waste. (*Refer to Establish a Debris Salvage Plan, page 3-20.*)

The NJ HPO can serve as a resource for municipalities by:

- Coordinating preservation activities with other response functions as a member of the emergency management center team;
- Identifying procedures to collect, label, and store displaced building elements for reinstallation rather than disposal;
- Prioritizing preservation concerns and organizing specialized assistance;
- Identifying qualified design professionals and contractors to assist in evaluation and stabilization of historic properties;
- Providing information about cleanup, drying out flooded properties, etc.; and/or
- Providing information regarding funding opportunities to repair and rehabilitate historic properties.

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6

Recovery: Hazard Mitigation for Historic Resources

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RECOVERY

“Rebuilding communities so individuals, businesses, and government infrastructure can function on their own, return to normalcy, and are protected against future hazards.”

– FEMA, A Nation Prepared

Recovery entails restoring and rebuilding a community’s physical, social, and economic structure following a disaster such as flooding. As response efforts wane, energies are shifted towards recovery and return to “normal.”

Short term needs associated with recovery begin with the restoration of critical services, such as restoration of access to water and electricity. As recovery continues, it transitions towards physically rebuilding the community, both infrastructure and buildings, including the longer-term process of providing temporary housing, repairing existing structures, and addressing the community’s social and economic needs. The scale of recovery projects can range from community-wide efforts to the repair of individual properties. By addressing recovery needs as quickly as possible, a community can regain its self-sufficiency, minimizing disruption of daily life, and commerce by stabilizing housing and businesses.

Like response, community-wide recovery is overseen by the municipality and is guided by an Emergency Operations Plan. The Emergency Operations Plan describes the strategies and procedures for coordinating recovery efforts across all departments and agencies and guides the operation. Through Recovery Support Function annexes, the Emergency Operations Plan identifies actions and activities that agencies will take to facilitate access to resources as well as coordination among state and federal agencies, non-governmental partners, and community stakeholders. *(Refer to Emergency Operations Plans, page 3-7.) In the shift from response to recovery, the responsibility for managing private*

property response shift to the property owner. This includes site issues such as debris removal as well as building repair.

Historic preservation is under of FEMA’s Natural and Cultural Resources Recovery Support Function (NCR RSF), and is largely implemented through the local planning and zoning office. (<https://www.fema.gov/news-release/2018/03/07/natural-and-cultural-resources-recovery-support-function>.) Through the NCR RFS, the agency aids communities seeking to preserve, protect, conserve, rehabilitate, and restore natural and cultural resources during the recovery from a disaster. The NCR RFS identifies supporting agencies who may aid in the recovery process including the NJ HPO; FEMA Office of Environmental Planning and Historic Preservation for Region II; and non-governmental partners. (<https://www.fema.gov/office-environmental-planning-and-historic-preservation>.) The emergency manager and director of planning and zoning should have a copy of the NCR RSF, which may be activated with or without a Presidential Disaster Declaration to support the recovery effort. **Even if a community chooses not to follow NCR RSF process, they should adopt policies and procedures to protect historic resources from recovery actions that may impact historic resources.**



Debris removal is generally the responsibility of the property owner. (Photography courtesy of the NJ HPO.)

A. COMMUNITY-WIDE RECOVERY

In addition to restoring essential services and repairing or rebuilding critical infrastructure, community-wide recovery projects can include protection projects, such as installing a bulkhead or fortifying a levy, as well as infrastructure repairs, like improving stormwater drainage systems. Community recovery projects, particularly those for which state and federal funding is required, will largely be based upon the mitigation projects identified in the municipal hazard mitigation plan. As a result, it is critical that preservation projects be identified in the plan and prioritized for implementation. (*Refer to Write, Adopt & Implement the Plan, page 4-28.*)

The recovery process can also provide the opportunity for municipalities to conduct surveys to assess the risk of flooding at historic properties. (*Refer to Flood Vulnerable Historic Property Documentation, page 4-15, and Chapter 8, Community Mitigation Strategies.*) **Documentation projects that also evaluate flood risk and provide actions for mitigation may be identified in hazard mitigation plans. The NJ HPO is available to assist communities in the identification of documentation projects.** (*Refer to Flood-Vulnerable Historic Property Documentation, page 4-15, and Historic & Cultural Resource Documentation, page 10-6.*)



Building assessment and stabilization identify whether or how quickly property owners can safely return. (Photography courtesy of the NJ HPO.)

B. BUILDING RECOVERY

B.1 ASSESSMENT & STABILIZATION

Flood waters have the potential to cause considerable damage to structures, rendering them unsafe for occupation. Addressing recovery needs quickly can minimize disruption to businesses and housing as well as minimize further damage to buildings.

After floodwaters recede, initial assessments should proceed as quickly as possible to identify buildings that are structurally unsound to determine whether property owners can safely return. Preservation professional can aid in the initial assessment process and provide recommendations regarding appropriate stabilization methods to protect historic resources. The local preservation planner generally leads this effort, with assistance of preservation partners supplemented by technical assistance from the NJ HPO. In the event of a Presidential Disaster Declaration, FEMA's Office of Environmental and Historic Preservation can assist in the effort. (Refer to Chapter 5, Response: Hazard Mitigation for Historic Resources.)

Once public safety has been assured, affected historic resources should be stabilized as quickly as possible. This should be followed by a more detailed assessment to better understand the extent of damage prior to allowing occupants to return. With the agreement of the local emergency manager and available expertise, assessments of historic properties can be conducted by preservation professionals, architects, engineers, and contractors. **As needed, assessments should be followed by quick, temporary stabilization measures to minimize additional damage, such as installing shoring, tarping a compromised roof, or securing window and door openings. This should be followed by efforts to prevent secondary damage such as mold by providing ventilation and installing plywood at openings to secure damaged windows to prevent vandalism.**

To assist in the assessment process during Superstorm Sandy, the NJ HPO worked with FEMA to establish criteria for "collapsed" buildings that are no longer eligible for listing on the National Register of Historic Places, thereby eliminating the need for NJ HPO review of proposed mitigation measures. (Refer to "Collapsed" Definition for Use In New Jersey Historic Building Surveys, page 6-4.)

B.2 REPAIR & REBUILDING

The administrative requirements for repairing and rebuilding historic properties can be daunting. Without prior preparation, historic preservation concerns can be lost in the fray. By working with local officials in advance of a flood event, zoning ordinance modifications can be implemented to limit building heights; design guidelines can be prepared to encourage compatible alterations

“COLLAPSED” DEFINITION FOR USE IN NEW JERSEY HISTORIC BUILDING SURVEYS

For the purpose of FEMA’s Section 106 compliance, any Building that is determined to be collapsed, and thus ineligible for listing in the National Register of Historic Places, must exhibit either:

One (1) of the three (3) apparent physical conditions listed below:

- A. It is rubble (you can’t determine what part of the building you are viewing)
- B. It is pancaked (the roof structure or one or more floors of the building have come to rest on the ground or the floor below)
- C. The building has been structurally compromised by fire damage

OR

Three (3) of the Five (5) apparent physical conditions listed on the following page.



Criteria A: This building in old Bridge, Middlesex County is rubble. (Photography courtesy of the NJ HPO.)



Criteria B: This residence in Mantoloking has pancaked, with the lower floors resting on the ground below. (Photography courtesy of the NJ HPO.)



Criteria C: Fire damage has structurally compromised this building in Brick, Ocean County. (Photography courtesy of the NJ HPO.)

Three (3) of the Five (5) apparent physical conditions listed below must be present in the main body of the building for the definition of “collapsed” to be applicable in New Jersey Historic Buildings Surveys (porches and additions should not be considered):

1. Canted or wracked (moved by forces in multiple dimensions which have distorted what was a rectangular shape into a parallelogram, twisted not merely shifted or tilted)
2. Roof collapsed or missing
3. Missing one or more full elevations
4. 50% or more off of its foundation
5. Split/sheared



Criteria 3: This Union Beach, Monmouth County residence is missing one or more of its complete elevations. (Photography courtesy of the NJ HPO.)



Criteria 1: This Sea Bright, Monmouth County is wracked. (Photography courtesy of the NJ HPO.)



Criteria 4: More than 50% of this residence in Mantoloking, Ocean County is off of its foundation. (Photography courtesy of the NJ HPO.)



Criteria 2: The roof has collapsed on this Highlands, Monmouth County building. It is also likely that it meets Criteria B for pancaking. (Photography courtesy of the NJ HPO.)



Criteria 5: This residence in Mantoloking, Ocean County is split or sheared. (Photography courtesy of the NJ HPO.)

and construction within a historic context; and building codes can be modified to improve the resilience of historic buildings in a manner that maintains their historic integrity. (Refer to [Modify Zoning Ordinance, page 3-9](#), [Develop Design Guidelines for Flood Mitigation, page 3-13](#), and [Modify Building Code Requirements, page 3-10](#).) If the local regulatory framework does not have sufficient provisions for addressing historic properties, local preservation planners can also work with local officials in the aftermath of a flood, providing information on “best practices” developed by similar communities. The NJ HPO is available to serve as a repository for information provided by municipalities.

As individual property owners plan to repair or rebuild their properties following a flood, several factors may influence the types of required reviews and approvals, some of which are identified below:

- **Level of damage incurred:** If damage to the building is such that the cost to restore the building to its pre-damaged condition would equal or exceed 50% of the market value of the building, under the local floodplain ordinance, this condition would likely meet the definition of “substantial damage.” (Municipalities may utilize a more rigorous metric to calculate substantial damage.) Repairing this damage will require that the property also be brought into compliance with local floodplain regulations. However, the municipal floodplain ordinance may identify potential exceptions for properties that meet the ordinance’s definition of “historic structures.” (Refer to [Floodplain Regulations & Ordinances, page 2-6](#).)
- **Value of anticipated improvements:** If the cost to improve a building equals or exceeds 50% of the market value of the building, those improvements would likely meet the definition of “substantial improvement,” which would require the property be brought into compliance with municipal floodplain regulations. (Municipalities may utilize a more rigorous metric to calculate substantial improvement.) The municipal floodplain ordinance may identify potential exceptions for properties that meet the ordinance’s definition of “historic structure.” (Refer to [Floodplain Regulations & Ordinances, page 2-6](#).)
- **Municipal floodplain regulation requirements:** Whether a building meets the local floodplain’s definition of “historic structure” will affect the degree to which the building must comply with the regulations. However, a floodplain permit would still be required for the development of any property located within the Special Flood Hazard Area (SFHA).
- **Municipal building code requirements:** Work to repair a building will likely require a building permit and compliance with all current municipal building codes and may require correction of previously existing violations. The New Jersey Uniform Construction Code, the Rehabilitation Subcode, and local amendments may include exemptions for buildings that meet the code’s definition of a historic structure, so long as the lack of compliance does not constitute a safety hazard. (Refer to [Modify Building Code Requirements, page 3-10](#).) Where permitted



If the level of damage is such that the cost to restore the building to its pre-damaged condition it will likely meet the definition of “substantial damage” in a municipal floodplain ordinance. (Photograph courtesy of the NJ HPO.)



Properties subject to local historic preservation review may be required to comply with specific criteria when implementing repairs. (Photograph courtesy of the NJ HPO.)

by a municipality, the Rehabilitation Subcode can be particularly beneficial for buildings constructed prior to existing codes that remain safe and structurally sound after a flood event. (Refer to [Modify Building Code Requirements, page 3-10.](#))

- **Local historic preservation requirements:** If a property falls under the jurisdiction of a local historic preservation commission (HPC), it may be subject to review for compliance with the criteria in the historic preservation criteria of municipality's zoning code or design guidelines related to alterations at historic properties prior to the issuance of a building permit. (Refer to [Historic Property Project Review sidebar, page 3-19.](#))
- **Funding source requirements:** Grant funds and loans frequently have conditions and restrictions governing their use. For example, funding from the National Park Service or county grant programs, the NJ HPO, and the New Jersey Historic Trust require compliance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties* (U.S. Department of the Interior, 2017) and may require that an easement be taken over the exterior and/or interior of the property. (Refer to [Historic Property Project Review sidebar, page 3-19.](#)) **Some grants may require a match in the form of direct or in-kind funds and place restrictions on the source of the direct funding. Eligibility requirements and grant conditions should be carefully considered before applying for grant funding.** If the property is listed in or determined eligible for listing in the National Register of Historic Places, federal or state funds, permits, or licenses will trigger historic preservation review by the lead federal agency and the NJ HPO.
- **Flood insurance company requirements:** Different requirements may or may not be triggered based upon whether a property is covered by flood insurance, and the insurance company's requirements. For example, FEMA-funded mitigation projects require that property owners maintain flood insurance as a condition to receive funding. (Refer to [National Flood Insurance Program, page 2-2.](#))

Repairing and rebuilding may also provide the opportunity for owners to rectify an existing condition that makes their property susceptible to costly flood damage. This can include elevating building systems above the Base Flood Elevation / Design Flood Elevation (BFE/DFE), improving structural connections between building elements, and providing floodwater evacuation pathways for low-lying areas. (Refer to [Modify Building Code Requirements, page 3-10.](#)) **On a larger scale, previously under-utilized or duntrodden historic buildings can be rehabilitated incorporating flood resilience measures, giving them new life. For example, this might include breathing new life into historic commercial buildings along a Main Street corridor or adaptively reusing a warehouse for multifamily housing.**

Prior to beginning any repair or rebuilding project, it is best for property owners to work with officials at all levels to ensure that requirements are understood, and approvals are in place prior to commencing work. In the long run, this can save both time and money.

C. FUNDING FOR RECOVERY

Community-wide and private properties share many of the same funding opportunities, except for flood insurance. Post-disaster assessments can provide a better understanding of a community's need and form the basis for requesting a Presidential Disaster Declaration, which may trigger funding opportunities from FEMA, as administered by NJOEM. (Refer to Chapter 5, Response: Hazard Mitigation for Historic Resources.) (Approximately half of all declared disasters receive FEMA funding, with the remainder ineligible). Other financial assistance from public and private entities may be available, as identified below.

- **Flood insurance** funding is limited to affected properties with an active policy, with limits established by the policy for both buildings and contents.
- **U.S. Department of Housing and Urban Development (HUD)** is able to provide financial assistance to affected areas following a Presidential Disaster Declaration through low to moderate income loans to municipalities, individuals, and businesses for housing, infrastructure, and business recovery efforts. (<https://www.hud.gov/info/disasterresources>.)
- **U.S. Small Business Administration (SBA)** is able to provide low income loans to affected areas following a Presidential Disaster Declaration for damage cause to homes and personal property; business and economic injury losses. (<https://disasterloan.sba.gov/ela/>.)

Although all affected properties may be eligible for certain types of federal funding, such as FEMA's Hazard Mitigation Assistance Program (HMA), **some funding sources will be limited to identified or designated historic properties, with eligibility requirements varying among programs.** (www.fema.gov/media-library/assets/documents/103279.) Following stabilization, the local government should contact emergency management lead and support agencies, including NJOEM, the NJ HPO, and the New Jersey Division of Housing and Community Resources, for assistance. Potential sources of funding specifically directed towards historic properties include the NJ HPO, the New Jersey Historic Trust (NJHT), and the National Park Service (NPS). (Refer to *National Flood Insurance Program*, page 2-2.)

Emergency funding may be available for projects from the NJ HPO or the NJHT. **However, in most cases, work completed prior to authorization is not eligible for funding or may disqualify a project from eligibility altogether.** As a result, identifying potential funding and contacting the funding agency as soon as possible to understand program requirements will provide the highest potential for financial assistance.

Eligibility and conditions of funding will vary between programs. For example, for a post-disaster project to be eligible for FEMA funding, it must be identified in an approved hazard mitigation plan. However, if used to mitigate flood-prone properties, this funding will only apply to those properties covered by an active flood insurance policy. Purchase of flood insurance prior to the commencement of the mitigation project is mandatory, and the flood insurance policy must be maintained



Flood insurance is one of the best means of funding recovery and mitigation activities. Low-cost loans may also be available through a number of sources. (Photograph courtesy of the NJ HPO.)



Excerpt showing flood risk analysis from U.S. Army Corps of Engineers, Baltimore District, Baltimore City Nonstructural Analysis Interagency Project, 2016.

throughout the life of the property regardless of whether the ownership of the property changes. **Therefore, it is critical for local historic preservation advocates to work with local emergency management personnel to identify mitigation projects to be included in a hazard mitigation plan; understand the regulatory responsibilities required and educate property owners, preferably in advance of a disaster; and advocate for the selection of those projects post-disaster.** (Refer to *Develop Mitigation Goals & Objectives*, page 4-24.)

Most post-disaster projects will involve physical construction efforts in terms of stabilization, rebuilding, and mitigation. Projects that include funding through either federal or state sources, or that require federal or state permits, will be subject to historic preservation review by the NJ HPO. (Refer to *Historic Property Project Review sidebar*, page 3-19.) **If identified as a project in a hazard mitigation plan, the local government may seek non-construction funding for community-wide preservation projects such as architectural and historical documentation and survey, so long as these projects also address mitigation planning.** For this reason (among others), the NJ HPO recommends a combined approach that includes both property documentation and a risk assessment to identify which properties are vulnerable to natural hazards and identify potential mitigation options. (Refer to *Assess & Document Historic Property Flood Risk*, page 4-13.)

When pursuing funding, consideration should be given to:

- Requirements for cost-sharing or matching funds;
- Whether the funds are a grant or a loan and, in the case of a loan, the conditions of repayment;
- Whether funds are immediately available, or whether the property owner must front the costs with expectation of reimbursement;
- The timeframe for funding or reimbursement; and
- Whether the proposed repair, reconstruction, or rehabilitation project will compromise the property’s historic integrity and/or continued eligibility for listing on the National Register of Historic Places.

If a proposed project may compromise the historic integrity of a property and its continued National Register eligibility, the municipality and property owner should consider three potential effects:

- The property may no longer be eligible for most historic preservation incentive programs, including state and federal tax credits and grants;
- If the property has benefited from prior funding through these programs, the beneficiary may have to return funds received; and
- Based upon the provisions of the local floodplain ordinance, properties that lose historic designation may be newly required to comply with stricter floodplain regulations, which can include substantial modifications, further impacting historic integrity and incurring additional costs for the property owner. (Refer to *Floodplain Regulations & Ordinances*, page 2-6.)

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7 Mitigation: Hazard Mitigation for Historic Resources

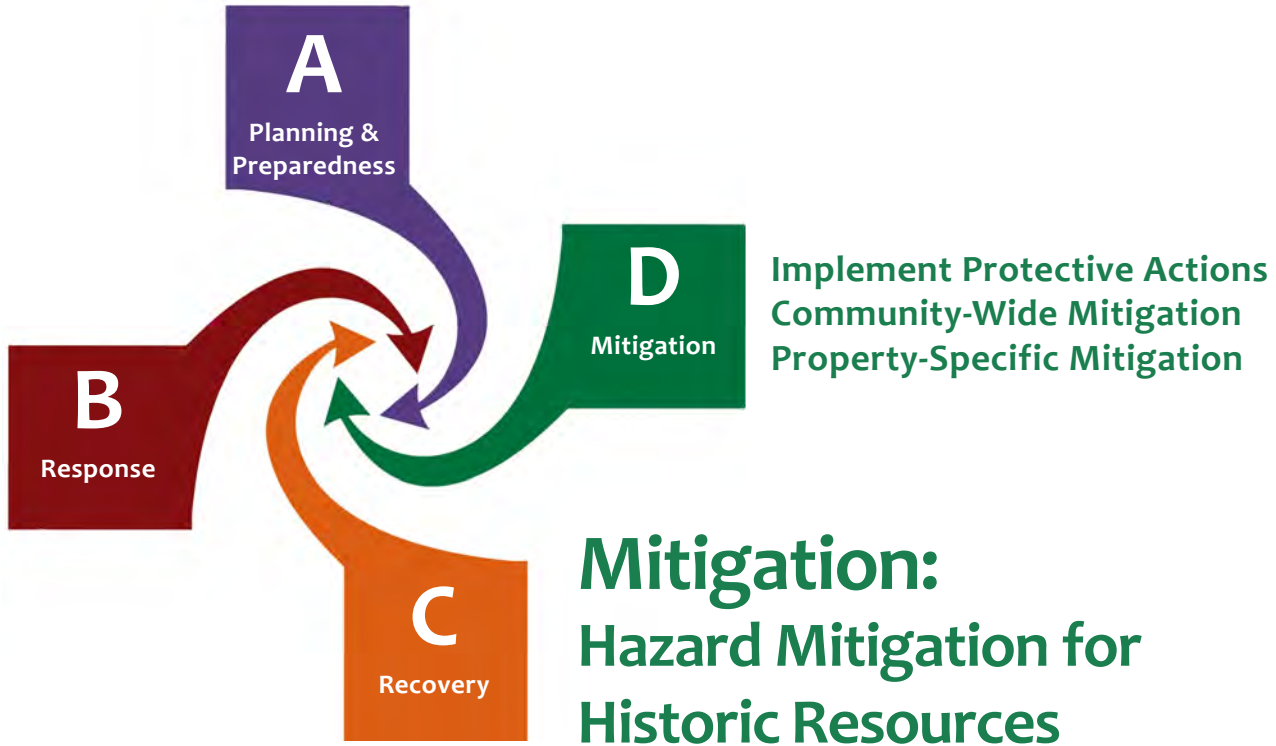
A. Selecting Preservation-Sensitive Options

7-2

Resources

7-4

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MITIGATION

Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. In order for mitigation to be effective we need to take action now — before the next disaster — to reduce human and financial consequences later (analyzing risk, reducing risk, and insuring against risk).

-- FEMA

Flood mitigation are actions taken by communities and individuals that decrease the negative effects of flooding, with the primary aim of protecting of human life and property. **Mitigation can occur as a protective measure, in anticipation of a potential flooding, but more likely as a reaction to flooding, during or immediately following the recovery process.**

When considering mitigation after a flood, there is a tendency to strive to return to “normal” pre-flood conditions. Although an emotionally comfortable response, reinstating a condition that is known to be prone to flood damage is not necessarily in a community’s or property owner’s best long-term interest. However, the careful selection of mitigation options allows both a community and its property owners to be forward-thinking, particularly in considering increasing flood vulnerabilities associated with sea level rise, subsidence, increased precipitation, and overdevelopment. There are a wide range of mitigations measure that can be implemented and can be identified to address flooding of various types and extents. **Community-wide mitigations options tend to be larger, beneficial to an extended area, and may alleviate the need for individual property mitigation. By contrast, property-specific mitigation options are initiated by an owner and are typically be limited to reducing flood impact at a single parcel.** (Refer to Chapter 8, Community Mitigation Strategies, and Chapter 9, Property Mitigation Strategies.)

Mitigation typically benefits from a holistic approach, with the type, extent, frequency, and severity of flooding being key considerations in identifying appropriate options. A holistic approach may have the added benefit of preventing the unintentional consequence of increasing flood vulnerability at unprotected adjacent areas following a targeted

implementation project. It is therefore prudent to evaluate protection options on a neighborhood or community-wide basis and/or engage adjacent properties or communities with similar flood challenges to evaluate and implement protection options together. (Refer to [Chapter 8, Community Mitigation Strategies](#).) In areas where the likely severity and frequency of flood events is low and limited to a small number of parcels, property-specific modifications may provide sufficient protection. (Refer to [Chapter 9, Property Mitigation Strategies](#).) Where flooding is prevalent and widespread, communities will likely benefit from a combination of local initiatives to improve community resilience, community-wide mitigation strategies providing protection to multiple properties, in addition to property-specific measures implemented by individual owners in response to specific vulnerabilities. (Refer to [Chapter 3, Local Tools: Preservation & Flood Mitigation](#).)

Local initiatives are largely administrative and include community resiliency improvements such as strengthening local codes and ordinances, participating in the Community Rating System (CRS), and encouraging property maintenance. (Refer to [Community Rating System, page 2-13](#), and [Chapter 3, Local Tools: Preservation & Flood Mitigation](#).) Community-wide mitigation options are identified through the local hazard mitigation planning process, which is guided by the emergency management personnel with input from a planning team that may include the expertise of professional consultants and ideally preservation planners and significant public engagement and support. (Refer to [Chapter 4, Planning: Hazard Mitigation for Historic Resources](#).) They provide protection to properties whose owners do not have the financial means to implement projects on their own accord but tend to be costly and take a long to complete. However, property-specific mitigation options are determined by individual owners within the requirements of local zoning, floodplain, and building code, including local historic preservation commissions where applicable, and may have the added benefit of reducing property flood insurance rates if compliant with the National Flood Insurance Program (NFIP). (Refer to [National Flood Insurance Program, page 2-2](#).)

A. SELECTING PRESERVATION-SENSITIVE MITIGATION OPTIONS

The practice of flood mitigation, although intended to protect life and property, is often at odds with those of historic preservation. To provide protection, mitigation requires change, often radical change, which can destroy or challenge current interpretations of historic integrity. As guided by *The Secretary of the Interior's Standards for the Treatment of Historic Properties*, the practice of preservation has traditionally been geared towards minimizing change at historic properties. ***The 2017 update of The Standards acknowledges that the best guidance for evaluation of flood mitigation options for historic properties will require trade-offs, balancing long-term protection while preserving the greatest degree of character and historic integrity.*** The National Park Service's (NPS) recommendations and each community's flood vulnerability



Preservation-sensitive mitigation may include limiting heights of elevations and selecting treatment options for raised foundations that are sympathetic to the building type and style and meet floodplain management regulations. Refer to companion Elevation Design Guidelines for Historic Properties for additional information.

continues to evolve, with adjustments in acceptance of appropriate goals. ***In November 2019, NPS released the Guidelines on Flood Adaptation for Rehabilitating Historic Buildings, which provides information about how to sensitively adapt historic buildings to be more resilient to flooding hazards.***

The inclusion of local preservation planners and advocates in the local initiatives and hazard mitigation planning processes can balance a community's need for flood mitigation and its long-term preservation objectives.

Flood mitigation projects typically have the following goals:

- **Mitigate direct impacts** including erosion, high wave action, high-velocity water flow, and debris impact.
- **Mitigate secondary impacts** such as rain and wind impacts that can damage buildings.
- **Mitigate property damage** to buildings and infrastructure including damage to community-wide infrastructure, individual building systems, and long-term damage associated with water infiltration such as mold.

To evaluate and select flood mitigation alternatives that meet community goals and protect historic properties, planners and preservation advocates should have an in-depth knowledge of:

- The location, significance, character, and integrity of local historic and cultural properties;
- How citizens value these properties, including which properties are deemed particularly important to the local sense of place;
- The extent to which those properties are vulnerable to flooding;
- How those properties are regulated, including whether they are locally designated and subject to review by an historic preservation commission (HPC); and
- How proposed mitigation measures might adhere to or conflict with *The Secretary of the Interior's Standards for the Treatment of Historic Properties, 2017. (For more detail on the relationship of preservation planning considerations within the hazard mitigation planning process, refer to Chapter 4, Planning: Hazard Mitigation for Historic Resources.)*

As part of the process of grappling with flood mitigation, one of the most difficult things for a community to accept is that while it can reduce the effect of flooding on historic properties, it may be impossible for a municipality to protect all historically and culturally significant properties. Financial and personnel resources are limited, requiring hard choices, which should be proactively decided during the hazard mitigation planning process. The hazard mitigation planning process provides a means of identifying a community's mitigation priorities based upon its vulnerability, availability of resources, and the community's will. *(Refer to Chapter 4, Planning: Hazard Mitigation for Historic Resources.)* To assist property owners in selecting mitigation options, communities can establish criteria through design guidelines for flood mitigation that balance local flood vulnerabilities with building characteristics and preservation goals. *(Refer to Develop Design Guidelines for Flood Mitigation, page 3-13, and companion Elevation Design Guidelines for Historic Properties.)*

REFERENCES

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8

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Community mitigation strategies will typically address large-scale measures such as shoreline protection.

Community Mitigation Strategies

Community-wide mitigation strategies can provide protection from floods, lessen the severity of flood-related damage, or assist in or promote response and recovery efforts. **The potential impact of large-scale physical mitigation options on historic integrity is generally reduced if the mitigation is physically remote from the historic resource.** As a rule, community-wide strategies will:

- Reduce or mitigate the extent of flood threat within the risk management timeframe;
- Benefit a large number of properties, whether they are historic or not;
- Create an environment which facilitates the continued population and lifestyle associated with the intangible sense of place; and
- Encourage community-wide buy-in, since the approach protects all properties rather than being geared towards only historic properties.

The appropriate strategies to consider for each community will depend on the risk management timeframe as well as the type and level of threat or vulnerability. (Refer to *Establish a Planning Timeframe*, page 4-13.) In addition, it is valuable to consider implementation of a variety of options simultaneously, to increase the likelihood of effectiveness. Like construction at individual properties, some large-scale options adjacent to historic resources may have a negative impact on the historic context of a resource. For example, significantly increasing the height of a sea wall adjacent to a historic district can obstruct the visual and physical connection to the water, altering the historic context and sense of place.

Strategies that are best geared toward community-wide implementation include:

- A. Shoreline or bank protection;
- B. Stormwater management systems upgrades;
- C. Utility and infrastructure improvements; and
- D. Transportation infrastructure improvements, including roadways bridges.

As part of the evaluation process for community-wide mitigation strategies, the local planning team should take the following considerations into account:

- They require planning and analysis to identify potential long-term benefit;
- They should be scalable to address increased flood vulnerability from climate change, sea level rise, subsidence, and overdevelopment;
- Many strategies can be costly to implement, and implementation funding must be balanced against other community needs (*funding may be available through FEMA's Hazard Mitigation Assistance Grant Program (HMA) - refer to Funding for Recovery, page 6-8*);
- To be effective, several strategies – particularly the natural strategies – require control of large areas of land, some of which may be in private ownership;
- The implementation of the strategy could increase the severity of the threat on adjoining unprotected areas;
- There must be both political will and community buy-in to execute the project;
- Significant time may be required for implementation, and local support for the project might not be sustained;
- A community must make a commitment to maintain the improvements so that they remain effective as long as possible; and
- There could be secondary consequences associated with a strategy – such as a decrease in the local tax base associated with undeveloped or underdeveloped real estate.

For shoreline protection and stormwater management projects, options range from emulating the natural landscape at one extreme, to building “structured” or “hard” adaptations at the other. Long-term, “natural” strategies are likely to be more effective than structural improvements because they tend to be more adaptable as the level of risk increases and require less maintenance over time. In addition, from a preservation point of view, natural strategies may provide a more historically appropriate setting by reestablishing a lost historic context. Many of the “natural” approaches are also scalable in that they can be adapted to a single property or across a municipality, providing equal protection to large areas irrespective of property values or the means of individual owners.

When evaluating these any mitigation option, it is important to consider the potential preservation implications, direct and long-term costs associated with maintenance, and the potential impact on property tax revenue.



Stream bank restoration can improve the flood management and health of a river or stream as well as support of biodiversity, and recreation.



Rip-rap represents a means of structural shoreline protection.

STRUCTURAL SHORELINE

One of the distinct advantages of structural shoreline protection is that it can provide equal protection to many properties in a vulnerable area. However, these measures present challenges such as:

- High construction costs
- Necessity for regular maintenance
- Increased erosion and flooding at nearby unprotected shorelines
- Alteration of the natural characteristics of the shoreline

Structural shoreline protection has the following potential preservation benefits and challenges:

Potential Preservation Benefits:

- Reduction of the potential flood damage risk at large numbers of properties and historic districts without requiring alteration of individual buildings and structures
- Potential protection of historic landscapes, landscape features, and archaeological resources

Potential Preservation Challenges:

- Alteration of the physical and visual relationship of historic resources to the shoreline, particularly if the implementation blocks view and access to water
- Possible requirement for destruction or alteration of cultural resources located along the shore, particularly archaeological resources, both on land and in the water and historic landscapes

A. SHORELINE PROTECTION

Shorelines occur along any body of water including oceans, bays, rivers, and streams. During flood events, water levels will typically rise and the effect will often be compounded by wave action, storm surge, or high-velocity water flow. A range of shoreline protection measures can provide protection for communities and individual properties. These generally fall within two broad categories, those that are constructed, “hard” or “armored” adaptations and “soft,” “natural,” or “landscape” adaptations that emulate a more natural condition.

A.1 STRUCTURAL SHORELINE PROTECTION

Hard adaptations are structural elements constructed to protect shorelines from wave impact-induced erosion, and high-velocity flow of floodwater. These elements can be located immediately at or along the shoreline, or in the case of lessening the effects of wave action, can be located offshore. Shoreline armoring protects development by reinforcing the shoreline to prevent it from retreating or eroding. Examples of shoreline armoring include seawalls, bulkheads, and revetments.

a. On-Shore

There are several structural protective measures that can be constructed parallel to a shoreline to fortify it against potential flood-related damage, including those listed below:

- **Sea walls** are vertical walls constructed along a shoreline to provide protection from waves on one side and retain earth on the other, possibly extending above existing grade. They are constructed to reflect incoming wave energy back out towards the water. It should be noted that they do not protect the land at the base of the wall from erosion and can accelerate damage to unprotected adjacent shorelines.
- **Bulkheads** are like seawalls in that they are vertical walls that extend along a shoreline and retain soil. However, unlike sea walls, bulkheads provide minimal protection from waves. They prevent shoreline erosion but can also create erosion in adjacent unprotected areas (as in those lacking bulkheads).
- **Revetments and rip-rap** are fortified slopes or banks made of boulders or chunks of concrete that disperse wave energy upon impact. They prevent erosion and improve the structural stability of soil slopes, providing similar protections as sea walls.
- **Flood barriers, levees, dikes, and embankments** are designed to contain water and provide protection against high floods. They can be constructed of natural or artificial materials. When located along a river, they

confine the flow of water, increasing its velocity and limiting the potential absorption of floodwater across a wider area.

- **Floodgates** control water flow through a flood barrier and must be operational to control the retention and equalization of water levels.

b. Off-Shore

Off-shore options, including those described below, can limit the effects of storm surge and wave action.

- **Breakwaters** are typically constructed of large boulders ranged in a linear or curvilinear form, with one end in contact with the shoreline. *(Refer to Oyster Shell Breakwaters, page 8-5.)* As incoming waves hit a breakwater, the wave intensity and force is greatly reduced before it approaches the shoreline. Thus, a breakwater provides protection of the shore and may also provide a protected harbor for boats.
- **Jetties** are like breakwaters in that they are constructed of large boulders in the water. However, they are constructed in pairs at the mouth of a navigable channel such as where a river discharges into a bay. They provide a buffer from storm surge and serve to confine the tidal flow of water to within the channel. In addition, they help maintain a navigable depth within the channel.

A.2 NATURAL SHORELINE PROTECTION

Natural shoreline protections, also known as non-structural or “soft” measures, are based on emulating the natural ecosystem of a specific area. These can be the basis for flood-resilient design. In considering the treatment options, it is important to have a clear understanding of the local natural environmental conditions and how water is managed in the community.

Natural shoreline protections utilize natural materials to absorb rainfall and intense storm surge. They can be more effective and less costly than structural measures, but they too will typically require maintenance.

a. On-Shore

There are several natural protective measures, including those described below, that can be constructed parallel to a shoreline to fortify it against potential flood-related damage.

- **Wetland reclamation** seeks to reestablish wetlands that have been removed or reduced over time. Wetlands are areas that are saturated with water that provide a distinct ecosystem for vegetation and fauna. This vegetation can filter water and promote ground absorption. In a flood event, it can store floodwater as well as reduce the effects of storm surge.



Wetlands are typically saturated with water with a distinct ecosystem of vegetation and fauna that can filter water and promote ground absorption. With the addition of a walking path, they can also serve as a public amenity.



Dunes with established vegetation can provide protection from wave impact.

NON-STRUCTURAL SHORELINE

Like structural protection, natural shoreline protection presents issues including:

- High construction costs
- Necessity for regular maintenance
- Requirement for large areas of undeveloped land

Potential Preservation Benefits:

- Reduction of the potential flood damage risk at large numbers of properties and historic districts without requiring alteration of individual buildings and structures
- Potential to protect historic landscapes, landscape features, and archaeological resources
- Potential to reestablish historic context, settings and landscapes

Potential Preservation Challenges:

- Alteration of the physical and visual relationship of the historic resources to the shoreline, particularly if implementation blocks water
- Possible requirement for destruction or alteration of resources located along the shore, particularly archaeological resources both on land and in the water, and historic landscapes – These effects may be greater for natural shoreline protection measures such as wetlands and floodplains, which require large land areas to be effective

- **Floodplain restoration** involves increasing the area for water disbursement and storage adjacent to a water body or channel such as a river, stream, or dry creek bed that is subject to inundation during a rain or flood event. Floodplain restoration, which often requires a reduction in impervious surface coverage, facilitates water absorption and potentially reduces the velocity of water flow, downstream flooding, and flash floods. (*Refer to Landscape Options, page 8-7.*)
- **Dune re-establishment** seeks to replace dunes that have been removed or reduced over time. Dunes are sand hills typically located on the shore of a large body of water such as an ocean, bay, or lake. They can provide protection from flooding and storm surge. Dunes are naturally formed by blowing sand but can be manmade (also known as engineered). Because they are formed of particulate matter, they can be highly susceptible to damage in a storm event. Established vegetation, with a dense root network and few intermediate pathways between dunes, reduces dune vulnerability.
- **Beach nourishment** is the addition of sand to an eroded beach to replace lost sand or to widen an existing beach to provide protection from inland flooding and storm surge. Beach nourishment is often completed in conjunction with dune enhancement. Because beaches are relatively unprotected, they are highly vulnerable to scour and erosion in the event of a storm or flood.

b. Off-Shore

Like their structural counterparts, natural off-shore options, such as oyster shell breakwaters, can limit the effects of storm surge and wave action.

- **Oyster shell breakwaters** are a natural, living breakwater that is like those constructed of boulders, concrete, or rocks, except they are constructed of oyster shells. (*Refer to Breakwaters, page 8-4.*) As incoming waves hit a breakwater, the wave intensity and force is greatly reduced as it approaches the shoreline. Thus, a breakwater provides protection of the shore. It may also provide a protected harbor for boats.

Natural shoreline protection has the advantage of being constructed of native, regionally appropriate materials, reducing the visual impact of the interventions and promoting biodiversity. Wetlands and floodplains have the added advantage of providing water storage, promoting infiltration, and reducing potential downstream flooding. However, both require large land areas to be effective, limiting potential developable land. Dunes and beach nourishment can be effective protective measures for beaches and shorelines; however, they are highly susceptible to damage from erosion or a storm event, particularly if not vegetated.

B. STORMWATER MANAGEMENT

In addition to flooding along shorelines of a water body, flooding can also occur because of precipitation, or stormwater, in the form of rain, ice, and snow melt. In a developed landscape, the ability of the land to absorb stormwater is reduced due to the presence of impervious surface coverage, unplanted areas, and areas planted with shallow-rooted and non-native species. Developed landscapes can be urban or rural and include homes, businesses, roadways, and paved surfaces, as well as man-made landscapes such as farms and golf courses. By reducing soil absorption capacity and altering drainage patterns, alteration of the landscape can have a detrimental effect on the way a site processes water, leading to uncontrolled water flow, erosion, and localized flooding. Possible improvements to address inland flooding include both engineered and natural options.

B.1 ENGINEERED OPTIONS

- **Drainage ditches** are a surface drainage system for removing excess water from a land surface. These are typically employed in less developed and rural areas and consist of depressed channels, often located adjacent to roadways, that can discharge into large drains or a body of water. Drainage ditches can be hard construction, made of natural materials, or a combination of the two. The use of natural materials increases the propensity for soil absorption of stormwater. Culverts, often part of a drainage ditch system, are engineered channels or pipes that allow stormwater to flow under intersecting roads, driveways, and railroads.
- **Stormwater management systems** channel the flow of stormwater and remove it, often through subsurface piping or culverts, and are typically utilized in cities, towns, and more developed communities. The level of complexity of a stormwater management system will likely be greatest in urban areas due to the dense level of development and the preponderance of impervious surface coverage. In most cities, it is not uncommon to have intakes that collect stormwater draining from road and sidewalk surfaces, and possibly also roof surfaces, into a piping system which conveys stormwater to a water treatment facility. The water treatment facility will then remove pollutants and contaminants including grease, automobile oil, pesticides, and animal waste bacteria before discharging stormwater back into an adjacent body of water. The conveyance, such as piping, limits or prohibits the potential for stormwater absorption, and the rapid discharge from the water treatment facility during a storm event can overwhelm a body of water. In addition, many older cities have combined stormwater and sewage systems which are often undersized relative to development, particularly when combined with significant storm events. When the water treatment facility is overwhelmed, untreated stormwater, and



Drainage ditches are depressed channels, often located adjacent to roadways, that remove stormwater from land surfaces. When constructed of natural materials, they can promote stormwater absorption.

ENGINEERED STORMWATER MANAGEMENT

Like other options that provide large-scale protection, engineering options face similar issues, including:

- High cost to upgrade systems
- Necessity for regular maintenance
- Requirement address changing weather and extreme precipitation

Potential Preservation Benefits:

- Existing systems that can be upgraded/maintained in place serve multiple properties and historic districts without additional adverse effect
- Increased effectiveness when used in combination with green infrastructure, which may result in lower project costs

Potential Preservation Challenges:

- Increasing capacity of systems could damage or destroy archaeological resources if additional excavation is required to implement upgrades
- Undersized/outdated systems will cause or exacerbate flooding during storms



Stormwater runoff from the adjacent roadway discharges directly into the canal.

LANDSCAPE STORMWATER MANAGEMENT

Potential Preservation Benefits:

- Direction of stormwater away from historic resources by levees, berms, and swales
- Visually unobtrusive collection of stormwater by such measures as levees, berms, swales, and rain gardens of appropriate scale with carefully chosen plantings
- A potentially more appropriate context for historic resources with reduction in impervious surface

Potential Preservation Challenges:

- Alteration of historic landscapes, settings and potential archaeological resources during construction, particularly at dramatic grade changes
- Alteration of the physical and visual relationship of the historic resources to the landscape

in some municipalities also sewage, is discharged directly into waterways or backs up into the stormwater system.

- **Pumping stations** supplement a stormwater management system by pumping floodwater out of a vulnerable area. They require an uninterrupted power or fuel supply to remain operational in a flood event.
- **Water storage areas and retention ponds** are man-made areas used to contain stormwater and slowly drain it to minimize the dependence on stormwater management systems and pumping stations. A disadvantage of this approach is that a man-made pond can create a new ecosystem that is incongruous with the natural landscape and historic setting in addition to reducing the developable land.

Like structural shoreline protection, inland structural or engineered improvements can provide equal protection to many properties in an affected area. However, they share some common issues including the need to increase capacities over time as conditions worsen and development adds to the impervious surface coverage in the watershed.

B.2 LANDSCAPE OPTIONS

Landscape measures can be utilized on a large-scale in an urban or suburban setting or at an individual property. Contrary to many of the structural or engineered measures, they can be relatively low impact, inexpensive to implement, and integrated into a designed landscape, particularly at new areas of development. Many of these landscape measures either preserve or mimic natural landscape systems, featuring native plant species, diverse wildlife and rich soils from the decomposition of plants and trees, thereby facilitating both shallow and deep absorption of stormwater.

- **Levees and berms** are landscaped hills that can be used to protect areas from flooding or, if continuous, to contain floodwater and encourage infiltration. They can be effectively utilized across multiple sites, at an individual parcel, or to protect a single building. (*Refer to Perimeter Barriers, page 9-14.*)
- **Swales** are either natural or man-made depressed landscaped channels used to manage stormwater runoff and promote infiltration. Like levees and berms, they can be effective across multiple sites, or on a single parcel, where they are often constructed to direct stormwater away from building foundations. They can also direct stormwater towards a wetland area, drywell, or rain garden to promote infiltration.
- **Reduction of impervious surfaces and introduction of permeable surfaces** provides a means of increasing infiltration and decreasing stormwater runoff. Impervious surfaces include roofed buildings and structures, roadways, parking areas, and paved surfaces. Any rainfall or other form of

water that hits these impervious surfaces becomes runoff, increasing the propensity for flooding downstream. Because of their limited absorption, impervious surfaces have the added effect of reducing infiltration into the ground, thus reducing the replenishment of aquifers. As another strategy to reduce the impact of runoff, roadways, and paved surfaces can be sloped towards drainage ditches in lieu of curbed asphalt that discharges into a stormwater system. (*Refer to Zoning Options, page 8-8.*)

- **Rain gardens** are gardens located in depressed areas of land, often near paved surfaces, that collect stormwater runoff and promote infiltration; they often incorporate native plants.
- **Native plants** absorb water to a greater degree than non-native plants, do not require significant maintenance, and can tolerate the range of extremes from very wet to very dry soil.
- **Rain barrels** are located at the base of buildings to collect stormwater discharged from roof surfaces through downspouts. These are a property-specific mitigation measure.



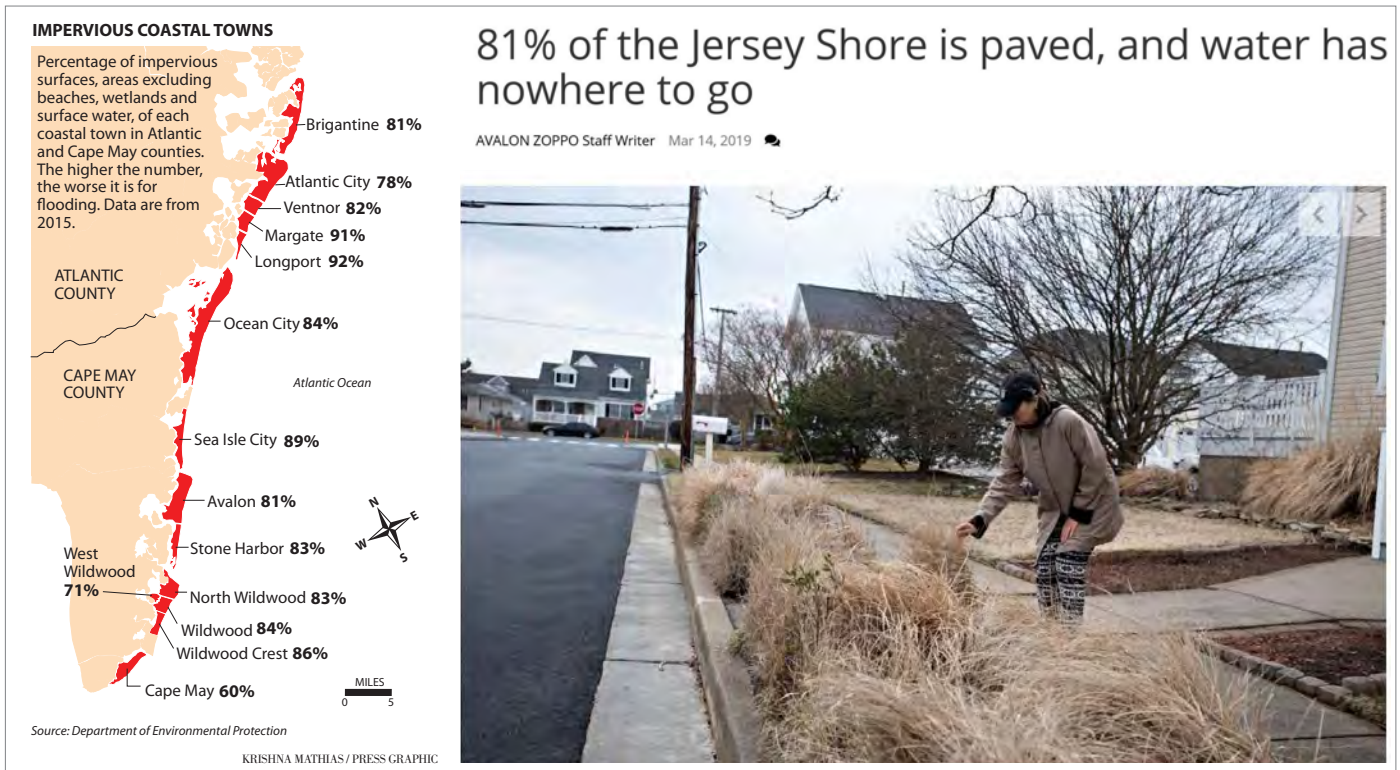
Rain gardens can limit stormwater runoff from a property onto roadways and into municipal stormwater management systems. Utilizing native plants further promotes absorption and minimizes required maintenance.



Although typically scaled for residential use, larger buildings can also harvest storm water in rain barrels.

B.3 ZONING OPTIONS

Governments use zoning codes to control land development and land use. Municipalities can regulate development and improvements in a manner that promotes infiltration and minimizes runoff and overburdening existing waterways and stormwater systems. Because local regulatory review is typically initiated by a request for a building permit, the use of zoning regulations to limit or reduce runoff is often only initiated in cases



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of new development, a substantial improvement to a property such as a new building or structure, or the expansion of the footprint of an existing building or structure. Even if no physical changes are required to be implemented on historic properties, any changes made on other properties in the community to reduce runoff can provide relief to existing and historic properties. If changes are required at historic properties, the community should consider establishing design parameters to ensure that alterations are in keeping with the historic character of the buildings and their setting. (Refer to *Develop Design Guidelines for Flood Mitigation*, page 3-13.)

ZONING

Potential Preservation Benefits:

- Reduction of additional runoff associated with construction and new development
- Regulating height of building
- Maintaining streetscape rhythm and patterns

Potential Preservation Challenges:

- Potentially inappropriate landscape improvements including berms, swales, and on-site drywell requirements at historic properties seeking to construct an addition or secondary building, as well as at new development in a historic district

Potential means for reducing runoff utilizing zoning include:

- Utilizing berms and swales to retain stormwater on site;
- Minimizing impervious surface coverage including driveways, parking areas, walkways, and patios and draining these to the site and not the public roadway;
- Installing permeable paving only where required;
- Disconnecting roof and subsurface drainage from the municipal stormwater system and encouraging on-site infiltration;
- Encouraging the use of rain barrels and stormwater to irrigate gardens;
- Removing roadway and parking curbs and installing drainage ditches and/or rain gardens along roadways and around parking areas;

- Requiring an on-site dry well to promote slow stormwater infiltration where the capacity of the land area is inadequate to provide natural absorption at a sufficient rate; and
- Increasing the use of native plantings with their typically deeper root systems to encourage infiltration. (These provide the added advantage of minimizing the need for supplemental irrigation and fertilization.)

Zoning modifications can also be used to improve stormwater management and manage alterations at historic buildings such as building elevation heights and streetscape rhythm. *(Refer to Modify Zoning Ordinance, page 3-9.)*



Zoning can be used to limit overall building elevation height as well as front-facing garages. *(Photograph courtesy of the NJ HPO.)*

B.4 BUILDING CODE OPTIONS

Building codes set the standards for safe construction. Although most communities utilize the International Building Code as the basis for their construction reviews, codes can be modified locally to address specific concerns such as flooding. *(Refer to Modify Building Code Requirements, page 3-10.)*



Building codes can be modified to require strong connections between the building and foundation to prevent shifting in flood waters. *(Photograph courtesy of the NJ HPO.)*

BUILDING CODE

Potential Preservation Benefits:

- Reduces the potential for flood-related damage

Potential Preservation Challenges:

- Potentially difficult to implement at historic buildings
- May have significant impact on an individual building or a new building constructed within a historic context, based upon the relative elevation of buildings to the floodplain

FLOODPLAIN MANAGEMENT

Potential Preservation Benefits:

- Reduces the potential for flood-related damage

Potential Preservation Challenges:

- Depending on how the volume capturing the compensatory storage is constructed, it could have an adverse effect on the integrity of a historic property or district

UTILITY INFRASTRUCTURE

Potential issues related to the improvement of utility infrastructure include:

- May require elevation; hardening to make it less susceptible to damage from flooding or associated debris, modification, replacement; or relocation to reduce flood vulnerability
- Alternative systems may be needed during an upgrade
- Costly to construct
- Require regular maintenance

Potential Preservation Benefits:

- Mostly “invisible” and considered necessities rather than visually obtrusive
- Potential to protect historic buildings, structures, settings, and archaeological resources

Potential Preservation Challenges:

- Potential abandonment of historic buildings and structures due to failure of infrastructure to provide needed services such as access to fresh water, sewage disposal, and electricity
- Potential to impact historic landscapes and archaeological resources due to installation of new inland structural improvements, i.e. trenching for new stormwater piping
- Possible destruction or alteration of resources, particularly archaeological resources and historic landscapes, if below-grade
- In the case of water storage areas and retention ponds, potential alteration of the physical and visual relationship of historic resources to the landscape with the introduction of a large-scale body of water where none previously existed

B.5 FLOODPLAIN MANAGEMENT OPTIONS

A community’s floodplain management ordinance can also address community-wide mitigation strategies for reducing flooding through incorporating higher standards than required by the National Flood Insurance Program (NFIP). (*Refer to National Flood Insurance Program, page 2-2.*) Examples include a compensatory storage clause that requires property owners who decrease the area available for floodwater storage in the floodplain by filling and constructing in the floodplain (even if in accordance to the regulations) to mitigate this effect by providing an equal volume of flood storage at or adjacent to the development site. A non-preservation benefit of including higher standards in the floodplain ordinance is the potential to capture additional credits for communities that participate in the Community Rating System (CRS). (*Refer to Community Rating System, page 2-13.*)



Infrastructure and utility improvements during the rebuilding process can make a community more resilient to future flood events. (Photograph courtesy of the NJ HPO.)

C. UTILITY INFRASTRUCTURE IMPROVEMENTS

Utility Infrastructure includes utilities needed for modern-day survival such as access to fresh water, sewage disposal, and electricity. If disrupted, quality of life can become severely compromised, limiting the ability of an area to remain habitable. In most communities, water, sewer, and electrical service are public utilities relying on processing, generating, and treatment plants. These facilities must be located and constructed to minimize service interruption in the event of a flood event. In addition, they require regular maintenance upgrading to ensure that a potential system failure, such as a burst water main, does not result in a flood. In communities that rely on well water and/or septic systems, sea level rise and subsidence can cause the water supply and soil to become compromised by brackish water and contaminated with bacteria from untreated sewage. In these cases, alternative water supply and sewage treatment may be required to allow continued occupancy.



Nuisance flooding can be an indicator of more severe conditions during a heavy rain or storm event. (Photograph courtesy of FEMA.)

D. TRANSPORTATION INFRASTRUCTURE IMPROVEMENTS

Transportation infrastructure, including roadways, bridges, and causeways, provide a transportation network for communities as well as a potential means of evacuation in a flood event. Establishing raised roadways or raising the elevation of existing roadways can prevent nuisance flooding and allow safe passage in more severe conditions. In addition to ensuring the roadway surface remains passable, bridge and causeway structural support systems may also require adaptation. This can include providing sufficient height and openings between structural members to allow the free flow of water without trapping debris and a support system adequate to withstand the force of running water.

TRANSPORTATION INFRASTRUCTURE

Potential issues related to the improvement of transportation infrastructure include:

- Roadways, bridges, and causeways may require further elevation or structural enhancement as flood conditions worsen
- Costly to construct
- Require regular maintenance

Potential Preservation Benefits:

- Mostly “invisible” and if not a contributing feature, considered necessities rather than visually obtrusive
- Potential to protect historic buildings, structures, settings, and archaeological resources

Potential Preservation Challenges:

- Potential abandonment of historic buildings and structures due to failure of infrastructure to provide needed services including access by road
- Potential abandonment, modification, or removal of historic bridges
- Potential to impact historic landscapes and archaeological resources due to installation of new or elevated transportation infrastructure
- Possible destruction or alteration of resources, particularly archaeological resources and historic landscapes, through construction activities
- Alteration of the physical and visual relationship of the historic resources to the landscape through construction

E. COMMUNITY MITIGATION STRATEGIES MATRIX

The following matrix is intended to provide a brief overview of the potential flood benefits and issues associated with the options presented in this section. Refer to the text boxes in the narrative for potential preservation benefits and challenges.

Strategy	Type	Potential Flood Benefits	Potential Issues
Seawalls, Bulkheads, Reventments, Rip-Rap	Shoreline / Structural	<ul style="list-style-type: none"> • Provide protection from wave action • Stabilize shoreline 	<ul style="list-style-type: none"> • Encouragement of continued development closer to the shoreline – possibly providing a false sense of security • Possible increased shoreline damage at nearby unprotected areas • Adaptability necessary to allow modification with increased threat
Flood Barriers – Levees, Dikes, Embankments	Shoreline / Structural	<ul style="list-style-type: none"> • Provide protection from high floodwaters 	<ul style="list-style-type: none"> • Water velocity increase in creeks, streams, and rivers • Continued development encouraged – possibly providing a false sense of security • Possible increased shoreline damage at nearby unprotected areas • Adaptability necessary to allow modification with increased threat
Breakwaters, Jetties	Shoreline / Structural	<ul style="list-style-type: none"> • Decrease shoreline wave impact • Provide added benefit of creating a potential harbor 	<ul style="list-style-type: none"> • Adaptability necessary to allow modification with increased threat
Establishment of Wetlands	Shoreline / Natural	<ul style="list-style-type: none"> • Promotes water absorption • Dissipates storm surge 	<ul style="list-style-type: none"> • Fewer issues with installations that do not require property acquisition or abandonment • Acquisition and/or abandonment of property possibly necessary if significant land area required to be effective
Floodplain Restoration	Shoreline / Natural	<ul style="list-style-type: none"> • Promotes water absorption • Reduces the velocity of running water • Reduces the potential for downstream flooding 	<ul style="list-style-type: none"> • Possibly costly acquisition and/or abandonment of property • Reduction of tax base growth with prevention of future development
Dunes	Shoreline / Natural	<ul style="list-style-type: none"> • Reduce inland flooding • Reduce the effects of storm surge 	<ul style="list-style-type: none"> • High susceptibility to damage in a storm event

Strategy	Type	Potential Flood Benefits	Potential Issues
Beach Nourishment	Shoreline / Natural	<ul style="list-style-type: none"> • Reduces inland flooding • Reduces the effects of storm surge 	<ul style="list-style-type: none"> • High susceptibility to damage in a storm event
Oyster Reef Breakwaters	Shoreline / Natural	<ul style="list-style-type: none"> • Decrease shoreline wave impact • Provide added benefit of creating a potential harbor 	<ul style="list-style-type: none"> • Adaptability necessary to allow modification with increased threat
Drainage Ditches	Inland Structural Improvements	<ul style="list-style-type: none"> • Remove excess water from land surface • Reduce reliance on stormwater management system • Increase potential infiltration 	<ul style="list-style-type: none"> • Possibility of discharge of untreated stormwater directly into waterway
Stormwater Management Systems/ Pumping Stations	Inland Structural Improvements	<ul style="list-style-type: none"> • “Invisibly” collects stormwater and removes it from developed areas, diverting it to treatment facilities 	<ul style="list-style-type: none"> • Difficulty of upgrading older systems - often near or at capacity due to increased development and combined stormwater/ sewage • Susceptibility of older systems to failure due to aging infrastructure • Possibility of untreated sewage discharge into waterway or back-up during flood events • Adaptability necessary to allow modification with increased threat and floodproofing necessary to the BFE plus freeboard if within the 1% floodplain
Water Storage Areas	Inland Structural Improvements	<ul style="list-style-type: none"> • Increase infiltration • Decrease runoff 	<ul style="list-style-type: none"> • Low impact if within public realm • Possible necessity to acquire and/or abandon of property if significant land area is required to be effective
Levees, Berms	Inland Structural Improvements / Landscape	<ul style="list-style-type: none"> • Divert stormwater • Protect from flooding • Contain stormwater to encourage infiltration if continuous 	<ul style="list-style-type: none"> • Diversion of problem water to other areas
Swales	Landscape	<ul style="list-style-type: none"> • Divert stormwater • Contain stormwater to encourage infiltration 	<ul style="list-style-type: none"> • Diversion of problem water to other areas

Strategy	Type	Potential Flood Benefits	Potential Issues
Reduce Impervious Surface Coverage	Landscape / Zoning	<ul style="list-style-type: none"> Increases infiltration Decreases runoff 	<ul style="list-style-type: none"> Low impact within public realm Reduction of tax base growth with prevention of future development Possible high cost of acquisition and abandonment and/or limited development potential of property
Rain Gardens	Landscape	<ul style="list-style-type: none"> Increase infiltration Decrease runoff 	<ul style="list-style-type: none"> Low impact within public realm
Rain Barrels	Landscape	<ul style="list-style-type: none"> Collect storm water from roof drains for future use Decrease runoff or stormwater system discharge 	<ul style="list-style-type: none"> Low impact
Native Plants	Landscape	<ul style="list-style-type: none"> Increase water absorption Minimize supplemental watering, fertilization, and care 	<ul style="list-style-type: none"> Low impact
Zoning Regulation Improvements	Zoning	<ul style="list-style-type: none"> Increase infiltration / decrease runoff Establish height for building elevation Maintain streetscape rhythms 	<ul style="list-style-type: none"> Reduction of tax base growth with prevention of future development Possibly costly acquisition and/or abandonment of property
Building Code Modifications	Required compliance with all NFIP regulations or local if more stringent	<ul style="list-style-type: none"> Reduce the potential for flood-related damage 	<ul style="list-style-type: none"> Possibility of difficult implementation at existing buildings
Utility Infrastructure Improvements – Water, Sewage, Electric	Structural Improvement	<ul style="list-style-type: none"> Possibly make systems more resistant, allowing continued functionality of water sewer and electrical systems via replacement, modification, or hardening 	<ul style="list-style-type: none"> Low impact if within public realm Adaptability necessary to allow modification with increased threat
Transportation Infrastructure Improvements	Structural Improvement	<ul style="list-style-type: none"> Maintain access to historic communities and resources Provide increased clearance for floodwater by removal of or raising bridge or causeway 	<ul style="list-style-type: none"> High impact if contributing historic feature Low impact if non-contributing historic feature



REFERENCES

Note: All references are available online unless otherwise noted. References that are only available as online resources are noted as “online resource.” Refer to Appendix B: Bibliography for web links.

New Jersey Department of Community Affairs. *Uniform Construction Code* (NJAC 5:23) (2019).

U.S. Department of the Interior [National Park Service]. *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings* (November, 2019).

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Property mitigation strategies should balance individual building protection with a strategy that maintains a sense of place. (Photograph courtesy of the NJ HPO.)

Property Mitigation Strategies

While municipalities can implement flood protection measures to protect entire communities, residential, business, and institutional property owners can take various measures to reduce the effects of flooding on their properties. There are three general categories of property-specific mitigation options available:

- A. Landscape improvements;
- B. Basic improvements; and
- C. Building mitigation.

As implied, landscape mitigation options occur within a site and are generally geared towards managing stormwater and providing shoreline protection. Basic improvements are generally simple, low-impact strategies that are relatively easy and inexpensive to complete. Building mitigation strategies are often more complex, likely require the assistance of a design professional, and typically have the greatest impact on the integrity of historic resources. (Refer to companion Elevation Design Guidelines for Historic Properties.) Proposed mitigation measures at designated historic properties may be subject to local historic preservation commission (HPC) or NJ HPO review. (Refer to *Historic Property Review sidebar, page 3-19.*)

Property-specific mitigation measures can greatly reduce the potential for flood damage. However, mitigation measures can provide property owners with a false sense of security, both in the efficacy of their own improvements, as well as the ability for the community to recover sufficiently to allow the area to become habitable. A property owner who has completed mitigation measures may assume that they can safely

MITIGATION REVIEW & APPROVAL REQUIREMENTS

Most property mitigation strategies will require municipal building, zoning, and floodplain management compliance. Most municipal regulations include a provision that limits or prohibits stormwater runoff onto adjacent properties. In addition to local review, New Jersey Department of Environmental Protection (DEP) Land Use Regulation approval may be required prior to proceeding with a project. (<https://www.nj.gov/dep/landuse/>)

choose not to evacuate in the event of a storm. Similarly, improvements to an individual property may greatly exceed the ability of a community to recover from a flood event. Necessary community infrastructure includes the ability of emergency personnel to do their jobs as well as utility infrastructure and safe access by roadways and bridges. (Refer to *Utility Infrastructure Improvements*, page 8-11, and *Transportation Structural Improvements*, page 8-12.)

A. LANDSCAPE IMPROVEMENTS

Except for dense, urban environments, individual properties often include a combination of land and one or more buildings or structures. As presented in the community-wide strategies, many of the landscape measures are scalable, meaning they can be applied across a community or district or at an individual property. (Refer to *Stormwater Management*, page 8-6.) These include:

- Bulkheads;
- Rip-rap;
- Retention ponds;
- Berms;
- Swales;
- Disconnection from stormwater drainage;
- Impervious surface reduction / pervious surface introduction;
- Rain gardens;
- Drywells;
- Native planting; and/or
- Rain barrels.



Paving stones and gravel parking can promote stormwater absorption at individual properties.



Rain barrels can collect stormwater discharge from roof surfaces and be used to water gardens.

B. BASIC IMPROVEMENTS

A first step for many property owners will include basic improvements that are relatively easy to complete and low cost, typically with nominal impact on historic integrity. In addition to interior building improvements, which are often not subject to preservation review, basic exterior improvements can include:

- Maintenance of historic resources and properties (refer to *Encourage Property Maintenance*, page 3-17);
- Relocation of critical systems and equipment above flood-prone elevations;
- Installation of solar collectors to allow electrical independence after a storm; and
- Use of flood damage-resistant materials in flood-prone locations.



Elevating building systems and equipment can reduce damage from rising water and expedite repairs following a flood event. Appropriate screening is recommended.



Elevation is a mitigation measure that is accepted by the National Flood Insurance Program for residential buildings. (Photograph courtesy of the NJ HPO.)

C. BUILDING MITIGATION

In addition to landscape mitigation measures, there are also several building alterations that can be implemented to increase flood resistance and/or reduce flood insurance premiums. Under the National Flood Insurance Program (NFIP), buildings located within Special Flood Hazard Areas (SFHAs) that participate in the program may be required to meet specific design criteria to minimize potential damage from future flood events. Compliance with municipal floodplain regulations is required for new construction, repair of “substantially damaged” buildings, and buildings that are “substantially improved.” (Refer to *Repair & Rebuilding*, page 6-3.) Unfortunately, alterations may also compromise a property’s historic integrity of a property to such an extent that it may no longer be considered historic according to the criteria of the National Register of Historic Places or via local designation criteria.

Through *The Secretary of the Interior’s Standards for the Treatment of Historic Properties*, (U.S. Department of the Interior, 2017), the National Park Service (NPS) provides guidance on the effects of alterations, demolition, and relocation within a historic context, generally making recommendations for minimal impact on both historic fabric and context. ***The 2019 Guidelines on Flood Adaptation for Rehabilitating Historic Buildings, developed by the NPS provides recommendations for flood resilience and mitigation at historic properties. Even with the NPS guidance on building elevations and elevation of new construction within the historic context, these mitigation options are often the most challenging for local planners, historic preservation commissions (HPCs), and citizens trying to protect their historic communities.*** Understanding this challenge, *Elevation Design Guidelines for Historic Properties* were prepared as a companion document to this Guide to provide a framework for municipalities to develop locally appropriate elevation criteria.

Examples of building mitigation options include:

1. Building Elevation;
2. Wet Floodproofing;
3. Dry Floodproofing;
4. Perimeter Barriers;
5. Relocation; and
6. Acquisition and Demolition.

If local preservation planners are considering these options, communities should reduce their impact by establishing limits under existing local ordinances including zoning and historic preservation. (Refer to *Modify Zoning Ordinance*, page 3-9, and *Develop Design Guidelines for Flood Mitigation*, page 3-13.) Policy statements should limit mitigation options, such as restricting building elevation to specific heights relative to the Base Flood Elevation (BFE) or Design Flood Elevation (DFE), to lessen impacts. As each option is evaluated, communities should also evaluate the existing local preservation regulatory review process and criteria to identify inconsistencies that will need to be addressed as part of the implementation process.

C.1 BUILDING ELEVATION

Building elevation is raising a building so its lowest habitable floor is at or above the base flood elevation in order to achieve the desired level of protection. Elevation typically involves abandoning basements and crawlspaces, and raising the first floor level onto an extended support system above the flood threat. Elevation of slab-on-grade buildings can include the original slab or abandoning it in place, with the construction of a new support system. Methods of lifting and supporting the building will vary from location to location, relying on the expertise of trained design professionals, although there are some common issues that must be addressed.

- **Feasibility:** Some buildings might be extremely difficult to elevate depending on size, configuration, or construction type, such as row houses with common party walls, or whether or not they are sufficiently stable to lift.
- **Appearance:** The greater the height of the elevation, the greater will be the exposed foundation, altering the appearance and proportions of the building and its relationship to its neighbors along the streetscape.
- **Foundation modification:** Although it might be possible to extend existing foundation walls or piers, they may not have sufficient strength or stability to be reused.
- **Access:** Elevation requires modification of building access including stairs and could include the installation of an elevator. Consequently, it may be difficult to maintain entrance stair orientation for buildings located close to a front property line and to provide access for physically challenged individuals.
- **Building equipment and systems:** All equipment and systems previously located in the now abandoned basement or crawl space will need to be relocated within the building interior, resulting in loss of habitable space. All interior and exterior equipment should be located above the Base Flood Elevation / Design Flood Elevation (BFE/DFE). All connections will require extension and potentially weatherproofing.

Depending on the type of construction, elevation can be achieved by first lifting the building and then either extending the existing support system or constructing a new support system. The support system will need to provide for both the vertical support of the building, and for resistance to the lateral forces related to the increase in height, potential wind load, storm surge, and debris impact. As a result, lateral reinforcing or stronger, non-traditional building materials may be required, such as filled concrete block or cast-in-place concrete. Based on the original foundation or pier materials and architectural style, it may be possible to mimic the appearance of the original material with a brick or stone veneer, as appropriate, or tinted stucco or concrete, which could visually reduce the impact of the higher foundation.



Building elevation should consider the historic context. Refer to the companion Elevation Design Guidelines for Historic Properties for additional information.

ELEVATION DESIGN GUIDELINES

Elevation Design Guidelines for Historic Properties (Guidelines) for residential buildings are available as a companion to this document. The Guidelines review the potential impact of elevation on individually significant buildings and in the larger context of historic districts. The Guidelines offer recommendations to minimize the effect of elevation on historic character in an effort to seek compliance with *The Secretary of the Interior's Standards for Rehabilitation, 2017*, and the *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings (2019)*.

BUILDING ELEVATION

Potential Preservation Benefits:

- Historic buildings can remain on original parcel

Potential Preservation Challenges:

- The relationship between the historic building and the ground plane is altered, as is the relationship to site features and possibly landscape elements such as trees, gardens, site walls, and fencing
- The visual relationship between a historic building and neighboring buildings on the site or along the streetscape is altered
- Given the expense and interruption associated with elevation, property owners might elect to elevate higher than mandated, increasing the impact on historic integrity

BUILDING ELEVATION

Potential Preservation Challenges (continued):

- Elevation can significantly alter the basic proportions of a building from horizontal to vertical, which could be stylistically inappropriate, particularly for slab on grade construction, such as ranch houses
- The elevation of exterior building systems and equipment has the potential to increase their visibility, making screening more challenging
- Elevation of wood-framed buildings requires a taller foundation or piers, increasing their visual prominence – Structural materials required to resist loads and forces may not be historically appropriate, requiring sensitively-designed screening
- Elevation of masonry buildings, or elements such as chimneys, typically requires the addition of masonry infill, which may be difficult to match to original materials
- Lower level features, such as basement windows and doors, will likely be removed or replaced with flood vents as part of building elevation
- Stairs, porches, or landings may require modification – Depending on the change in height and location of the building relative to the lot lines, the modification might necessitate relocation of the historic entrance
- Providing access for disabled persons is more challenging, impacting commercial and institutional buildings as well as some residences
- Overall level of alteration required for effective implementation might compromise historic integrity

NON-STRUCTURAL ELEVATION

Non-structural elevation entails the abandonment and floodproofing of living uses at flood-prone levels of a building that cannot be lifted, such as a row house, or has not been elevated, such as a basement. (*Refer to the companion Elevation Design Guidelines for Historic Properties, and Wet Floodproofing, page 9-6, for additional information.*)

As part of elevating the building, the abandoned lower level must be addressed. This can include the:

- Removal of abandoned equipment and hazardous materials prior to stabilizing the support system and infilling the basement or crawlspace;
- Modification of the area below the first floor to be wet floodproofed, providing flood openings to allow the free passage of water; and/or
- Re-grading the area below the first floor to promote drainage away from the building foundation.

In addition to elevating the building, it may be desirable to also raise the grade around the building to maintain the relative height of the building above grade. On larger parcels, it may be possible to construct a berm that gradually extends up to the required height, while smaller parcels may require the installation of retaining walls to address the grade change. The significant runoff impact to adjacent parcels of raising all or a part of the grade should be considered.

Given the cost associated with elevating a building, many property owners seek to raise a building a full story, often well above the required BFE/DFE, to achieve “bonus” space for parking or storage. As individual properties are raised, this can have a significant impact on historic streetscapes, particularly in districts with consistent scale, form, massing, floor-to-floor heights, and fenestration patterns. Similarly, conformance with floodplain regulations typically requires that new buildings, and significant additions to existing buildings, be constructed to meet current elevation requirements. As a result, they can have similarly detrimental impacts on a historic streetscape.

Under the requirements of the National Flood Insurance Program (NFIP), buildings located within Special Flood Hazard Areas (SFHAs) that participate in the Program, may be required to meet specific design criteria to minimize potential damage from future flood events. Compliance with floodplain regulations is required for new construction, repair of Substantially Damaged buildings and buildings that are Substantially Improved. (*Refer to Repair & Rebuilding, page 6-3.*) Municipal requirements may establish a Design Flood Elevation (DFE) above the Base Flood Elevation (BFE) within historic districts. In communities in which the BFE and the DFE are the same, it may be prudent to establish a DFE one to two feet above the BFE. (*Refer to Floodplain Regulations & Ordinances, page 2-6.*)



C.2 WET FLOODPROOFING

Wet floodproofing allows floodwaters to enter an enclosed area of a building and rise at the same rate, and to the same levels, as floodwaters outside of the building. As a result, the lateral and buoyancy forces are equalized across the interior and exterior, significantly lessening the strain on the building's structure.

To be compliant with the NFIP, wet floodproofing relies on automatic passage of floodwater in and out of a building so pressures remain equalized. In addition, spaces located below the Design Flood Elevation (DFE) should be considered “wet,” use of these spaces should be limited to non-living functions, and materials used should be moisture tolerant. These criteria apply to all wet floodproofed floor levels, including basements.

Wet floodproofing may be the best alternative for buildings that are required to comply with NFIP design criteria and are technically difficult to elevate or relocate. This can include residential, commercial, or institutional buildings, and is often the best alternative for very large or complex structures, or buildings that share party walls such as row houses. To meet wet floodproofing requirements, it may be necessary to abandon or limit the use of a portion of a building. This could pose an economic challenge to the building owner, who might seek to compensate for lost space by altering the building with an incompatible addition.

a. Uses Below Base Flood Elevation

To be considered wet floodproofed, the allowable uses of enclosed space below the BFE/DFE should be limited to minimize potential flood damage. Uses that should be permitted include building entrances, storage, and parking. In a wet floodproofed area, all building systems must be located above the BFE/DFE. In the case of existing buildings, options that allow modification and/or abandonment of lower floor levels to comply with a municipality's floodplain regulations can include the following:

Basements

- **Abandon the use of the basement:** The basement may need to be partially or fully infilled with a water permeable material like gravel to provide sufficient resistance against the lateral forces of floodwater.
- **Allow floodwater to freely enter and leave the building:** This might include adding flood openings in the walls and providing openings for floodwater to infiltrate the soil through the floor slab. In addition, a sump pump with a secondary power supply above the BFE/DFE should be required for expelling residual water during and after an event.
- **Modify basement window and door openings:** Depending on their location, basement windows and doors can be modified to allow drainage or ventilation to facilitate drying of area after an event.



Allowable uses below the DFE for wet floodproofed structures include parking, entries, and storage. Wet floodproofing relies on the free passage of flood water in and out of a building. In this case, it occurs through flood vents, as seen in the bottom right.



Floor drains and sump pumps can be installed to remove flood water from the interior of the building.

FLOOD DAMAGE RESISTANT MATERIALS: AN ALTERNATIVE APPROACH

In the publication, *Flooding and Historic Buildings* (2015), Historic England's conclusions differ from FEMA's National Flood Insurance Program Technical Bulletin 2, *Flood Damage-Resistant Materials Requirements* (2008), regarding historic materials and flooding.

Flooding and Historic Buildings

Although relatively resistant to flood damage, historic-building materials can all suffer some degradation and may need appropriate treatment. These materials include stone, solid brick-and-mortar walls, timber frames, wattle-and-daub panels, timber boarding and paneling, earthen walls and floors, lime-plaster walls and ceilings and many decorative finishes.

Organic materials such as timbers swell and distort when wet and suffer fungal and insect infestations if left damp for too long. If dried too quickly and at temperatures that are too high, organic materials can shrink and split, or twist if they are restrained in panels. Inorganic porous materials do not generally suffer directly from biological attack.

Significant damage can occur when inherent salt and water (frost) crystals carried through the substrate are released through inappropriate drying or very cold conditions.

- Historic England, 2015

To best preserve historic building components, English Heritage recommends a slow, temperature-controlled, carefully monitored process of drying-out. Although they acknowledge that there will be some material degradation, particularly for high floods or if the floodwater contains salts or other contaminants, they argue that many historic materials can be saved with proper care. This approach may be an appropriate alternative to material replacement where not otherwise required for NFIP compliance.

First Floors

- **Raise the floor:** If sufficient first floor ceiling height is available, raise the floor above the BFE/DFE. This may require the modification of stairs, adjustment of interior doors, and alteration of windows.
- **Limit first floor use:** If the floor level is below the BFE/DFE and sufficient floor to ceiling height is not available to raise the floor, the use of the first floor may be limited to a building entrance, parking, and storage. This may require reconfiguration of upper building floors to accommodate formerly first floor public spaces such as living rooms, kitchens, etc.

b. Flood Damage-Resistant Materials

Certain materials are less affected by being submerged in water than others. FEMA categorizes building materials in one of five levels to rank their potential resistance to flood, ranging from those that require a constant dry environment to those that can withstand high flood exposure. The materials evaluated include both structural and finish materials, with many traditionally historic materials considered "unacceptable" below the BFE, including plaster; solid wood doors, solid wood floors, trim, and cabinets; and wallpaper. In addition, several materials popularized during the mid-20th century that appear to be water resistant are also rated "unacceptable," such as asphalt, ceramic and linoleum tile, and non-ferrous metals including aluminum, copper, and zinc tiles (FEMA 2008). (www.fema.gov/media-library-data/20130726-1502-20490-4764/fema_tb_2_rev1.pdf.) One thing to keep in mind is that the FEMA standards are for materials, not floor or wall assemblies. Therefore, all components of an existing or proposed assembly should be reviewed.

FEMA, through ASCE 24-14 *Flood Resistant Design and Construction*, requires that flood damage-resistant materials be used in the Special Flood Hazard Area (SFHA) to a minimum BFE/DFE height (FEMA 2015). In the case of The New Jersey Uniform Construction Code, flood damage-resistant materials must be used to the BFE/DFE or the BFE/DFE plus one-to two-feet, whichever is higher, based upon building use and Flood Insurance Rate Map (FIRM) classification.

c. Flood Openings

Flood openings allow the passage of floodwater in and out of building without mechanical intervention such as sump pumps. They must be of sufficient size and number to be able to quickly equalize interior and exterior water levels. They will typically be located around the perimeter of a building or foundation, close to the adjacent grade height, and may also be needed between adjacent enclosed spaces, such as in interior foundation walls.



In cases in which all or portions of floors have been abandoned, flood openings must be located in a manner that allows the relative level of the water, at the interior and exterior of the building, to be equalized. In the case of an abandoned basement, installation of drainage through the basement slab may be required.

Many manufactured flood openings are metal louvers or vents. Flood openings can be designed to be more in keeping with the architectural character of the building with the understanding that they must be designed to allow the free flow of water and to prevent animal and insect infestation.

In addition to flood openings, it is important to consider how spaces will be ventilated in the event of a flood. Secondary damage after a flood such as mold and rot can be reduced with adequate ventilation. Although operable windows can typically be used for inhabited spaces, ventilation of abandoned basements or areas below raised finish floors can be more challenging.

d. Building Systems and Equipment

A potential costly effect of flooding can be damage to building systems and equipment. Traditionally, building systems and equipment are often located in a basement, first floor, or at exterior grade. This can include boilers, water heaters, electrical and internet service, air conditioning equipment, generators, and appliances. Exposure to floodwater can irrevocably damage any of these systems, rendering them useless in the flood recovery process.

Two options to address building systems and equipment are protection in place or relocation to an area that will not be affected by floodwater. If the floodwater depth is not too deep, it may be possible to protect equipment in place by dry floodproofing the equipment, that is, constructing perimeter floodwalls with secondary drainage such as a sump pump to remove any water seepage. (*Refer to Dry Floodproofing, page 9-9.*)

Relocation will often require raising the systems and equipment to higher levels. This includes not only major equipment, but raising secondary elements such as electrical outlets, junction boxes, switches, panels, and meters. Relocated equipment should be installed in a manner that meets both manufacturers' and local code requirements including clearances, access, and ventilation. At the interior of a building, the relocation of equipment to upper floors can result in the loss of habitable space. ***Relocation of exterior equipment may require mounting on roofs, walls, and platforms as well as providing screening to minimize visibility.***

WET FLOODPROOFING

Potential Preservation Benefits:

- Historic buildings can remain at original location and elevation
- It might be possible to minimize exterior alterations, retaining the exterior integrity, which under many programs and jurisdictions is the extent of preservation regulatory review
- Typically, abandonment of a basement level will not significantly impact historic integrity

Potential Preservation Challenges:

- Loss of historic materials on the interiors of buildings is detrimental regardless of whether changes to interior spaces are regulated – Such a loss of historic fabric would likely not be allowable under many financial incentive or easement programs
- Abandonment or reconfiguration of a first floor often involves modification to windows and doors and thus can significantly alter the integrity of the interior of a building, as well as potentially the exterior
- Loss of space associated with abandonment may necessitate construction of an addition or rooftop addition, impacting the exterior appearance of the building
- Flood openings must sensitively designed for compatibility as should openings and mechanisms to promote ventilation
- Wholesale removal of historic materials may be required below a specific elevation to meet NFIP requirements, including wood and plaster components
- Application of waterproofing membranes, sealers, etc. for proper wet floodproofing can potentially trap moisture in historic buildings and building materials during non-flood periods, leading to deterioration
- The elevation of exterior building systems and equipment often increases their visibility, making screening more challenging
- The level of alteration required for effective implementation might compromise historic integrity



For dry floodproofing to be effective, all openings at the perimeter of the building must be sealed to prevent water ingress. This may necessitate excavation around foundation walls to apply waterproofing membranes and sealers.

C.3 DRY FLOODPROOFING

To be effective, dry floodproofing must keep all, or almost all, water out of a building. Essentially, it provides a “wetsuit” at the exterior of the flood-prone areas of the building to prevent infiltration through:

- Wall surfaces;
- Floor slabs;
- Window and door openings; and
- Joints and gaps at pipe penetrations and between different materials.

In considering whether dry floodproofing is a viable option, it is important to understand the potential depth and duration of the flood and the characteristics of the building. In a flood event, standing water and saturated soil exert two types of forces: lateral and buoyancy. There may be additional forces imposed by wave action or debris impact from flowing water. The type and method of construction must be able to withstand the anticipated forces for dry floodproofing to be a feasible alternative.

Dry floodproofing can be utilized at non-residential buildings and is allowed under the NFIP for historic residential structures only when other adaptations what would mitigate the building to the BFE would case the structure to lose its historic designation. However, dry floodproofing may not be permitted for residences within municipal floodplain ordinances and would not reduce the property owner’s flood insurance premium under the NFIP.

Dry floodproofing, keeping floodwater out of a building, is only viable as an option in situations the meet the criteria described below.

- The depth of floodwaters is relatively low, typically no higher than to 2-3 feet so that lateral forces are limited. (The height may be increased with significant engineering interventions.)
- The exterior building and foundation walls can withstand the lateral forces, wave action, and flood-borne debris impact forces. This limits viable wall materials to load-bearing masonry and concrete.
- The building and basement slab can resist buoyancy forces.
- Window and door openings can be effectively sealed to protect against the anticipated lateral force of the floodwater and to prevent infiltration for the flood’s duration. This will generally require human action in anticipation of a potential flood event. (*Refer to Barriers and Shields – Windows and Doors, page 9-11.*)
- Minor openings such as pipe penetrations and crevices can be effectively sealed to minimize seepage.
- The duration of flooding is limited. Seepage can accelerate as materials are exposed to water for longer periods of time.

- Water seepage can be removed until floodwaters recede. This typically requires a sump-pump or other mechanical system that will remain operational even with a power failure.

Because the feasibility of dry floodproofing is so site-specific, it is important to have a structural engineer evaluate the structural soundness of the building to determine whether it can withstand flood-related forces.

a. Construction Types

As a general rule, only masonry bearing wall and concrete foundations or buildings are potential candidates for dry floodproofing. (Refer to *Assess & Document Historic Property Flood Risk*, page 4-13.)

- **Masonry buildings** include stone, brick, and block construction, and have walls composed of masonry units bonded with mortar, grout, or sealant. The wall assembly tend to be continuous from the roof to the foundation, often providing sufficient structural capacity to withstand the lateral force of water or capable of being reinforced to have sufficient capacity. Conversely, their irregular surface can be difficult to waterproof and they often have openings or voids through which water might pass – either designed, such as weep holes, or openings that develop over time through deterioration or lack of maintenance.
- **Concrete buildings** and slabs might appear to be waterproof but concrete is a very porous material and typically allows water seepage. In addition, concrete may be vulnerable to seepage at transitions between structural members or between installation “pours.” Because of concrete’s relatively smooth surface, the application of a waterproof membrane can often be readily accomplished. The structural capacity of concrete to resist lateral and buoyancy forces is influenced by the thickness of the concrete, the size and configuration of reinforcing, and the manner in which it was constructed.
- **Wood-framed buildings**, typically constructed of wood studs with exterior clapboard, shingles, or siding, are generally porous, with many small holes and crevices that allow water seepage. In addition, wood-framed structures are vulnerable to water penetration at the connection between the foundation and the wall framing. As a result, effective dry floodproofing of wood-framed buildings is typically limited to a continuous masonry or concrete foundation or basement.

b. Wall & Slab Surface Sealers

To prevent infiltration through masonry and concrete walls and slabs, the surfaces must be sealed. Wall and slab sealants generally fall into two categories, either asphalt-based coatings that can be brush or spray applied or a heavy-duty rubber membranes. It is generally most effective to seal a

DRY FLOODPROOFING

Potential Preservation Benefits:

- Historic buildings can remain at original location and elevation

Potential Preservation Challenges:

- Installation of waterproofing materials may necessitate modification of historic appearance
- Proper floodproofing application of waterproofing membranes, sealers, etc. has the potential to trap moisture in historic buildings and building materials during non-flood periods, potentially leading to deterioration
- Attachment or installation locations for barriers and shields can be obtrusive
- Interior structural elements may require reinforcing
- Lower elevation window and door openings may be infilled or modified to achieve waterproofing and provide required lateral resistance to floodwater
- The elevation of exterior building systems and equipment often increases their visibility, making screening more challenging



Window and door barriers and shields for dry floodproofing are generally inserted into pre-installed channels flanking window and door openings. They must be individually labelled and stored onsite in a convenient location, and installed by trained personnel immediately preceding a flood event.



building at the exterior wall, foundation wall, or slab surface to prevent prolonged saturation of building materials during a flood event.

Because the building's "wetsuit" needs to be continuous, or as continuous as possible, this can present challenges at existing buildings in which foundations need to be exposed to apply the protection. Slabs may need to be replaced to allow installation of an underlying sealant barrier. There are different challenges above-ground where building materials or aesthetic considerations, such as historic preservation regulations, may limit options for the application of wall sealant systems. In these cases, it may be necessary to rely on joint sealers to minimize infiltration.

c. Joint Sealers

Many buildings have joints or gaps at penetrations, where dissimilar materials meet, or where different elements are joined. To improve the effectiveness of dry floodproofing, all joints and gaps must be sealed to provide a continuous barrier at the wall and slab.

Joint sealers generally come in two categories, sealants and gaskets. Sealant is typically a flexible, putty-like material that adheres to surfaces and to form a watertight seal. Gaskets are generally rubber and are compression fit to form a water-resistant seal between two materials. While sealants adhere to adjacent materials, gaskets can be utilized as a sealer between two joining parts, such as around an operable door or window.

One of the difficulties associated with sealants and gaskets is that they tend to degrade and fail relatively quickly. As they begin to fail, they lose their water tightness, becoming ineffective as a water barrier.

d. Barriers & Shields – Windows & Doors

Barriers and shields can provide temporary protection against floodwater entering doors and windows and are installed immediately preceding an anticipated flood event. The range of barriers and shields includes sandbags; drop-in or roll-up barriers; shields at door openings; floating barriers; and engineered barriers secured to building walls and the ground. With the exception of the engineered barriers, the other forms of protection are typically limited structurally to a maximum of 2- to 3-feet of floodwater.

Shields and barriers are generally constructed of metal, with heavier gauges for more sophisticated engineered applications. To minimize potential seepage, the shield and barrier systems typically include gaskets where components join and where they meet the building wall or ground surface.

The following factors should be considered when contemplating utilizing barriers and shields at windows and doors:

- **Available manpower:** Most, such as drop-down or roll-up barriers, window and door shields and engineered barriers, are dependent on individuals to install them preceding an event (with the exception of floating flood barriers). Sufficient trained manpower must be available and in place for the implementation. Therefore, this approach is most effective when there are a limited number of openings requiring protection and sufficient advance notice. Consequently, this approach is less effective in flash flood events.
- **Building evacuation:** Since exit doors typically swing out, barriers and shields that prevent doors from operating should only be installed after a building has been evacuated.
- **Sandbags:** Sandbags require substantial available materials, onsite trained personnel to properly stack bags, and appropriate disposal methods if contaminated by floodwater.
- **Certification:** The Association of State Floodplain Managers and USACE National Nonstructural / Floodproofing Committee have implemented a national program to test and certify flood barriers. The barriers tested under the program, the National Flood Barrier Testing and Certification Program, are evaluated for material properties, consistency in manufacturing, and resistance to water forces. (<https://nationalfloodbarrier.org/>.) It is recommended that if using flood barriers, that the program website be consulted and certified barriers chosen in lieu of untested, non-certified barriers.

e. Fenestration Modification

An alternative to installing a barrier or shield at existing window and door openings would be to modify low-lying openings to prevent floodwater infiltration. In the case of very low openings, such as basement windows, this could mean infilling the opening. For windows and unused doors with sill heights vulnerable to flooding, it might mean infilling the lower portion of the opening and raising the sill.

In either case, the infill material must provide a watertight seal and have sufficient structural capacity to withstand the lateral force of floodwater. This generally suggests infilling with masonry or concrete. However, permanent modification of windows and doors can dramatically change the exterior appearance of a building.

f. Secondary Drainage System

No matter how effective a dry floodproofing system is, it is highly likely that some water will seep into the building through the walls, joints, and underlying slab. Therefore, it is prudent to have a drainage and under drainage system with a



Sandbags can provide temporary protection at doorways. However, they substantial available materials, onsite trained personnel to properly stack bags, and appropriate disposal methods if contaminated by floodwater



Building maintenance is a key requirement of dry floodproofing. In a poorly maintained building, water can easily find its way through cracks and open joints, including at concealed areas such as under porches.

sump pump to evacuate any accumulated water. In addition, building systems should be installed so that they will not be damaged by seepage. (Refer to [Wet Floodproofing, page 9-9.](#))

g. Maintenance

One of the key requirements of a dry floodproofing option is a well-maintained building. (Refer to [Encourage Property Maintenance, page 3-17.](#)) During a flood event, the force of the water can easily undermine a compromised structural system. In addition, any small gap or opening can provide a path for water seepage. Therefore, for dry floodproofing to be effective it is critical to ensure that:

- Structural framing is sufficient to resist forces;
- Masonry and concrete walls have sufficient lateral load capacity;
- Masonry walls are fully pointed; and
- All joints are properly sealed, including around window and door frames, pipe penetrations, etc.

h. Cautions

Although dry floodproofing can provide protection from water infiltration during a flood event, the application of permanent or semi-permanent sealers and waterproof membranes can lead to deterioration of building materials by trapping moisture or promoting condensation, both of which can lead to material degradation of masonry, concrete, and wood. In the case of wood, increased moisture can promote rot, mold and insect infestation, such as termites and carpenter ants, in both exterior wall elements and in other parts of the building such as floor framing and interior finishes.

C.4 PERIMETER BARRIERS

An alternative to wet or dry floodproofing is providing a continuous barrier to keep floodwater away from the perimeter of a building, or group of buildings, either permanently or immediately preceding a flood event. Permanent barriers can be constructed masonry or concrete floodwalls or levees. (In some cases, existing masonry site walls can be modified to have sufficient strength to act as a floodwall.) Because levees are constructed of sloped earth, they require significantly more space than floodwalls. To be effective, both options should be engineered to assure that they:

- Are located in soils that are impermeable and can withstand the forces associated with rising floodwater (floodwater can percolate up through porous soil);
- Are of sufficient height to provide protection during a flood event;
- Have sufficient structural capacity to withstand the lateral force of floodwater;
- Include temporary barriers to seal off openings at walkways and driveways;
- Are watertight above and below grade to minimize seepage; and
- Include a secondary drainage system within the perimeter to remove groundwater, rain, or seepage.

An important consideration for a permanent barrier system is that many of the same mechanisms used to prevent water from approaching a building during a flood event will tend to trap or collect water adjacent to a building. Prolonged periods of soil saturation can have long-term ramifications for building materials.

Temporary barrier systems can include water-filled rubber tubes or structural wall systems installed immediately preceding a flood event. The empty tubes are laid on the ground and filled with water and might provide up to two-feet of protection depending on the contour of the land and whether joints between sections are properly sealed. Temporary structural wall systems typically require installation into pre-mounted anchors on the ground and can provide protection to higher elevations. Both of these options rely on human intervention to establish a continuous perimeter barrier and do not necessarily include a secondary drainage system to evacuate water collected within the barrier. (Refer to *Barriers & Shields – Windows & Doors*, page 9-11.)



Flood wall (black granite, foreground) forms a perimeter barrier surrounding the National Museum of African American History and Culture and protects the museum from flooding by the Potomac River. Washington, DC.

PERIMETER BARRIERS

Potential Preservation Benefits:

- The location and elevation of the historic building is unchanged
- Temporary barriers can reduce or prevent flood damage minimizing lasting effects at historic buildings

Potential Preservation Challenges:

- Permanent barriers, such as a surrounding levee or landscape wall, alter the historic context of a building
- Permanent barriers can prevent adequate drainage away from the protected building, essentially trapping moisture near the foundation, potentially leading to the degradation of historic materials



All systems must be disconnected prior to lifting the building off of its foundation.

RELOCATION

Potential Preservation Benefits:

- Historic buildings and structures can be saved

Potential Preservation Challenges:

- Historic context is lost
- Recreating historic relationships between site elements and surroundings can be difficult; for example, a building's or structure's relationship to a shoreline might be difficult to duplicate
- Relationship to adjoining buildings and sites is lost
- Building may be moved out of the historic district boundaries
- Building may be de-listed if historic context is not maintained

C.5 RELOCATION

Relocation involves moving a building out of a flood area onto a portion of the existing parcel that is at a higher elevation, if available, or onto a different parcel. It provides an alternative to demolition for situations where it is not feasible for the building to remain in place.

Some of the factors determining the level of difficulty in moving a building include:

- **Foundations:** Buildings resting on piers or with basements facilitate the installation of lifting beams. Slab-on-grade buildings can be more challenging.
- **Size:** Smaller buildings are easier to move than larger, multi-story buildings.
- **Footprint geometry:** Simple rectangular buildings are easier to move than buildings with multiple wings and complex footprints.
- **Material:** Wood framed buildings are lighter than masonry buildings, and therefore easier to move.
- **Condition:** Buildings in good condition are better candidates for relocation than buildings in poor or fair condition. (*Refer to Encourage Property Maintenance, page 3-17.*)

The actual process of moving a building is similar to building elevation in that it generally involves its lifting off its foundation. From there it is placed onto a flatbed truck, driven to its new location and set upon a new foundation. Because the building is being moved horizontally, and not simply lifted vertically and set down again, relocation is a complex process that involves:

- Finding an available, appropriate parcel;
- Ensuring that there is an accessible route to the new location and minimizing obstructions such as underpasses, utility lines, traffic signals, and narrow or low load capacity roadways and bridges;
- Securing the required permits;
- Constructing a foundation and providing utility hook-ups at the new site;
- Disconnecting utilities at the existing site;
- Reinforcing the existing building to ensure it can take the stress of moving;
- Bracing chimneys, porches, and other projecting elements, or carefully dismantling them in a manner that allows reassembly at the new site;
- Inserting a structural support system under the building and detaching it from and lifting it off its existing foundation;
- Placing the building and its structural support system onto a trailer;
- Transporting the building to the new location;
- Lowering the building onto the new foundation;

- Connecting the utilities;
- Finishing the new site, including regrading and installing paving and plantings;
- Removing and/or addressing contaminated materials including septic systems and fuel storage tanks; and
- Restoring the former site to address local requirements, potentially including removal of utilities, backfilling the basement, removing paving, regrading, and replanting the site to a more “natural” landscape.



Selective demolition can offer the opportunity of restoring a site to its natural condition and promote water absorption.

C.6 DEMOLITION

Demolition involves the intentional tearing down of all or part of a building or structure. In flood-prone areas, demolition may be proposed if a building has been extensively damaged by a flood event. Considerations for the future resultant site include the following possibilities:

- Potential replacement of a non-flood-compliant building with a flood-compliant building, with all that entails, including higher floor elevations and flood resistant materials, which may be incompatible with the historic context;
- Allowing an area regularly affected by flood to return to a more natural state as part of a buy-out or similar program ([Refer to Blue Acres Floodplain Acquisition Program sidebar, page 2-10](#));
- Disconnecting utilities at the existing site;

DEMOLITION

Potential Preservation Benefits:

- Restoration of natural conditions
- Reduction of risk of flooding at adjacent historic properties

Potential Preservation Challenges:

- Loss of historic resource
- Alteration of historic context, particularly along the streetscape within a historic district
- Possible damage to archaeological resources

- Removal of or addressing contaminated materials at the property including septic systems and fuel storage tanks; and
- Restoring the site to address local requirements, potentially including removal of utilities, backfilling of the basement, removal of paving, regrading, and replanting the site to a more natural landscape.

Demolition of some buildings may also be used to reduce the risk of flooding at others. This can occur when developed sites are returned to a more natural setting such as wetlands or floodplains. In considering this adaptation option, the relative significance of the saved and sacrificed properties should be evaluated as should their flood vulnerability. Another consideration is whether the property has been abandoned through migration, and whether the property is slated for demolition to improve the functionality of the floodplain as part of a buy-back program. (Refer to *Blue Acres Floodplain Acquisition Program sidebar, page 2-10, and Chapter 10, Adaptation.*)

Documentation should precede the demolition of any historic resource and should be a requirement in a historic district ordinance, a floodplain management ordinance, or as part of the permitting process for any building over a certain age. The extent of required documentation can be as basic as exterior photographs or sufficiently detailed to meet the standards of the Historic American Building Survey (HABS). **Whenever possible and appropriate, documentation should be shared with NJ HPO for inclusion on the Statewide Inventory of Historic Places to provide a lasting contribution to the understanding of the state's architecture, engineering, archaeology, and culture.** (Refer to *Identify Historic Properties within Flood-Prone Areas, page 3-3, and Historic & Cultural Resource Documentation, page 10-6.*)

D. PROPERTY MITIGATION OPTIONS MATRIX

The following matrix is intended to provide a brief overview of the potential issues and impacts associated with the options presented in this section. Refer to the text boxes in the narrative for potential preservation benefits and challenges.

Strategy	Potential Design Option	Potential Issues	Additional Considerations
Elevation	Elevate building or structure	<ul style="list-style-type: none"> • Size, configuration, or materials may make elevation cost prohibitive • Vertical extension of building foundation and building elements such as chimneys • Extension of building systems, equipment, and associated connections – Removal of abandoned equipment and hazardous materials • Abandonment of former basements – Potential need for infill and grading or wet floodproofing and removal of windows and doors • Extension of access stairs and potentially ramps and elevators 	<ul style="list-style-type: none"> • Level of alteration required for effective/desired implementation might compromise historic integrity • Relationship between building and ground plane as well as adjacent buildings will be altered • Significant elevation change can alter stylistic proportions • More foundation will be exposed • Basement-level openings will be lost • Modification of stairs, ramps, and potentially porches necessitated • Property owners might desire higher elevation than required to provide off-street parking • Excavation around foundation to accommodate cribbing and elevation equipment may damage or destroy archaeological resources
	Elevate ground plane with building or structure	<ul style="list-style-type: none"> • Sufficient area required around building to berm-up to raised foundation or construct retaining walls to provide a “plinth” • Grading to prevent runoff onto adjacent parcels • Vertical extension of building foundation and building elements such as chimneys • Extension of building systems, equipment, and associated connections – Removal of abandoned equipment and hazardous materials • Abandonment of former basements – Potential need for infill and grading or wet floodproofing and removal of windows and doors • Removal and reinstallation of paving at new elevated grade 	<ul style="list-style-type: none"> • Relationship between building and adjacent buildings will be altered • Site regrading may impact historic landscapes or archaeological resources • Berming or retaining walls may be inconsistent with historic context • Minimal impact to archaeological resources if fill is brought in from off-site

Strategy	Potential Design Option	Potential Issues	Additional Considerations
Wet Floodproofing	Abandon basement level if below DFE	<ul style="list-style-type: none"> • Modification of basement to allow floodwater to enter and drain from building • Installation of flood openings and potentially ventilation • Modification of basement window and door openings to accommodate floodproofing • Relocation of building systems and equipment above DFE 	<ul style="list-style-type: none"> • Basement windows and doors must be modified • Flood and ventilation openings must be provided • Elevation of exterior and interior systems and equipment may require alteration of interior spaces or new construction to house the equipment
	Raise 1st floor level above DFE while maintaining exterior walls at existing elevation	<ul style="list-style-type: none"> • Modification of basement and 1st floor structures to address lateral and buoyancy forces • Installation of raised 1st floor level – Modification of stairs • Modification of windows and doors at basement and potentially 1st floor • Installation of flood openings and potentially ventilation • Replacement of existing materials with flood damage-resistant materials • Relocation of building systems and equipment 	<ul style="list-style-type: none"> • Basement windows and doors must be modified • Flood and ventilation openings must be provided • Existing materials must be removed and replaced with flood-damage-resistant materials • Exterior systems and equipment must be elevated
	Abandon basement and 1st floor	<ul style="list-style-type: none"> • Modification of basement and 1st floor structures and 1st floor walls to address lateral and buoyancy forces • Removal of all functions with the exception of storage, garage, and entry at residential • Modification of windows and doors at basement and 1st floor • Installation of flood openings and potentially ventilation • Replacement of historic materials with flood damage-resistant materials • Relocation of building systems and equipment 	<ul style="list-style-type: none"> • Basement and 1st floor windows and doors must be modified • Garage doors may be added • Flood and ventilation openings must be installed • Historic materials may be removed and replaced with flood damage-resistant materials that do not retain the appearance, workmanship, etc. of the original material • Exterior systems and equipment may be elevated

Strategy	Potential Design Option	Potential Issues	Additional Considerations
<p style="text-align: center;">Dry Floodproofing (Not NFIP compliant for residential buildings)</p>	Sealing walls and slabs	<ul style="list-style-type: none"> • Possible requirement for trenching of building perimeter to apply sealer material below-grade • Possible requirement for new basement slab with secondary drainage system below • Structural modifications to address lateral and buoyancy forces • Application and maintenance of joint sealers at all openings and penetrations • Relocation of building systems and equipment 	<ul style="list-style-type: none"> • Trenching may damage or destroy archaeological resources • Wall sealers may trap moisture in wall system or promote condensation • Windows and doors may require modification to withstand lateral loads and prevent seepage • Exterior systems and equipment may be elevated
	Window and door barriers and shields	<ul style="list-style-type: none"> • Pre-installation of anchors or channels adjacent to each affected opening • Installation of barriers and shields in an accessible location • Installation training and practice in preparation for flooding, and regular inspection and maintenance of anchors, channels, and panels • Emergency operations plan to address installation in advance of flood event and protocol for building evacuation • Access to sufficient materials, assembly and proper installation of temporary sandbags in advance of flood event – Can become hazardous waste requiring proper handling and disposal if floodwater is contaminated 	<ul style="list-style-type: none"> • Channels and anchors can be visible at building exterior
	Fenestration modification	<ul style="list-style-type: none"> • Installation of waterproof infill in openings or portions of openings able to withstand force of lateral loads 	<ul style="list-style-type: none"> • Alteration of window and door openings can impact the historic integrity of the building and may cause more damage to the building if they fail

Strategy	Potential Design Option	Potential Issues	Additional Considerations
Perimeter Barrier (Not NFIP compliant for residential buildings)	Site walls and levees	<ul style="list-style-type: none"> Sufficient available land around building(s) and structure(s) Sufficient soil capacity to withstand water forces Limited opening for walkways or driveways – Requires installation of barriers or shields in advance of flood event Secondary drainage system with emergency power to remove seepage during flood event 	<ul style="list-style-type: none"> Historic landscapes and archaeological resources may be affected Site wall or levee might not be appropriate in historic context Stormwater may be trapped at perimeter of building foundation, degrading materials
	Temporary barriers	<ul style="list-style-type: none"> Effectiveness generally limited to 2 feet Installation in advance of flood event 	<ul style="list-style-type: none"> None
Relocation	Relocate on same or different parcel	<ul style="list-style-type: none"> Preparation of new building location, foundation, and utility hook-ups Clearance of a path to move building – Move building Abandonment of former location with removal of utilities, hazardous materials, foundations, and paving New paving and landscaping at new location 	<ul style="list-style-type: none"> Building will be severed from historic context, which may be difficult to recreate at new site Loss of building at former site may create a “hole” in the streetscape Historic landscapes and archaeological resources may be affected Secondary buildings and structures might not be relocated, altering historic relationship
Demolition	Site Abandonment	<ul style="list-style-type: none"> Abandonment of location, removal of utilities, hazardous materials, foundations, and paving – Provide appropriate landscaping 	<ul style="list-style-type: none"> Historic resource will be lost Historic context, particularly along a streetscape, will be lost
	Replacement with compliant building	<ul style="list-style-type: none"> New construction meeting all regulatory requirements 	<ul style="list-style-type: none"> Compliant building might be incompatible within historic context
Do Nothing (Not Mitigation)	Limited to properties not required to have flood insurance	<ul style="list-style-type: none"> Financial burden for flooding rests with property owner 	<ul style="list-style-type: none"> Existing conditions are maintained until potential flood impact or change of ownership Likelihood is increased for more significant damage if and when flooding occurs

REFERENCES

Note: All references are available online unless otherwise noted. References that are only available as online resources are noted as “online resource.” Refer to Appendix B: Bibliography for web links.

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10 Adaptation

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Adaptation may include making small incremental changes in response to nuisance flooding or making decisions regarding whether habitation of a place remains feasible. (Photograph courtesy of the NJ HPO.)

Adaptation

“ADAPTATION” = CHANGE

Although currently not included in the emergency management cycle, adaptation is gaining importance in communities wishing to address increasing nuisance flooding, precipitation, and more intense storm events. Often used interchangeably, climate adaptation and hazard mitigation are different yet related concepts. Within the current emergency management context, mitigation focuses on reduction of harm from known hazards and relies primarily on historic trends. Adaptation planning goes one step further: it anticipates future conditions and attempts to adjust natural and human systems to respond to and take advantage of those conditions. **Both mitigation and adaptation involve steps to improve community resilience to flooding, but adaptation is typically more expansive, including social, cultural, economic, structural, and environmental factors.**

Adaptation means “change.” Physical changes to structures and the environment can dramatically extend the life of a community in an environment susceptible to flooding. The ability to remain in flood-prone areas is dependent on a community’s willingness to embrace the changes needed to become more resilient and to accept the risk posed by flood hazards. Sometimes adaptation requires a community to acknowledge that remaining in place is no longer feasible and it will be necessary to abandon that area. Whatever the given situation, a community threatened by increased flooding must plan to manage the changes required to remain in place or to migrate to new locations.

Each community in New Jersey has a different level of flood vulnerability and different circumstances that will inform their potential level of adaptation. Persistent flooding, worsened by climate change that

progressively changes the landscape or a sudden occurrence such as a major storm or flash flood, can make continued life in an area undesirable. Some communities have access to human and financial resources for adaptation; some do not. For communities highly vulnerable to flooding, more change or adaptation will be needed to mitigate the effects of flood hazards and increase the community's ability to withstand and recover from those effects. Major interventions may have serious consequences on daily routines, the community setting, or residents' quality of life. Outside factors, including the future role and requirements of the National Flood Insurance Program (NFIP), may set boundaries on what is or is not possible for adaptation.

Adaptation will require rethinking how the community looks and feels, what aspects of the community are most characteristic and most valued, what can be saved for the future, what types of mitigation can be used to increase resiliency, where to invest, and what types of economic activity to support. Frequently, adaptation planning requires identifying areas where the community will physically shrink and areas that will expand and grow. As with all planning efforts, decisions should be made through a deliberative process with extensive public input and captured and integrated across all the planning documents that guide community development: hazard mitigation plans, master plans, historic preservation elements, economic development plans, among others, as well as planning for capital improvement projects. (Refer to *Addressing Preservation & Flooding in Local Planning Initiatives*, page 3- 5.) Because it is a new process, adaptation requires ongoing communication with the public as efforts progress, to ensure that support remains constant and to resolve any obstacles or issues as they appear. (Refer to *Engage the Public*, page 4-11.)



Adaptation can begin with a change in behavior, such as avoiding a roadway that is vulnerable to flooding during high tide.

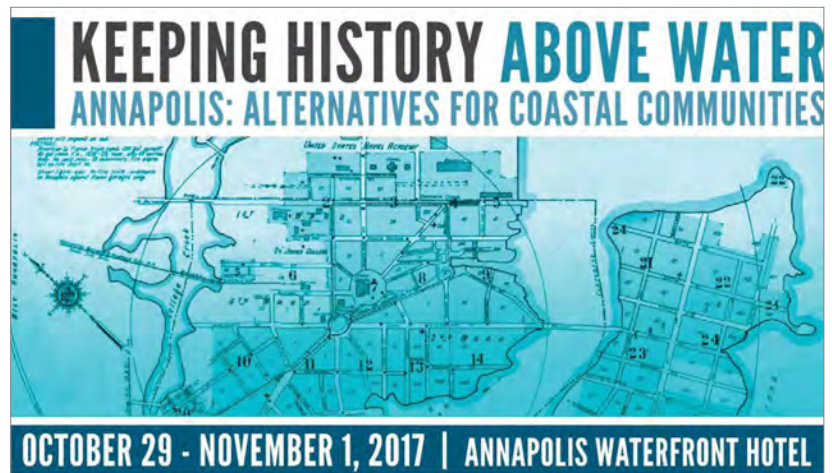
A. PLANNING FOR ADAPTATION

This *Guide* recommends a hazard mitigation planning process that includes climate projections and therefore allows communities to begin the climate adaptation process. Some jurisdictions, such as Hoboken and Sea Isle City, have already incorporated climate adaptation planning into hazard mitigation plans even without official guidance from federal and state government. **During this transitional time, planners also must grapple with communities and citizens at varying stages in their acknowledgement of the increased flooding and climate change.** While a single event such as a flash flood or strong storm may raise attention, the slow, progressive effects of rising water have been, and will be, unfolding for decades.

Flood impacts vary from subtle to dramatic, depending on the environmental and physical characteristics of each location, and local social, cultural, and economic factors influence the response of populations in flood-prone areas. Due to these circumstances, residents of some communities believe that sea level rise and climate change are remote threats that might affect future generations, while others see their way of life disappearing before their eyes. It is also likely

COMMUNITY IMPACT OF FLOODING

In addition to affecting historic properties, flooding can remove the intangible qualities traditionally associated with a community. The closing of a school for lack of students, loss of a grocery store, or inability to perform traditional local work, such as farming or crabbing, may cause young families to move where there are more opportunities, resulting in the slow abandonment of the community.



As greater numbers of communities are challenged by flooding of historic resources, professional workshops, conferences, and seminars are being offered to share ideas and approaches to better address the issues.

that stakeholders within the same community will have very different perceptions of the problem, making planning and decision-making extremely difficult.

Currently, the effects of a changing climate are manifesting in these way, among others:

- Coastal towns are experiencing more nuisance flooding;
- Shorelines and river banks are actively eroding at a faster rate;
- Brackish water is intruding into low-lying areas, preventing farming, killing tree stands, and converting solid land to marsh;
- Wetter spring seasons and longer summer seasons affect many industries that depend on natural resources, including agriculture and fishing; and
- Coastal storms have storm surges that are deeper and reach further inland and into back bays due to warm, expanding oceans, and a higher elevation of mean sea level.

Regardless of the debate over why these changes are occurring or what to call these changes, local municipalities should begin planning now to address current natural hazards and anticipated future conditions. The key to adapting historic properties and communities to be more resilient in the face of the coming changes is to be proactive in crafting policies, plans, and ordinances. With the increasing impact of flooding, local governments are faced with ever harder choices regarding the use of limited resources to protect their communities.

As part of their planning processes, local governments should utilize available tools and resources to guide their mitigation decisions. Rutgers University is a leader in the state regarding the impacts of climate change, addressing the human and social dimensions, including how social, economic, political, cultural, and behavioral factors drive climate change, shape vulnerabilities, and condition response strategies. Their mission includes developing and sharing information to guide local governments in identifying appropriate strategies and policies related to climate

NJ COASTAL RESILIENCY PLAN

The Office of Coastal and Land Use Planning, of the Department of Environmental Protection (DEP), has worked with towns through its local and regional planning initiatives to understand the potential impacts of climate change and coastal hazards and has established a living shoreline program and guidance that would increase the use of nature-based solutions in coastal resiliency projects. They are developing a Coastal Resilience Plan and tools to move the state forward in preparing for sea-level rise and coastal storms. (<https://www.nj.gov/dep/coastalresilience/>)

change, including flooding. (Refer to *Sea Level Rise & Subsidence*, page 1-4.) Within the state, the New Jersey Emergency Management Office (NJOEM) is available to consult with communities in the preparation of local hazard mitigation plans and the New Jersey Department of Environmental Protection (NJDEP) has a number of entities and affiliated organizations that address flooding and floodplain management. (Refer to Chapter 11, *Flood Mitigation Partners*.)

For historic communities, adaptation planning can build on the community's inherent resiliencies and relationship to water while looking for solutions that provide both physical protection and support of traditional lifeways. Marsh restoration projects, for example, can absorb and reduce storm surge and create habitat for fish and shellfish. Similarly, constructing oyster reefs off-shore creates habitat as well as breakwaters that reduce wave energy during storms. Daylighting historic streams, and restoring channelized and submerged or buried waterways and buried wetlands to their natural appearance, configuration, and function, has a double benefit of better stormwater management and partial restoration of the historic setting. Adaptation strategies like these serve multiple purposes; in addition to hazard reduction and increasing the habitat of aquatic life, they contribute to economic resiliency for traditional water-based industries and recreation, while enhancing the historic and natural features of a community that make it attractive for heritage tourism. Since many historic communities in New Jersey are water-oriented, whether riverine or coastal, adaptation strategies should consider how to adapt the buildings and infrastructure as well as the natural systems that also support the community.

Within the framework of adaptation planning, climate mitigation can also imply greenhouse gas reduction. In this context, planners often value historic communities which were built prior to automobiles and can easily re-adapt to pedestrian routes and, in some cases, emphasize biking. Climate adaptation also emphasizes the retention and reuse of building fabric, which can benefit historic buildings, although the proposed treatments of older and historic properties do not always adhere to *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings* (U.S. Department of the Interior, 2017), which form the basis for preservation practice in the United States.

B. APPROPRIATE PHYSICAL ADAPTATION FOR HISTORIC PROPERTIES & COMMUNITIES

The philosophical approach to historic preservation, particularly with the passage of the National Historic Preservation Act of 1966, has favored minimizing change to historic properties. This approach has successfully allowed many communities to identify and protect the character that defines a sense of place, but it has largely ignored the context of environmental change, leaving many historic properties vulnerable

RESILIENCE TO NATURAL HAZARDS

The subject of Resilience to Natural Hazards was addressed as part of the 2017 edition of *The Secretary of the Interior's Guidelines for Rehabilitation*.

Resilience to natural hazards should be addressed as part of the treatment Rehabilitation. A historic building may have existing characteristics or features that help address or minimize the impacts of natural hazards. These should be used to best advantage and should be taken into consideration early in the planning stages of a rehabilitation project before proposing any new treatments. When new adaptive treatments are needed they should be carried out in a manner that will have the least impact on the historic character of the building, its site, and setting.

A RISING TIDE

N.J. trees on the brink

Surviving 400 years or more, but climate threatens.

By Frank Kummer
STAFF WRITER

Dark water formed an eddy around Steve Eisenhauer's boots as they sank into the muck at the base of a 90-foot black gum tree so old, its roots were deep in this ground when the Pilgrims landed.

Scientists estimate the age of black gums in an old-growth forest surrounded by Bear Swamp in Cumberland County ranges from 400 to 500 years, making it among the most

ancient of trees in the most ancient forest of its kind surviving in the Northeast U.S.

But sea-level rise fueled by warmer oceans and sinking land is pushing saltwater ever closer to the trees, with the potential to kill them in the not-so-distant future.

Less than half a mile away, hundreds of trees separate from the old-growth forest are already dead from rising salt levels in what once was mostly a freshwater stream.

See **TREES** on A23

Steve Eisenhauer at the refuge where saltwater is pushing closer to trees. DAVID SWANSON / Staff



Philadelphia Inquirer, December 16, 2018.

to natural hazards, including flooding. *The Secretary of the Interior's Standards and Guidelines* (2017) addresses resilience to natural hazards, recommending the least amount of intervention needed to achieve protection of a historic property from natural hazards. The *Guidelines* recognize that minimal intervention may not be enough to protect a property and that more invasive interventions may be necessary to ensure the continued survival of the building, despite the loss of some of the building's historic character. The National Park Service's 2019 *Guidelines on Flood Adaptation for Rehabilitating Historic Buildings* take a step further by providing recommendations with the goal of reducing flood risk and achieving greater resilience. ([Refer to Planning & Assessment for Flood Risk Reduction matrix, page 4-19.](#))

Most local governments and the New Jersey Historic Preservation Office (NJ HPO) utilize *The Secretary of the Interior's Standards* as the criteria for regulatory reviews regarding alterations to historic properties. The *Standards*, and more specifically the *Standards for Rehabilitation*, recognize that physical change may be necessary to allow the continued use of historic buildings and sites. Given the new acknowledgement of natural hazards in the *Guidelines*, and the imminent threat from flooding facing many historic New Jersey communities, it may be necessary to adapt the philosophical approach to interpretation of the *Standards* and the level of change deemed acceptable. Flood vulnerability may require high-risk communities to rethink the recommended level of physical adaptation required to balance the desire to maintain historic fabric with the need to sustain building occupancy.

Simultaneously it must also be recognized that, for a variety of reasons, it will not be possible to save all historic resources. With the acceptance that physical loss of place might be inevitable comes the responsibility to document the historic fabric before it is lost. In addition to the abandonment and disappearance of physical features, historic places also have socio-cultural traditions and practices that can be lost when the people who occupy those places relocate.

To document historic places and cultural heritage threatened by flooding, communities should consider a combination of traditional historic



HISTORIC & CULTURAL RESOURCE DOCUMENTATION

Traditional Methods of Property Documentation

Depending on the type and significance of the historic property and the goals for documentation, a local government or preservation advocate may consider the following options:

- **New Jersey Historic Resource Survey Form.** For any property, but particularly properties for which historic designation is uncertain or may be undesirable, preservation planners or consultants can work with the NJ HPO to complete a New Jersey Historic Resource Survey form(s), including all required supporting documentation, and submit the information to NJ HPO. (Information regarding Preliminary Applications for Registration and Certification of Eligibility Requests are available through the NJ HPO. (https://www.nj.gov/dep/hpo/1identify/nrsr_lists.htm))
- **National Register of Historic Places Nomination.** For properties where formal designation is desired (for example, where historic preservation project review would be beneficial in the event of FEMA actions), preservation planners, consultants, or advocates can complete the National Register nomination form, including all required supporting documentation, and submit the information to NJ HPO.
- **Local Inventory Collection.** Where properties would benefit from local designation, or if data collected is not sufficient to support a submission to the NJ HPO or the National Register, planners may elect to complete a local property inventory form and supporting documentation and submission to local department of planning and zoning.
- **Historic American Buildings Survey (HABS)/Historic American Engineering Record (HAER)/Historic American Landscapes Survey (HALS).** For extremely significant or rare historic properties, local planners and advocates may wish to propose HABS/HAER/HALS documentation and submission to the National Park Service.

Community-Based Methods of Documentation

- **Oral Histories.** Through audio or video interviews, volunteers can record oral histories of the community, particularly those aspects that may be lost or altered by increased flooding. Ideally, this process should be overseen by a professional or volunteer with experience in collecting oral histories. The local government can help facilitate this process and/or help locate an appropriate repository for the data, such as a local university.
- **Digital Archives.** A local government or non-profit group can encourage community members to share family photos and documents to be scanned and digitally archived. As with oral history collection, this process should be overseen by someone with experience, and options for data collection should be considered in advance.

Emerging Methods of Documentation

- **Drones.** Using photographic and geographic data collected by a camera and GPS device mounted to a drone flown at a low altitude, a high resolution three-dimensional model of a streetscape, building, or landscape can be created.
- **Laser Scanning.** The process of 3D laser scanning (or phase-shift/phase-comparison scanning) generates a collection of xyz coordinates that are used to create a high resolution three-dimensional model of a streetscape, building, or landscape. Laser scanning can be a cost effective means of accurately capturing a space three dimensionally.

property documentation, more informal community-based methods of documentation, and, in some cases, the use of emerging technologies such as drones and laser scanning to achieve more complete documentation.

In cases of anticipated severe flooding, documentation can help capture the memory of a community through the voices of its residents prior to their migration. (Refer to *Historic & Cultural Resource Documentation*, page 10-6.)

Preservation planners and historic preservation commissions should also strive to work with local emergency managers and floodplain administrators to guide changes to infrastructure and the landscape. For example, although it may have a detrimental impact to some historic properties, it may be necessary to conduct a stream daylighting or marsh restoration project in an area that was historically filled and built upon to protect other properties, in effect sacrificing one group of historic resources for another. *Large-scale physical changes must have community-buy in to be effective, transparent, and fair, and these decisions must not be made lightly, but rather through a deliberative planning process and incorporation into the community's planning documents that guide the community's vision of its continuing evolution.* (Refer to *Engage the Public*, page 4-11.)



PORTSMOUTH VILLAGE, NORTH CAROLINA

Portsmouth Village was established in the 18th century as a fishing village. The last residents left the island in 1971 and in 1976 the land came under the ownership of the National Park Service as part of the Cape Lookout National Seashore is listed on the National Register of Historic Places. Currently, the Village is only accessible by boat. Volunteers assist with the preservation of the twenty-one buildings as well recording the stories of former residents at their biannual meetings and Portsmouth homecomings. (<https://www.nps.gov/calofplanyourvisit/visit-portsmouth.htm>)

C. MIGRATION

Migration is already occurring across New Jersey, for example, on the Delaware Bay, as younger generations move out of rural villages and resettle in towns or cities. As areas once farmed have become too wet for too much of the growing season and traditional methods of subsistence cease, those economic systems collapse and disappear. For historic communities vulnerable to flood hazards, out-migration will likely continue as flooding progressively worsens. Progressive flooding can result in:

- Interrupted access as roadways and bridges become impassable;
- Lack of fresh water as well water becomes contaminated with brackish water;
- Sewer system backups that necessitate costly and frequent upgrading;
- Local industry interruptions which mean that businesses are no longer sustainable in a flood-prone environment; and
- Loss of employment opportunities and resultant out-migration of population.

Out-migration need not erase a historic community. Adaptation planning can encompass strategies for relocating historic communities and historic buildings. Philosophically, preservationists and planners will need to grapple with adapting their preservation paradigm and interpretation of the *Standards* to the circumstances they will face. Relocation of historic structures may become less contentious and more accepted as a method of preservation as well as flood protection.

If historic communities are determined to be of very high significance, they can be relocated wholesale. This is already occurring elsewhere in the United States among Native American communities, most notably in Louisiana, the Isle de Jean Charles, and Alaska, the City of Shishmare. Relocation of an entire historic community to a similar setting could preserve both tangible and intangible heritage, especially if water-oriented communities are relocated to areas that allow for traditional water-oriented practices to continue (e.g, boatbuilding, oystering, and crabbing).

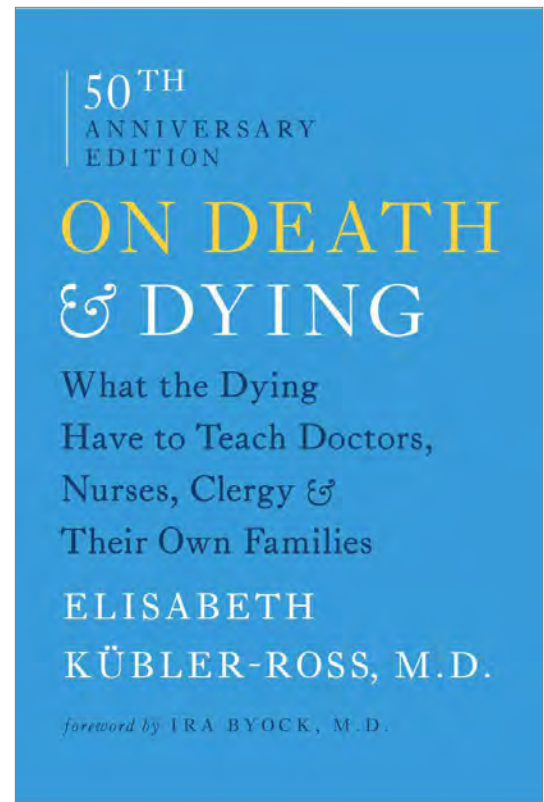
D. ACCEPTING LOSS & MOVING FORWARD

Change can be frightening. In many ways, acceptance of the need for adaptation requires being able to say goodbye to the way we have known a community and its culture and to acknowledge the passing or changing of a way of life before moving on to a new way of looking at a community.

In her 1969 book *On Death & Dying*, Swiss psychiatrist Elisabeth Kübler-Ross identified five stages in the grieving process. As some climate scientists and activists have noted, similar stages can be identified in the process of accepting the need for adaptation.

1. **Denial:** Belief that flooding does not pose an immediate threat, and if it will become a concern, it will be far in the future, not affecting me or my children.
2. **Anger:** Realization that flooding is affecting me or my community, and the unfairness of the burden it is placing on me because my property floods, my flood insurance premiums are increasing, or my community must make infrastructure improvements.
3. **Bargaining:** Recognition that I have a problem, accompanied by the conviction that I can fix the problem by implementing a mitigation measure, be it floodproofing, elevation, relocation, or demolition.
4. **Depression:** Sadness and hopelessness in the inevitability that my community may change radically or be abandoned and that its social and cultural structure may disappear because of the loss of population, buildings, landscapes, and infrastructure.
5. **Acceptance:** Acknowledgement of the fact that flooding is a problem, everything cannot be saved, and that what can be saved will be different from what it was – establishing a “new normal.”

Adaptation shapes a future path that recognizes the significance of the past and incorporates elements before they are erased. It is the responsibility of communities to identify their own goals as they adapt to changing conditions, whether it be implementing physical changes to historic properties or migrating and re-establishing the community in less risky locations. However, if communities fail to act and do not plan for the future, the results could be devastating, including ad hoc abandonment and dispersal. Historic communities have long legacies of evolution and



On Death & Dying.

change. Through adaptation, those changes can be planned for and managed to promote the protection, preservation, and reuse of historic buildings, while ensuring that the communities themselves continue to survive and thrive.



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Flood Mitigation Partners

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Flood Mitigation Partners

Although local governments ultimately have the responsibility of planning for their own futures, there are several federal, state, regional and county agencies, departments, and organizations that can provide resources and assistance at the various stages of the emergency management cycle. This section includes a list of key partners, primarily representative of federal and state levels, and their associated roles in hazard mitigation and the emergency management cycle. It is important to keep in mind that the specific functions and programs offered by the partners can change with time, therefore, their websites should be checked regularly for current information.

In addition, it is important to be aware that the primary mission of many of the identified agencies and departments, and therefore their strategies and recommendations, may be at odds with the traditional approach to historic preservation as defined by *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings* (2017), maintained and promulgated by the National Park Service. The NJ HPO is available to provide guidance, particularly as local communities consider appropriate mitigation measures to protect historic and cultural resources.



FEDERAL EMERGENCY MANAGEMENT AGENCY

At the federal level, FEMA is the lead agency for emergency response activities. FEMA's activities at each phase in the emergency management cycle include, but are not limited to, the activities listed below. (www.fema.gov)

Planning/Preparedness:

- Administers the National Flood Insurance Program (NFIP) (*refer to National Flood Insurance Program, page 2-2*)
- Publishes Flood Insurance Rate Maps (FIRMs) to identify areas most likely to flood (*refer to Flood Insurance Rate Maps, page 2-5*)
- Funds and approves updates to state and local hazard mitigation plans (*refer to Write, Adopt & Implement the Plan, page 4-28*)
- Provides preparedness guidance via publications, education and outreach activities (www.fema.gov)
- Conducts training and exercises at all levels of government

Response & Recovery:

- Manages response to Presidential Disaster Declarations as well as recovery programs and activities (*Refer to Chapter 5, Response: Hazard Mitigation for Historic Resources*)
- Coordinates federal agencies during response and recovery (*refer to Chapters 5 and 6, Response: Hazard Mitigation for Historic Resources and Recovery: Hazard Mitigation for Historic Resources*)

Mitigation:

- Provides pre- and post-disaster mitigation planning and project funding (*Refer to Funding for Recovery, page 6-8*)
- Provides guidance on how to retrofit and protect buildings against natural hazards (www.fema.gov)

U.S. ARMY CORPS OF ENGINEERS

Among its many responsibilities, the U.S. Army Corps of Engineers (USACE) has authority to support mitigation of the nation's infrastructure and building stock to reduce the impacts of riverine and hurricane storm damage. The USACE has a strong presence in New Jersey through their New York and Philadelphia Districts offices and the New Jersey Silver Jackets. (www.usace.army.mil/)

- **The New Jersey Silver Jackets** is comprised of a team of federal, regional, state, county, and non-profit organizations, who conducts education and outreach activities for the public on flood risk and hazard mitigation with a current focus of implementing the recommendations of the Passaic River Flood Advisory Commission. The Silver Jackets also share data and work cooperatively on mitigation projects to comprehensively address flood risks across the state. FEMA, NOAA, NJDEP, NJOEM, and NJ Homeland Security and Preparedness are all members. The USACE's New York and Philadelphia Districts are the lead agencies for the New Jersey Silver Jackets. (<http://silverjackets.nfrmp.us/State-Teams/New-Jersey>)

Preparedness

- Provides flood risk/water resources technical assistance to communities through the Floodplain Management Services Program, Planning Assistance to the States Program, and the National Hurricane Program

Response & Recovery:

- Provides support and technical assistance to FEMA and communities during and following disasters

Mitigation:

- Provides nonstructural approaches to flood proofing that are intended to reduce damage from encroaching flood water by altering a property; including acquiring and/or relocating a building, preparing emergency measures, such as sandbagging, and flood proofing. (www.iwr.usace.army.mil/Missions/Flood-Risk-Management/Flood-Risk-Management-Program/Frequently-Asked-Questions/FAQ-Definitions/)
- Designs and constructs flood risk management projects through its Civil Works program
- Provides technical assistance to communities so that they can construct mitigation projects

NEW JERSEY EMERGENCY MANAGEMENT OFFICE

The New Jersey Office of Emergency Management (NJOEM) is the State equivalent of FEMA. NJOEM is responsible for planning, directing and coordinating emergency operations within the state which are beyond local control. ([https://nj.gov/njoem/.](https://nj.gov/njoem/))

Like FEMA, NJOEM is involved in all four phases of the emergency management cycle.

Planning/Preparedness:

- Produces state-wide preparedness plans (e.g. *New Jersey Hazard Mitigation Plan* and *New Jersey Emergency Operations and Response Plan*) (<http://ready.nj.gov/mitigation/hazard-mitigation-plans.shtml>)
- Conducts training programs and exercises for state and local partners
- Reviews and approves local hazard mitigation plans before they go to FEMA for final approval
- Applies for and manages grants as the State administrative agency and official applicant for FEMA grants
- Conducts public outreach
- Implements the New Jersey Emergency Management System

Response & Recovery:

- Coordinates the state's response and recovery operations
- Works with FEMA to request Presidential Disaster Declarations and aids those affected by a disaster
- Manages FEMA mitigation and recovery programs post-disaster
- Operates and manages the State Emergency Operations Center and may also operate and manage the State's Joint Information Center
- Operates and manages the state's support to local disaster response and coordinates between federal agencies, state agencies, private sector partners, and volunteer organizations

Mitigation:

- Applies for and manages mitigation programs and projects funded through FEMA's programs including: Flood Mitigation Assistance (FMA); Pre-Disaster Mitigation & Pre-Disaster Mitigation Competitive (PDM & PDM-C); and the Hazard Mitigation Grant Program (HMGP)
- Develops and oversees mitigation projects in local communities

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

The New Jersey Department of Environmental Protection (NJDEP) has primary responsibility for floodplain management in the State of New Jersey. Under the NJDEP's umbrella, there are a number of entities that address floodplain management. ([www.state.nj.us/dep/.](http://www.state.nj.us/dep/))

- **Bureau of Flood Control** serves as the State NFIP Coordinator, responsible for coordinating NFIP program aspects of floodplain management in New Jersey. Flood Control provides technical community assistance and is the repository for regulations used by NJDEP's Land Use Regulation Program floodplain mapping, mitigation, regulation, and prepares model Flood Damage Prevention Ordinances, which are updated to comply with New Jersey's floodplain regulations. (*Refer to National Flood Insurance Program, page 2-2, Floodplain Regulations & Ordinances, page 2-6.*) NJDEP also encourages participation in the Community Rating System (CRS) to reduce local flood risk and property owners' flood insurance premiums. (*Refer to Community Rating System, page 2-16.*) ([www.nj.gov/dep/floodcontrol/.](http://www.nj.gov/dep/floodcontrol/))
- **Bureau of Dam Safety** regulates the construction, demolition, and maintenance of all dams over 5' in height. ([www.nj.gov/dep/damsafety/.](http://www.nj.gov/dep/damsafety/))
- **Division of Land Use Regulation (DLUR)** administers permitting for dams under 5' (berms) and for stream encroachments, including floodways and tidelands. ([www.nj.gov/dep/landuse/.](http://www.nj.gov/dep/landuse/)) The Coastal Permit Program and Coastal Zone Management, within DLUR, regulates activities within the coastal zone. ([www.nj.gov/dep/landuse/coastal/.](http://www.nj.gov/dep/landuse/coastal/))
- **Stormwater Management** oversees the protection of water quality, and includes an aspect of floodplain management. The website brings together varying aspects of dealing with water, including green infrastructure information and pollution control and regulations. ([www.nj.gov/dep/stormwater/.](http://www.nj.gov/dep/stormwater/))
- **New Jersey's Coastal Management Program (NJCMP)** addresses coastal issues, including sustainable and resilient coastal community planning and climate change for all coastal areas from the Hudson River to the Delaware Bay. ([www.nj.gov/dep/cmp/.](http://www.nj.gov/dep/cmp/))
- **Bureau of Tidelands** issues grants, licenses, and "statements of no interest" regarding title to riparian lands, and permits for use of and construction in riparian lands. ([www.nj.gov/dep/landuse/.](http://www.nj.gov/dep/landuse/))
- **Green Acres Program** administers the Blue Acres program for floodplain acquisitions (buyouts). ([www.nj.gov/dep/greenacres/.](http://www.nj.gov/dep/greenacres/))

Planning/Preparedness:

- Administers the National Flood Insurance Program (NFIP) (*refer to National Flood Insurance Program, page 2-2*)
- Assists municipal floodplain administrators in efforts to reduce risks associated with development in floodplains



NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION - AFFILIATED ORGANIZATIONS

The following organizations are independent of DEP but whose work is affiliated with the department's mission or whose advice is provided to the Commissioner for consideration in setting department policy.

- **The New Jersey Highlands Water Protection and Planning Council** works in partnership with municipalities and counties in the 859,267-acre Highlands Preservation Area, located in northern New Jersey. Their mission is to regulate the protection of natural resources, particularly water quality at headwaters, encompassing both land use and water resources provisions. ([www.state.nj.us/njhighlands/.](http://www.state.nj.us/njhighlands/))
- **The New Jersey Pinelands Commission** is an independent state agency whose mission is to “preserve, protect, and enhance the natural and cultural resources of the Pinelands National Reserve, and to encourage compatible economic and other human activities consistent with that purpose.” The Commission implements a Master Plan that guides land use, development and natural resource protection programs in southern New Jersey's 938,000-acre Pinelands. ([http://www.state.nj.us/pinelands/.](http://www.state.nj.us/pinelands/))
- **The Delaware River Basin Commission** regulates floodplain management relating to the Delaware and Raritan (D&R) Canal. It provides a forum for coordination of actions that can affect downstream areas (including releases from reservoirs) in a massive watershed encompassing 13,359 square miles. Their programs include water quality protection, water supply allocation, regulatory review (permitting), water conservation initiatives, watershed planning, drought management, flood loss reduction, and recreation. ([www.state.nj/drbc.](http://www.state.nj/drbc))

NEW JERSEY HISTORIC PRESERVATION OFFICE

The New Jersey Historic Preservation Office (NJ HPO), an agency of the New Jersey Department of Environmental Protection, acts on behalf of the State's preservation goals in all four phases of the emergency management cycle. Through its collaboration with local, federal, and state agencies and departments, as well as nonprofit organizations in a variety of programs and organizations, the NJ HPO ensures that New Jersey's cultural resources are considered in emergency management decisions, hazard mitigation planning and sound floodplain management. ([https://www.state.nj.us/dep/hpo/.](https://www.state.nj.us/dep/hpo/))

The NJ HPO also serves as a resource to local governments striving to integrate historic resources into their hazard mitigation planning projects and activities. This includes reviewing the potential impact of proposed mitigation options on historic resources during the planning and preparedness process. In the aftermath of a flood event, the NJ HPO is available to assist the emergency response team and local historic preservation commission representatives in conducting assessments and evaluating the appropriateness of proposed stabilization and/or repair options. This can be particularly helpful when communities are severely impacted or for those who have limited, local professional expertise.

Planning/Preparedness

- Provides and administers grant funding and loans for bricks-and-mortar preservation projects
- Provides and administers grant funding for the identification of historic resources through survey and architectural and historical investigation
- Assists with the development of recovery plans to address the protection and preservation of historic resources

Response & Recovery

- Provides technical assistance to communities immediately before and after an event, including preservation best practices
- Compiles and communicates information about impacted historic resources
- Participates in post-event damage assessment and review of economic options for recovery
- Coordinates with local government and state and federal partners
- Conducts outreach to impacted property owners

Mitigation:

- Reviews and comments on hazard mitigation actions funded through state or federal grants that impact historic resources through the Section 106 process



NEW JERSEY CULTURAL ALLIANCE FOR RESPONSE

The New Jersey Cultural Alliance for Response (NJCAR) has worked closely with New Jersey Office of Emergency Management (NJOEM) to incorporate the state's cultural resources into the statewide Emergency Response Framework for disaster planning, risk assessment, hazard mitigation, and recovery. With these connections, NJCAR strives to prevent and mitigate the loss of cultural and historic resources in the event of a disaster and to serve as a statewide resource. (<https://njculturalalliance.wixsite.com/njcar>.)

Planning/Preparedness

- Provides a framework for county and municipal government emergency managers to connect through NJOEM and NJCAR with managers of cultural assets in their local communities
- Maintains a database of members and a detailed list of experts and services related to emergency response for collections, facilities, and other needs
- Provides, promotes, and facilitates information exchanges, training, exercises, and educational opportunities related to emergency preparedness and response for cultural and historic resources

Response & Recovery

- Provides remote and onsite (if possible) assistance to natural, cultural and historical organizations or history, cultural, and creative professionals who experience an emergency or disaster

RUTGERS UNIVERSITY

- **The Rutgers Climate Institute** is a University-wide effort to address the impacts of climate change across a broad range of disciplines in the natural, social, and policy sciences. The Climate Institute conducts research and fosters outreach and education to the general public, students, educators, policymakers, governmental and non-governmental organizations, and other interested parties. (www.climatechange.rutgers.edu/)
- **The New Jersey Climate Change Alliance (NJCCA)**, formerly the New Jersey Climate Adaptation Alliance, includes policy makers, public and private sector practitioners, academics, and business leaders that share the goal of advancing science-informed climate change strategies and policy at the state and local levels in New Jersey. (<https://njadapt.rutgers.edu/>)
- **NJ Food Mapper** is an interactive mapping website created to provide a user-friendly visualization tool that will inform local communities in their decisions concerning flooding hazards and sea level rise in their planning and preparedness decision making process. (njfloodmapper.org/)

Planning/Preparedness

- Provides tools to help local governments assess their vulnerability to natural hazards and climate change, to inform local mitigation projects and planning efforts

MUNICIPAL GOVERNMENT

At the local level, county and municipal governments will often have an Office of Emergency Management, a Department (or Division of) Planning and Zoning, and a historic preservation commission (HPC), which may all participate in creating and implementing hazard mitigation plans and projects. The specific roles of each organization or group will vary based upon the municipal governmental structure, and they may be supported by other governmental departments and potentially nonprofit partners.

- **Office of Emergency Management (OEM)** – Responsible for conducting preparedness, response, recovery, and mitigation activities.
- **Department of Planning and Zoning** – Responsible for coordinating long-range planning through the development and implementation of a municipal master plan. Enforces the zoning ordinance (which may address the treatment of properties in a historic district), processes building permits and reviews development proposals. If a community has a historic district commission, it is often housed under Planning and Zoning. A representative from Planning and Zoning is often part of the planning team in updating the hazard mitigation plan. (*Refer to Chapter 3, Local Tools: Preservation & Flood Mitigation.*)

Examples of emergency management activities typically conducted by an OEM include:

Planning/Preparedness

- Educates and conducts outreach to communicate disaster/hazard event preparedness information to citizens, businesses and communities
- Acts as team lead in the preparation of local hazard mitigation, Continuity of Operations, and Emergency Operations plans
- Conducts training and exercises to ensure the plans are functional and, if not, revise the plans
- Operates watch and warning systems

Response & Recovery:

- Runs the local Emergency Operations Center and taking the lead in incident management, and guides and coordinates response and recovery efforts

Mitigation

- Serves as the leader for implementing the mitigation actions in the local hazard mitigation plan, and manages and conducts mitigation projects

LOCAL VOLUNTEERS

Although not formally part of the emergency management process, local volunteers, including historic preservation commissions (HPCs), business associations and civic associations as well as nonprofit organizations and private citizens, can play a supporting role in all phases of the process, particularly in jurisdictions with limited governmental resources. Participation can also draw attention to areas of interest, such as the protection of cultural resources. (*Refer to Engage the Public, page 4-11.*)



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Appendix **A** **Glossary**

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FLOOD & PRESERVATION ACRONYMS

ASCE: American Society of Civil Engineers
BFE: Base Flood Elevation
CDBG-DR: Community Development Block Grant Disaster Recovery (HUD)
CRS: Community Rating System
DEP: See NJDEP
DFE: Design Flood Elevation
DFIRM: Digital Flood Insurance Rate Map
FEMA: Federal Emergency Management Agency
FIRM: Flood Insurance Rate Map
GIS: Geographic Information System
HPC: Historic Preservation Commission
HMA: Hazard Mitigation Assistance Program (FEMA)
HUD: U.S. Department of Housing and Urban Development
IHP: Individuals and Households Program (FEMA)
LimWA: Limit of Moderate Wave Action
NFIP: National Flood Insurance Program
NJCAR: New Jersey Cultural Alliance for Response
NJDEP: New Jersey Department of Environmental Protection
NJ HPO: New Jersey Historic Preservation Office
NJHT: New Jersey Historic Trust
NJOEM: New Jersey Office of Emergency Management
NOAA: National Oceanic and Atmospheric Administration
NPS: National Park Service
SBA: U.S. Small Business Administration
SFHA: Special Flood Hazard Area
STAPLEE: Social, Technical, Administrative, Political, Legal, Economic, Environmental
SWEL: Still Water Elevation
USACE: U.S. Army Corps of Engineers

Glossary

The definition sources referenced in the glossary:

- **FEMA:** Federal Emergency Management Agency
- **NFPI:** National Flood Insurance Program, 44.CFR.59.1 Definitions
- **NJ FDPO:** New Jersey Flood Damage Prevention Ordinance - (60.3) Best Available Data Model Type D&E (2019)
- **NOAA:** National Oceanic and Atmospheric Administration

1% Annual Chance Floodplain (100-year Floodplain) — An area that has a 1% chance of flooding in any given year. Properties can experience a “100-year flood” in two consecutive years, just as it is possible for properties to flood even if they are located outside of the floodplain, particularly in a severe weather event such as a hurricane.

0.2% Annual Chance Floodplain (500-year Floodplain) — An area that has a 0.2% chance of flooding in any given year.

Adaptation — The process of adjusting to new (climate) conditions in order to reduce risks to valued assets.

AH Zone — Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown in this zone. (NJ FDPO)

AO Zone — Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. (NJ FDPO)



Area of Shallow Flooding — A designated AO or AH zone on a community's Flood Insurance Rate Map (FIRM) with a one percent annual or greater chance of flooding to an average depth of one to three feet where a clearly defined channel does not exist, where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow. (NFIP / NJ FDPO)

Area of Special Flood Hazard — Land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year. It is shown on the FIRM as Zone V, VE, V1-30, A, AO, A1 A30, AE, A99, or AH. (NJ FDPO)

ASCE 24 — ASCE/SEI 24, American Society of Civil Engineers, "Flood Resistant Design and Construction."

Base Flood — A flood having a one percent chance of being equaled or exceeded in any given year. (NFIP / NJ FDPO)

Base Flood Elevation (BFE) — The flood elevation shown on a published Flood Insurance Study (FIS) including the Flood Insurance Rate Map (FIRM). For zones AE, AH, AO, and A1-30 the elevation represents the water surface elevation resulting from a flood that has a 1-percent or greater chance of being equaled or exceeded in any given year. For zones VE and V1-30 the elevation represents the stillwater elevation (SWEL) plus wave effect (BFE = SWEL + wave effect) resulting from a flood that has a 1-percent or greater chance of being equaled or exceeded in any given year. (NJ FDPO)

Basement — Any area of the building having its floor subgrade (below ground level) on all sides. (NFIP / NJ FDPO)

Best Available Flood Hazard Data — The most recent available flood risk guidance FEMA has provided. The Best Available Flood Hazard Data may be depicted on but not limited to Advisory Flood Hazard Area Maps, Work Maps, or Preliminary FIS and FIRM. (NJ FDPO)

Best Available Flood Hazard Data Elevation — The most recent available flood elevation FEMA has provided. The Best Available Flood Hazard Data Elevation may be depicted on an Advisory Flood Hazard Area Map, Work Map, or Preliminary FIS and FIRM. (NJ FDPO)

Breakaway Wall — A wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces without causing damage to the elevated portion of the building or supporting foundation system. (NFIP / NJ FDPO)

Coastal A Zone — The portion of the Special Flood Hazard Area (SFHA) starting from a Velocity (V) Zone and extending up to the landward Limit of the Moderate Wave Action delineation. Where no V Zone is mapped the Coastal A Zone is the portion between the open coast and the landward Limit of the Moderate Wave Action delineation. Coastal A Zones may be subject to wave effects, velocity flows, erosion, scour, or a combination of these forces. Construction and development in Coastal A Zones is to be regulated the same as V Zones/Coastal High Hazard Areas. (NJ FDPO)

Climate Change — Climate is determined by the long-term pattern of oceanic and atmospheric conditions at a location. Climate is described by statistics, such as means and extremes of temperature, precipitation, and other variables, and by the intensity, frequency, and duration of weather events. Over Earth’s history, indications of climate change have been recorded in fossils and ice core samples. At one extreme, climate change can result in extended periods of heat and drought; at the other, extensive glaciation. Currently, our planet’s global surface temperature is rising. This change is linked to human activities that increase the amount of greenhouse gases (e.g., carbon dioxide and methane) in the atmosphere. It is important to understand climatic processes because they have the potential to affect environmental conditions. (NOAA)

Coastal A Zone — The portion of the Special Flood Hazard Area (SFHA) starting from a Velocity (V) Zone and extending up to the landward Limit of the Moderate Wave Action delineation. Where no V Zone is mapped the Coastal A Zone is the portion between the open coast and the landward Limit of the Moderate Wave Action delineation. Coastal A Zones may be subject to wave effects, velocity flows, erosion, scour, or a combination of these forces. Construction and development in Coastal A Zones is to be regulated the same as V Zones/Coastal High Hazard Areas. (NJ FDPO)

Coastal High Hazard Area — An area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. (NFIP / NJ FDPO)

Community Rating System (CRS) – A voluntary program for National Flood Insurance Program (NFIP) participating communities. The goals of the CRS are to reduce flood damages to insurable property, strengthen and support the insurance aspects of the NFIP, and encourage a comprehensive approach to floodplain management. (FEMA)

Cumulative Substantial Improvement *[optional NJ FDPO higher standard]* — Any reconstruction, rehabilitation, addition, or other improvement of a structure that equals or exceeds 50 percent [lower threshold – e.g.: replace 50 percent with 40 percent] of the market value of the structure at the time of the improvement or repair when counted cumulatively for 10 years.

Design Flood Elevation (DFE) – Regulatory flood elevation adopted by a local community. If a community regulates to minimum NFIP requirements, the DFE is identical to the BFE. Typically, the DFE is the BFE plus any freeboard adopted by the community. (FEMA).

Digital Flood Insurance Rate Maps (DFIRMs): Digitally converted flood insurance maps developed in conjunction with FEMA.

Development — Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, or storage of equipment or materials located within the area of special flood hazard. (NFIP / NJ FDPO)

Elevation Certificate – NFIP form used to provide elevation information to ensure compliance with floodplain regulations and to aid in determining the insurance rate for a specific property.

Emergency Management – The managerial function charged with creating the framework within which communities reduce vulnerability to hazards and cope with disasters. (FEMA)

Event Flooding – Occasional flooding that has a specific cause, typically a storm or a devastating failure of infrastructure.

Elevated Building — A non-basement building

- (i) built, in the case of a building in an Area of Special Flood Hazard, to have the top of the elevated floor or, in the case of a building in a Coastal High-Hazard Area or Coastal A Zone, to have the bottom of the lowest horizontal structural member of the elevated floor, elevated above the base flood elevation plus freeboard by means of piling, columns (posts and piers), or shear walls parallel to the flow of the water, and
- (ii) adequately anchored so as not to impair the structural integrity of the building during a flood up to the magnitude of the base flood.

In an Area of Special Flood Hazard “elevated building” also includes a building elevated by means of fill or solid foundation perimeter walls with openings sufficient to facilitate the unimpeded movement of flood waters. In Areas of Coastal High Hazard and Coastal A Zones “elevated buildings” also includes a building otherwise meeting the definition of “elevated building” even though the lower area is enclosed by means of breakaway walls. (NJ FDPO)

Erosion — The process of gradual wearing away of land masses. (NJ FDPO)

Existing Construction — For the purposes of determining rates, structures for which the “start of construction” commenced before the effective date of the FIRM or before January 1, 1975, for FIRMs effective before that date. “Existing construction” may also be referred to as “existing structures.” (NFIP – Note: Also known as “Pre-FIRM”)

Federal Agency – Any department, agency, corporation, or other entity or instrumentality of the executive branch of the Federal Government, and includes the Federal National Mortgage Association and the Federal Home Loan Mortgage Corporation. (NFIP)

Financial Assistance – Any form of loan, grant, guaranty, insurance, payment, rebate, subsidy, disaster assistance loan or grant, or any other form of direct or indirect Federal assistance, other than general or special revenue sharing or formula grants made to States. (NFIP)

Flood or Flooding — A general and temporary condition of partial or complete inundation of normally dry land areas from:

- a) The overflow of inland or tidal waters and/or
- b) The unusual and rapid accumulation or runoff of surface waters from any source. (NJ FDPO)

Flood Damage Resistant Materials — Materials identified by FEMA as flood resistant.

Flood Elevation Determination – A determination by the Administrator of the water surface elevations of the base flood, that is, the flood level that has a one percent or greater chance of occurrence in any given year. (NFIP)

Flood Insurance Rate Map (FIRM) — The official map on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community. (NJ FDPO – Note: These maps are based upon historical flood information and are updated periodically. They do not include anticipated sea level rise or climate change.)

Flood Insurance Study (FIS) — The official report in which the Federal Insurance Administration has provided flood profiles, as well as the Flood Insurance Rate Map(s) and the water surface elevation of the base flood. (NJ FDPO)

Floodplain or Flood-prone Area – Any land area susceptible to being inundated by water from any source (see definition of “flooding”). (NFIP)

Floodplain Management – The operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to emergency preparedness plans, flood control works and flood plain management regulations. (NFIP)

Floodplain Management Regulations — Zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as a floodplain ordinance, grading ordinance, and erosion control ordinance) and other applications of police power. The term describes such State or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction. (NFPI / NJ FDPO)

Floodproofing — Any combination of structural and nonstructural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents. (NFPI / NJ FDPO)

Floodproofing Certificate — A certification, in the form and containing the information required by FEMA, that a structure has been designed and constructed to be dry floodproofed to the flood protection elevation. A floodproofing certificate may only be prepared and certified by a licensed professional engineer or professional architect.

Floodproofing, Dry — The floodproofing method that, as specified in ASCE 24, is used to render a structure’s envelope substantially impermeable to the entrance of floodwaters.

Floodproofing, Wet — The floodproofing method that relies on flood-damage-resistant materials and construction techniques to minimize flood damage to areas below the design-flood elevation of a structure.

Flood Protection System – Those physical structural works for which funds have been authorized, appropriated, and expended and which have been constructed specifically to modify flooding in order to reduce the extent of the area within a community subject to a “special flood hazard” and the extent of the depths of associated flooding. Such a system typically includes hurricane tidal barriers, dams, reservoirs, levees, or dikes. These specialized flood modifying works are those constructed in conformance with sound engineering standards. (NFIP)

Flood-Related Erosion – The collapse or subsidence of land along the shore of a lake or other body of water as a result of undermining caused by waves or currents of water exceeding anticipated cyclical levels or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as a flash flood or an abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in flooding. (NFIP)

Floodway — The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than 0.2 foot. (NJ FDPO)

Freeboard — A factor of safety usually expressed in feet above a flood level for purposes of flood plain management. “Freeboard” tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed. (NFPI / NJ FDPO)

Hazard Mitigation Planning — The process by which states and municipalities identify and implement policies and actions to reduce their vulnerability to hazards and establish a framework to respond to a disaster.

Highest Adjacent Grade — The highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure. (NFPI / NJ FDPO)

Historic Structure — Any structure that is:

- a) Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
- b) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
- c) Individually listed on a State inventory of historic places in States with historic preservation programs which have been approved by the Secretary of the Interior; or
- d) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:
 - (1) By an approved State program as determined by the Secretary of the Interior; or
 - (2) Directly by the Secretary of the Interior in States without approved programs. (NFPI / NJ FDPO)

Integrity – The ability of a property to convey its historic significance.

Levee – A man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding. (NFIP)

Levee System – A flood protection system which consists of a levee, or levees, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices. (NFIP)

Limit of Moderate Wave Action (LiMWA) – Inland limit of the area affected by waves greater than 1.5 feet during the Base Flood. Base Flood conditions between the V Zone and the LiMWA will be similar to, but less severe than those in the V Zone. (NJ FDPO)

Lowest Floor — The lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for the parking of vehicles, building access or storage in an area other than a basement is not considered a building's lowest floor provided that such enclosure is not built so to render the structure in violation of other applicable non-elevation design requirements of 44 CFR Section 60.3. (NFPI / NJ FDPO)

Mean Sea Level – For purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929 or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map are referenced. (NFIP)

Mitigation – Mitigation is the effort to reduce loss of life and property by lessening the impact of disasters. (FEMA)



New Construction — Structures for which the start of construction commenced on or after the effective date of a floodplain regulation adopted by a community and includes any subsequent improvements to such structures. (NJ FDPO)

National Flood Insurance Program (NFIP) — A program administered by the federal government that enables property owners in participating communities to purchase flood insurance protection against losses from flooding.

100-year Flood — See base flood. (NFIP)

Participating Community, also known as an Eligible Community — A community in which the Administrator has authorized the sale of flood insurance. (NFIP)

Persistent (“Nuisance”) Flooding — Minor flooding which typically results in traffic problems, road closures, overwhelmed storm drains, and occasionally infrastructure damage, in addition to public inconvenience and business interruptions.

Pre-FIRM Structures — Buildings constructed or substantially improved prior to the community’s initial FIRM are called “pre-FIRM structures” and were likely not built to avoid or reduce flood damage. Buildings constructed or substantially improved after the community’s initial FIRM should have been constructed in compliance with the local floodplain ordinance. Most historic buildings are pre-FIRM structures.

Preliminary Flood Insurance Rate Map (pre FIRM) — The draft version of the FIRM released for public comment before finalization and adoption. (NJ FDPO)

Primary Frontal Dune — A continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves from coastal storms. The inland limit of the primary frontal dune occurs at the point where there is a distinct change from the relatively steep slope to a relatively mild slope. (NFPI / NJ FDPO)

Project Cost — The total financial cost of a flood protection system (including design, land acquisition, construction, fees, overhead, and profits), unless the Federal Insurance Administrator determines a given “cost” not to be a part of such project cost. (NFIP)

Repetitive Loss Property — An NFIP-insured structure that has had at least 2 paid flood losses of more than \$1,000 each in any 10-year period since 1978. (FEMA)

Resilience, Flood — The ability to withstand, respond to, and recover from a flooding or storm event.

Riverine — Relating to, formed by, or resembling a river (including tributaries), stream, brook, etc. (NFIP)

Sand Dunes — Naturally occurring or man-made accumulations of sand in ridges or mounds landward of the beach. (NFPI / NJ FDPO)

Sea Level Rise — A result of climate change, refers to the increased average elevation of coastal waters. The increased height of the seas can cause low lying coastal areas, such as those along the Delaware Bay and Atlantic Ocean, to experience more frequent flooding.

Severe Repetitive Loss Property – Any building that:

1. Is covered under a Standard Flood Insurance Policy;
2. Has incurred flood damage for which:
 - a. 4 or more separate claim payments have been made under a Standard Flood Insurance Policy with the amount of each such claim exceeding \$5,000, and with the cumulative amount of such claims payments exceeding \$20,000; or
 - b. At least 2 separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceed the fair market value of the insured building on the day before each loss. (FEMA)

Special Flood Hazard Area – See “area of special flood hazard.” (NFPI)

Special Hazard Area – An area having special flood, mudslide (i.e., mudflow), or flood-related erosion hazards, and shown on an FHBM or FIRM as Zone A, AO, A1-30, AE, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/ A, A99, AH, VO, V1-30, VE, V, M, or E. (NFIP)

Start of Construction — (For other than new construction or substantial improvements under the Coastal Barrier Resources Act (P.L. No. 97-348)) includes substantial improvements and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement, or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site such as the pouring of a slab or footings, the installation of pilings, the construction of columns, or any work beyond the stage of excavation, or the placement of a manufactured home on a foundation.

Permanent construction does not include land preparation, such as clearing, grading and filling nor does it include the installation of streets and/or walkways, nor does it include excavation for a basement, footings or piers, or foundations or the erection of temporary forms, nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building. (NFPI / NJ FDPO)

Storm Surge – The abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide. The surge is caused primarily by a storm’s winds pushing water onshore. The amplitude of the storm surge at any given location depends on the orientation of the coast line with the storm track; the intensity, size, and speed of the storm; and the local bathymetry. (NOAA)

Structure — A walled and roofed building, a manufactured home, or a gas or liquid storage tank that is principally above ground. (NJ FDPO)

Subsidence — The lowering of ground plane elevation that results from geological factors and the compression of land mass following the extraction of groundwater from underground aquifers. Subsidence can exacerbate other types of flooding and increase the frequency of tidal flooding in low-lying areas, particularly when coupled with sea level rise.

Substantial Damage — Damage of any origin sustained by a structure whereby the cost of restoring the structure to its condition before damage would equal or exceed fifty (50) percent *[optional NJ FDPO higher standard – lower threshold – e.g.: replace 50 percent with 40 percent]* of the market value of the structure before the damage occurred. (NFIP (50%) / NJ FDPO)

Substantial Improvement — Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds fifty (50) percent *[optional NJ FDPO higher standard – lower threshold – e.g.: replace 50 percent with 40 percent]* of the market value of the structure before the “start of construction” of the improvement. This term includes structures which have incurred “substantial damage,” regardless of the actual repair work performed. The term does not, however, include either:

- a) Any project for improvement of a structure to correct existing violations of State or local health, sanitary or safety code specifications which have been identified by the local code enforcement officer and which are the minimum necessary to assure safe living conditions; or
- b) Any alteration of a “historic structure,” provided that the alteration will not preclude the structure’s continued designation as a “historic structure.” (NFIP (50%) / NJ FDPO)

Variance — A grant of relief from the requirements of this ordinance that permits construction in a manner that would otherwise be prohibited by this ordinance. (NJ FDPO)

Violation — The failure of a structure or other development to be fully compliant with this ordinance. A new or substantially improved structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in 44 CFR §60.3(b)(5), (c)(4), (c)(10), (e)(2), (e)(4), or (e)(5) is presumed to be in violation until such time as that documentation is provided. (NJ FDPO)

V Zone – See “coastal high hazard area.” (NFIP)

Water Surface Elevation – The height, in relation to the National Geodetic Vertical Datum (NGVD) of 1929, (or other datum, where specified) of floods of various magnitudes and frequencies in the flood plains of coastal or riverine areas. (NFIP)

Zone of Imminent Collapse – An area subject to erosion adjacent to the shoreline of an ocean, bay, or lake and within a distance equal to 10 feet plus 5 times the average annual long-term erosion rate for the site, measured from the reference feature. (NFIP)

NJ FDPO OPTIONAL HIGHER STANDARDS

Substantial Damage — Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed fifty (50) percent of the market value of the structure before the damage occurred. Substantial Damage also means flood-related damages sustained by a structure on two or more separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on the average, equals or exceeds 25 percent of the market value of the structure before the damages occurred.

Substantial Improvement — Any reconstruction, rehabilitation, addition, or other improvement of a structure during a 10-year period the cost of which equals or exceeds fifty (50) percent of the market value of the structure before the “start of construction” of the improvement. Substantial improvement also means “cumulative substantial improvement.” This term includes structures which have incurred “substantial damage”, regardless of the actual repair work performed or “repetitive loss.” The term does not, however, include either:

- (1) Any project for improvement of a structure to correct existing violations of State or local health, sanitary or safety code specifications which have been identified by the local code enforcement officer and which are the minimum necessary to assure safe living conditions; or
- (2) Any alteration of a “historic structure,” provided that the alteration will not preclude the structure’s continued designation as a “historic structure.”

Appendix

B

Bibliography

- A. International
- B. Federal
- C. States
- D. Other Entities

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INTERNATIONAL

A large, light grey, serif capital letter 'A' is positioned in the lower right quadrant of the page. A thin black horizontal line passes through the middle of the letter, intersecting the word 'INTERNATIONAL' which is printed in a bold, black, sans-serif font across the line.

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THE EU FLOODS DIRECTIVE

EUROPEAN COMMISSION

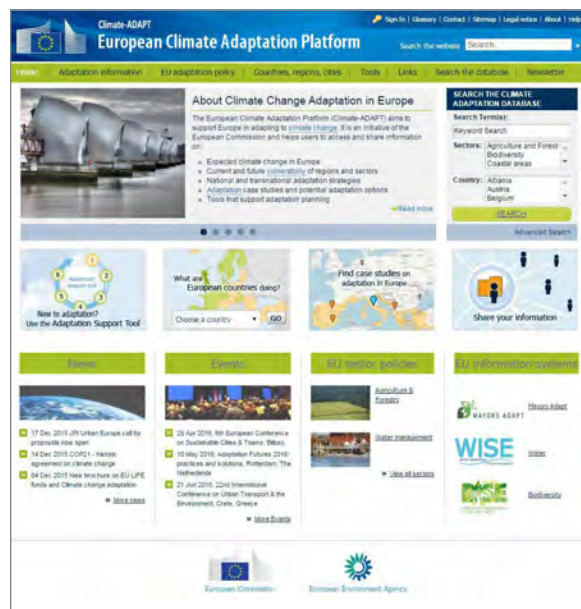
No Date

http://ec.europa.eu/environment/water/flood_risk/
Date Accessed: 23 October 2019

This Directive requires Member States to assess all water courses and coastlines for risk from flooding, to map the flood extent, assets, and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. This Directive also reinforces the rights of the public to access this information and to have a say in the planning process.



EUROPEAN CLIMATE ADAPTATION PLATFORM



EUROPEAN ENVIRONMENT AGENCY

No Date

[Http://climate-adapt.eea.europa.eu/](http://climate-adapt.eea.europa.eu/)
Date Accessed: 23 October 2019

The European Climate Adaptation Platform (CLIMATE-ADAPT) is an electronic platform intended to support Europe in adapting to climate change. It helps users access and share data regarding:

- Expected climate change in Europe
- Current and future vulnerability of regions and sectors
- EU, national and transnational adaptation strategies and actions
- Adaptation case studies and potential adaptation options
- Tools that support adaptation planning

Information is organized under the following main entry points and can be easily searched:

- Adaptation information (Observations and scenarios, Vulnerabilities and risks, Adaptation measures, National adaptation strategies, Research projects)
- EU sector policies (Agriculture and forestry, Biodiversity, Coastal areas, Disaster risk reduction, Financial, Health, Infrastructure, Marine and fisheries, Water management)
- Transnational regions, Countries and Urban areas
- Tools (Adaptation Support Tool, Case Study Search Tool, Map Viewer)

DIRECTIVE 2007/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 23 OCTOBER 2007 ON THE ASSESSMENT AND MANAGEMENT OF FLOOD RISKS

6.11.2007		Official Journal of the European Union		L 288/27	
DIRECTIVES					
DIRECTIVE 2007/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL					
of 23 October 2007					
on the assessment and management of flood risks					
(Text with EEA relevance)					
THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,	coordinated throughout a river basin if they are to be effective.				
Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,	(4) Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (*) requires river basin management plans to be developed for each river basin district in order to achieve good ecological and chemical status, and it will contribute to mitigating the effects of floods. However, reducing the risk of floods is not one of the principal objectives of that Directive, nor does it take into account the future changes in the risk of flooding as a result of climate change.				
Having regard to the proposal from the Commission,					
Having regard to the Opinion of the European Economic and Social Committee (*),					
Acting in accordance with the procedure laid down in Article 251 of the Treaty (*),	(5) The Commission Communication of 12 July 2004 to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Flood risk management — Flood prevention, protection and mitigation' sets out its analysis and approach to managing flood risks at Community level, and states that concerted and coordinated action at Community level would bring considerable added value and improve the overall level of flood protection.				
Whereas:					
(1) Floods have the potential to cause fatalities, displacement of people and damage to the environment, to severely compromise economic development and to undermine the economic activities of the Community.	(6) Effective flood prevention and mitigation requires, in addition to coordination between Member States, cooperation with third countries. This is in line with Directive 2000/60/EC and international principles of flood risk management as developed notably under the United Nations Convention on the protection and use of transboundary water courses and international lakes, approved by Council Decision 95/108/EC (*), and any succeeding agreements on its application.				
(2) Floods are natural phenomena which cannot be prevented. However, some human activities (such as increasing human settlements and economic assets in floodplains and the reduction of the natural water retention by land use) and climate change contribute to an increase in the likelihood and adverse impacts of flood events.	(7) Council Decision 2001/792/EC, Euratom of 23 October 2001 establishing a Community mechanism to facilitate reinforced cooperation in civil protection assistance interventions (*) mobilises support and assistance from Member States in the event of major emergencies, including floods. Civil protection can provide adequate response to affected populations and improve preparedness and resilience.				
(3) It is feasible and desirable to reduce the risk of adverse consequences, especially for human health and life, the environment, cultural heritage, economic activity and infrastructure associated with floods. However, measures to reduce these risks should, as far as possible, be					
(*) OJ C 195, 18.8.2006, p. 37.					
(*) Opinion of the European Parliament of 13 June 2006 (OJ C 100 E, 9.12.2006, p. 123), Council Common Position of 23 November 2006 (OJ C 311 E, 19.12.2006, p. 10) and Position of the European Parliament of 23 April 2007, Council Decision of 18 September 2007.	(*) OJ L 327, 22.12.2000, p. 1. Directive as amended by Decision No 2455/2001/EC (OJ L 331, 15.12.2001, p. 1).				
	(*) OJ L 186, 5.8.1995, p. 42.				
	(*) OJ L 297, 15.11.2001, p. 7.				

EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION

23 October 2007

<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007L0060&from=EN>

Date Accessed: 23 October 2019

This Directive was adopted by the European Parliament in recognition of the fact that flooding can have an impact on:

- Human health and life
- Cultural heritage
- Economic activity
- Infrastructure

The directive establishes a both framework for coordination between countries and local implementation in order to address various types of flooding and a fund to assist in the event of an emergency. It encourages the preparation of a Flood Risk Management Plan (FRMP) and describes its components, implementation and the process of updating a FRMP.

THE SCIENCE OF SAVING VENICE

ANNA SOMERS COCKS

2005/2006

https://www.wmf.org/sites/default/files/article/pdfs/pg_23-29_venice_c.pdf

Date Accessed: 23 October 2019

This article details the response to November 1966 flooding in Venice - over two meters above mean sea level - as well as continuing efforts to conserve the built fabric from the threat of sea level rise. Cocks describes the factors that impact increased flood events in the city, including:

- Abandonment
- Reduction in permeable surfaces
- Soil compaction
- Erosion
- Salt water intrusion

The article summarizes efforts to protect Venice. The highlight of these efforts is an international discussion amongst scientists, which concluded that Venice's best possible would be a variety of methods, including a mobile barrier system for the Lagoon. Cocks concludes with a reminder that the question is not how to protect Venice from the water, but for how long.

The Science of Saving Venice

PLAGUED BY RECORD HIGH TIDES AND A SETTLING LANDMASS, THE CITY PRESENTS ONE OF THE WORLD'S GREAT CONSERVATION CHALLENGES

by ANNA SOMERS COCKS

*Oh Venice! Oh Venice! When thy marble walls
Are level with the waters, there shall be
A cry of nations o'er thy sunken halls
A loud lament along the sweeping sea!*

—LORD BYRON, *Ode to Venice*, June 28, 1819

In the old days of the Venetian Republic, the doge would board his golden barge on Ascension Day to be rowed out beyond the lagoon into the waters of the Adriatic. There, he would throw a consecrated ring into the sea, saying "Desponsamus te, mare." (We wed thee, O sea.)

On the night of 3 November 1966, that marriage—more than a millennium in the making—failed as a violent storm surge rolled into the city, flooding its labyrinthine canals to a depth of nearly two meters above mean sea level. Miraculously, no one perished. Yet Venice was forever changed. As debris and pollution from oil spills flowed throughout the city, its most basic services rendered inoperable, the flood threw a harsh spotlight onto the crumbling architectural fabric of Venice, which had been slowly but surely sinking into the waters of the lagoon that had given it life, unbeknownst to the outside world.

Within weeks, the international community responded, pledging to aid Venice in its recovery. Working closely with the soprintendenti or cultural heritage officials in the Italian government, UNESCO drew up a list of more than 100 structures in urgent need of stabilization and conservation and launched an appeal for funds and technical assistance. Among the first to step forward were the British Art and Archives Rescue Fund (renamed Venice in Peril in 1977) and the U.S. Committee to Rescue Italian Art (CRIA). The World Monuments Fund (WMF)—known at that time as the International Fund for Monuments—partnered with the latter and established the Venice Committee to carry out restoration work. Its example was soon followed by the formation of a number of national committees dedicated to the preservation of the city.

In that time WMF has supported some 30 restoration projects in Venice, making it one of the largest beneficiaries of the organization's time and resources, while Venice in Peril has restored more than 40 buildings and works of art, as well as



IMPACT OF CLIMATE CHANGE ON CULTURAL HERITAGE: FROM INTERNATIONAL POLICY TO ACTION

MAY CASSAR

2011

http://www.getty.edu/conservation/publications_resources/newsletters/26_1/impact.html

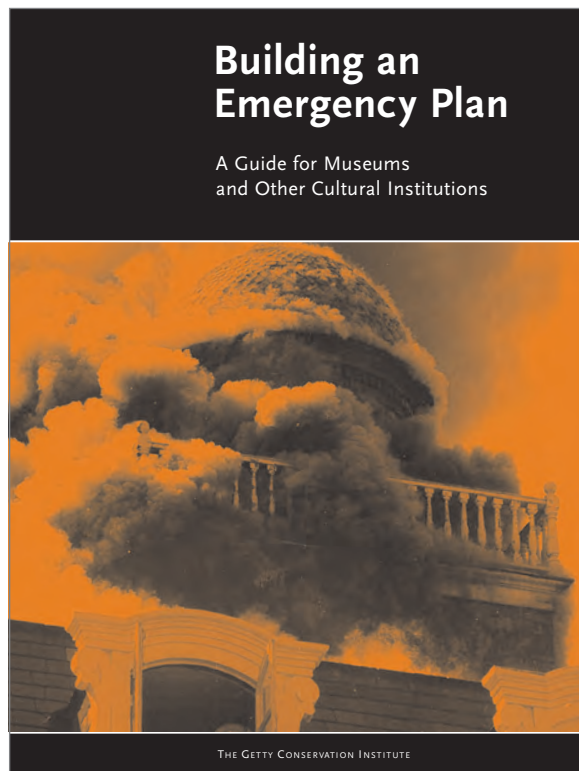
Date Accessed: 23 October 2019

Mary Cassar's article, published in The Getty Conservation Institute's Newsletter, is a brief overview of methods for addressing heritage and climate change. Cassar emphasizes that the physical, cultural, and social aspects of a heritage site cannot be separated and includes a review of past research initiatives on heritage and climate change.

Cassar makes several calls to action. The author advocates for: an interdisciplinary approach to preparing for climate change, renewed focus on damage risk and a bridge between the arts and the sciences. The article concludes by reiterating that all disciplines are affected by climate change and emphasizing that "the way we live [...] who we are [...]" is fundamentally at stake.



BUILDING AN EMERGENCY PLAN: A GUIDE FOR MUSEUMS AND OTHER CULTURAL INSTITUTIONS



VALERIE DORGE AND SHARON L. JONES

1999

http://www.getty.edu/conservation/publications_resources/pdf_publications/pdf/emergency_plan.pdf

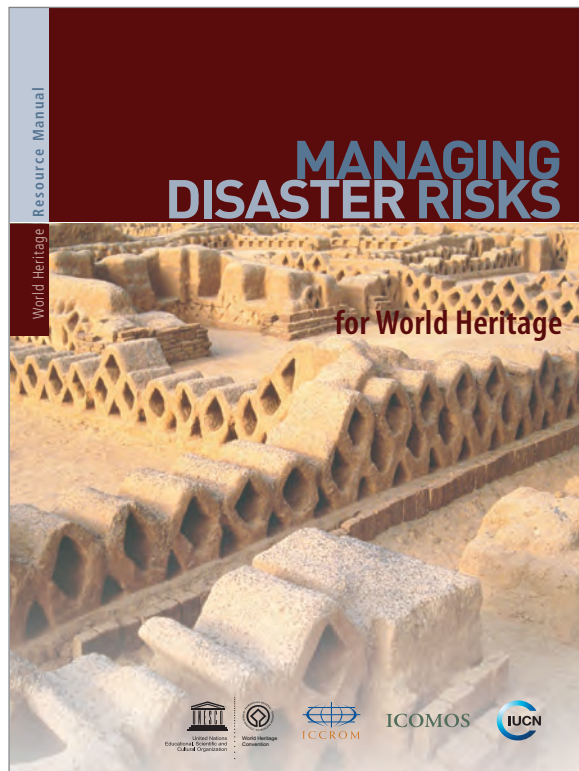
Date Accessed: 23 October 2019

This guide is aimed at museum staff and other cultural institutions, emphasizing that the effects of natural disasters and other emergencies can be minimized if an institution establishes a proper plan. The intent of this guide is to provide methods for developing and instituting the appropriate emergency response plan. It is broken into three parts, each part aimed at a different audience:

- Director of the institution
- Emergency preparedness manager
- Institution departments, including collections and buildings and maintenance

The guide is a jumping off point for a conversation and addresses concerns unique to the three audience list above. It encourages interdepartmental dialogue for a more holistic plan. The guide concludes with an appendix of additional resources as well as examples of emergency plans.

MANAGING DISASTER RISKS FOR WORLD HERITAGE



ICCROM, ICOMOS, IUCN AND UNESCO WORLD HERITAGE CENTRE
2010

<https://whc.unesco.org/uploads/activities/documents/activity-630-1.pdf> - Date Accessed: 23 October 2019

This manual is intended to provide managers of World Heritage properties a better understanding of the risks associated with natural and man-made disasters and a methodology for the preparation of a Disaster Risk Management (DRM) plan.

Although prepared for World Heritage sites, the principals of DRM plans can be applied to any cultural institution that is at risk for a disaster. The manual explains:

- Identification and assessment of disaster risk
- Prevention and mitigation of disaster risk
- Disaster preparation and response
- Disaster recovery
- Implementation of the plan

HERITAGE AND RESILIENCE: ISSUES AND OPPORTUNITIES FOR REDUCING DISASTER RISK

ROHIT JOGYASU, ET AL

2013

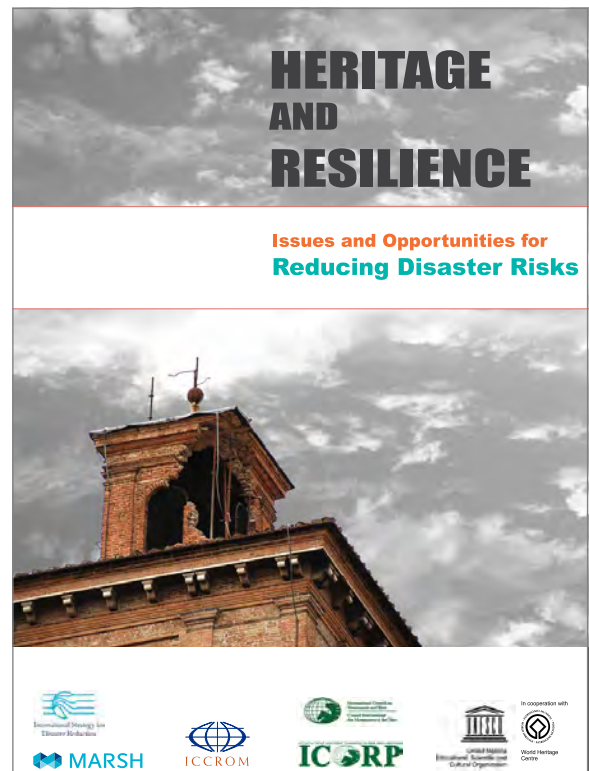
http://nrl.northumbria.ac.uk/17231/1/Heritage_and_Resilience_Report_for_UNISDR_2013.pdf

Date Accessed: 23 October 2019

This paper presents the current thinking in the field as well as examples of how heritage can be better protected from disasters while contributing to the resilience of societies. It aims to bring these issues to the attention of the disaster risk reduction community and stimulate discussion within a post-2015 framework for disaster risk reduction and a post 2015 development agenda. In advocating for integration of these issues within both disaster risk and heritage conservation policies and practices, this paper promotes strategic partnerships that bring the knowledge and capacities of actors in the fields of cultural heritage and disaster risk together and encourages support to the initiatives of local governments and, most importantly, communities that safeguard our shared cultural heritage for resilience.

Five main issues are discussed:

- Why protect heritage?
- How is heritage being protected from disaster risk?
- How is heritage being used to promote resilience after disasters?
- Who is protecting heritage from disasters?
- Way forward for promoting heritage and resilience.



THE EFFECTS OF CLIMATE CHANGE ON CULTURAL HERITAGE IN THE POLAR REGIONS

SUSAN BARR

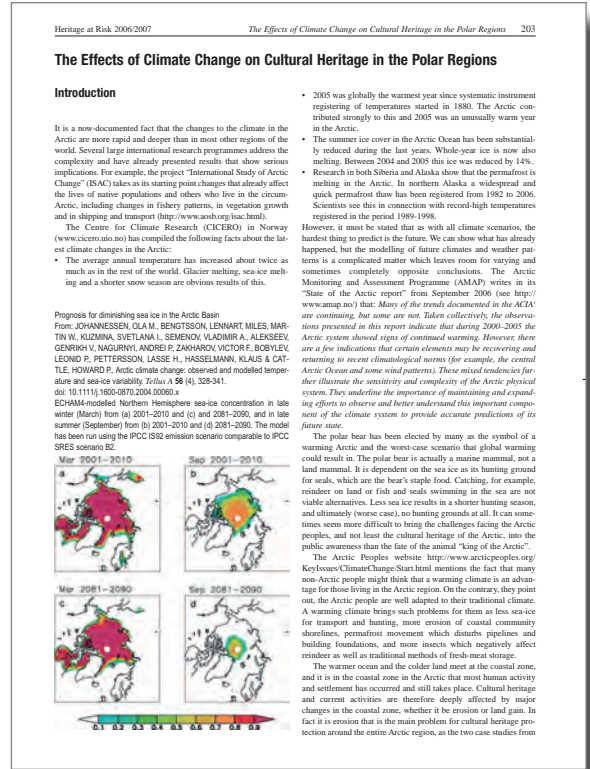
2008

http://www.icomos.org/risk/world_report/2006-2007/pdf/H@R_2006-2007_53_Special_Focus_Effects_GCC_Polar.pdf
Date Accessed: 23 October 2019

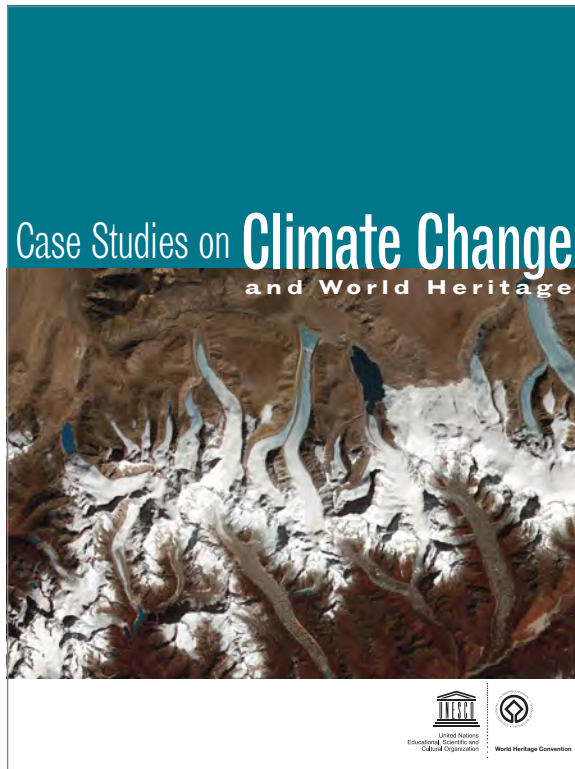
Climate change currently impacts the Arctic region the hardest, threatening historic sites. Barr points specifically to the potential loss of graveyard and other materials preserved by the now melting layer of permafrost.

In instances where a site is sure to be lost, Barr encourages documenting that site for future reference. The article also considers how climate change may open up opportunities for increased tourism in the Arctic, which may produce unintended consequences, such as further erosion of the landscape.

Barr concludes by pointing to the Arctic as a laboratory for mitigating the effects of climate change, which the international community can look to as the impact of climate change manifests itself throughout the rest of the world.



CASE STUDIES ON CLIMATE CHANGE AND WORLD HERITAGE



AUGUSTIN COLETTE

2007

<http://whc.unesco.org/en/activities/473/>
Date Accessed: 23 October 2019

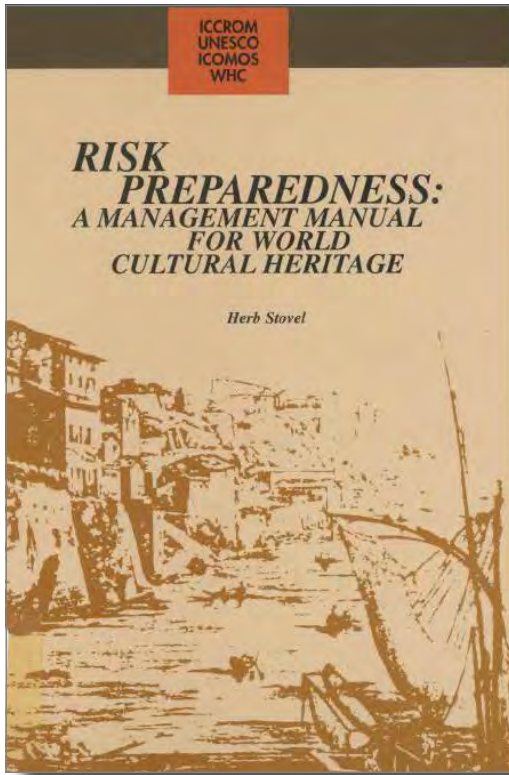
The twenty-six case studies presented here intend to illustrate the effect of climate change on heritage sites. These case studies range from Sagarmatha National Park in Nepal to the Golden Mountains of Altai in the Russian Federation to Timbuktu in Mali. The case studies are organized by category: Glaciers, Marine Biodiversity, Terrestrial Biodiversity, Archaeological Sites, and Historic Cities and Settlements.

Each case study attempts to illustrate the observed, as well predicted, effects of climate change. These effects include:

- Bleaching of coral reefs due to sea-temperature rise
- Changing of animal migration patterns
- Loss of sites due to flooding

In addition to presenting the issues faced by these sites, these case studies include a review of adaptation strategies deployed to counter the effects of climate change.

RISK PREPAREDNESS: A MANAGEMENT MANUAL FOR WORLD CULTURAL HERITAGE



HERB STOVEL

1998

https://www.iccrom.org/sites/default/files/ICCROM_17_RiskPreparedness_en.pdf

Date Accessed: 23 October 2019

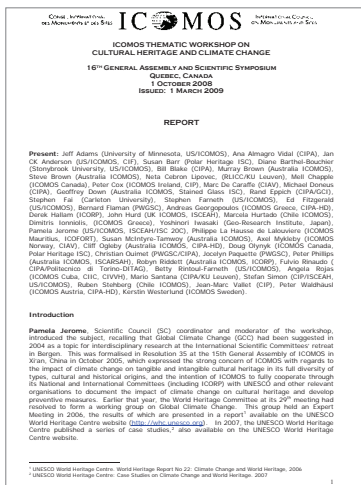
This manual was prepared to assist property managers in developing site-specific risk-preparedness guidelines that address potential natural and man-made disasters in the context of the specific political, economic and cultural conditions. The manual encourages integrating protection of cultural heritage and existing emergency planning mechanisms, and includes the necessary administrative, operational, and technical measures.

The manual is organized to provide general information about risk preparedness for historic buildings and districts followed by chapters applicable to various types of risk. Chapter 7 provides strategies to address potential flooding including:

- Describing the types of flood damage to individual historic buildings, districts, cultural, and archaeological sites
- Developing a flood strategy
- Reducing risk and increasing resistance
- Response
- Recovery

REPORT FROM THE ICOMOS THEMATIC WORKSHOP ON CULTURAL HERITAGE AND CLIMATE CHANGE, 16TH GENERAL ASSEMBLY AND SCIENTIFIC SYMPOSIUM QUEBEC, CANADA, OCTOBER 2008

SUMMARY OF THE SIGNIFICANCE OF AND THREATS TO THE CULTURAL RESOURCES LOCATED AT THE HISTORIC SETTLEMENT AREA ON HERSHEL ISLAND TERRITORIAL PARK IN YUKON



PAMELA JEROME - 2009

http://www.icomos.org/climatechange/pdf/ICOMOS_GCC_Cultural_Heritage_Workshop_Quebec_2008_Report_Final_EN.pdf

Date Accessed: 23 October 2019

DOUG OLYNYK - 2008

http://www.icomos.org/risk/world_report/2006-2007/pdf/H@R_2006-2007_56_Special_Focus_Herschel_Yukon.pdf

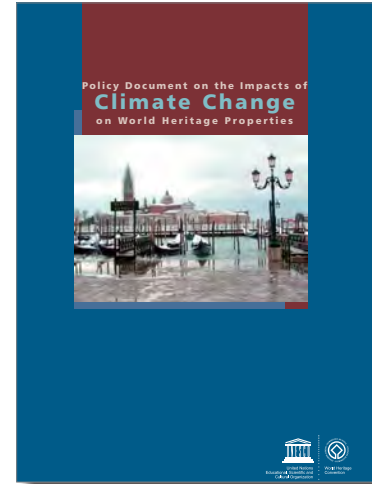
Date Accessed: 23 October 2019

WORLD HERITAGE REPORTS 22, CLIMATE CHANGE AND WORLD HERITAGE



UNESCO/WORLD HERITAGE - 2007
<http://whc.unesco.org/en/activities/474>
 Date Accessed: 23 October 2019

POLICY DOCUMENT AND THE IMPACTS OF CLIMATE CHANGE ON WORLD HERITAGE PROPERTIES



UNESCO - 2008
<http://whc.unesco.org/en/CC-policy-document/>
 Date Accessed: 23 October 2019

FLOODING AND HISTORIC BUILDINGS



DAVID PICKLES, ET AL

2015

<https://historicengland.org.uk/images-books/publications/flooding-and-historic-buildings-2ednrev/heag017-flooding-and-historic-buildings/>

Date Accessed: 23 October 2019

This document was published by Historic England. It describes:

- The increased risk of flooding due to:
 - Climate change
 - Increasing urbanization
- The costs of flooding:
 - Damage to property, infrastructure and occupant possessions
 - Disruption and stress due to evacuation of occupants
- Major consultations and reviews since 2007 by government and regulatory agencies
- Increasing recognition of the need at the local level for coordinated flood-risk management
- The necessity for integrated flood-risk management and effective communication between all involved parties in order to appropriately protect the historic environment

FLOODING FROM GROUNDWATER

LOCAL GOVERNMENT ASSOCIATION

2011

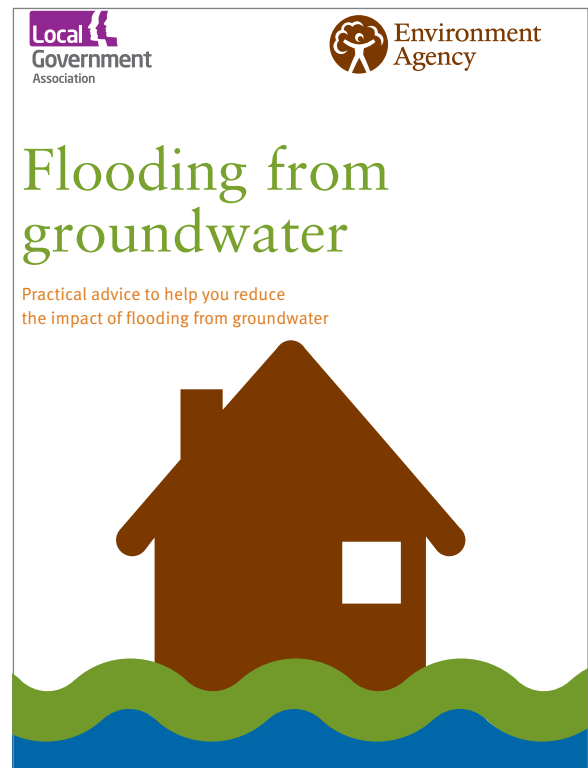
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297421/flho0911bugi-e-e.pdf

Date Accessed: 23 October 2019

This document was authored by the Local Government Association of the Environment Agency of the United Kingdom to provide practical advice primarily to homeowners to reduce the impact of flooding from groundwater on persons and property.

The document describes:

- The potential sources of flooding
- The initiation, duration, and emergent location of flood events
- Potential sources of information regarding groundwater flood risk at a particular property
- Recommended homeowner preparations for flooding
- Alternatives for preventing groundwater from entering a property, such as pumping
- Recommendations for reducing potential damage to the most vulnerable parts of a property
- Recommended actions during a flood event
- Recommended actions after a flood event
- Sources for further information

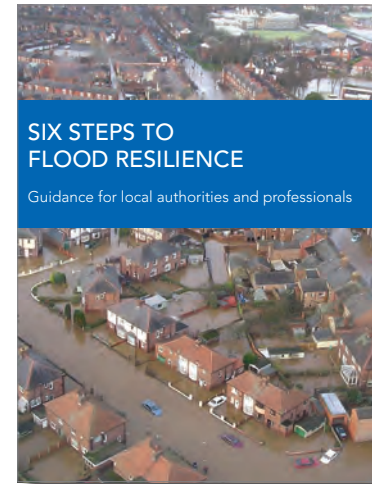


CLIMATE CHANGE AND THE HISTORIC ENVIRONMENT OF WALES: A SUMMARY OF POTENTIAL IMPACTS



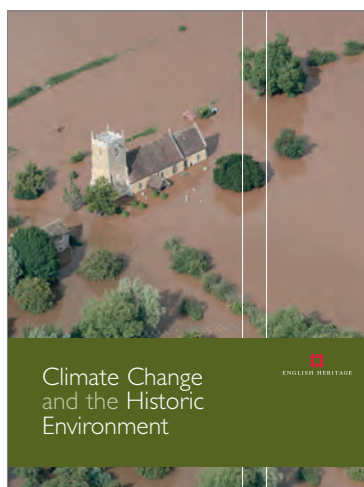
K. MURPHY AND M. INGS - 2013
http://cadw.gov.wales/docs/cadw/publications/Climate_change_and_the_historic_environment_of_Wales_EN.pdf
 Date Accessed: 19 July 2016

SIX STEPS TO FLOOD RESILIENCE – GUIDANCE FOR LOCAL AUTHORITIES AND PROFESSIONALS



I. WHITE, ET AL - 2013
<https://www.bre.co.uk/filelibrary/pdf/projects/flooding/Six-Steps-Professional-web-Aug2013.pdf>
 Date Accessed: 23 October 2019

CLIMATE CHANGE AND THE HISTORIC ENVIRONMENT



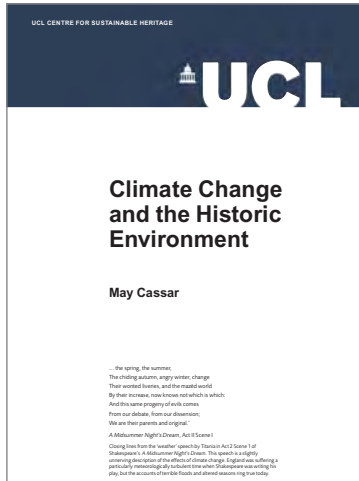
ENGLISH HERITAGE (HISTORIC ENGLAND) - 2011
<https://www.nps.gov/subjects/culturallandscapes/upload/English-Heritage-Climate-Change-and-the-Environment.pdf>
 Date Accessed: 23 October 2019

FLOOD DAMAGE TO TRADITIONAL BUILDINGS: INFORMATION FOR HISTORIC BUILDINGS



HISTORIC SCOTLAND - 2014
<https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=13349883-20bf-48ec-afd9-a59500e9a44e>
 Date Accessed: 23 October 2019

CLIMATE CHANGE AND THE HISTORIC ENVIRONMENT



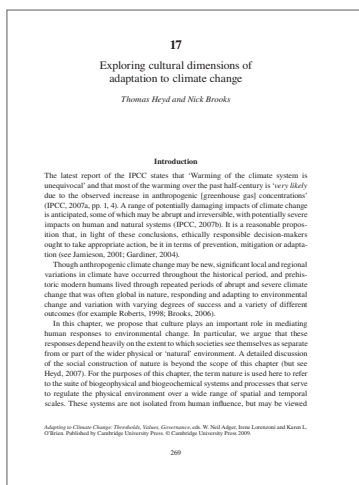
MAY CASSAR - 2005
<http://discovery.ucl.ac.uk/2082/1/2082.pdf>
 Date Accessed: 23 October 2019

QUANTIFYING THE COST OF CLIMATE CHANGE IMPACTS ON THE BUILT HERITAGE



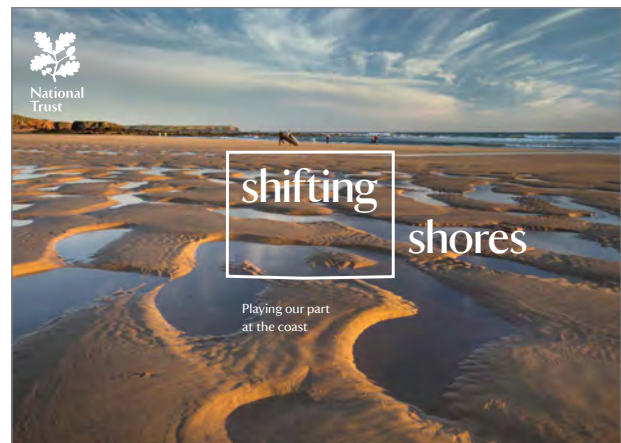
TIM TAYLOR, ALISTAIR HUNT, MAY CASSAR, AND IAN WAINWRIGHT - 2007
<http://discovery.ucl.ac.uk/2612/1/2612.pdf>
 Date Accessed: 23 October 2019

EXPLORING CULTURAL DIMENSIONS OF ADAPTATION TO CLIMATE CHANGE



THOMAS HEYD AND NICK BROOKS - 2009
https://www.climatelearningplatform.org/sites/default/files/resources/Heyd%2BBrooks_2009.pdf
 Date Accessed: 23 October 2019

SHIFTING SHORES: PLAYING OUR PART AT THE COAST



NATIONAL TRUST- 2015
<https://nt.global.ssl.fastly.net/documents/shifting-shores-report-2015.pdf>
 Date Accessed: 23 October 2019

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36 CFR PART 800 – PROTECTION OF HISTORIC PROPERTIES

ADVISORY COUNCIL ON HISTORIC PRESERVATION

2004

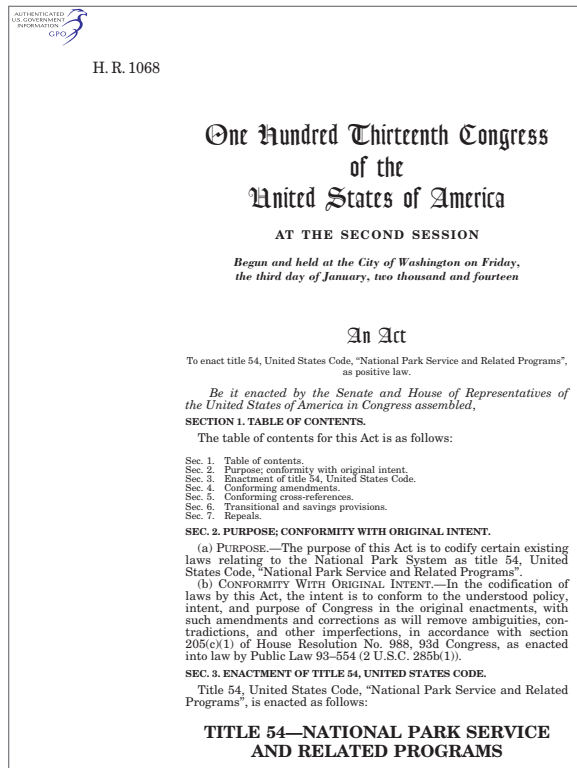
[https://www.achp.gov/sites/default/files/regulations/2017-02/regs-
rev04.pdf](https://www.achp.gov/sites/default/files/regulations/2017-02/regs-
rev04.pdf) - Date Accessed: 23 October 2019

Section 106 of the National Historic Preservation Act of 1966 mandates that all Federal undertakings - any project that uses Federal funding at least in part - must be reviewed with regard to any potential impact on any property or site that is listed, or is eligible for, the National Register of Historic Places.

This document elaborates on the circumstances that will initiate a Section 106 review as well as the required protocol for that process, including assessment of adverse effects. It also details the responsibilities of each party in the process as well as instructions for various situations that may arise.



H. R. 1068, TITLE 54, UNITED STATES CODE, “NATIONAL PARK SERVICE AND RELATED PROGRAMS.”



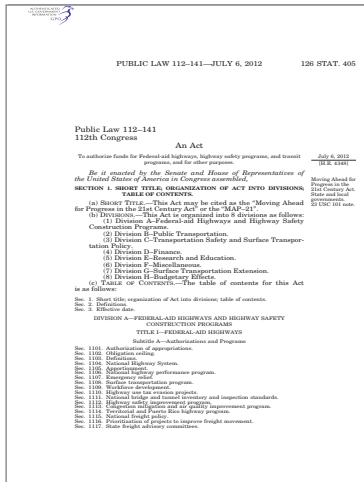
ONE HUNDRED THIRTEENTH CONGRESS OF THE UNITED STATES OF AMERICA AT THE SECOND SESSION 2014

<https://www.congress.gov/113/plaws/publ287/PLAW-113publ287.pdf>
Date Accessed: 23 October 2019

This law was enacted by Congress on 12/19/2014 and gathers existing numerous laws relating to the organization and management of the National Park System by the National Park Service. The Service is responsible for carrying out the Historic Sites, Buildings, and Antiquities Act, the National Historic Preservation Act, and other laws relating to protecting and preserving sites that illustrate America’s history. These laws had been classified as part of Title 16, Conservation, but were classified throughout title 16 rather than being in one distinct place in the title. Furthermore, as laws relating to the National Park System were amended and new laws were enacted that related closely to these laws, the Code classifications had become cumbersome to use.

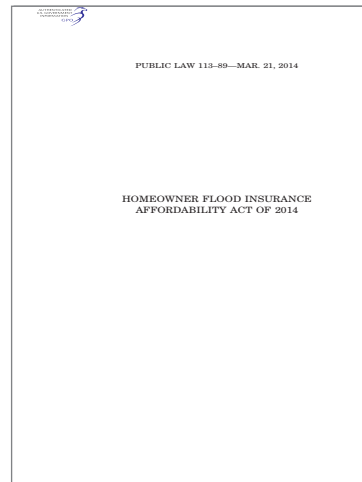
H.R 1068, Title 54 restates these provisions as a new positive law title of the United States Code. The new positive law title replaces the former provisions, which are repealed by the bill. All changes in existing law made by the bill are purely technical in nature.

BIGGERT-WATERS ACT OF 2012



US GOVERNMENT PUBLISHING OFFICE - 6 July 2012
<https://www.gpo.gov/fdsys/pkg/PLAW-112publ141/pdf/PLAW-112publ141.pdf>
 Date Accessed: 23 October 2019

HOMEOWNER FLOOD INSURANCE AFFORDABILITY ACT OF 2014



US GOVERNMENT PUBLISHING OFFICE - 21 March 2014
<https://www.congress.gov/113/plaws/publ89/PLAW-113publ89.pdf>
 Date Accessed: 23 October 2019

FEMA FACT SHEET: HISTORIC STRUCTURES AND THE BIGGERT-WATERS FLOOD INSURANCE REFORM ACT OF 2012

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

2014
http://www.fema.gov/media-library-data/1389204656960-d8d62a77fde51036c4a7157ec6ba1577/Historic_Structures_FS_2013_v01_08_2014.pdf
 Date Accessed: 23 October 2019

As a follow-up to FEMA P-467-2 (Floodplain Management Bulletin – Historic Structures), this Fact Sheet clarifies the application of the Biggert-Waters Insurance Reform Act of 2012 (BW 12) to historic structures. BW 12 includes provisions that required the National Flood Insurance Program (NFIP) “to raise the rates to reflect true flood risk, make the program more financially stable, and change how Flood Insurance Rate Map (FIRM) updates impact policyholders.” The fact sheet states that there is no exemption for insurance rate increases for historic buildings or structures. However, it does provide two provisions for qualifying historic buildings:

- The classification of “substantial improvement” does not apply to appropriate alterations to historic buildings
- A variance can be granted for repairs or rehabilitation in a manner that allows continued designation

The Fact Sheet states FEMA P-467-2 will be updated to address BW 12.

1. What does BW12 say about historic buildings?
 BW 12 makes no special provisions or exceptions for historic buildings. For rating purposes, historic buildings are to be treated the same as any other Pre-FIRM properties.

2. How does BW12 impact the premiums for flood insurance policies for historic structures?
 Section 100205 requires the phase-in of full risk rates for the following types of property: non-primary residences, business properties, severe repetitive loss (SRL) properties, properties for which claims payments exceed the fair market value, and substantially damaged or improved properties. Additionally, Section 100205 requires the immediate application of full risk rates to new policies, lapsed policies, and policies for property that has been sold to a new owner since the enactment of BW 12.

Any currently subsidized policies for historic buildings meeting the criteria established in Section 100205 will see premium rate increases. Those structures will have rate increase at a rate of 25% per year until full actuarial rates are achieved.

3. If a historic structure is a primary residence, what impact will this have on its flood policy premium?
 All primary residences – including those that are historic buildings – that were built before the initial Flood Insurance Rate Map (Pre-FIRM), and that are located in special flood hazard areas (flood zones A, AE, AH, AO, AI-A30, V, VE, VI-V30) and D zones will see a 16 to 17 percent increase effective on or after October 1, 2013, in order to reduce the amount of subsidy provided to these policyholders.

This percentage increase is based on actuarial analysis and includes the 5 percent Reserve Fund assessment for all policies, excluding Preferred Risk Policies. The Reserve Fund assessment is mandated under Section 100205.

4. Is it possible to get an exemption for a historic building from the mandated rate increases?
 No. The wording of Section 100205 does not allow FEMA any discretion in implementing it. FEMA does not have the statutory authority to exempt historic buildings from the mandated rate increases of Section 100205.

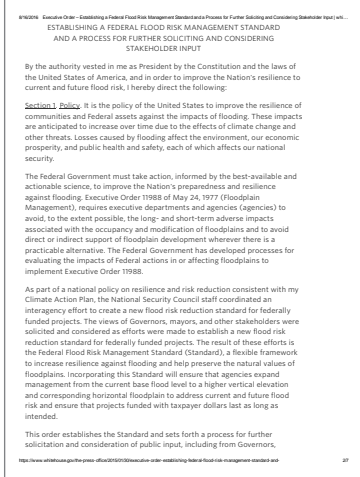
5. Did BW12 modify or address any specific aspect of the National Flood Insurance Program's floodplain management provisions pertaining to historic structures?
 No. BW 12 did not modify or address any aspect of the NFIP floodplain management provisions pertaining to historic structures.

6. What are the NFIP floodplain management provisions that pertain to historic structures?
 The NFIP contains two provisions that provide relief for “historic structures” in Special Flood Hazard Areas from the NFIP floodplain management regulations for new construction and substantial improvements/substantial damage. The two provisions include:

(1) The definition of “substantial improvement” at 44 CFR 59.1, states, “alteration to an ‘historic structure’ does not constitute a ‘substantial improvement’,” provided that the alteration will not preclude the structure’s continued

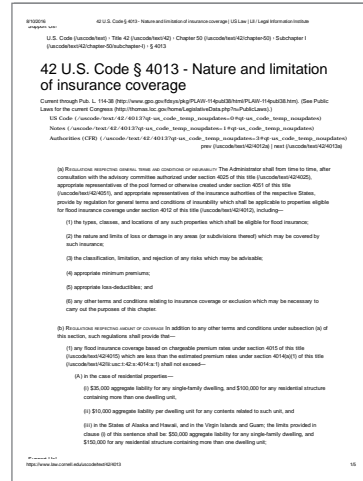
“FEMA’s mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards.”

EXECUTIVE ORDER 13690: ESTABLISHING A FEDERAL FLOOD RISK MANAGEMENT STANDARD AND A PROCESS FOR FURTHER SOLICITING AND CONSIDERING STAKEHOLDER INPUT



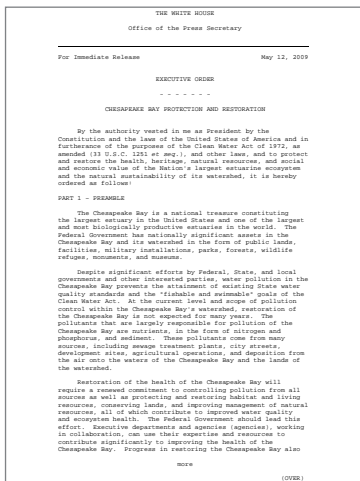
THE WHITE HOUSE - January 2015
<https://www.whitehouse.gov/the-press-office/2015/01/30/executive-order-establishing-federal-flood-risk-management-standard-and->
 Date Accessed: 16 August 2016

U.S. CODE SECTION 4013 – NATURE AND LIMITATION OF INSURANCE COVERAGE



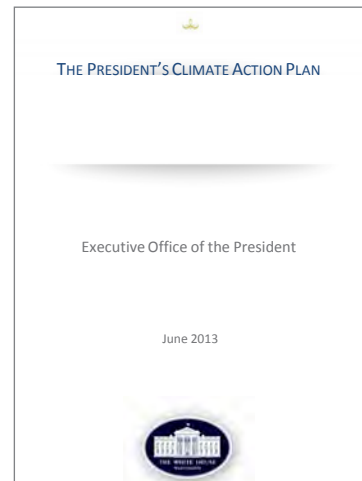
CODE OF FEDERAL REGULATIONS - No Date
<https://www.law.cornell.edu/uscode/text/42/4013>
 Date Accessed: 10 August 2016

EXECUTIVE ORDER, CHESAPEAKE BAY PROTECTION AND RESTORATION



THE WHITE HOUSE - 12 May 2009
<https://federalleadership.chesapeakebay.net/file.axd?file=2018%2f1%2f2018-2019+Programmatic+WQ+Milestones.pdf>
 Date Accessed: 23 December 2019

THE PRESIDENT'S CLIMATE ACTION PLAN



EXECUTIVE OFFICE OF THE PRESIDENT - June 2013
<https://www.whitehouse.gov/sites/default/files/image/president27climateactionplan.pdf>
 Date Accessed: 23 October 2019



EMERGENCY MANAGEMENT AND ASSISTANCE



44 US CODE

1984

http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title44/44cfr60_main_02.tpl

Date Accessed: 23 October 2019

This is a single page document listing the contents of FEMA's Criteria for Land Management and Use with regard to federal and state regulations governing flood plain management.

EXECUTIVE ORDER 13287: "PRESERVE AMERICA"

PRESIDENT GEORGE W. BUSH

2003

<https://www.gpo.gov/fdsys/pkg/WCPD-2003-03-10/pdf/WCPD-2003-03-10-Pg286.pdf>

Date Accessed: 23 October 2019

The order has these main objectives:

- The Federal government shall provide leadership in preserving America's heritage through active advancement and by promoting partnerships for the preservation and use of historic properties.
- Federal agencies shall seek to build preservation partnerships with State and local governments, Indian tribes, and the private sector to promote economic development and vitality through use.
- Federal agencies shall prepare assessments of historic properties in their management, ensure their compliance with the NHPA, report on their progress in caring for historic properties and designate an official with preservation oversight responsibility.
- Federal agencies shall promote historic properties' long-term preservation and use, increase community benefits, including economic ones, and encourage private preservation assistance. The National Park Service shall assist other agencies. The Council will recognize special achievements.
- Heritage Tourism shall be strengthened. Economic partnerships shall be fostered toward this goal.



FEMA 386-6, INTEGRATING HISTORIC PROPERTY AND CULTURAL RESOURCE CONSIDERATIONS INTO HAZARD MITIGATION PLANNING

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

May 2005

https://www.fema.gov/pdf/fima/386-6_Book.pdf

Date Accessed: 23 October 2019

The importance of integrating historic property and cultural resource considerations into mitigation planning has been made all too apparent by disasters that have occurred in recent years, such as the Northridge Earthquake, the Midwest floods, and Hurricane Katrina. Whether a disaster impacts a major community museum, a historic “Main Street,” or collections of family photographs, the sudden loss of historic properties and cultural resources can negatively impact a community’s character and economy, and can affect the overall ability of the community to recover from a disaster. “How-To” Guide #6 (FEMA 386-6) shows state and local communities step by step, with the needed tools and resources, how to develop, implement and monitor progress of a pre-disaster planning strategy for historic properties and cultural resources. While the emphasis is on the built environment, this Guide includes cultural institutions in order to address the mitigation of cultural heritage, including museum collections, works of art, and books, and documents.



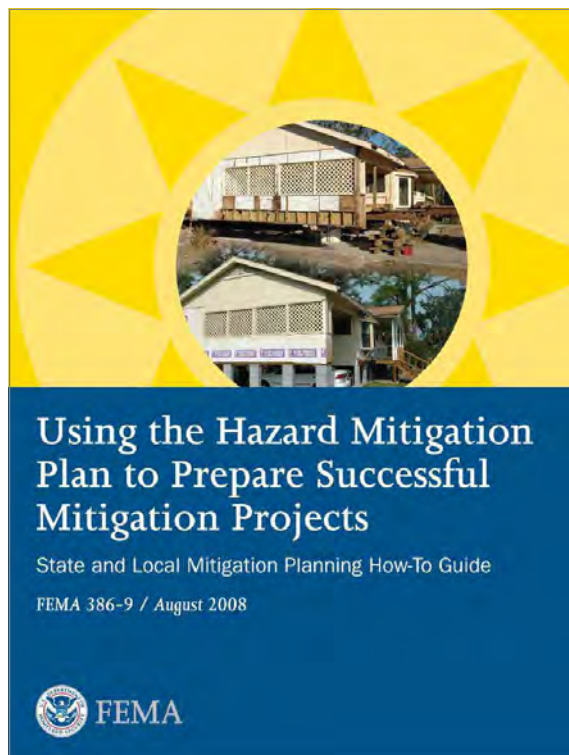
Integrating Historic Property and Cultural Resource Considerations Into Hazard Mitigation Planning

State and Local Mitigation Planning How-To Guide

FEMA 386-6 / May 2005



FEMA 386-9, USING THE HAZARD MITIGATION PLAN TO PREPARE SUCCESSFUL MITIGATION PROJECTS



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

August 2008

<https://www.fema.gov/media-library/assets/documents/14242>

Date Accessed: 23 October 2019

How-To Guide #9 (FEMA 386-9) shows how a community can move from a hazard mitigation plan to developing mitigation projects that may be implemented fully using FEMA Hazard Mitigation Assistance as appropriate. This Guide explains the process of developing the scope of a project, identifies the key components of a successful mitigation project funding application, and describes how to identify funding available through FEMA and other agencies. It explains how valuable information in the mitigation plan can be used to develop the project scope of work and how to use lessons learned through the implementation of mitigation projects to improve the mitigation plan when it is updated. This Guide is intended for grant writers, project developers, planners, emergency managers, and community leaders. It is particularly helpful for State, Tribal, and local government officials, department heads, nonprofit organizations, and other parties responsible for implementing hazard mitigation actions.

FEMA P-467-2, FLOODPLAIN MANAGEMENT BULLETIN: HISTORIC STRUCTURES



National Flood Insurance Program (NFIP)
Floodplain Management Bulletin
Historic Structures

FEMA P-467-2

May 2008



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

May 2008

https://www.fema.gov/.../tb_p_467_2_historic_structures_05_08_web.pdf - Date Accessed: 23 October 2019

This guide, prepared by FEMA in May 2008 before the Biggert-Waters Act of 2012 (BW 12), describes the establishment of the National Flood Insurance Program (NFIP) and the application of NFIP to individual historic structures and those within historic districts.

The guide offers mitigation strategies to protect historic buildings ranging from simple measures, many of which can be completed by homeowners, to more complex recommendations that require professional design assistance, including:

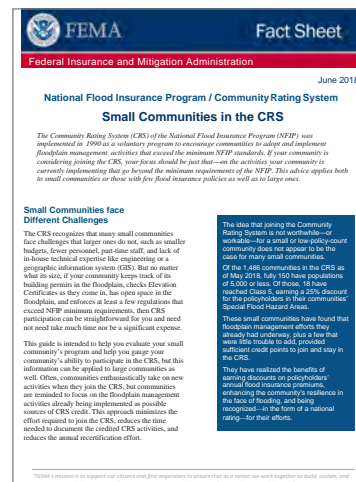
- Elevation
 - Buildings and associated foundations
 - Floor levels inside of buildings
- Flood proofing
 - Dry flood proofing
 - Wet flood proofing
- Relocation

FEMA B-573, COMMUNITY RATING SYSTEM



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - 2018
https://www.fema.gov/media-library-data/1562876385763-262f88e35f4dde1484be9093b099e670/2018_NFIP_CRS_Brochure_June_2018_508OK_corrected.pdf - Date Accessed: 23 October 2019

FEMA FACT SHEET, SMALL COMMUNITIES IN THE CRS



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - JUNE 2018
https://www.fema.gov/media-library-data/1534966644297-c0f-ab027d48811267c3b9d53abf78178/Small_Communities_CRS_Fact_Sheet_FINAL_508OK.pdf - Date Accessed: 23 October 2019

FEMA P-312, 3RD EDITION: HOMEOWNER'S GUIDE TO RETROFITTING: SIX WAYS TO PROTECT YOUR HOME FROM FLOODING

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

June 2014

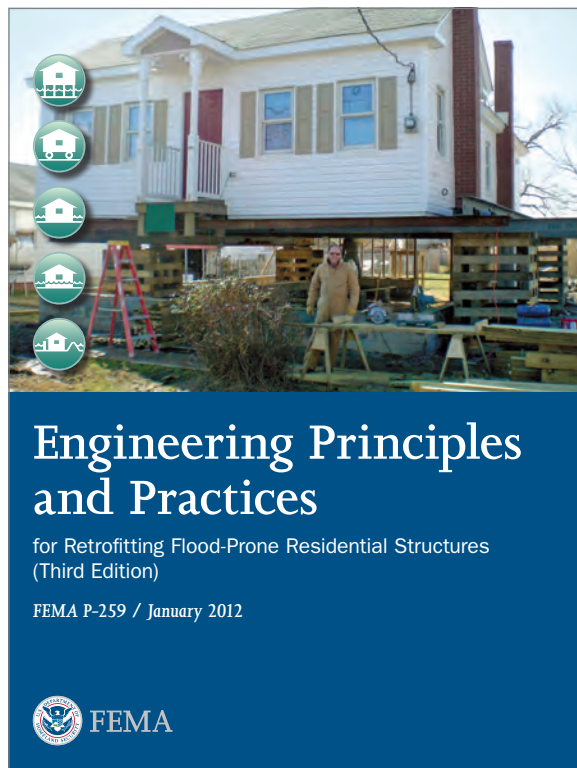
<https://www.fema.gov/media-library/assets/documents/480>

Date Accessed: 23 October 2019

The Federal Emergency Management Agency (FEMA) has prepared this guide specifically for homeowners who want to know how to protect their homes from flooding. Homeowners need clear information about the options available and straightforward guidance in making decisions. This guide gives both, in a form designed for readers who have little or no experience with flood protection methods or building construction techniques.



FEMA P-259, 3RD EDITION: ENGINEERING PRINCIPLES AND PRACTICES OF RETROFITTING FLOODPRONE RESIDENTIAL STRUCTURES



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

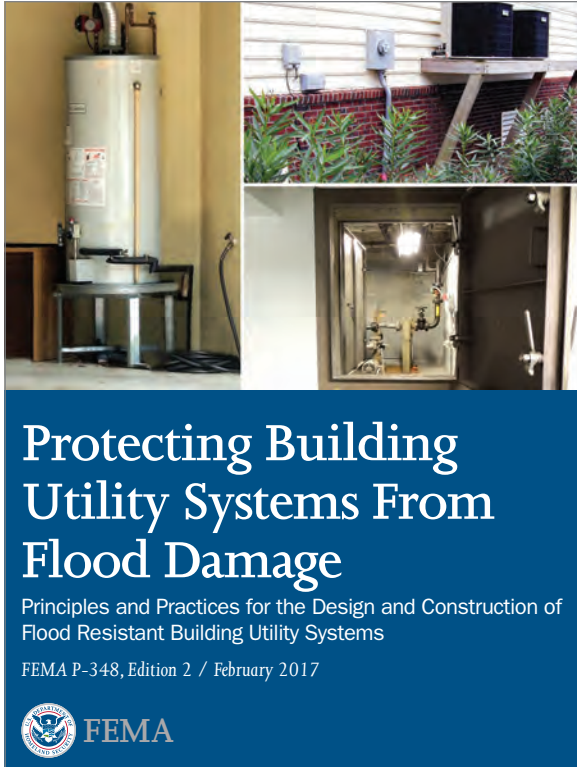
January 2012

<https://www.fema.gov/media-library/assets/documents/3001>

Date Accessed: 23 October 2019

The third edition of this document is intended to further aid homeowners in selecting and successfully executing a flood retrofit on their home. Engineering design and economic guidance on what constitutes feasible and cost-effective retrofitting measures for flood-prone residential and non-residential structures are presented. Elevation, relocation, dry floodproofing, wet floodproofing, and the use of levees and floodwalls to mitigate flood hazards are discussed. This edition was updated to be more user-friendly and concise and the overall length of the publication has been shortened.

FEMA P-348, EDITION 1, PROTECTING BUILDING UTILITIES FROM FLOOD DAMAGE



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

February 2017

<https://www.fema.gov/media-library/assets/documents/3729>

Date Accessed: 23 October 2019

The overall objective of this document is to assist in the design and construction or improvement of building utility systems in new, substantially improved or existing buildings so that the buildings can be re-occupied and fully operational as soon as electricity, sewer, and water are restored to the neighborhood.

FEMA P-936, FLOODPROOFING NON-RESIDENTIAL BUILDINGS

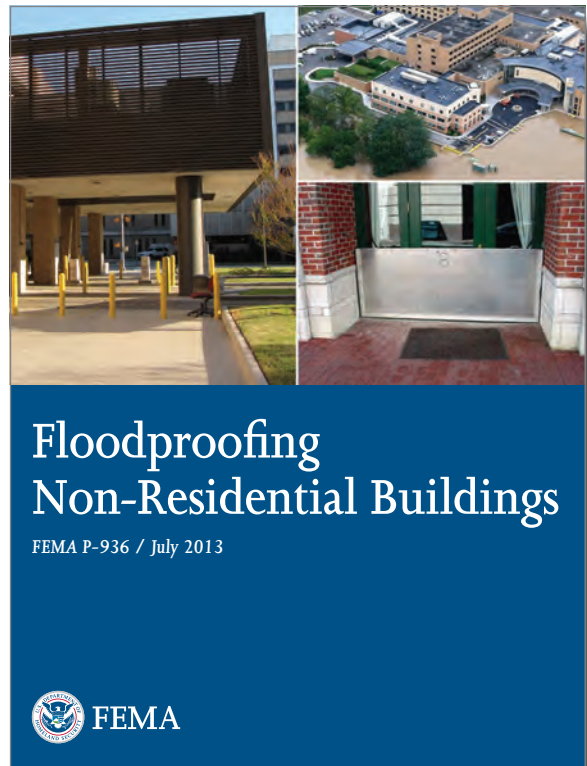
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

July 2013

<https://www.fema.gov/media-library/assets/documents/34270>

Date Accessed: October 2019

The primary focus of this guidance document is on dry floodproofing technologies for non-residential buildings located in riverine and coastal areas not subject to wave action. It also includes an overview of other techniques including wet floodproofing, the use of levees and floodwalls, protection of utilities, and emergency floodproofing. The publication provides information about regulatory requirements, design considerations, and descriptions of floodproofing methods and equipment. Key document features include: 1) Tools to assist the designer or building owner in determining the best floodproofing option for a particular building, including a vulnerability checklist, 2) Case studies providing examples of applied floodproofing techniques, 3) Equations for determining flood forces and loads, 4) A summary of results from recent dry floodproofing research and testing for new construction.

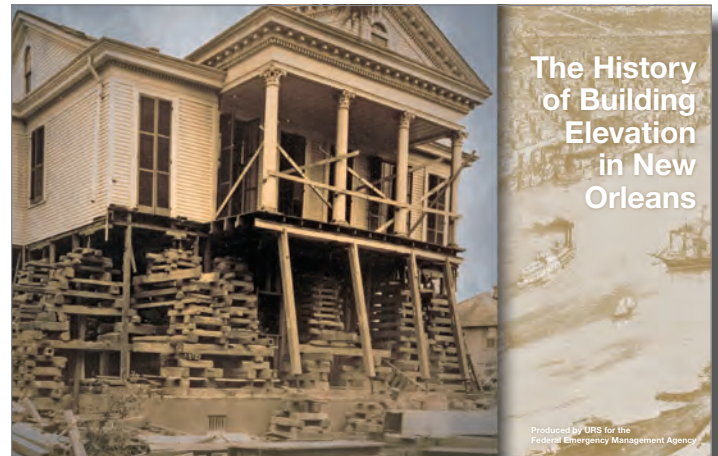


THE HISTORY OF BUILDING ELEVATION IN NEW ORLEANS

This document presents a detailed history of the evolution of the City of New Orleans, from French and then Spanish control to purchase by the United States. This history highlights the city's relationship to the river and how the built fabric responded to the threat of flooding historically, through measures such as elevation, construction on high ground, and development of a canal and drainage system. In the 19th-century, the city required by code that first floors be elevated, of at least three feet above the sidewalk. Around the same time, businesses appeared that specialized in raising structures. Their report dedicated an entire chapter to these businesses. The following chapters detail raised house types and techniques for elevating these homes.

Despite these measures, New Orleans continued fall victim to destructive storms. Following Hurricane Katrina, the city's improved infrastructure encouraged development at sea level, which has only further increased New Orleans' risk to flooding, despite the intention of behind putting this new infrastructure in place.

The report wraps up with a chapter on the archaeological concerns associated with elevating a building. It recommends leaving archaeological findings in place and consulting an archaeologist if this cannot be avoided.



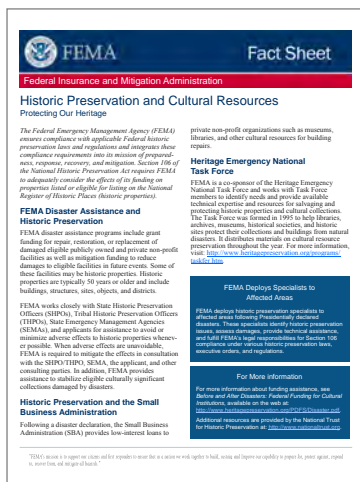
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

December 2012

http://www.fema.gov/media-library-data/20130726-1919-25045-5921/cno_history_bldg_elev_042313.pdf

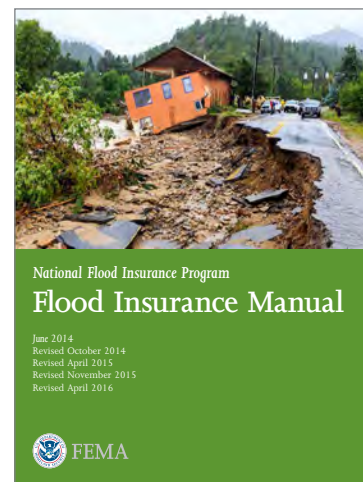
Date Accessed: 23 October 2019

FEMA FACT SHEET: HISTORIC PRESERVATION AND CULTURAL RESOURCES



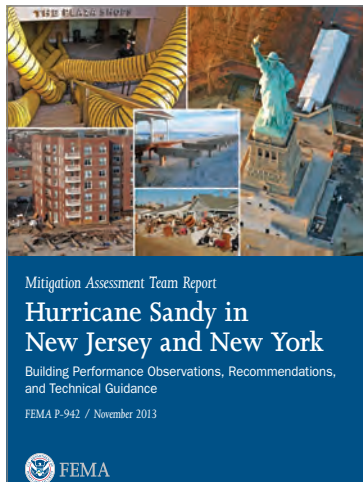
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - 14 July 2014
http://www.fema.gov/media-library-data/20130726-1533-20490-9000/historicpreservationcultural_resources_2012.pdf Date Accessed: 23 October 2019

NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE MANUAL



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - Revised April 2016
<http://www.fema.gov/media-library/assets/documents/115549>
 Date Accessed: 23 October 2019

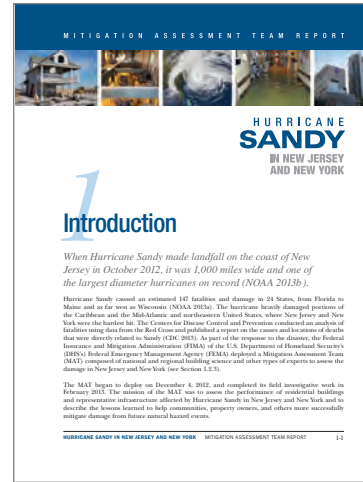
FEMA P-942, HURRICANE SANDY IN NEW JERSEY AND NEW YORK



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - November 2013

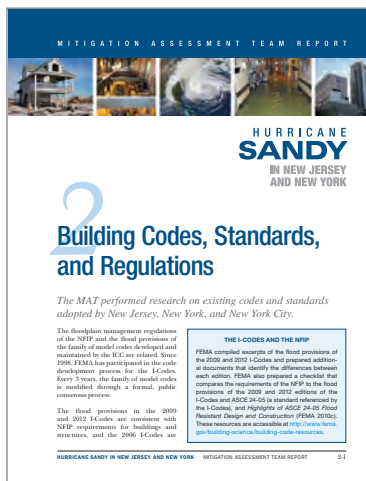
https://www.fema.gov/media-library-data/1386850803857-025eb299df32c6782fdccb6f69b35b13/Combined_Sandy_MAT_Report_508post.pdf Date Accessed: 23 October 2019

FEMA P-942, HURRICANE SANDY IN NEW JERSEY AND NEW YORK - INTRODUCTION



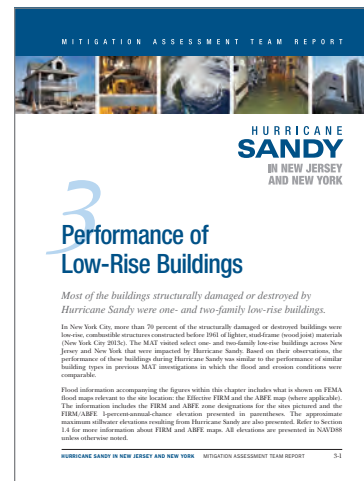
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - November 2013

FEMA P-942, HURRICANE SANDY IN NEW JERSEY AND NEW YORK - BUILDING CODES, STANDARDS AND REGULATIONS



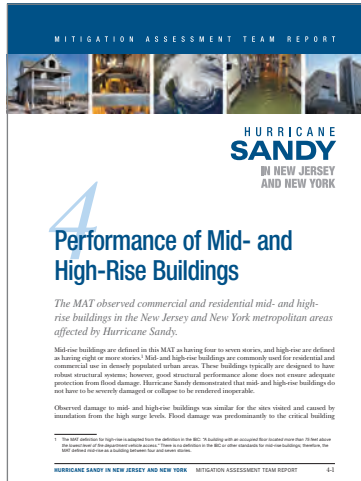
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - November 2013

FEMA P-942, HURRICANE SANDY IN NEW JERSEY AND NEW YORK - PERFORMANCE OF LOW-RISE BUILDINGS



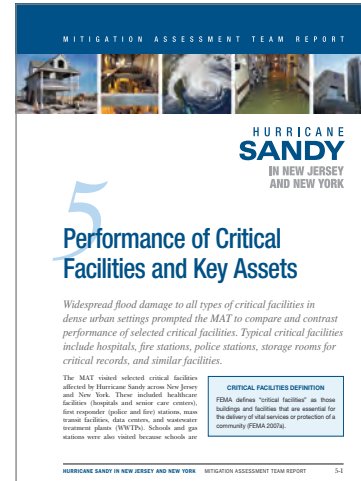
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - November 2013

FEMA P-942, HURRICANE SANDY IN NEW JERSEY AND NEW YORK - PERFORMANCE OF MID- AND HIGH-RISE BUILDINGS



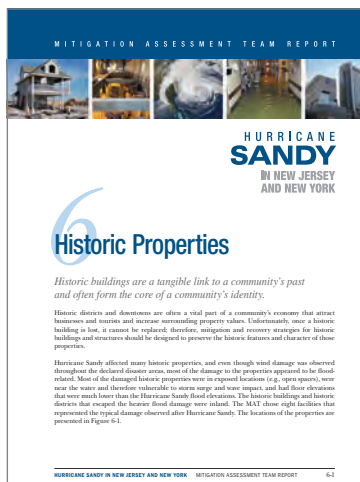
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - November 2013

FEMA P-942, HURRICANE SANDY IN NEW JERSEY AND NEW YORK - PERFORMANCE OF CRITICAL FACILITIES AND KEY ASSETS



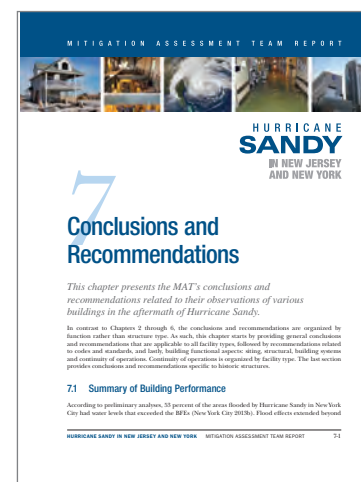
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - November 2013

FEMA P-942, HURRICANE SANDY IN NEW JERSEY AND NEW YORK - HISTORIC PROPERTIES



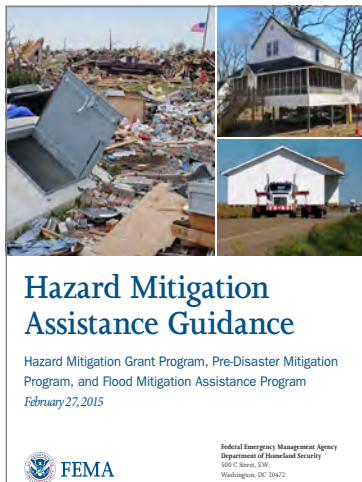
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - November 2013

FEMA P-942, HURRICANE SANDY IN NEW JERSEY AND NEW YORK - CONCLUSIONS AND RECOMMENDATIONS



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - November 2013

HAZARD MITIGATION ASSISTANCE GUIDANCE



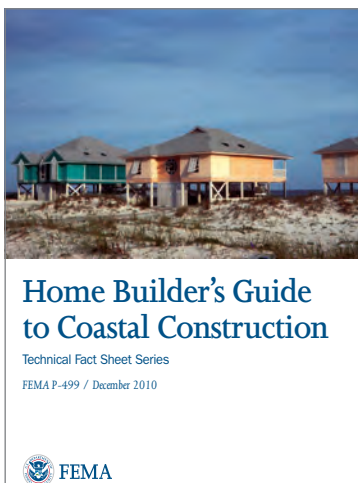
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) -
 27 February 2015
http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA_Guidance_022715_508.pdf
 Date Accessed: 23 October 2019

PRE-DISASTER MITIGATION GRANT PROGRAM



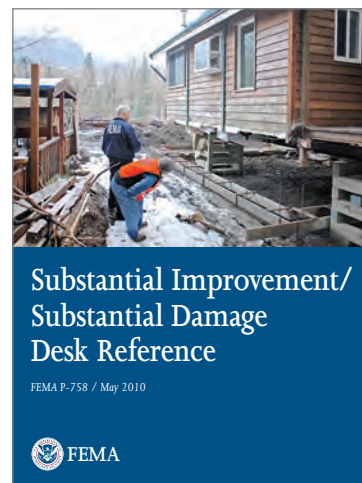
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) -
 30 October 2015
<http://www.fema.gov/pre-disaster-mitigation-grant-program>
 Date Accessed: 23 October 2019

FEMA P-499, HOME BUILDER'S GUIDE TO COASTAL CONSTRUCTION



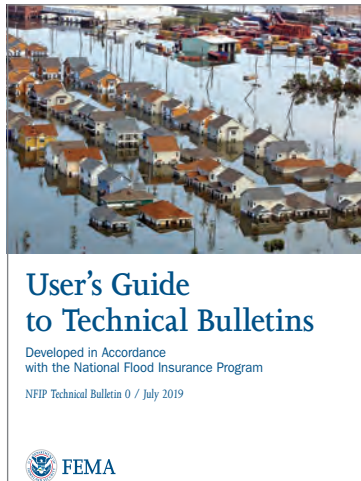
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) -
 December 2010
http://www.fema.gov/media-library-data/20130726-1538-20490-2983/fema499web_2.pdf
 Date Accessed: 23 October 2019

FEMA P-758, SUBSTANTIAL IMPROVEMENT/SUBSTANTIAL DAMAGE DESK REFERENCE



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) -
 May 2010
http://www.fema.gov/media-library-data/20130726-1734-25045-8822/fema_p_758_cvr_toc_r2.pdf
 Date Accessed: 23 October 2019

TECHNICAL BULLETIN 0: USER'S GUIDE TO TECHNICAL BULLETINS



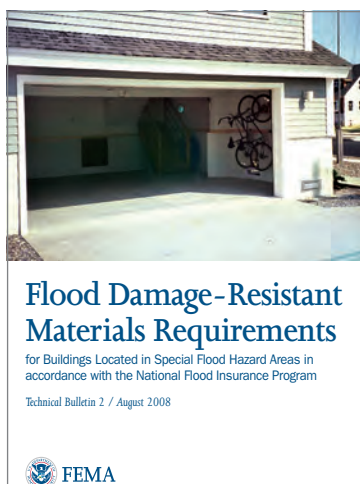
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) -
Date: July 2019
https://www.fema.gov/media-library-data/1565284117751-5ebbe8d7132abd481507d2b445249fdd/FEMA_TB0_FINAL_070319_508.pdf - Date Accessed: 23 October 2019

TECHNICAL BULLETIN 1: OPENINGS IN FOUNDATION WALLS AND WALLS OF ENCLOSURES



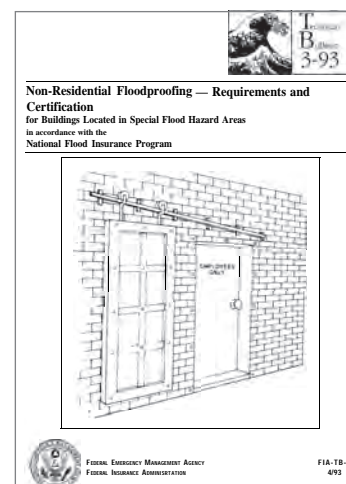
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) -
August 2008
http://www.fema.gov/media-library-data/20130726-1502-20490-9949/fema_tb_1__1_.pdf
Date Accessed: 23 October 2019

TECHNICAL BULLETIN 2: FLOOD DAMAGE-RESISTANT MATERIALS REQUIREMENTS



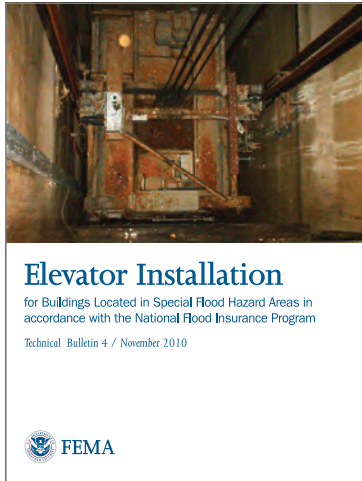
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) -
August 2008
http://www.fema.gov/media-library-data/20130726-1502-20490-4764/fema_tb_2_rev1.pdf
Date Accessed: 23 October 2019

TECHNICAL BULLETIN 3: NON-RESIDENTIAL FLOODPROOFING - REQUIREMENTS AND CERTIFICATION



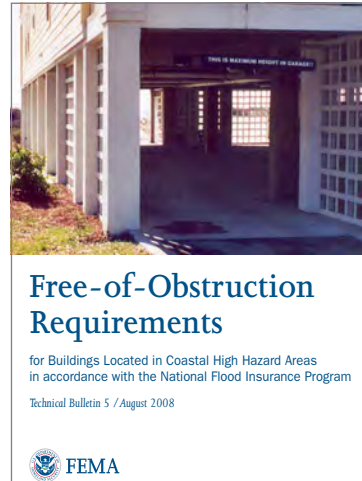
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) -
1993
<http://www.fema.gov/media-library-data/20130726-1511-20490-5294/job6.pdf>
Date Accessed: 23 October 2019

TECHNICAL BULLETIN 4: ELEVATOR INSTALLATION



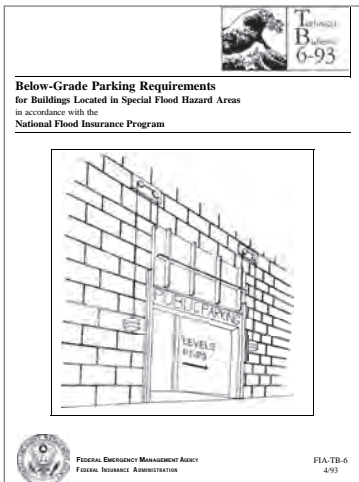
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - November 2010
<https://www.fema.gov/es/media-library/assets/documents/3478>
 Date Accessed: 23 October 2019

TECHNICAL BULLETIN 5: FREE-OF-OBSTRUCTION REQUIREMENTS



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - August 2008
http://www.fema.gov/media-library-data/20130726-1511-20490-9526/fema_tb_5.pdf
 Date Accessed: 23 October 2019

TECHNICAL BULLETIN 6: BELOW-GRADE PARKING REQUIREMENTS



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - 1993
<http://www.fema.gov/media-library-data/20130726-1511-20490-1163/job12.pdf>
 Date Accessed: 23 October 2019

TECHNICAL BULLETIN 7: WET FLOODPROOFING REQUIREMENTS



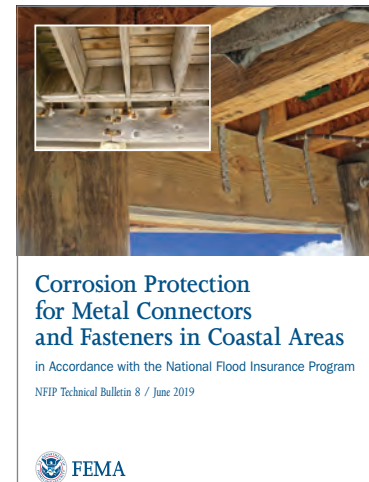
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - 1993
http://www.fema.gov/media-library-data/20130726-1511-20490-8042/tb_7_complete_scan.pdf
 Date Accessed: 23 October 2019

TECHNICAL BULLETIN 8: CORROSION PROTECTION FOR METAL CONNECTORS IN COASTAL AREAS



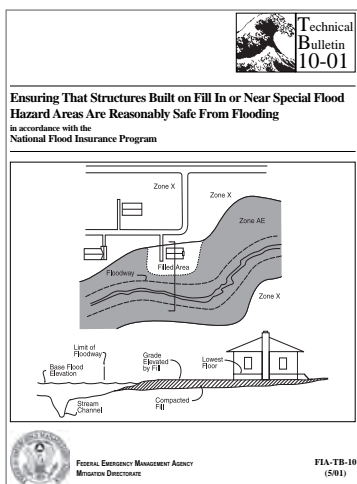
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - 1996
<https://www.fema.gov/media-library/assets/documents/3509>
 Date Accessed: 22 February 2016

TECHNICAL BULLETIN 9: DESIGN AND CONSTRUCTION GUIDANCE FOR BREAKAWAY WALLS



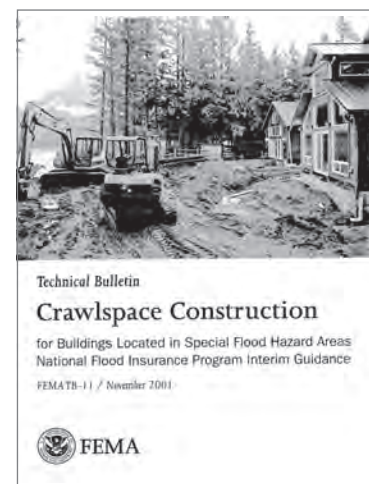
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - June 2019
http://www.fema.gov/media-library-data/20130726-1511-20490-8359/fema_tb_9.pdf
 Date Accessed: 23 October 2019

TECHNICAL BULLETIN 10: ENSURING THAT STRUCTURES BUILT ON FILL IN OR NEAR SPECIAL FLOOD HAZARD AREAS ARE REASONABLY SAFE FROM FLOODING



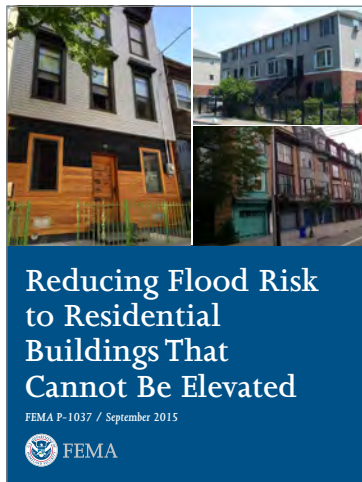
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - May 2001
<http://www.fema.gov/media-library-data/20130726-1511-20490-3169/tb1001.pdf>
 Date Accessed: 23 October 2019

TECHNICAL BULLETIN 11: CRAWLSPACE CONSTRUCTION



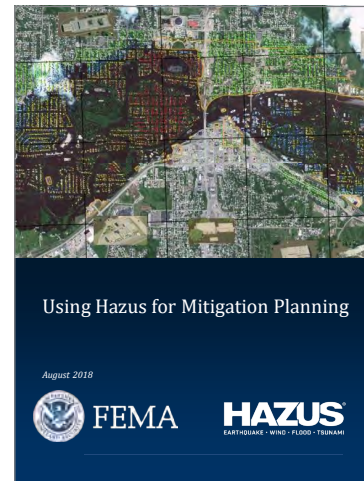
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - November 2001
http://www.fema.gov/media-library-data/20130726-1511-20490-0716/tb_11_rev.pdf
 Date Accessed: 23 October 2019

FEMA P-1037, REDUCING FLOOD RISK TO RESIDENTIAL BUILDINGS THAT CANNOT BE ELEVATED



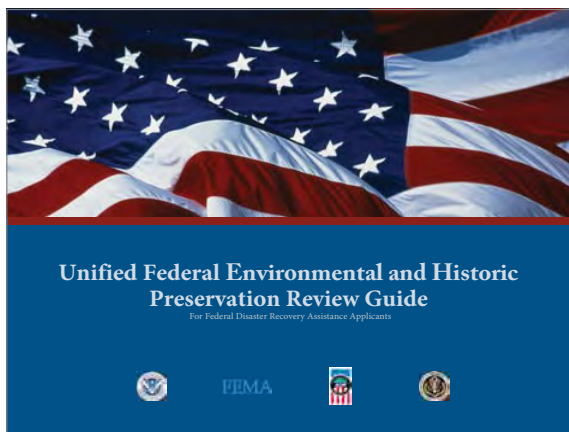
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - September 2015
http://www.fema.gov/media-library-data/1443014398612-a4dfc0f86711bc72434b82c4b100a677/revFEMA_HMA_Grants_4pg_2015_508.pdf Date Accessed: 23 October 2019

USING HAZUS FOR MITIGATION PLANNING



FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - August 2018
https://www.fema.gov/media-library-data/1540479624999-ab1eca852448e271f0de82cf2031a01b/Using_Hazus_in_Mitigation_Planning_20180820_Final_508_Compliant.pdf
 Date Accessed: 23 October 2019

UNIFIED FEDERAL ENVIRONMENTAL AND HISTORIC PRESERVATION REVIEW GUIDE



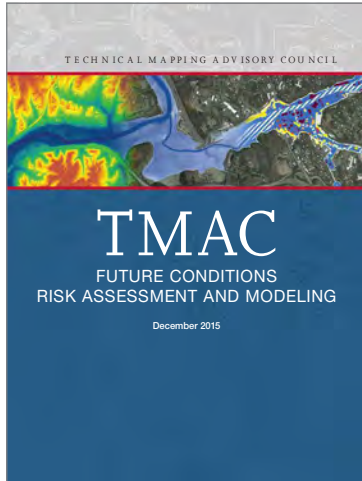
FEMA AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION - No Date
http://www.fema.gov/media-library-data/1440713845421-9bd b5c0c8fe19ab86d97059ccb26e3b4/UFR_Applicant_Guide_Final_508.pdf
 Date Accessed: 23 October 2019

FEMA P-234, REPAIRING YOUR FLOODED HOME



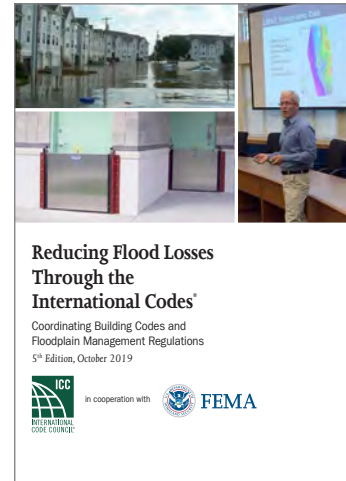
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - October 2010
https://www.austintexas.gov/sites/default/files/files/Watershed/flood/fema_p234_complete.pdf
 Date Accessed: 23 October 2019

TMAC FUTURE CONDITIONS RISK ASSESSMENT AND MODELING



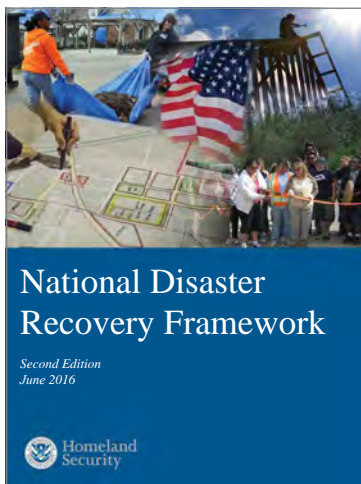
TECHNICAL MAPPING ADVISORY COUNCIL - December 2015
http://www.fema.gov/media-library-data/1454954261186-c348aa9b1768298c9eb66f84366f836e/TMAC_2015_Future_Conditions_Risk_Assessment_and_Modeling_Report.pdf
 Date Accessed: 23 October 2019

REDUCING FLOOD LOSSES THROUGH THE INTERNATIONAL CODES: COORDINATING BUILDING CODES AND FLOODPLAIN MANAGEMENT REGULATIONS, 5TH EDITION (2019)



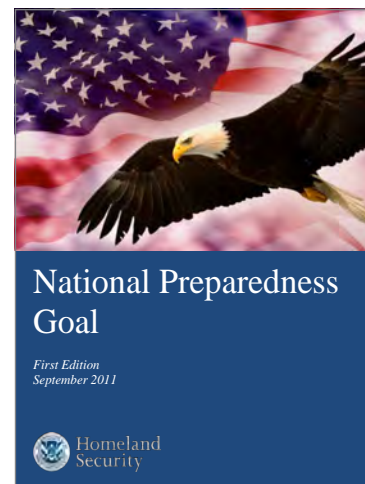
FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) - October 2019
https://www.fema.gov/media-library-data/1571406518758-09a19d62a13fa63bf7300cf9744df20e/FEMA_Reducing_Flood_Losses_RFL_5th-Ed_508.pdf
 Date Accessed: 23 December 2019

NATIONAL DISASTER RECOVERY FRAMEWORK



DEPARTMENT OF HOMELAND SECURITY - June 2016
http://www.fema.gov/media-library-data/1466014998123-4bec8550930f774269e0c5968b120ba2/National_Disaster_Recovery_Framework2nd.pdf
 Date Accessed: 23 October 2019

NATIONAL PREPAREDNESS GOAL



DEPARTMENT OF HOMELAND SECURITY - September 2011
<http://www.fema.gov/pdf/prepared/ngp.pdf>
 Date Accessed: 23 October 2019

REBUILDING WATER-DAMAGED HOMES



Rebuilding Water-Damaged Homes

A manual for the safe, healthy, green, and low-cost restoration of housing

September 2009



Produced by The Alliance for Healthy Homes
 Primary Content & Illustrations: Dennis Livingston
 Design and Production: Jennie Keinard & Ruth Klotz-Chamberlin
 Additional Content: Ralph Scott

DENNIS LIVINGSTON

2009

<https://ag.purdue.edu/extension/eden/Mold/AFHH-manual.pdf>

Date Accessed: 23 October 2019

This manual provides information for homeowners interested in low-cost restoration of their homes following a flood. It is lavishly illustrated with clear, annotated line-diagrams that describe:

- Traditional building systems and terminology
- Clean out procedures for flood-damaged buildings including safety precautions and lists of required supplies and tools, as well as cleaning and treatment procedures for building surfaces
- Flood and moisture resilient rebuilding techniques for rehabilitation, including details to prevent water from entering a building and techniques for draining and drying out a building if water enters a building
- Repair techniques for historic building materials
- Hurricane resistant strategies
- Explanation of the house lifting process

This document was prepared by The Alliance for Healthy Homes, and is now distributed by the Department of Housing and Urban Development. Unlike many other guides, the illustrations in this manual are heavily annotated to identify recommended materials and supplies. It provides a shopping list to aid homeowners in preparing for a flood event, or its immediate aftermath.

HURRICANE SANDY REBUILDING TASK FORCE, REBUILD BY DESIGN



U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT - No Date

<http://portal.hud.gov/hudportal/HUD?src=/sandysrebuilding/rebuildbydesign>

Date Accessed: 23 October 2019

HURRICANE SANDY REBUILDING STRATEGY

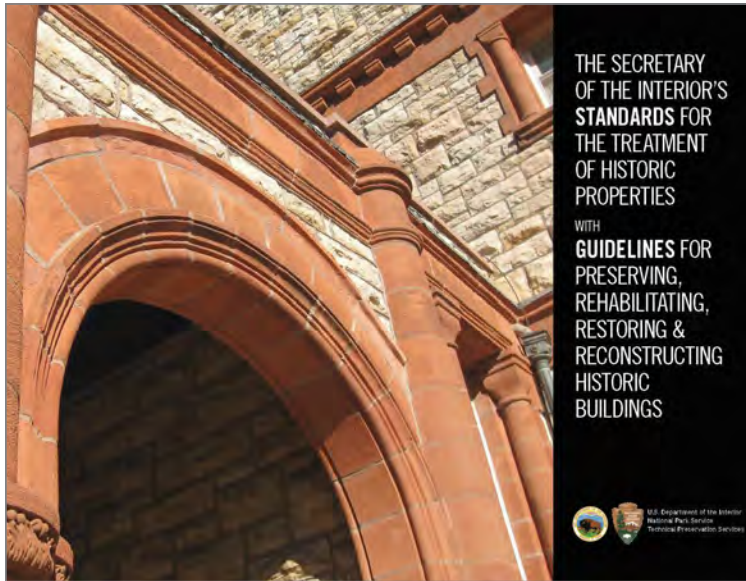


HURRICANE SANDY REBUILDING TASK FORCE - August 2013

<http://portal.hud.gov/hudportal/documents/huddoc?id=HSRebuildingStrategy.pdf>

Date Accessed: 23 October 2019

THE SECRETARY OF THE INTERIOR'S STANDARDS FOR REHABILITATION

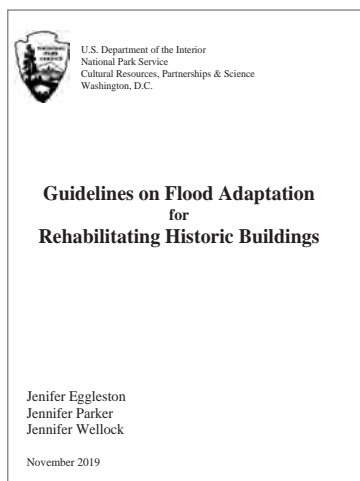


NATIONAL PARK SERVICE

2017
<https://www.nps.gov/tps/standards/history-of-standards.htm>
 Date Accessed: 23 October 2019

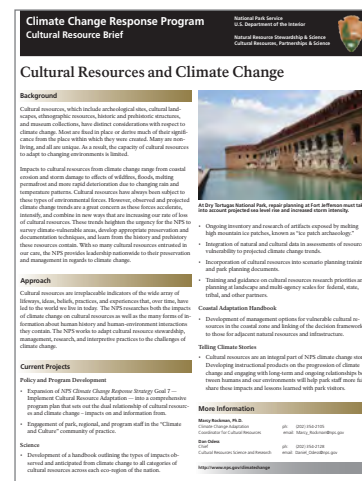
The State of New Jersey follows *The Secretary of the Interior's Standards for Rehabilitation* and requires that all projects qualifying for state or federal tax credits meet these standards. The ten standards outlined in this policy address the preservation of a site's character, finishes, and changes that have acquired historic significance, to name a few.

GUIDELINES ON FLOOD ADAPTATION FOR REHABILITATING HISTORIC BUILDINGS



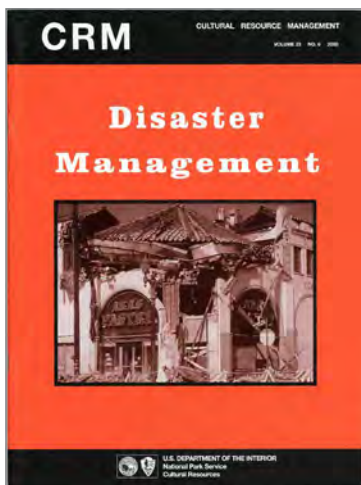
NATIONAL PARK SERVICE - November 2019
<https://www.nps.gov/tps/standards/rehabilitation/flood-adaptation-guidelines.pdf>
 Date Accessed: 23 December 2019

CULTURAL RESOURCES AND CLIMATE CHANGE, CULTURAL RESOURCE BRIEF



NATIONAL PARK SERVICE
<https://www.nps.gov/subjects/climatechange/upload/CCRP-Cultural-Resources-Brief-2019July-508COMPLIANT.pdf>
 Date Accessed: 23 October 2019

DISASTER MANAGEMENT FOR CULTURAL PROPERTIES



DAVID W. LOOK AND DIRK H.R. SPENNEMANN - 2000
<https://home1.nps.gov/CRMJournal/CRM/v23n6.pdf>
 Date Accessed: 23 October 2019

DISASTER PREPAREDNESS, PLANNING, AND MITIGATION



DAVID W. LOOK AND DIRK H.R. SPENNEMANN - 2001
<https://www.nps.gov/CRMJournal/CRM/v24n8.pdf>
 Date Accessed: 23 October 2019

EARTH, WIND, FIRE, AND WATER - HISTORIC PRESERVATION DISASTER PLANNING IN MIAMI-DADE COUNTY, FLORIDA



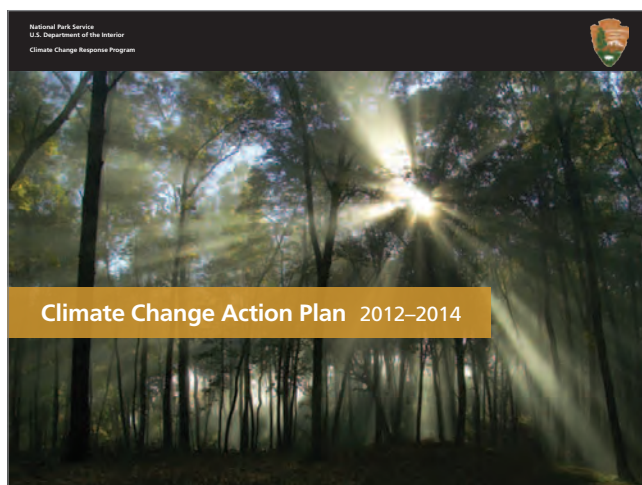
CHRISTOPHER R. ECK - 2000
<https://home1.nps.gov/CRMJournal/CRM/v23n6.pdf>
 Date Accessed: 23 October 2019

“LORD WILLING N’ THE CREEK DON’T RISE” - FLOOD SUSTAINABILITY AT HARPERS FERRY NATIONAL HISTORICAL PARK



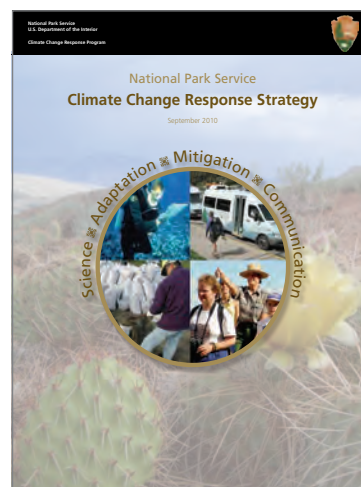
BRUCE J. NOBLE, JR. - 2001
<https://www.nps.gov/CRMJournal/CRM/v24n8.pdf>
 Date Accessed: 23 October 2019

CLIMATE ACTION PLAN 2012-2014



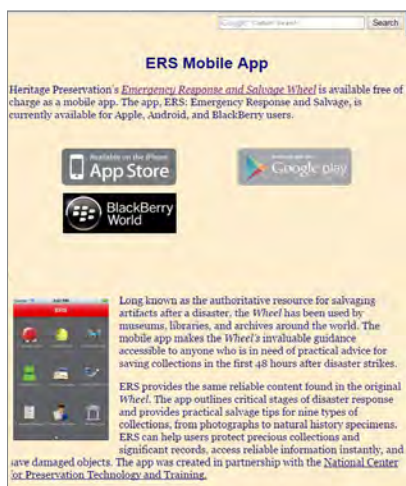
November 2012
<https://www.nps.gov/subjects/climatechange/upload/CCActionPlan-508compliant.pdf>
 Date Accessed: 23 December 2019

CLIMATE CHANGE RESPONSE STRATEGY: SCIENCE, ADAPTATION, MITIGATION, COMMUNICATION



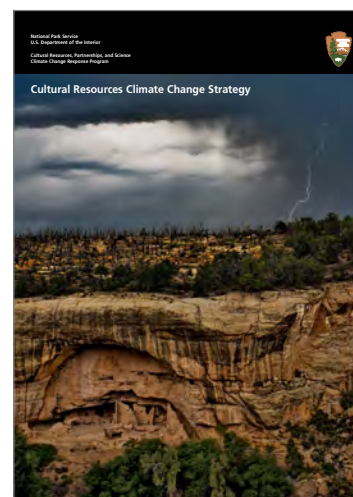
NATIONAL PARK SERVICE - September 2010
https://www.nps.gov/subjects/climatechange/upload/NPS_CCRS-508compliant.pdf
 Date Accessed: 23 October 2019

EMERGENCY RESPONSE AND SALVAGE



JORGE ALBERTO RODRIGUEZ AND SEAN M. CLIFFORD - 9
 November 2012
<https://ncptt.nps.gov/blog/ers/>
 Date Accessed: 5 February 2016

CULTURAL RESOURCES CLIMATE CHANGE STRATEGY



NATIONAL PARK SERVICE - 2016
https://www.nps.gov/subjects/climatechange/upload/NPS-2016_Cultural-Resoures-Climate-Change-Strategy.pdf
 Date Accessed: 23 October 2019

RESILIENT HERITAGE: PROTECTING YOUR HISTORIC HOME FROM NATURAL DISASTERS



NATIONAL CENTER FOR PRESERVATION TECHNOLOGY & TRAINING - 2015
<https://ncptt.nps.gov/blog/resilient-heritage-2015-03/>
 Date Accessed: 123 October 2019

PREPARING TO PRESERVE; EMERGENCY PLANNING: MODEL CHECKLIST FOR HISTORIC PRESERVATION



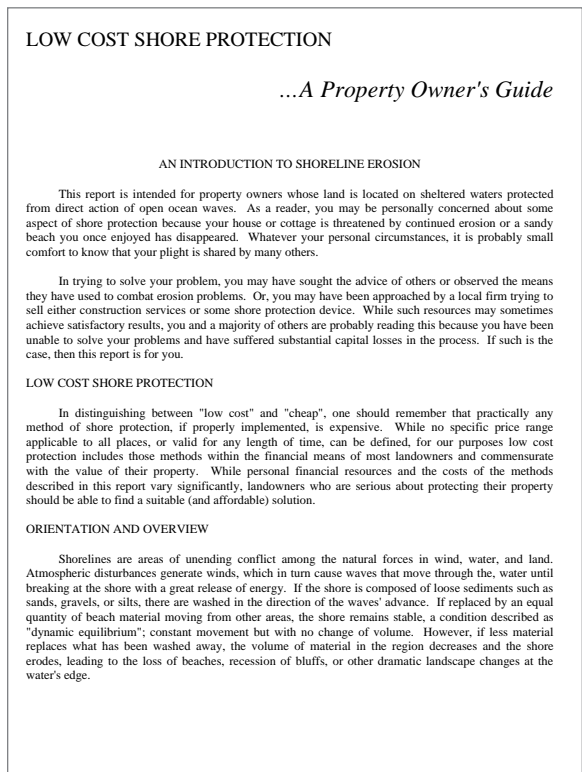
HERITAGE PRESERVATION - No Date
http://www.heritagepreservation.org/PROGRAMS/PtoP_EPChecklist.pdf
 Date Accessed: 16 February 2016

LOW COST SHORE PROTECTION ...A PROPERTY OWNER'S GUIDE

U.S. ARMY CORPS OF ENGINEERS

<https://apps.dtic.mil/dtic/tr/fulltext/u2/a112531.pdf>
 Date Accessed: 23 October 2019

Report published by the U.S. Army Corps of Engineers for home owners considering implementing a shore protection, such as bulkheads or riprap. The report details how wave action impact coastline. It provides a detailed explanation, as well as illustrative diagrams, regarding a variety of methods for modifying shorelines. These explanations include a overview of the impact these protections have on the shoreline, such as downdrift erosion. This document can be helpful for an individual considering taking on the expense of this mitigation method.



NONSTRUCTURAL MITIGATION ASSESSMENT FOR THE CITY OF ANNAPOLIS HISTORIC DISTRICT

STEPHEN D. O'LEARY, AIA, CFM

December 2014

<https://www.annapolis.gov/DocumentCenter/View/2177/>

Nonstructural-Mitigation-Assessment-for-Annapolis-Historic-District-PDF

Date Accessed: 23 October 2019

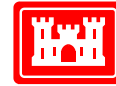
In Annapolis, Maryland, the long-term concern for the accelerating rate of sea level rise and the the aftermath of Hurricane Sandy created a sense of urgency for the development of a Cultural Resource Hazard Mitigation Plan (CRHMP). In 2013, the City of Annapolis embarked on developing a plan per Federal Emergency Management Agency's (FEMA) 'how-to' guide to State and Local Mitigation Planning. This approach outlines four phases in the development of a comprehensive CRHMP:

- Organize resources
- Assess risks
- Develop a mitigation plan
- Implement the plan and monitor progress.

The risk assessment includes an analysis of each property's significance, integrity, economic importance and overall public sentiment. Historic American Building Survey level documentation may be recommended for properties that are deemed of high public interest.

NONSTRUCTURAL MITIGATION ASSESSMENT FOR THE CITY OF ANNAPOLIS HISTORIC DISTRICT

Annapolis, Maryland



Prepared for: City of Annapolis
145 Gorman Street, 3rd Floor
Annapolis, Maryland 21401

Prepared by: Planning Division
U.S. Army Corps of Engineers, Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203-1715

DECEMBER 2014

NATIONAL NONSTRUCTURAL / FLOOD PROOFING COMMITTEE PRESENTATION



U.S. ARMY CORPS OF ENGINEERS

No Date

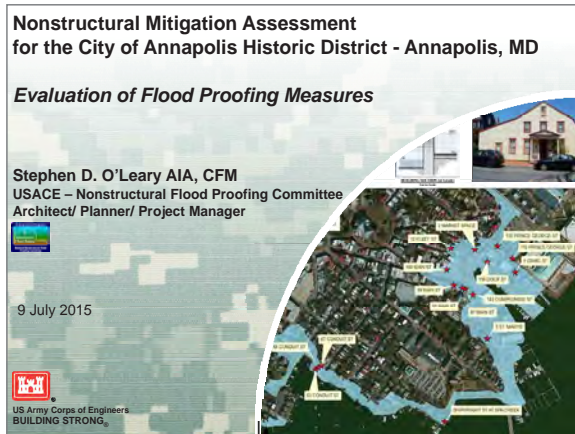
<http://www.kafm.org/downloads/Floodproofing.pdf>

Date Accessed: 23 December 2015

Nonstructural / Flood Proofing measures are permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding. Nonstructural/ Flood Proofing measures differ from Structural measures in that they focus on reducing the consequences of flooding instead of on reducing the probability of flooding. Nonstructural Flood Proofing measures include:

- Elevation
- Relocation
- Buyout / Acquisition
- Dry flood proofing
- Wet flood proofing
- Berms or floodwalls

NONSTRUCTURAL MITIGATION ASSESSMENT FOR THE CITY OF ANNAPOLIS HISTORIC DISTRICT



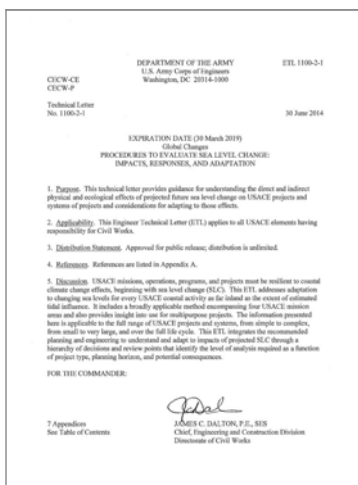
PLANNING DIVISION, U.S. ARMY CORPS OF ENGINEERS - 9 July 2015
<https://www.annapolis.gov/DocumentCenter/View/2182/US-Army-Corps-of-Engineers---Nonstructural-Mitigation-PDF>
 Date Accessed: 23 October 2019

SEA LEVEL CHANGE AND LONG RANGE WATER RESOURCES PLANNING FOR FLORIDA



MIAMI-DADE SEA LEVEL RISE TASK FORCE AND GLENN B. LANDERS - 4 April 2014
<http://www.miamidade.gov/planning/library/presentations/2014-04-04-sea-level-change-and-long-range-water-resources.pdf>
 Date Accessed: 23 October 2019

GLOBAL CHANGES, PROCEDURES TO EVALUATE SEA LEVEL CHANGE: IMPACTS, RESPONSES, AND ADAPTATION

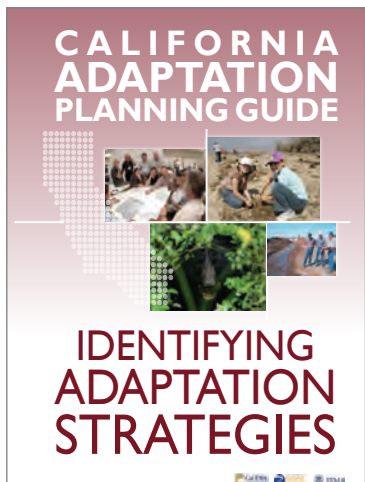


U.S. ARMY CORPS OF ENGINEERS - June 2014
http://www.publications.usace.army.mil/Portals/76/Publications/EngineerTechnicalLetters/ETL_1100-2-1.pdf
 Date Accessed: 23 October 2019

C
STATES

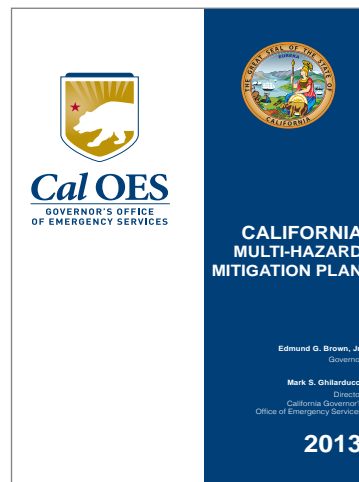
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CALIFORNIA ADAPTATION PLANNING GUIDE



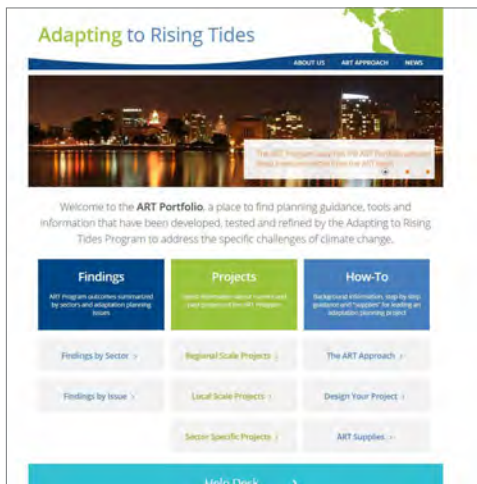
CALIFORNIA EMERGENCY MANAGEMENT AGENCY - July 2012
http://resources.ca.gov/climate/safeguarding/adaptation_policy_guide/
 Date Accessed: 24 October 2019

CALIFORNIA MULTI-HAZARD MITIGATION PLAN



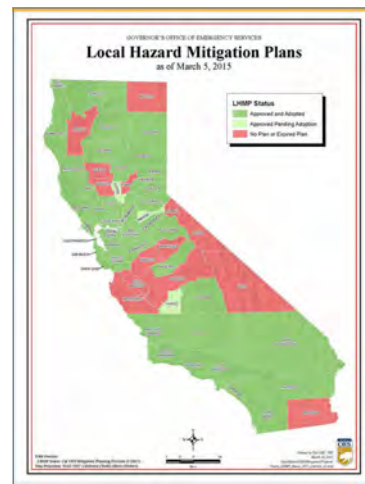
GOVERNOR'S OFFICE OF EMERGENCY SERVICES - 2013
<http://www.caloes.ca.gov/cal-oes-divisions/hazard-mitigation/hazard-mitigation-planning/state-hazard-mitigation-plan>
 Date Accessed: 3 February 2016

ADAPTING TO RISING TIDES



2016
<http://www.adaptingtorisingtides.org/>
 Date Accessed: 23 October 2019

CALIFORNIA COUNTY HAZARD MITIGATION PROGRAMS



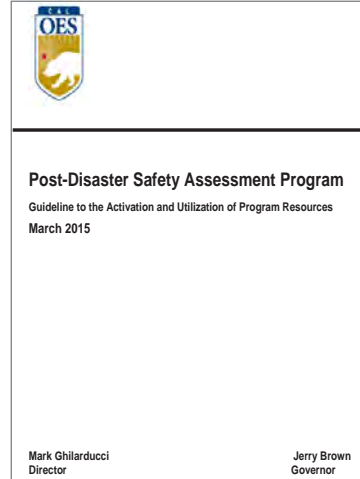
Various Dates
<http://www.caloes.ca.gov/cal-oes-divisions/hazard-mitigation/hazard-mitigation-planning/local-hazard-mitigation-program>
 Date Accessed: 23 February 2016

NATURAL FLOOD PROTECTION



SANTA CLARA VALLEY WATER DISTRICT - 2015
<https://www.valleywater.org/project-updates/safe-clean-water-and-natural-flood-protection-program>
 Date Accessed: 23 December 2019

POST-DISASTER SAFETY ASSESSMENT PROGRAM



GOVERNOR'S OFFICE OF EMERGENCY SERVICES - March 2015
<http://www.caloes.ca.gov/RecoverySite/Documents/SAP%20Guidelines.pdf>
 Date Accessed: 29 October 2019

DISASTER MITIGATION FOR HISTORIC STRUCTURES: PROTECTION STRATEGIES

This report is a joint agency effort to integrate disaster mitigation and historic preservation. It is a continuation of Disaster Planning for Florida's Historic Resources, providing guidelines for protecting historic structures from disasters.

The report provides background on the Florida Building Code and how historic structures fit within the Code's framework. The report also examines how to determine the most appropriate mitigation method for a particular structure. These mitigation methods are divided by topic, roofs, windows, doors, etc. Guidance on how to sensitively employ these methods is presented. The report makes recommendations based on historic or non-historic materials and provides additional resources for further information.



1000 FRIENDS OF FLORIDA

August 2008

<https://dos.myflorida.com/media/697182/fdem-disaster-mitigation-for-historic-structures.pdf>

Date Accessed: 24 October 2019

DISASTER PLANNING FOR FLORIDA'S HISTORIC RESOURCES - INCLUDING CASE STUDIES



1000 FRIENDS OF FLORIDA

August 2008

https://www.floridadisaster.org/globalassets/importedpdfs/disaster_planning_for_historic_resources.pdf

Date Accessed: 24 October 2019

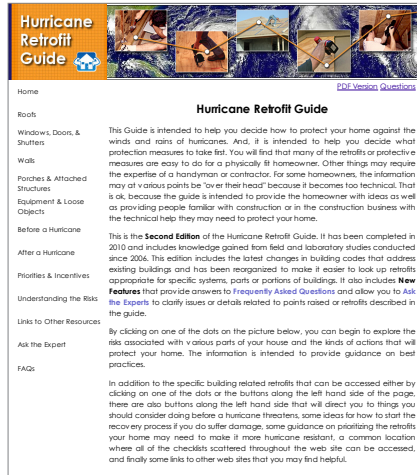
The purpose of this report is to provide guidance on integrating emergency management and historic preservation. The report first provides background information on emergency management and historic preservation individually, then describes how these fields interact. This typically happens only after a disaster has occurred and federal funding has triggered a Section 106 review.

The issues inherent in this approach to addressing historic preservation and emergency management are delineated and recommended solutions follow. These solutions include:

- Creating and updating historic resource surveys
- Developing site-specific plans
- Identifying sources of funding
- Linking preservation and disaster mitigation policy to one another

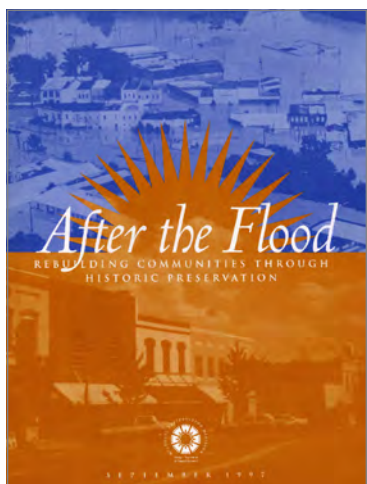
The report provides case studies from various Florida counties, detailing the unique approach taken by each county and the lessons learned.

HURRICANE RETROFIT GUIDE



DIVISION OF EMERGENCY MANAGEMENT - No Date
<http://www.floridadisaster.org/hrg/index.asp>
 Date Accessed: 14 January 2016

AFTER THE FLOOD - REBUILDING COMMUNITIES THROUGH HISTORIC PRESERVATION



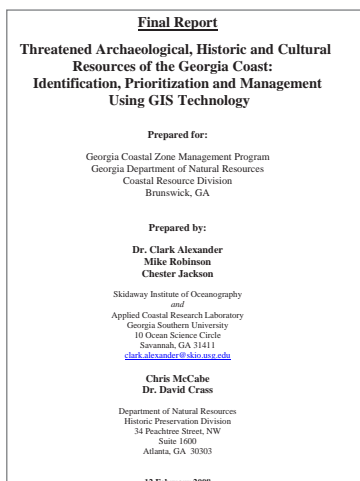
September 1997
https://georgiashpo.org/sites/default/files/hpd/pdf/financial_and_technical_assistance/AfterTheFloodTwo.pdf
 Date Access: 23 December 2019

AFTER THE FLOOD - REHABILITATING HISTORIC RESOURCES



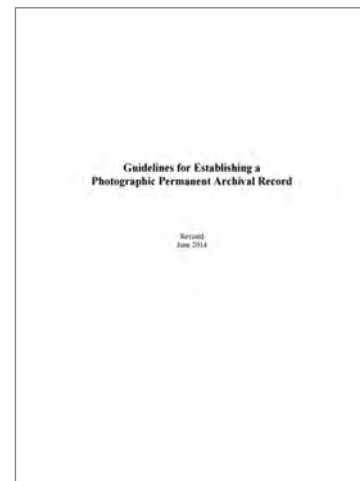
1996
https://georgiashpo.org/sites/default/files/hpd/pdf/financial_and_technical_assistance/AfterTheFloodOne.pdf
 Date Accessed: 23 December 2019

THREATENED ARCHAEOLOGICAL, HISTORIC AND CULTURAL RESOURCES OF THE GEORGIA COAST - IDENTIFICATION, PRIORITIZATION AND MANAGEMENT USING GIS TECHNOLOGY



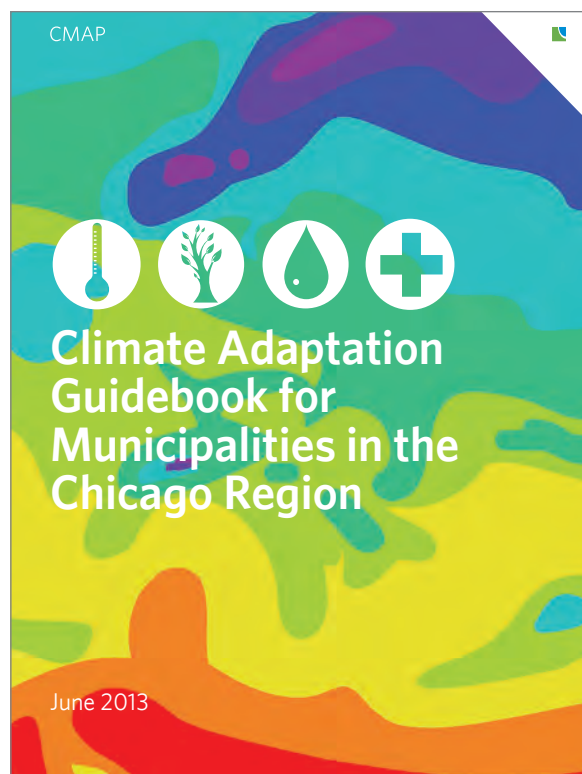
DR. CLARK ALEXANDER, MIKE ROBINSON AND CHESTER JACKSON - 12 February 2008
<https://docs.google.com/file/d/0B3jQMqDd3SpMXc4cVMbDFKekU/edit?pref=2&pli=1>
 Date Accessed: 6 January 2016

GUIDELINES FOR ESTABLISHING A PHOTOGRAPHIC PERMANENT ARCHIVAL RECORD



June 2014
https://georgiashpo.org/sites/default/files/hpd/pdf/ER_and_compliance/GuidelinesforEstablishingPAR.pdf
 Date Accessed: 23 December 2019

CLIMATE ADAPTATION GUIDEBOOK FOR MUNICIPALITIES IN THE CHICAGO REGION



June 2013

<http://www.cmap.illinois.gov/documents/10180/14136/FY13-0119%20Climate%20Adaptation%20toolkit.pdf/fa5e3867-8278-4867-841a-aad4e090847a>

Date Accessed: 23 December 2019

Targeted for municipalities, this report recommends methods for integrating climate-related measures into a community's planning. The report first stresses the importance of conducting a self-assessment. With an assessment, a municipality can move forward, prioritize issues and anticipate the impact of climate change.

Next, the report presents recommendations by area. The most relevant area to the purposes of this bibliography is "Standards for Building and Site Planning." General in nature, recommendations under this heading include:

- Requiring measures to improve building material durability
- Encouraging participation in voluntary "above-code" programs for wind/hail resistance

Overall, this report is general in nature. It is a starting point for integrating hazard and climate mitigation measures.

REPORT FOR THE URBAN FLOODING AWARENESS ACT

BRAD A. WINTERS

June 2015

http://www.dnr.illinois.gov/WaterResources/Documents/Final_UFAA_Report.pdf

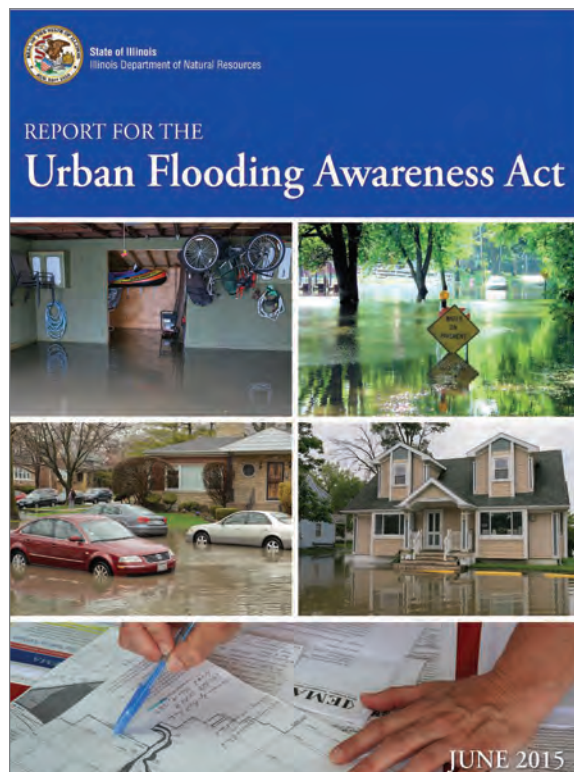
Date Accessed: 23 December 2019

This report for the Illinois General Assembly investigates the causes of urban flooding and methods for reducing urban flooding events. This type of flooding is often attributed to infrastructure that is overwhelmed by rainfall. As a result, older, more densely developed areas have a higher chance of experiencing urban floods due to increased runoff.

Thirty-three recommendations are presented in this report, including:

- Improved data collection
- Adoption of stormwater ordinances and improved stormwater management in developing areas
- Establishment of community cost-sharing mitigation programs
- Development of existing property evaluation programs for homeowners

These recommendations focus almost entirely on stormwater management and related infrastructure. Though not targeted for historic structures, the report's recommendations could reduce the frequency of flooding in historic areas.



RESILIENT NEW ORLEANS

JEFF HEBERT, ET AL

August 2015

http://resilientnola.org/wp-content/uploads/2015/08/Resilient_New_Orleans_Strategy.pdf

Date Accessed: 23 December 2019

Guided by the 100 Resilient Cities project, this report examines practices, employed at a variety of scales, related to resilience. The report looks at resilience strategies of U.S. cities and abroad. It also incorporates feedback from New Orleans' community members. The recommended measures are organized into three sections. Each section, outlined below, presents a range of strategies for addressing challenges to New Orleans.

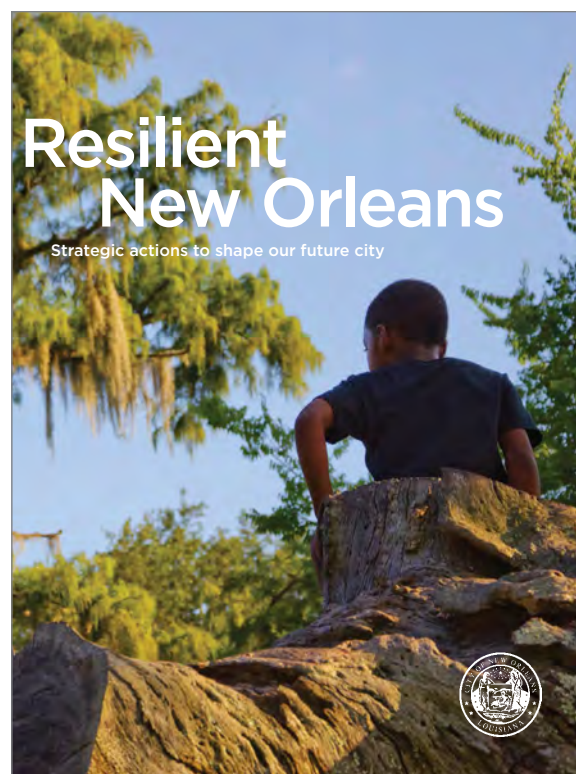
“Adapt to Thrive” advocates:

- Embracing change with wetland restoration
- Incentivizing storm retrofits for homeowners
- Implementation of the Urban Water Plan

“Connect to Opportunity” stresses the importance of equitable development across the city.

“Transform City Systems” focuses on updating:

- Operational systems
- Infrastructure



ELEVATION DESIGN GUIDELINES FOR HISTORIC BUILDINGS IN THE LOUISIANA GO ZONE



URS - 2014

<http://www.crt.state.la.us/Assets/OCD/hp/uniquely-louisiana-education/Disaster-Recovery/Final%20Elevation%20Design%20Booklet%2012-07-15%20v2.pdf>

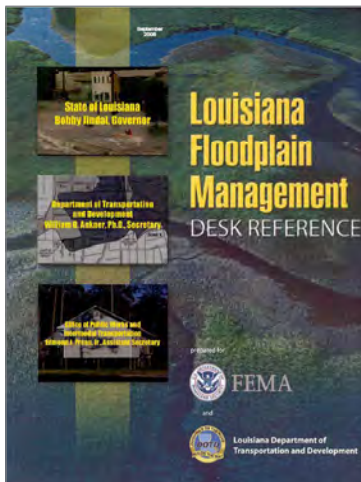
Date Accessed: 23 December 2019

These *Guidelines* are the product of a collaboration between the Louisiana Division of Historic Preservation, 37 parishes in the state of Louisiana and local stakeholders, including flood plain managers, architects, and building officials. As the report explains, these *Guidelines* are intended to be a proactive response to plans for building elevation in the face of floods and sea level rise. Geared to residential and commercial historic structures, the *Guidelines* provides information to homeowners and planning and building officials alike.

The ultimate goal of this document, as described in the “Introduction,” is to “limit the total height of elevation for historic buildings.” (5) In limiting height, the hope is to preserve not only the character of the individual structure, but its relationship to its context. The *Guidelines* intend to achieve this goal while also meeting the regulatory requirements prescribed by federal agencies such as the Federal Emergency Management Agency.

The document provides detailed guidance on a wide range of considerations, including: methods for elevation, site design, accessibility, design considerations, and foundation design.

LOUISIANA FLOODPLAIN MANAGEMENT DESK REFERENCE

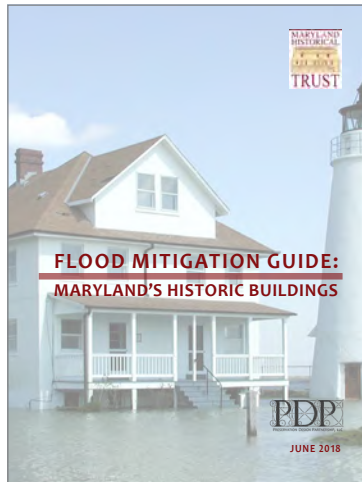


LOUISIANA DEPARTMENT OF TRANSPORTATION AND
DEVELOPMENT - September 2008

http://www8.dotd.la.gov/lafloods/documents/2008_Desk_Ref.pdf

Date Accessed: 23 December 2019

FLOOD MITIGATION GUIDE: MARYLAND'S HISTORIC BUILDINGS



DOMINIQUE M. HAWKINS, FAIA - June 2018
<https://mht.maryland.gov/weatherit.shtml>
 Date Accessed: 23 December 2019

FELLS POINT FLOOD MITIGATION GUIDELINES



DOMINIQUE M. HAWKINS, FAIA - December 2018
https://chap.baltimorecity.gov/sites/default/files/2018-12_FellsPointFlood_FINAL.PDF
 Date Accessed: 23 December 2019

STANDARDS AND GUIDELINES FOR ARCHITECTURAL AND HISTORICAL INVESTIGATIONS IN MARYLAND

Standards and Guidelines for Architectural and Historical Investigations in Maryland



MARYLAND HISTORICAL TRUST
 Maryland Department of Planning

MARYLAND DEPARTMENT OF PLANNING AND MARYLAND HISTORICAL TRUST

2000

http://mht.maryland.gov/documents/PDF/research/Survey_standards_architecture_web.pdf

Date Accessed: 23 December 2019

Geared toward preservation professionals, this guide centralizes information relevant to architectural and historical investigations. Its purpose is to provide comprehensive guidance on conducting work that meets standards as determined by the Maryland Historical Trust.

The guide details the training required by individuals who will undertake projects as well as state and federal channels for funding. It is an excellent resource for preparing projects - such as preservation surveys, compliance reports and nominations for Maryland's Inventory of Historic Properties - that meet the state's standards. These standards address content, graphic representation and organization of the final product.

For additional information, the guide also provides resources for general reference.

LOW-IMPACT DEVELOPMENT DESIGN STRATEGIES: AN INTEGRATED DESIGN APPROACH



ENVIRONMENTAL PROTECTION AGENCY/MARYLAND

June 1999

<https://www.princegeorgescountymd.gov/DocumentCenter/View/86/Low-Impact-Development-Design-Strategies-PDF?bidId=>

Date Accessed: 23 December 2019

Low impact development (LID) is an approach to storm water control that strives to mimic natural hydrology as part of the development process. Recommendations include:

- The maintenance of natural drainage courses, resources, and ecosystems
- Dispersing storm water throughout the landscape and controlling storage and runoff to match pre-development conditions
- Minimizing or reducing impervious surface coverage, as well as dependence on storm water drains, structures, and ponds

The strategies are geared toward individual properties as well as larger communities and their management of storm water through mechanisms that include restricting development through zoning, storm water infrastructure construction and maintenance, and roadway specifications.

AN ASSESSMENT OF MARYLAND'S VULNERABILITY TO FLOOD DAMAGE

JOHN M. JOYCE AND MICHAEL S. SCOTT

August 2005

https://www.researchgate.net/publication/237388828_An_Assessment_Of_Maryland's_Vulnerability_To_Flood_Damage

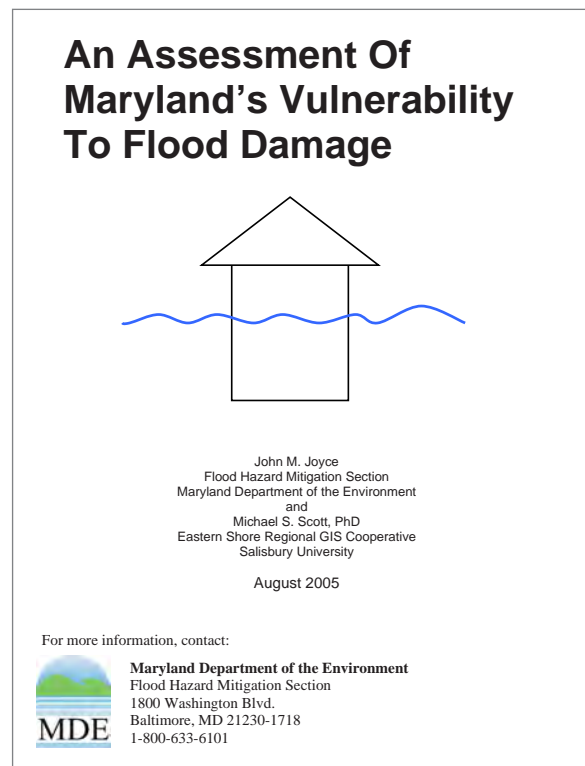
Date Accessed: 23 December 2019

This report provides an in-depth overview of flooding in the state of Maryland. It provides a history of flooding as well as the level of threat in the state, estimating that over 68,000 structures in Maryland are on a floodplain, at an assessed value of \$8 billion.

After presenting extensive flood estimates, the report turns to mitigation strategies. It summarizes the requirements for the National Flood Insurance Program followed by discussion of other strategies used in Maryland. These strategies include, but are not limited, to:

- Maryland Model Floodplain Management Ordinance
- Floodplain Management Database and Repetitive Loss Project
- Mapping efforts in the state

The report wraps up with a list of recommendations - a takeaway for state policymakers. This list emphasizes coordination between agencies, implementation of a statewide "No Adverse Impact" policy and utilization of local planning efforts, tax incentives, and grants in order to encourage action.



COME HIGH WATER; SEA LEVEL RISE AND CHESAPEAKE BAY. A SPECIAL REPORT FROM CHESAPEAKE QUARTERLY AND BAY JOURNAL

VARIOUS

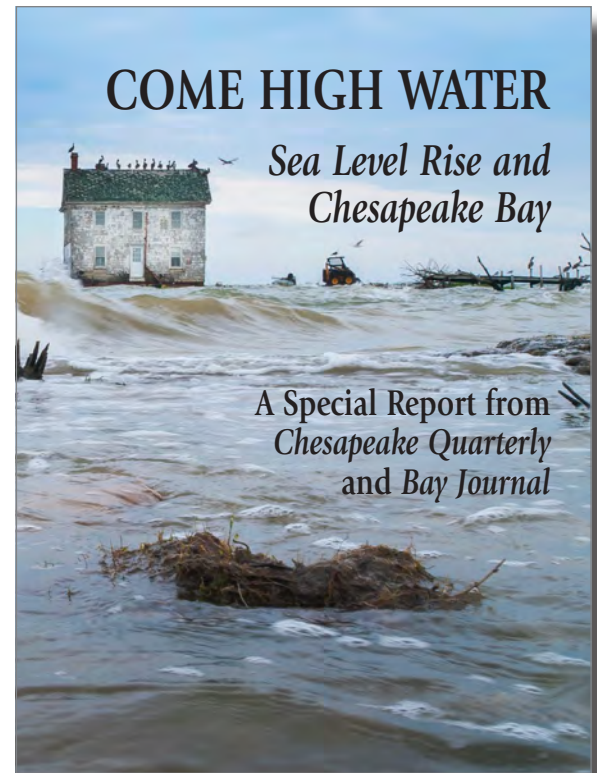
June 2015

<http://www.mdsg.umd.edu/sites/default/files/files/Come%20High%20Water-Report-2015.pdf>

Date Accessed: 23 December 2019

Come High Water is an anthology of articles by contributors to the *Chesapeake Quarterly* and the *Bay Journal*. Both of these publications collaborated to produce this collection of articles on sea level rise and the Bay. Each article zeroes in on a distinct challenge and is grouped together by theme: the causes of, the costs of and the response to sea level rise. These articles cover a wide array of topics within these themes, from the effects of the Gulf Stream on the Bay, to the impact of storm surge on the City of Baltimore and to local response efforts on Smith Island.

While this collection of articles lacks any concluding remarks, the intent is to demonstrate that sea level rise will effect communities as well as wildlife. The articles attempt to illustrate for a wide audience the reality, as well as the unpredictability, of sea level rise.



WINDS OF CHANGE; OFFSHORE WIND AND OCEAN PLANNING

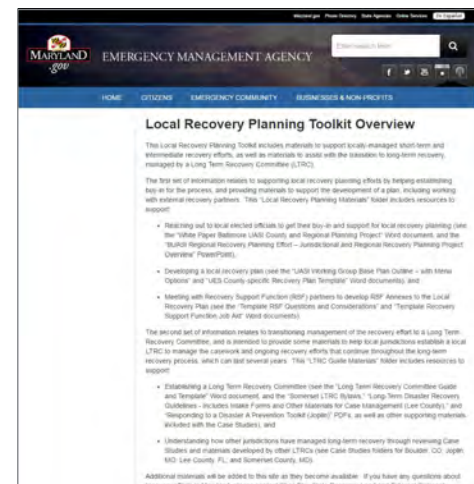


CHRIS CORTINA, ET. AL. - Fall 2010

https://dnr.maryland.gov/ccs/Publication/articles_wcfall2010.pdf

Date Accessed: 23 December 2019

LOCAL RECOVERY PLANNING TOOLKIT OVERVIEW



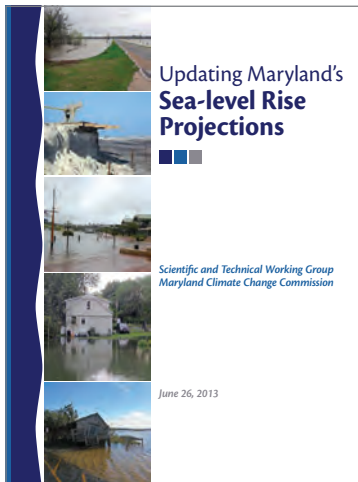
MARYLAND EMERGENCY MANAGEMENT AGENCY - No Date

<http://mema.maryland.gov/Pages/Local-Recovery-Planning-Toolkit.aspx>

Date Accessed: 23 December 2019

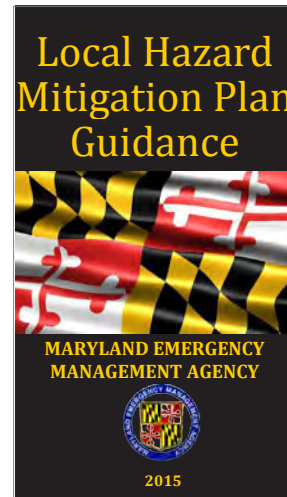


UPDATING MARYLAND'S SEA-LEVEL RISE PROJECTIONS. SPECIAL REPORT OF THE SCIENTIFIC AND TECHNICAL WORKING GROUP TO THE MARYLAND CLIMATE CHANGE COMMISSION



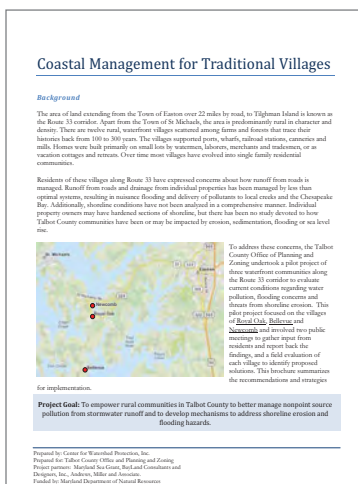
D. F. BOSCH, ET AL - 2013
http://climatechange.maryland.gov/wp-content/uploads/sites/16/2014/12/ian_report_4131.pdf
 Date Accessed: 23 December 2019

LOCAL HAZARD MITIGATION PLAN GUIDANCE



MARYLAND EMERGENCY MANAGEMENT AGENCY - 2015
<http://mema.maryland.gov/community/Pages/Mitigation.aspx>
 Date Accessed: 23 December 2019

COASTAL MANAGEMENT FOR TRADITIONAL VILLAGES



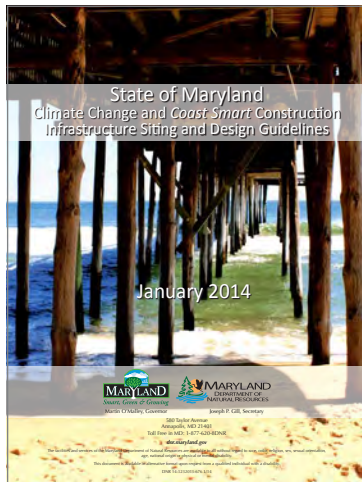
CENTER FOR WATERSHED PROTECTION, INC. - 21 July 2016
http://dnr.maryland.gov/ccs/Publication/Talbot_CMTV.pdf
 Date Accessed: 23 December 2019

CITY OF BALTIMORE DISASTER PREPAREDNESS AND PLANNING PROJECT (DP3)



CITY OF BALTIMORE - October 2013
<http://www.baltimoresustainability.org/wp-content/uploads/2015/12/Executivesummary.pdf>
 Date Accessed: 23 December 2019

CLIMATE CHANGE AND COAST SMART CONSTRUCTION: INFRASTRUCTURE SITING AND DESIGN GUIDELINES. SPECIAL REPORT OF THE ADAPTATION RESPONSE WORKING GROUP OF THE MARYLAND COMMISSION ON CLIMATE CHANGE



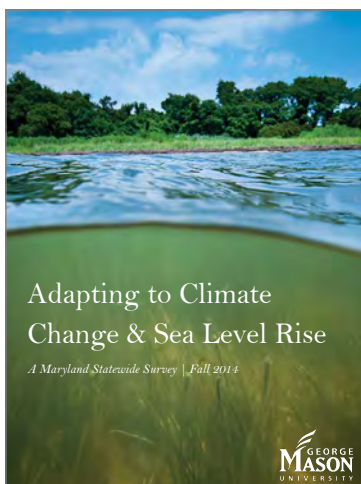
Zoë P. Johnson - January 2014
http://climatechange.maryland.gov/wp-content/uploads/sites/16/2014/12/climate_change_and_coast_smart_final_report1.pdf
 Date Accessed: 23 December 2019

ON A COLLISION COURSE WITH SEA LEVEL RISE: HELPING MARYLAND COMMUNITIES BECOME COAST-SMART



GWEN SHAUGHNESSY - April 2010
https://dnr.maryland.gov/ccs/Publication/Collision_GS.pdf
 Date Accessed: 23 December 2019

ADAPTING TO CLIMATE CHANGE & SEA LEVEL RISE: A MARYLAND STATEWIDE SURVEY



K. AKERLOF AND E.W. MAIBACH - 2014
http://climatechange.maryland.gov/wp-content/uploads/sites/16/2014/12/sea_level_rise_and_adaptation_20141.pdf
 Date Accessed: 23 December 2019

MARYLAND BUILDS RESILIENCE TO CLIMATE CHANGE THROUGH COASTSMART COMMUNITIES



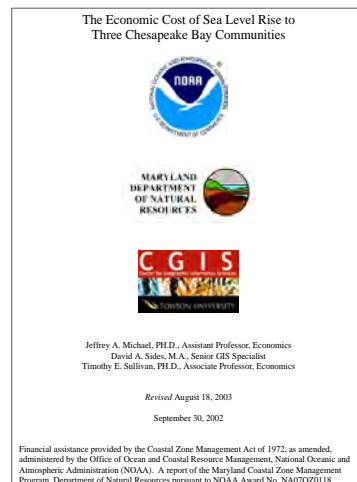
July 2011
<http://dnr.maryland.gov/ccs/Publication/czmnewsjul11.pdf>
 Date Accessed: 23 December 2019

MERGING BLUE AND GREEN INFRASTRUCTURE IN MARYLAND



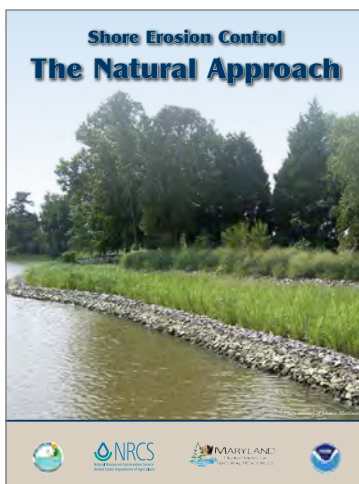
Sept/Oct 2010
http://dnr.maryland.gov/ccs/Publication/articles_mbgj09102010.pdf
 Date Accessed: 23 December 2019

THE ECONOMIC COST OF SEA LEVEL RISE TO THREE CHESAPEAKE BAY COMMUNITIES



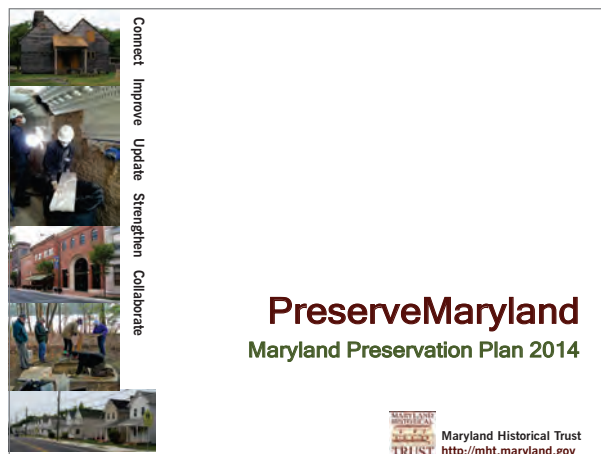
MICHAEL A. JEFFREY, DAVID A. SIDES AND TIMOTHY E. SULLIVAN - July 2004
http://dnr.maryland.gov/ccs/Publication/2003ec_SeaLevelRise.pdf
 Date Accessed: 23 December 2019

SHORE EROSION CONTROL THE NATURAL APPROACH



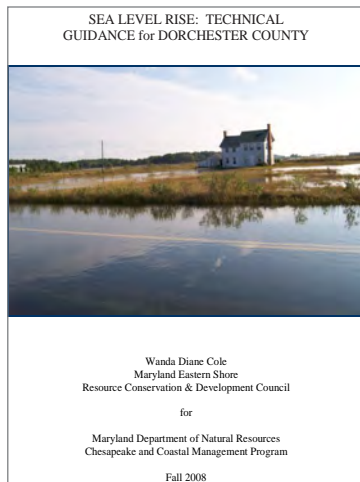
2007
http://dnr.maryland.gov/ccs/Publication/SE_Natural_Approach_2007.pdf
 Date Accessed: 23 December 2019

PRESERVE MARYLAND: MARYLAND PRESERVATION PLAN 2014



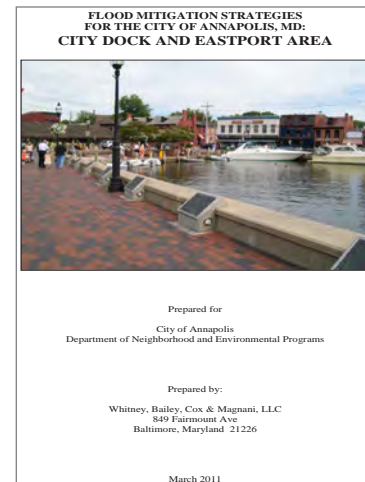
2014
https://mht.maryland.gov/documents/PDF/PreserveMaryland_plan2014.pdf
 Date Accessed: 23 December 2019

SEA LEVEL RISE: TECHNICAL GUIDANCE FOR DORCHESTER COUNTY



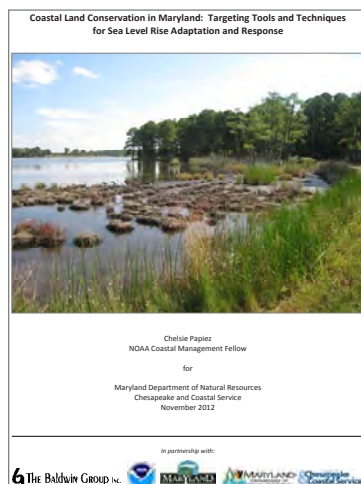
WANDA DIANE COLE
http://dnr.maryland.gov/ccs/Publication/SeaLevel_Dorchester.pdf
 Date Accessed: 23 December 2019

FLOOD MITIGATION STRATEGIES FOR THE CITY OF ANNAPOLIS, MD: CITY DOCK AND EASTPORT AREA



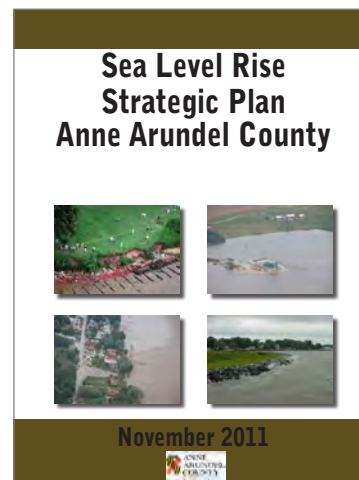
WHITNEY, BAILEY, COX & MAGNANI, LLC - March 2011
<https://www.annapolis.gov/DocumentCenter/View/5953/SEA-RISE-STUDY-Report-City-Dock-Revised-12-05-12>
 Date Accessed: 23 December 2019

COASTAL LAND CONSERVATION IN MARYLAND: TARGETING TOOLS AND TECHNIQUES FOR SEA LEVEL RISE ADAPTATION AND RESPONSE



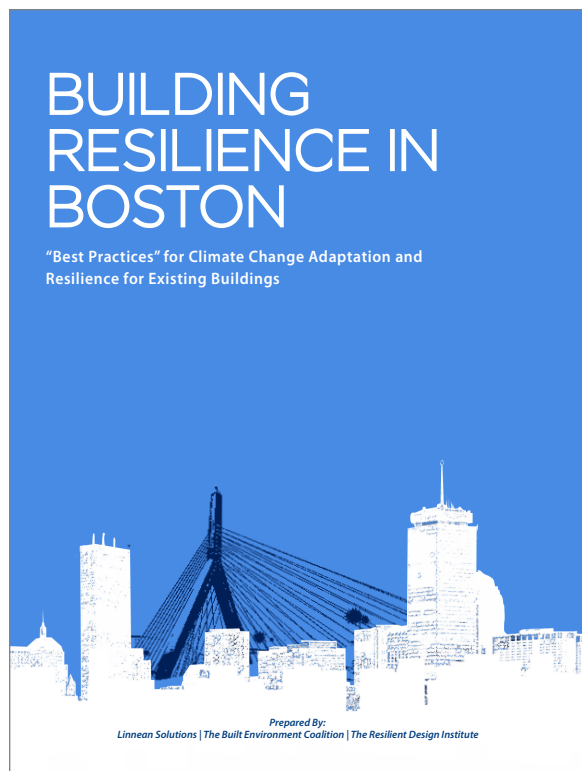
CHELSIE PAPIEZ - November 2012
http://dnr.maryland.gov/ccs/Publication/coastalland_conserv_md.pdf
 Date Accessed: 23 December 2019

SEA LEVEL RISE STRATEGIC PLAN ANNE ARUNDEL COUNTY



ANNE ARUNDEL COUNTY OFFICE OF PLANNING AND ZONING - November 2011
http://dnr.maryland.gov/ccs/Publication/AASLRStrategicPlan_final.pdf
 Date Accessed: 23 December 2019

BUILDING RESILIENCE IN BOSTON



JIM NEWMAN, ET AL

July 2013

http://www.cityofboston.gov/images_documents/Building_Resilience_in_Boston_FINAL_tcm3-40185.pdf

Date Accessed: 23 December 2019

This report is geared toward property owners and policy-makers and provides an overview of relevant initiatives, policies, reports, and findings related to preparing existing buildings for the impacts of climate change.

As a response to extensive mapping related to flooding and other climactic events, the report examines other resilience studies for guidance - from Post-Sandy Recovery to the Federal Emergency Management Agency publications. Strategies pulled from these reports are then listed by area, such as "Site" and "Building systems."

The report concludes by reiterating the importance of retrofitting existing buildings to improve resilience not only for preserving the built fabric but for preserving life. Its suggested next steps include activating community organizations to identify vulnerabilities and to initiate steps toward resiliency.

PREPARING FOR THE RISING TIDE

ELLEN DOUGLAS

February 2013

http://www.cityofboston.gov/images_documents/preparing_for_the_rising_tide_final_tcm3-40186.pdf

Date Accessed: 23 December 2019

This is a report for property owners, policy-makers, and planners. In addition to outlining how climate change-related coastal flooding will impact Boston, the report provides an assessment of Boston's vulnerability to flooding and an overview of the city's 2012 preparedness plan.

The city's vulnerability is calculated using parcel data and three different flood scenarios. The data analysis and assessment includes special consideration for historic districts "because they represent areas of irreplaceable cultural value [...]" (26)

The report outlines strategies for adapting to climate change as well as two Massachusetts-based case studies. These case studies examine how to develop and deploy strategies. Here the report emphasizes that any plan must have a time component, wherein strategies are implemented over many decades if needed. These are described as "time-phased strategies."

In addition to cooperative efforts, the report concludes by emphasizing that a strategy implemented over time is the most effective method for adapting to climate change.



BOSTON RESILIENT, HISTORIC BUILDINGS DESIGN GUIDE



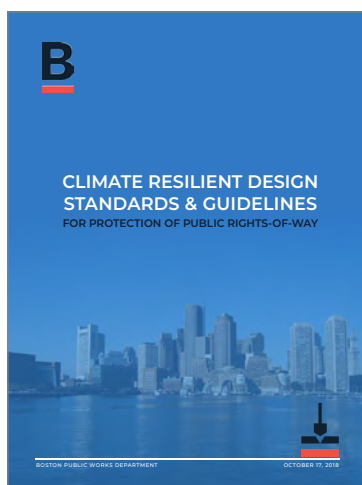
BOSTON ENVIRONMENTAL DEPARTMENT - August 2018
https://www.boston.gov/sites/default/files/imce-uploads/2018-10/resilient_historic_design_guide_updated.pdf
 Date Accessed: 23 October 2019

COASTAL FLOOD RESILIENCE DESIGN GUIDELINES



BOSTON PLANNING AND DEVELOPEMNT AGENCY - Draft
 September 2019
<http://www.bostonplans.org/getattachment/d1114318-1b95-487c-bc36-682f8594e8b2>
 Date Accessed: 23 October 2019

CLIMATE RESILIENT DESIGN STANDARDS & GUIDELINES FOR PROTECTION OF PUBLIC RIGHTS-OF-WAY



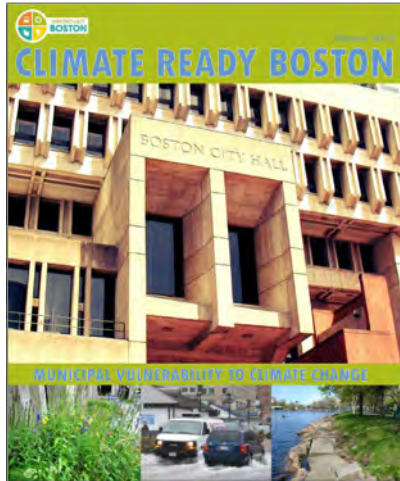
WESTON & SAMPSON - October 17, 2018
https://www.boston.gov/sites/default/files/imce-uploads/2018-10/climate_resilient_design_standards_and_guidelines_for_protection_of_public_rights-of-way_no_appendices.pdf - Date Accessed: 23 October 2019

GREENOVATE BOSTON 2014 CLIMATE ACTION PLAN UPDATE



2014
http://www.cityofboston.gov/eos/pdfs/Greenovate%20Boston%202014%20CAP%20Update_Full.pdf
 Date Accessed: 23 December 2019

CLIMATE READY BOSTON



CLIMATE PREPAREDNESS TASK FORCE - October 2013
http://issuu.com/ees_boston/docs/final_report_29oct13
 Date Accessed: 23 December 2019

COMMONWEALTH OF MASSACHUSETTS STATE HAZARD MITIGATION PLAN



October 2010
<http://northeastoceancouncil.org/wp-content/uploads/2012/10/MA-Hazard-Mitigation-Plan-2010.pdf>
 Date Accessed: 23 December 2019

MASSACHUSETTS CLIMATE CHANGE ADAPTATION REPORT

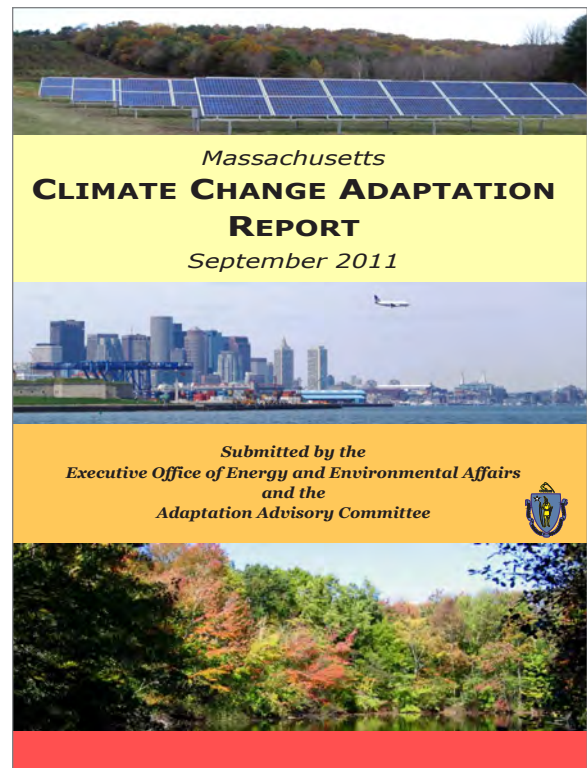
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
 AND THE ADAPTATION ADVISORY COMMITTEE
 September 2011
<http://www.mass.gov/eea/docs/eea/energy/cqa/eea-climate-adaptation-report.pdf>
 Date Accessed: 23 December 2019

The first half of this two-part report details the predicted impact of climate change on the state. It reviews broad strategies for adapting and mitigating these impacts which are meant to be implemented by institutions and agencies across fields. A few examples of these strategies are:

- Combining mitigation and adaptation strategies
- Identifying and filling critical information gaps
- Improving planning and land use practices

The organization of the second half of this report is similar to that of follows a similar organization found in the first half. Here, the focus is not on the state and agencies, but on five different areas. These areas include “local economy and government” and “coastal zone and oceans” and detail related vulnerabilities and strategies.

The report concludes by encouraging action instead of reaction while also acknowledging that while some strategies are new, many result from the evolution of programs and policies.



THINKING ABOUT THE UNTHINKABLE - A DISASTER PLAN FOR HISTORIC PROPERTIES IN MINNESOTA

CLAYBAUGH PRESERVATION ARCHITECTURE, INC.

September 1999

<http://www.mnhs.org/shpo/disaster/toc.php>

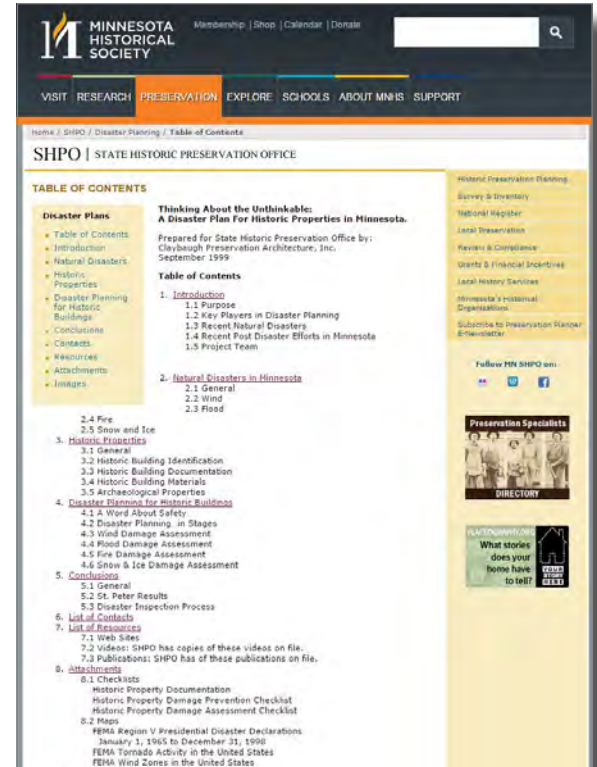
Date Accessed: 23 December 2019

This guide, published by the Minnesota Historical Society, is geared toward owners of historic properties, local governments, and disaster management professionals. Its purpose is to provide information on preparing historic structures for disasters and implementing recovery measures after such an event.

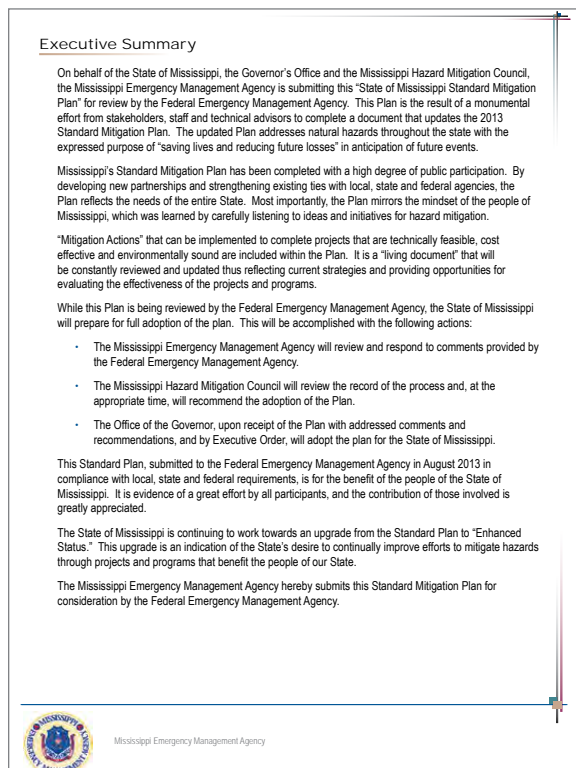
It provides a list of actions property owners and other community members can take to mitigate the effect of disasters. In the case of post-disaster recovery, the guide also gives instructions on how to assess and address damage.

Based on the nature of the disaster, the guide provides “Before,” “During,” and “After” guidance. In the case of flooding, the guide’s “Before” checklist loosely describes raising ventilation equipment and ensuring that the same equipment can be drained. During a flood, the guide instructs readers to secure windows and doors. After a flood, the guide addresses documenting damage and salvaging materials.

Overall, the guide provides a fair introduction to hazard mitigation for historic structures. It serves as a good introduction to the issue, yet, due to its general nature, it leaves many questions unanswered.



STATE HAZARD MITIGATION PLAN



MISSISSIPPI EMERGENCY MANAGEMENT AGENCY

August 2013

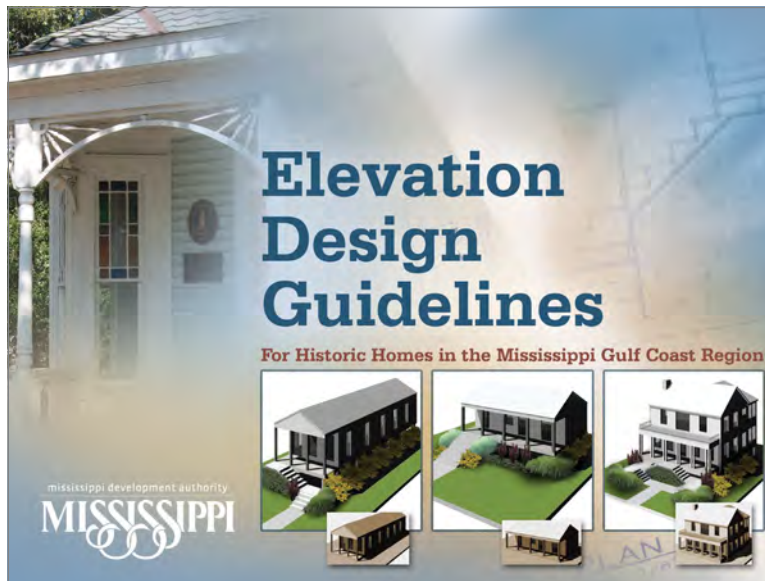
<http://www.msema.org/wp-content/uploads/2012/06/State-Hazard-Mitigation-Plan-2013.pdf>

Date Accessed: 23 December 2019

This document is an update to Mississippi’s Standard Mitigation Plan and includes input from community members. The plan also demonstrates the state’s pursuit of FEMA-approved enhanced hazard mitigation plans, which would grant the state additional FEMA funds. To achieve enhanced status, the plan must demonstrate comprehensive hazard mitigation as well as the ability to manage these funds.

In addition to detailing mitigation measures for a variety of risks - including flood - the plan also details how the state produced this document, which included oversight from the Hazard Mitigation Council. While this mitigation plan has a lot in common with other state plans, it is instructive with regard to the process of developing and improving on such plans.

ELEVATION DESIGN GUIDELINES: FOR HISTORIC HOMES IN THE MISSISSIPPI GULF COAST REGION



In the aftermath of Hurricane Katrina, this document was developed to provide guidance for the elevation of historic buildings in order to reduce damage from potential future flooding. Property owners are encouraged to protect the historic character of buildings and districts when elevating their homes. The guidance includes recommendations related to sites, buildings, and foundations. Diagrams of prevalent historic building types illustrate the potential impact of raising buildings 5-, 10-, and 15-feet above grade and associated mitigation strategies.

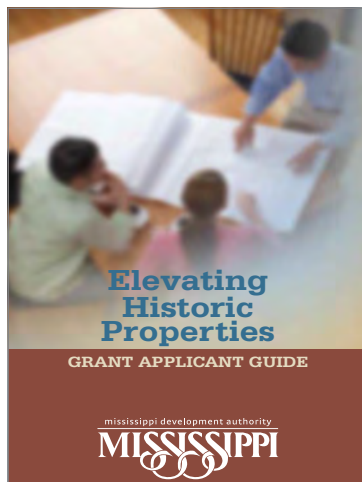
URS

2008

http://www.nj.gov/dep/hpo/hrrcn_sandy_pdf%20files/mississippi.pdf

Date Accessed: 23 December 2019

ELEVATING HISTORIC PROPERTIES GRANT APPLICATION GUIDE



URS - No Date

http://www.msdisasterrecovery.com/documents/historic_prop_grant_app.pdf

Date Accessed: 4 March 2016

STEMMING THE TIDE OF FLOOD LOSSES - STORIES OF SUCCESS FROM THE HISTORY OF MISSOURI'S FLOOD MITIGATION PROGRAM

MISSOURI STATE EMERGENCY MANAGEMENT AGENCY

No Date

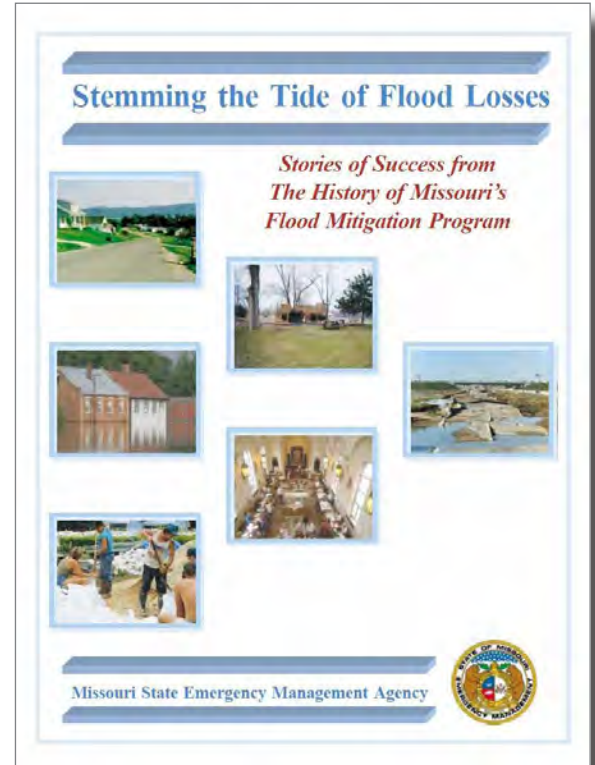
<http://sema.dps.mo.gov/docs/publications/stemming.pdf>

Date Accessed: 23 December 2019

This report details administration and processes of a hazard mitigation program of the Missouri State Emergency Management Agency following major flooding in 1993. The Agency determined that the best course of action would be state acquisition of damaged, residential properties. These damaged homes were demolished and the open land that resulted was dedicated to public use. This Acquisition program is known as the Missouri Community Buyout Program.

The report details the evolution of the Program's procedures and elaborates on its policies, including that participation had to be voluntary and that nothing could be built on vacated land, except for structures related to open, public use.

The report provides case studies from many communities on the impact of the Missouri Community Buyout Program. It does not detail any other mitigation measures. It is ultimately an overview of how the program was executed. The very success of the program is determined by the program itself.



NEW JERSEY STATE HAZARD MITIGATION PLAN



OFFICE OF EMERGENCY MANAGEMENT / MICHAEL BAKER INTERNATIONAL

January 25, 2019

<https://www.state.nj.us/njoem/mitigation/2019-mitigation-plan.shtml>

Date Accessed: 23 October 2019

The State Hazard Mitigation Plan (HMP) is the cornerstone to reducing New Jersey's vulnerability to disasters. It is the State's commitment to reducing risks from hazards and serves as a guide for State decision makers as they commit resources to reducing the effects of hazards. Hazard mitigation distinguishes actions that have a long-term impact from those that are more closely associated with pre-disaster preparedness, response to an event, and recovery from an incident. Hazard mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage, reconstruction, and repeated damage.

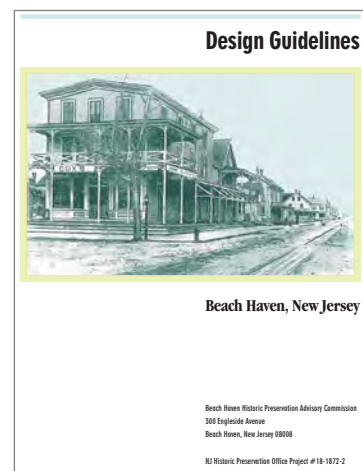
The State HMP 2019 update captures historic disaster experiences and presents the hazards New Jersey faces based on current science and research. The Plan has been prepared to outline a strategy to reduce risks from hazards and serve as the basis for prioritizing future project funding. The Plan has been thoughtfully prepared, administratively adopted, and approved by FEMA, enabling state and local governments to apply for and participate in the various FEMA-funded mitigation programs.

ELEVATION DESIGN GUIDELINES FOR HISTORIC PROPERTIES



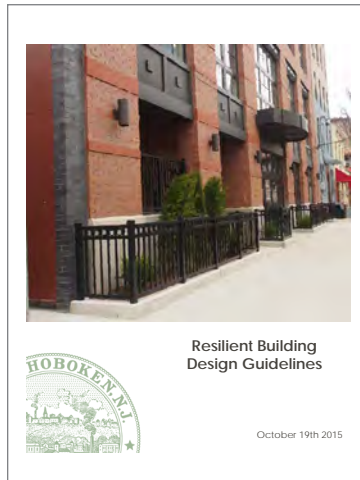
DOMINIQUE M. HAWKINS, FAIA - December 2019

DESIGN GUIDELINES: BEACH HAVEN, NEW JERSEY



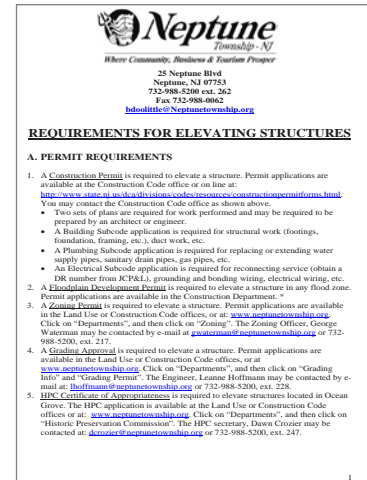
WESTFIELD ARCHITECTS & PRESERVATION CONSULTANTS-
April 2019

RESILIENT BUILDING DESIGN GUIDELINES



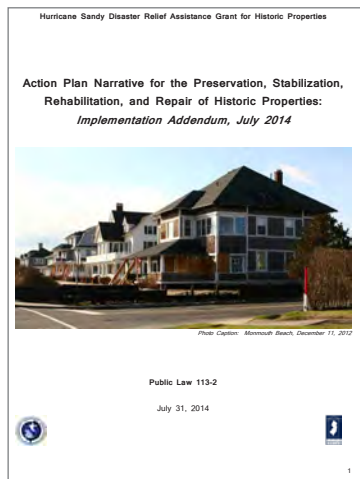
HOBOKEN, NJ - October 19, 2015
<http://betterwaterfront.org/wp-content/uploads/2016/05/Resilient-Buildings-Design-Guidelines.pdf>
 Date Accessed: 23 October 2019

REQUIREMENTS FOR ELEVATING STRUCTURES



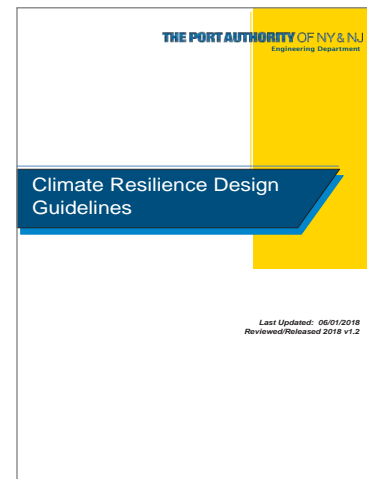
NEPTUNE, NJ TOWNSHIP - No Date
<http://www.neptunetownship.org/sites/default/files/documents/Construction/ELEVATING%20STRUCTURES%20-%20Requirements.pdf>
 Date Accessed: 23 October 2019

ACTION PLAN NARRATIVE FOR THE PRESERVATION, STABILIZATION, REHABILITATION, AND REPAIR OF HISTORIC PROPERTIES: IMPLEMENTATION ADDENDUM



STATE OF NEW JERSEY - July 2014
http://www.nj.gov/dep/hpo/Index_HomePage_images_links/Hurricane%20Sandy/01-Action%20Plan%20ADDENDUM_2014-07-31_final.pdf
 Date Accessed: 23 October 2019

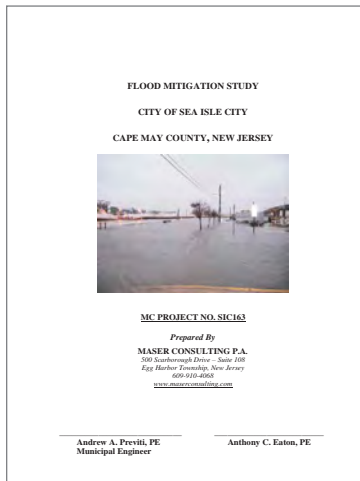
CLIMATE RESILIENCE DESIGN GUIDELINES



THE PORT AUTHORITY OF NY & NJ - June 1, 2018
<https://www.panynj.gov/business-opportunities/pdf/discipline-guidelines/climate-resilience.pdf>
 Date Accessed: 23 October 2019

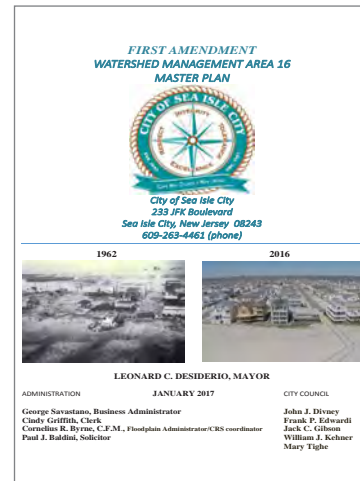


FLOOD MITIGATION STUDY: CITY OF SEA ISLE CITY, CAPE MAY COUNTY, NEW JERSEY



MASER CONSULTING P.A. - 2018
<http://seaislecitynj.us/LinkClick.aspx?fileticket=-Tt8slVzH7Y%3d&tabid=2389>
 Date Accessed: 23 October 2019

FIRST AMENDMENT: WATERSHED MANAGEMENT AREA 16 MASTER PLAN



CITY OF SEA ISLE CITY, NJ - January 2017
<http://seaislecitynj.us/LinkClick.aspx?fileticket=iiPjplAc5o=&tabid=2415&mid=7733>
 Date Accessed: 23 October 2019

SUSTAINED SURVIVAL

STEPHANIE L. CHERRY-FARMER

March 2013
http://gardenstatelegacy.com/files/Sustained_Survival_Cherry-Farmer_GSL19.pdf
 Date Accessed: 23 October 2019

As of the date of Cherry-Farmer's article, the response to the impact of Hurricane Sandy was in a state of flux and the preservation community in NJ could not yet predict how the response would impact historic resources. The full effect of Sandy on these resources was also not yet fully understood and will likely never be grasped. As Cherry-Farmer explains, it is difficult to get a true tally of the extent of damage to listed and eligible-for-listing sites.

The article describes the NJ Historic Preservation Office's response to Sandy, primarily by surveying neighborhoods. The lack of a pre-Sandy survey is the primary obstacle, as described here, to understanding Sandy-related damage. The article then summarizes the Section 106 process that will accompany federally-subsidized recovery projects. It also addresses elevating structures, citing the Mississippi Elevation Design Guidelines as the "Gold Standard," while also acknowledging that these guidelines are not easily applied to NJ's built fabric.

The article concludes that final decisions for recovery rest with property owners and calls for updated planning efforts to guide these decisions.



RETROFITTING BUILDINGS FOR FLOOD RISK

CARL WEISBROD

October 2014

<https://www.slideshare.net/LaraMoockLEEDGreenAs/retrofitting-buildings-for-flood-risk>

Date Accessed: 23 December 2019

Retrofitting Buildings for Flood Risk is a guide for the public to navigating post-Sandy policies in an effort to improve community resiliency throughout New York City's boroughs. New floodmaps, building codes and insurance programs can be difficult to maneuver. This report is an attempt to illustrate what methods for retrofitting buildings satisfy these updated regulations. The profiled methods are specific to New York City and its typical building typologies (tenements, apartment buildings, rowhouses, etc.).

In addition to a glossary for the general public, the report provides a profile of building types, linked to the city's geography and provides in-depth information for an individual to independently determine the most appropriate method for retrofitting their home.

A series of case studies demonstrate how these retrofitting measures have been applied.



ALL HANDS ON DECK - MOBILIZING NEW YORKERS FOR A LIVABLE AND RESILIENT CITY



THE MUNICIPAL ARTS SOCIETY OF NEW YORK

December 2013

<https://assets.rockefellerfoundation.org/app/uploads/20131201174244/All-Hands-on-Deck.pdf>

Date Accessed: 23 December 2019

The Municipal Arts Society (MAS), an organization focused on civic engagement and invested in improvement of New York City as well as preservation of its character, published this strategy in response to Hurricane Sandy. It is an effort to advocate for the goals of the MAS. The report emphasizes collaboration and transparency across the four themes addressed:

- Using local funding along with a hybrid of local and international strategies
- Improving neighborhood adaptability
- Strengthening existing infrastructure with design
- Authoring legislation that will encourage hazard mitigation in future plans

Each chapter details related priorities and recommendations, developed through extensive community dialogue. The report concludes by acknowledging that, despite the recommendations presented here, a city's resilience strategy should constantly evolve.

NYC'S RISK LANDSCAPE: A GUIDE TO HAZARD MITIGATION



NYC EMERGENCY MANAGEMENT

November 2014

http://www1.nyc.gov/assets/em/downloads/pdf/hazard_mitigation/nycs_risk_landscape_a_guide_to_hazard_mitigation_final.pdf

Date Accessed: 23 December 2019

This guide is geared toward the broader population of New York City. It is an attempt to clearly illustrate hazards faced by the city and to provide methods for mitigating hazard risks. The hazards discussed include flooding, strong windstorms, and winter weather. In addition to chapters that provide an overview and reasons for producing the report, the three key chapters are:

- An introduction to New York City's risk landscape
- Selected hazards and risk management strategies
- Behind the scenes: our risk management process and what lies ahead

The focus is not on responding to disasters but preparing for disasters.

The guide also makes clear that hazard mitigation methods constantly evolve and that the guide itself will require periodic updates.

ONE NEW YORK: THE PLAN FOR A STRONG AND JUST CITY

ONENYC

April 2015

<http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf>

Date Accessed: 23 December 2019

OneNY is an initiative from the City of New York to articulate challenges faced by the city and propose a plan for addressing those challenges. This plan is organized around four principles: economic growth, equity, sustainability, and resiliency.

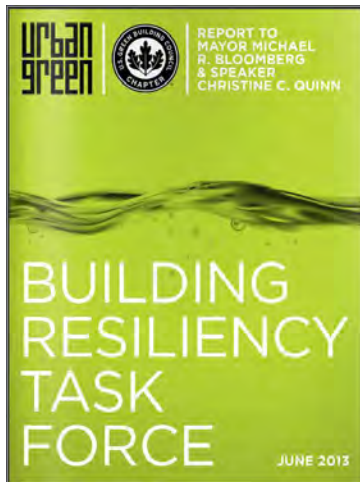
The plan's chapter on resiliency calls for improved disaster mitigation measures for New York City's buildings, neighborhoods, and coastline and proposes several initiatives, including:

- Upgrading public and private city buildings
- Adopting policies to support building upgrades
- Working to reform FEMA's National Flood Insurance Program (NFIP)

These initiatives focus on both small scale goals that apply to individuals and changes that can occur at the scale of the city.

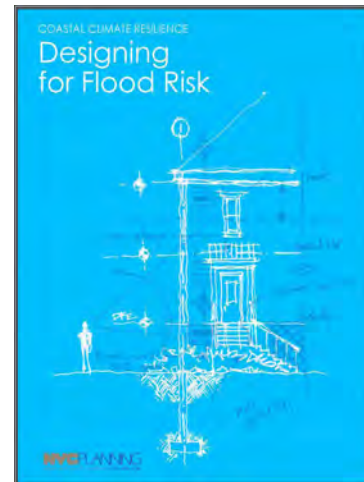


BUILDING RESILIENCY TASK FORCE: REPORT TO MAYOR MICHAEL R. BLOOMBERG & SPEAKER CHRISTINE C. QUINN



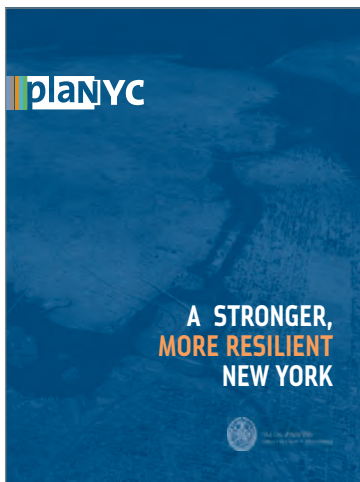
June 2013
http://issuu.com/urbangreen/docs/btrtf_executive_summary
 Date Accessed: 23 December 2019

DESIGNING FOR FLOOD RISK



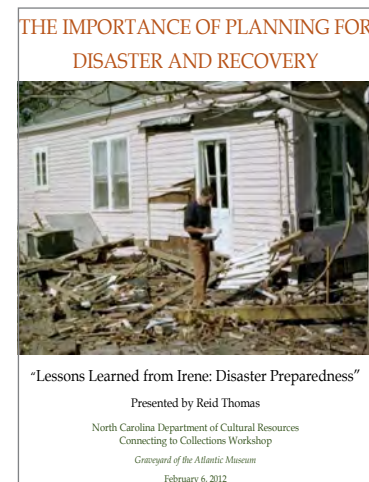
DEPARTMENT OF CITY PLANNING CITY OF NEW YORK -
 June 2013
http://www1.nyc.gov/assets/planning/download/pdf/plans-studies/sustainable-communities/climate-resilience/designing_flood_risk.pdf
 Date Accessed: 23 December 2019

A STRONGER, MORE RESILIENT NEW YORK



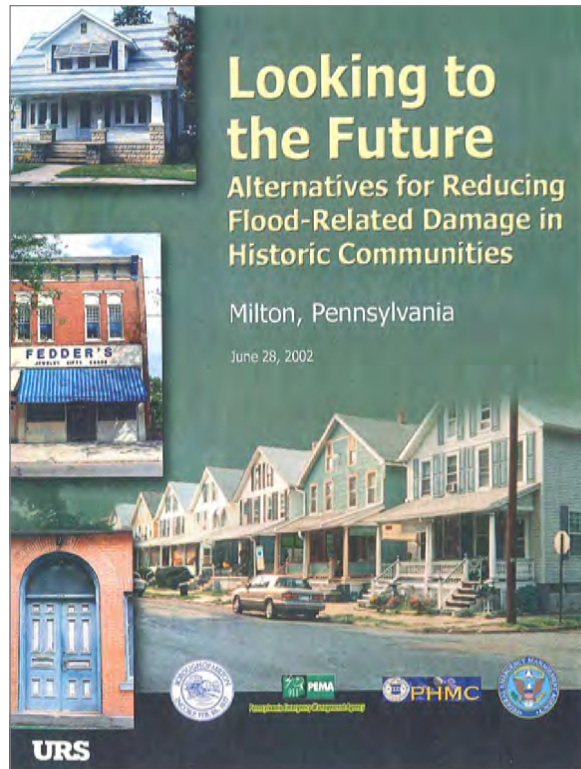
PLAN NYC - June 2013
http://s-media.nyc.gov/agencies/sirr/SIRR_singles_Lo_res.pdf
 Date Accessed: 23 December 2019

THE IMPORTANCE OF PLANNING FOR DISASTER RECOVERY



REID THOMAS - 6 February 2012
<http://www.hpo.ncdcr.gov/DisasterPlanning&Recovery.pdf>
 Date Accessed: 23 December 2019

LOOKING TO THE FUTURE: ALTERNATIVES FOR REDUCING FLOOD-RELATED DAMAGE IN HISTORIC COMMUNITIES



URS

28 June 2002

<https://www.phmc.pa.gov/Preservation/About/Documents/Looking-Future-Milton-study-2002.pdf>

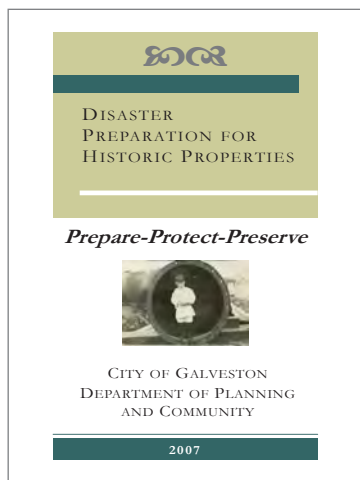
Date Accessed: 23 December 2019

The goal of this report, published by URS, is to identify methods for integrating mitigation measures that are sensitive to cultural resources into Milton's plans. With Milton's history of repeated flooding, this report was undertaken to provide guidance for Milton and serve as a model for other historic towns in Pennsylvania.

Following extended historical flood research, historic architectural surveys and public participation, the report reviews the following mitigation measures for their applicability in Milton:

- Acquisition and demolition
- Relocation
- Elevation
- Floodproofing
- Structural flood diversion improvements and stream channel modifications

DISASTER PREPARATION FOR HISTORIC PROPERTIES

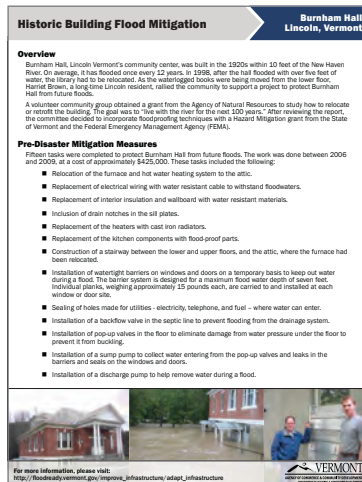


2007

<http://www.cityofgalveston.org/DocumentCenter/View/104>

Date Accessed: 23 December 2019

HISTORIC BUILDING FLOOD MITIGATION IN VERMONT

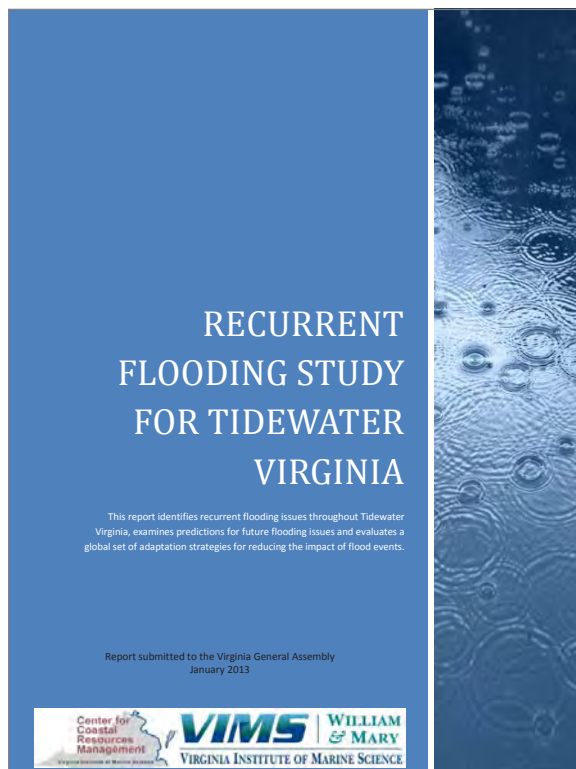


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<https://accd.vermont.gov/sites/accdnew/files/documents/CD/CPR/CPR-VERI-Toolkit-Floodproofing-CaseStudies.pdf>

Date Accessed: 23 December 2019

RECURRENT FLOODING STUDY FOR TIDEWATER VIRGINIA



VIRGINIA INSTITUTE FOR MARINE SCIENCE

January 2013

<http://tinyurl.com/q22p77s>

Date Accessed: 23 December 2019

This study reviews and predicts flooding in Virginia's Tidewater region. In addition to these predictions, the study examines potential strategies to mitigate the impact of flooding. The study considers strategies from the United States and abroad and recommends mitigation measures that may best address challenges unique to Tidewater Virginia.

Recommended strategies are addressed on three levels:

- State actions
- Locality Actions
- Individual Actions

Included in this study was review of recommended measures by stakeholders.

NORFOLK: RESILIENT CITY



JUDITH RODIN, ET AL

October 2015

<https://www.norfolk.gov/DocumentCenter/View/16292/Coastal-Resilience-Strategy-Report-to-Residents-?bidId=>
Date Accessed: 23 December 2019

Funded in part by the Rockefeller Foundation, this document outlines Norfolk's resilience plan. As a port city, the plan acknowledges that the city is especially vulnerable to the threats of sea-level rise and emphasizes the need for collaboration among all community members. This plan reviews the guiding tenets for resiliency as well as the plan's three goals:

- Design the coastal community of the future
- Create economic opportunity by advancing efforts to grow existing and new sections of the city
- Advance initiatives to connect communities, deconcentrate poverty, and strengthen neighborhoods

These three goals are elaborated upon with a description of the strategies for pursuing these goals.

POTOMAC RIVER WATERFRONT FLOOD MITIGATION STUDY: EVALUATION AND RECOMMENDATION OF MITIGATION MEASURES

URS

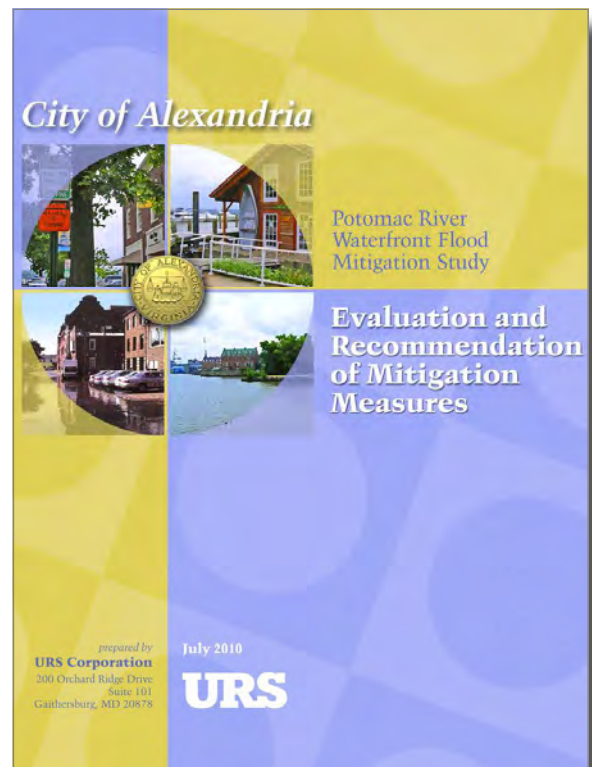
July 2010

https://www.alexandriava.gov/uploadedFiles/tes/info/Final_Potomac_Mitigation_Studyx.pdf

Date Accessed: 23 December 2019

Commissioned by the City of Alexandria, this report aims to outline issues related to flooding within the city and to propose solutions for these issues. After an assessment, the report provides an extended list of 27 mitigation measures, both structural and nonstructural, available to the city. The report examines various potential mitigation measures and considers each along with survey results from Alexandria's decision-makers and community members. Of those 27, the report concludes that three structural mitigations are the most appropriate options for Alexandria:

- Elevated walkways
- Floodproofing
- Inlet and roadway improvement



MITIGATION LEADS TO PRESERVATION AND ECONOMIC RECOVERY FOR ONE COMMUNITY: DARLINGTON, WISCONSIN

No Date

https://dma.wi.gov/DMA/divisions/wem/mitigation/docs/stories/Darlington_Downtown_Retrofit_WEM.pdf

Darlington_Downtown_Retrofit_WEM.pdf

Date Accessed: 23 December 2019

This article details the development of a flood mitigation plan for Darlington, Wisconsin following multiple flood events. Approved by FEMA, Darlington's plan attempts to mitigate flood-damage using the following methods:

- Purchasing and demolishing structures along the river
- Providing as much protection as possible for buildings that cannot be elevated or floodproofed
- Retrofitting historic buildings along the central business corridor

The town's solution to retrofitting historic structures was to construct floodproof vestibules at ground floor entrances. Water will be allowed into the vestibules but not beyond. This method for mitigating damage would not interfere with the streetscape. In addition to the retrofitting vestibules, the plan requires that owners purchase flood insurance and that all historic structures satisfy building codes.

In addition to improved preparation, the plan also had significant economic and social impact on the community.

Mitigation Leads to Preservation and Economic Recovery For One Community: Darlington, Wisconsin

The Effects of Flooding

During the past half century, multiple flooding events along the Pecatonica River took a toll on Darlington, the county seat of Lafayette County, population of 2418. Numerous times the river wreaked havoc with its destructive force, leaving a trail of mud, debris and bacteria, and contributing financial stress to both families and businesses. Repetitive flooding deteriorated structures and lowered property values. Owners experienced substantial loss of business during the times of flooding, cleanup, and repair. The buildup of mold and mildew in constantly flooded structures led to unhealthy conditions in the buildings.



Preserving Main Street

After the 1993 flood, the community adopted four goals, as part of a comprehensive plan, in order to retain the historic and community value of Darlington's Main Street as well as to mitigate against future flood damage:



1. Preserve the historic downtown business district
2. Restore the downtown economic base
3. Develop an urban river open space park and recreation area
4. Eliminate or substantially reduce flood damage in the future

Partnering for Success

The city needed to obtain funding and expert knowledge to implement the plan. The success in reaching the city's goals depended on forming an interagency coalition and promoting the cooperation of government – local, state, and federal – and businesses. Multiple agencies contributed grants and/or expertise to the project, including:

- Federal Emergency Management Agency (FEMA); Hazard Mitigation Grant Program (HMGP) and the National Flood Insurance FMA program
- Wisconsin Emergency Management
- Wisconsin Department of Natural Resources
- Wisconsin Department of Commerce
- Wisconsin Department of Administration
- Wisconsin Historical Society
- Economic Development Administration
- Southwest Wisconsin Regional Planning Commission

HOW MANY PRE-FIRM HISTORIC BUILDINGS ARE OUT THERE IN THE FLOODPLAIN?

How many pre-FIRM historic buildings are out there in the floodplain?

Written by Rod Scott, CFM, of L&R Resources, LLC in Mandeville, Louisiana

Rod Scott will be writing a series of columns on the issue of historic buildings and the challenges when attempting to mitigate them.



Hurricane Sandy surged onto the South Side of Ellis Island, depositing debris and flooding the basements of the historic hospital and administration buildings. Photo taken Nov. 3, 2012 by NPS/Leonard's via Flickr.

Now that we are in the era of great change in flood insurance policy rates for pre-Flood Insurance Rate Map (pre-FIRM) buildings, we need to take a look at the challenges ahead. Many of us who work in the flood hazard mitigation field are trying to get a better handle on the reality of the situation. FEMA's National Flood Insurance Program has had about 1.5 million pre-FIRM policies when the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA) was passed. About 250,000 property owners have dropped flood insurance since HFIAA went into effect, which is a very troubling trend.

It is also well known that many more pre-FIRM buildings do not carry flood insurance due to the lack of a mortgage, which requires flood insurance coverage. The fact is that we do not know how many pre-FIRM buildings are out there in the special Flood hazard area and many of them are our historic buildings. These pre-FIRM buildings are more at risk from flooding due to being built before we had flood mapping and building codes that reduce the risk of flooding. For more than 40 years these buildings have been charged a discounted flood policy rate that was artificially low compared to the risk of and actually being flooded. Owners of these older historic buildings are now going to pay substantially more for flood insurance due to the buildings being below Base Flood Elevation.

News & Views August 2015

ROD SCOTT - August 2015

http://www.floods.org/ace-files/documentlibrary/News_VIEWS/News_VIEWS_Aug2015.pdf

Date Accessed: 23 December 2019

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OTHER ENTITIES

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TREATMENT OF FLOOD-DAMAGED OLDER AND HISTORIC BUILDINGS

RICHARD WAGNER AND CLAUDETTE HANKS REICHEL

No Date

<https://forum.savingplaces.org/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=0a57fa53-ebf2-90d5-205e-c1d7e8732ca2&forceDialog=0>
 Date Accessed: 23 December 2019

Published by the National Trust for Historic Preservation, this article provides guidance to owners on how to safely approach a flooded building. The article illustrates how to properly begin the drying process and reviews how to approach the process of repair and restoration depending on the material affected.

The article also provides safe methods for addressing mold and provides owners a checklist for properly executing repairs. For further guidance, readers can find additional resources listed at the end of the article.

Treatment of Flood-Damaged Older and Historic Buildings

In recent years, many older and historic buildings have been affected by the heavy rains and flooding that occurred during hurricanes and tropical storms. The purpose of this booklet is to help building owners minimize structural and cosmetic flood damage. If you suspect that your building may have some structural damage, contact a qualified structural engineer or architect to thoroughly assess the situation and suggest remedies. Your state historic preservation office (SHPO) can provide you with a list of architects who are experienced in the treatment of historic buildings. A description of the tax credit programs for rehabilitation of historic structures, free technical publications available through your state historic preservation office and the Federal Emergency Management Agency (FEMA), telephone numbers you can call for more assistance, and additional resources are provided at the end of the booklet.

Once you are able to return to your building, the first tasks will likely be to remove mud and debris and to inspect the building for damage. Saving your building, no matter how historic, is not worth losing your life or risking permanent injury. Please observe these safety precautions:

- Do not walk through flowing water.
- Do not drive through a flooded area.



- Stay away from power lines and electrical wires.
- Make sure that all of your electrical wiring is turned off. If any electrical wiring was submerged, have it inspected before turning the power back on.
- Look before you step. Floods deposit mud which makes most walking surfaces very slippery.
- Be alert for gas leaks.
- Carbon monoxide exhaust kills. If you use electrical generators or charcoal grills, make sure that they are properly vented.
- Clean everything that got wet. Floodwaters carry sewage and chemicals. Hose down concrete and masonry walls. Scrub all surfaces with disinfectant. Discard any food and medicine that came in contact with floodwater. Wear protective clothing and make sure the building is properly ventilated while working inside.

- Remember to follow local health guidelines concerning preventive shots or vaccinations.

After the Water Recedes
 No other "element" is as destructive to buildings as water. After your building has been saturated and once the floodwaters recede, it is important that the drying process begin immediately. Most of the damaging effects of water, such as rot, rust, and spalling, can be minimized by reducing both interior and exterior moisture levels. The least damaging drying process appears to be one that begins by using only ventilation. To speed evaporation, outside air must be vented to the outside. The most effective way to do this is to open windows and doors and allow the moisture to escape. Fans can be used to speed evaporation by moving interior air and exhausting humid air to the outdoors.

In 2005, floodwaters severely damaged New Orleans and other communities along the Gulf Coast following Hurricane Katrina and Rita.



CLIMATE CHANGE IN NEWPORT

Preservation Leadership Forum Blog
 Insights and information for Preservation Professionals

Climate Change in Newport
 Posted on September 4th, 2015 by Special Contributor
 By Pieter N. Roos

Preservationists around the country are taking steps to document, protect, and mitigate the effects of climate change on cultural resources. In the summer issue of the *Forum Journal*, *High Water and High Stakes: Cultural Resources and Climate Change*, an interview examined in detail changing weather patterns, reasons for cultural resources, what communities are doing to prepare, and how rising sea levels are already affecting communities. The *PLF* blog will continue to cover these issues; this week Pieter N. Roos, the executive director of the Newport Restoration Foundation, writes about the work that his organization is doing to address the effects of sea level rise on the historic Rhode Island community.

Like so many coastal cities, Newport, Rhode Island's vitality is down from the sea. Through the centuries, Newport has been a powerful colonial entrepot, Gilded Age resort, base for the Navy, and, more recently, a vibrant tourist destination—with changes foreshadowed by a distant relationship to the water. Proximity to the ocean has always been one of Newport's greatest assets, now it poses an imminent survival threat.

Newport's 375-year history is strikingly visible in neighborhoods populated by brick- and white-washed facades, commercial buildings, houses of worship, and wharves. This remarkable collection of historic structures is an extraordinary resource that deserves critical protection in the face of the sea—weather conditions improved by climate change. The Newport Restoration Foundation (NRF), of which I am the director, has saved and recently saved nearly 500th-century houses in Newport. Our stake in the stewardship of the city's heritage is clear.

Newport's historic connection to catastrophic weather events should be as obvious as its location. Over the centuries nearly a dozen hurricanes have decimated Rhode Island. One of the most and most tragic was the infamous Category III "Hurricane of 1938." It was closely followed by Hurricane Carol, yet another Category III storm in 1954. These storms provide well-documented benchmarks for tidal flooding and help us understand the impact for low-lying areas. They also remind us that increased tropical activity will bring us the

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PIETER N. ROOS

4 September 2015

http://blog.preservationleadershipforum.org/2015/09/04/climate-change-in-newport/#.Vp_gGfkrJmM

Date Accessed: 23 December 2019

In his post for the Preservation Leadership Forum Blog, Roos details how sea-level rise impacts Newport, Rhode Island today and how it will do so in the future. He describes how flooding measures have a significant impact on a historic district in the city. The answer, according to Roos, is to communicate within and across professions.



CLIMATE CHANGE AND RISING SEA LEVEL: IMPLICATIONS FOR HISTORIC PRESERVATION

Climate Change and Rising Sea Level: Implications for Historic Preservation

BY JOHN ENGLANDER

We have entered a new era, totally unprecedented in all human civilization. The melting of glaciers and ice sheets due to global warming has just started to raise sea level—a trend that is now unstoppable. Rising seas will have profound and permanent repercussions in all coastal regions worldwide.

I was delighted to give a talk at PastForward 2014 in Savannah, where I met many preservation advocates and professionals. It was immediately obvious that preservationists are uniquely suited to see what is at risk in this new era and to help communicate that to the public. You have a wonderful long-term perspective and passion. Climate change and rising sea level mandate a new kind of assessment of the vulnerability of historic resources, requiring stakeholders to look at adaptation options and to decide what will be saved for future generations—both in terms of determining what is technically possible, and also in terms of allocating finite resources.

Though it may be tempting to think of rising sea level like a storm event, it is quite different. Storms hit one area. They are sudden. The major impact is at the coast from wave damage. High waters recede rather quickly. But rising sea level is exactly the opposite in all those aspects. The impact is global and slow, it affects lowlands and tidal rivers far inland, and it is essentially permanent.

Unlike a storm, rising sea level does give us time to prepare. That is a blessing. We still have time to plan and adapt, but no time to waste.

This is the moment in history for us to change our perspective, to recognize a revolutionary reality, and, in many places, to plan for a new priority of preservation. History gives us context. One reason why we preserve buildings and landscapes is for education. The increasingly threatened state of some historic places can now help illustrate the depth and extent of the change

ForumJournal SUMMER 2015

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JOHN ENGLANDER, ET. AL.

Summer 2015
Forum Journal

Englander provides an introduction to this issue in *Forum Journal*. The article provides a good taste of the relevant issues, though it does not delve too deeply into those issues. (His book, *High Tide on Main Street*, is referenced on page E.22.)

CLIMATE CHANGE AND CULTURAL LANDSCAPES: OBSERVATIONS AND OPTIONS

Climate Change and Cultural Landscapes: Observations and Options

ROBERT Z. MELNICK, FASLA

Ever since the Mount Vernon Ladies' Association enlightened our society to the value of preserving significant historic sites and resources in the mid-19th century, historic preservation has changed, adapted and evolved over time. We have seen the preservation movement mature from protecting the homes of past presidents to addressing a much wider range of concerns, including protecting sites where important events happened, historic districts of workers' housing, historic bridges and engineering accomplishments, and now also significant cultural landscapes.

A cultural landscape is "a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein), associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. There are four general types of cultural landscapes, not mutually exclusive: [historic sites](#), [historic designed landscapes](#), [historic vernacular landscapes](#), and [ethnographic landscapes](#). Gettysburg National Military Park, Central Park, Chaco Canyon, and the Presidio of San Francisco are all examples of cultural landscapes.

As we come to grips with one of the most pressing problems of the 21st century, we can now ask: What can an understanding of cultural landscapes tell us about climate change? How has attention to historic landscapes altered our view of historic preservation? And how can concern for these landscapes help us grapple with the impacts of global climate change? As will be evident, there are more questions than answers.

Because of their inherent integration of natural and human systems, cultural landscapes can be understood as the "canary in the coal mine"—providing warning signs of the impact of climate change on cultural resources. They can also be the testing ground for making wise and thoughtful decisions, as we gain a better recognition of the certainty of uncertain change to these valued

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ROBERT Z. MELNICK - Summer 2015
Forum Journal

PRESERVATION IN A CHANGING CLIMATE: TIME TO PICK UP THE TAB

Preservation in a Changing Climate: Time to Pick Up the Tab

ANTHONY VEERKAMP

On June 23, 1988, Dr. James E. Hansen, director of NASA's Institute for Space Studies, testified before the Senate Energy and Natural Resources Committee, stating: "Global warming has reached a level such that we can ascribe with a high degree of confidence a cause and effect relationship between the greenhouse effect and observed warming...It is already happening now."

By all accounts, the testimony provided by Hansen and other scientists was pretty convincing stuff. Senator Timothy E. Wirth, the Colorado Democrat who presided at the hearing, stated: "As I read it, the scientific evidence is compelling: the global climate is changing as the earth's atmosphere gets warmer. Now, the Congress must begin to consider how we are going to slow or halt that warming trend and how we are going to cope with the changes that may already be inevitable."

At the time, one might have reasonably expected that by 2015, more than a quarter century later, Congress would have long since moved beyond the consideration stage and taken meaningful action to address the looming threat. One would be gravely disappointed.

HOW DID WE GET HERE?

At the time of Hansen's testimony on Capitol Hill, congressional—indeed, global—resolve to address climate change seemed certain. After all, the international treaty to phase out substances that deplete the ozone layer (the "Montreal Protocol") had just been agreed upon the previous fall, proving that a multilateral agreement to address a global environmental threat was politically feasible. It also proved to be remarkably effective: by 2009, 98 percent of the chemicals listed by the protocol as damaging to the ozone layer had been phased out.

Indeed, in 1992 the United Nations Framework Convention on Climate Change (UNFCCC) was signed by 165 countries, including

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ANTHONY VEERKAMP - Summer 2015
Forum Journal

THE IMPACTS OF COASTAL EROSION ON TRIBAL CULTURAL HERITAGE

The Impacts of Coastal Erosion on Tribal Cultural Heritage

PATTY FERGUSON-BOHNEE

Growing up, I never thought that the community to which I belong, the *Pointe-au-Chien Indian Community*, would be on the verge of disappearing. Our people have occupied our traditional homelands since time immemorial and have been documented as living here since the first explorers visited Louisiana. The land on which we live was once lush and fertile. We had large agricultural enterprises, domesticated animals, fresh water, and access to game and fish. We lived and continue to live a subsistence lifestyle.

Isolated in the lower bayous of Terrebonne and Lafourche Parishes, we were able to live peacefully and to prosper. Topsoil carried by the Mississippi replenished the earth and created new land. The barrier islands protected the community from flood waters. Today the barrier islands have disappeared, and salt water intrusion has ended most farming and cattle grazing.

Over the past six decades, tribal members have adapted to this changing environment. We continue to fish, hunt and trap, but our small tribe of approximately 700 members faces serious challenges trying to maintain our homelands, culture and traditions due to coastal erosion and environmental neglect. Sacred sites and cemeteries are at risk and some are already submerged. Despite the challenges, the *Pointe-au-Chien* people have been resilient.

COASTAL EROSION

During the past 100 years, Louisiana has lost more than one million acres of coastal land and wetlands, and is losing approximately 25-40 square miles per year.² Ninety percent of the coastal wetlands loss in the United States is in Louisiana. *Pointe-au-Chien* is located in the Terrebonne Basin, one of the fastest eroding areas in the United States.³

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PATTY FERGUSON-BOHNEE - Summer 2015
Forum Journal

THE NATIONAL FLOOD INSURANCE PROGRAM AND HISTORIC RESOURCES

The National Flood Insurance Program and Historic Resources

JENIFER EGGLESTON AND JEN WELLOCK

Nearly a decade after Hurricane Katrina hit the Gulf Coast on August 29, 2005, its effects on the coastal communities in Alabama, Louisiana and Mississippi are still clearly visible. Claiming more than 1,800 lives and causing over \$100 billion in property damage, Hurricane Katrina was the single most catastrophic natural disaster in our nation's history. Much of Katrina's damage, stretching 400 miles across the Gulf Coast, was due to a storm surge that reached an estimated 35 feet and to sustained winds of up to 140 miles per hour. In addition to being our nation's most costly disaster, Hurricane Katrina destroyed thousands of irreplaceable historic resources while leaving countless more severely damaged and vulnerable. In response, Congress appropriated \$53 million in Historic Preservation Fund (HPF) grant funding to the state historic preservation offices (SHPOs) of Alabama, Louisiana and Mississippi to aid in the recovery and rehabilitation of historic resources on the Gulf Coast. A similar congressional appropriation of \$47.5 million was made to the Northeast SHPOs and tribal historic preservation offices (THPOs) following the devastation of Superstorm Sandy, which battered the mid-Atlantic coast in late October 2012. The projects supported by these two grant programs have helped the National Park Service (NPS)



recognize the vulnerability of historic resources to flooding and the challenges both of protecting them before disaster strikes and of addressing damage afterward. Specifically, we at the NPS have learned how

The interior of this historic home in Ocean Springs, Mississippi shows damage to the interior walls, floor marks on the walls following Hurricane Katrina.
PHOTO COURTESY NATIONAL PARK SERVICE

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JENIFER EGGLESTON AND JEN WELLOCK - Summer 2015
Forum Journal

WEATHER IT TOGETHER: ANNAPOLIS' MODEL PLANNING EFFORT

Weather It Together: Annapolis' Model Planning Effort

LISA CRAIG

While many other communities are planning for the impacts of climate change to infrastructure, Annapolis is breaking new ground by specifically accounting for the historic places that are such an important part of [the] your city's fabric, cultural identity, and economy. By naming Annapolis a National Treasure, we are raising awareness of the threats posed by climate change to historic places nationwide.
—Stephanie Meeks, President, National Trust for Historic Preservation, Oct. 23, 2014¹

While recognition of the historic city of Annapolis is usually welcome—certainly, the local economy is dependent on the heritage traveler—we would rather have visitors uploading digital images of our beautiful City Dock than shots of tidal flood waters circling the feet of the statue of Alex Haley as he reads to children at the Kunta Kinte Memorial. Yet Alex has become the high water mark for flooding events in Annapolis—events that have become an increasingly urgent call to action.

The Colonial Annapolis Historic District was designated one of 43 National Historic Landmark Districts in 1965 by the U.S. Department of the Interior. While Annapolis' collection of 18th-, 19th- and 20th-century architecture is important to the entire nation, the historic district is a major heritage tourism asset for the local economy.²

When Secretary of the Interior Stewart Udall visited Annapolis on July 7, 1965, to officially announce the designation, he warned, "Annapolis must work now to preserve its historic heritage... otherwise it will simply share the weakness of so many cities in America—sameness."³

Now in 2015 we are again heeding a warning, but it is not the prospect of unplanned, insensitive development that threatens destruction of our historic city, but the unpredictable, inescapable

Forum Journal | SUMMER 2015

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LISA CRAIG - Summer 2015
Forum Journal

A HERITAGE COALITION'S "CALL TO ACTION" ON CLIMATE CHANGE AND CULTURAL HERITAGE

A Heritage Coalition's "Call to Action" on Climate Change and Cultural Heritage

ADAM MARKHAM AND JEANA WISER

Global average temperatures have been rising since the late 1800s, with much of the warming due to human activities, especially the release of carbon dioxide and other greenhouse gases into the atmosphere from the burning of fossil fuels. This is causing sea levels to rise and extreme weather events—heat waves, droughts, rain deluges—to occur more often. Now these global environmental changes threaten built and natural resources, presenting new challenges for stewardship.

Numerous organizations around the country—indeed the globe—are concerned about the effects of climate change on historic resources. And not just cultural heritage organizations. The *Union of Concerned Scientists* (UCS), a nonprofit science advocacy organization that has worked on climate change science and policies for decades, had not previously addressed the issues of heritage preservation. But in 2014, with no prospect of congressional action in Washington in response to the problem, UCS turned its attention



to highlighting how the impacts of a changing climate are already affecting communities across America. Its research drew on the knowledge of USC's network of more than 18,000 scientists nationwide as well as all the latest scientific reports and peer-reviewed literature. As UCS

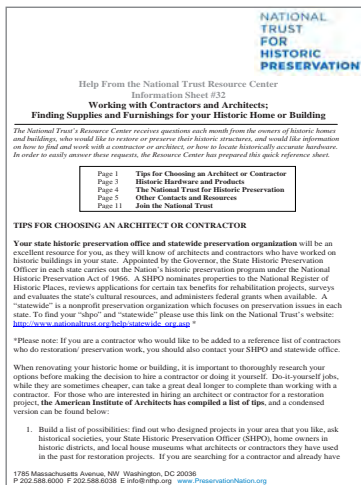
The Union of Concerned Scientists released the report *National Landmarks at Risk* in May 2014 to draw attention to the threat to cultural heritage from sea level rise.

Forum Journal | SUMMER 2015

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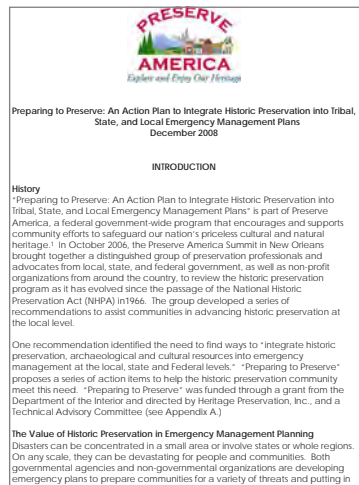
ADAM MARKHAM AND JEANA WISER - Summer 2015
Forum Journal

INFORMATION SHEET #32: WORKING WITH CONTRACTORS AND ARCHITECTS - FINDING SUPPLIES AND FURNISHINGS FOR YOUR HISTORIC HOME OR BUILDING



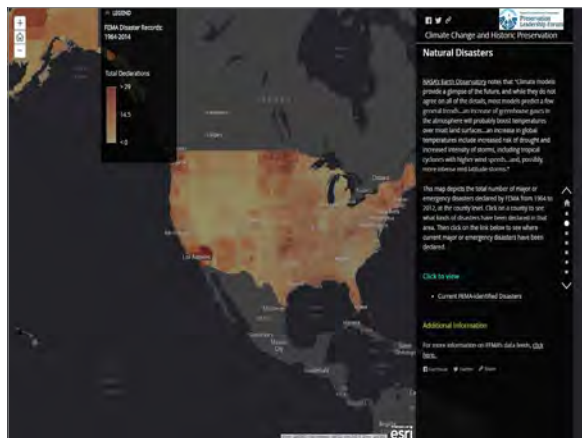
No Date
<http://www.preservationnation.org/resources/disaster-recovery/additional-resources/flood-recovery-resources/32-Working-with-Contractors-and-Architects-Finding-Supplies-and-Furnishings-for-your-Historic-Home-or-Building.pdf>
 Date Accessed: 16 February 2016

PREPARING TO PRESERVE: AN ACTION PLAN TO INTEGRATE HISTORIC PRESERVATION INTO TRIBAL, STATE, AND LOCAL EMERGENCY MANAGEMENT PLANS



December 2008
<https://www.doi.gov/sites/doi.gov/files/migrated/pmb/oepr/rppr/upload/12-18-08-Preparing-To-Preserve.pdf>
 Date Accessed: 5 Feb 2016

CLIMATE CHANGE AND HISTORIC PRESERVATION



NATIONAL TRUST FOR HISTORIC PRESERVATION - No Date
<http://nthp.maps.arcgis.com/apps/MapJournal/index.html?appid=a6e67c159c364434af3950b407edc8f2>
 Date Accessed: 18 July 2016

WHOLE BUILDING DESIGN GUIDE

NATIONAL INSTITUTE OF BUILDING SCIENCE

12 April 2015

https://www.wbdg.org/design/historic_pres.php

Date Accessed: 23 December 2015

The National Institute of Building Science's Whole Building Design Guide includes an introduction to historic preservation, including a summary of *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. Discussion includes a brief consideration of how to address disaster preparation within historic preservation, along with additional related resources.

12/23/2015

Historic Preservation | Whole Building Design Guide

WBDG a program of the National Institute of Building Science

Home | Objectives | Links | References | Books | Education | BIM

Historic Preservation
by the WBDG Historic Preservation Subcommittee
Last updated: 04-16-2015

OVERVIEW

Preserving historic buildings is vital to understanding our nation's heritage. In addition, it is an environmentally responsible practice. By reusing existing buildings historic preservation is essentially a recycling program of historic proportions. Existing buildings can often be energy efficient through their use of good ventilation, durable materials, and spatial relationships. An immediate advantage of older buildings is that a building already exists, therefore energy is not necessary to demolish a building or create new building materials and the infrastructure may already be in place. Minor modifications can be made to adapt existing buildings to compatible new uses. Systems can be upgraded to meet modern building requirements and codes. This not only makes good economic sense, but preserves our legacy and is an inherently sustainable practice and an intrinsic component of whole building design. [Learn more about historic preservation.](#) (See also [SustainableConstruction.org](#) and [SustainableHistory.org](#))

Realizing the need to protect America's cultural resources, Congress established the [National Historic Preservation Act \(NHPA\)](#) (<http://www.nps.gov/whd/historical/historicalact.htm>) in 1966, which mandated the active use of historic buildings for public benefit and to preserve our national heritage. Cultural resources, as identified in the [National Register for Historic Places](#) (<http://www.nps.gov/>), include buildings, archeological sites, structures, objects, and historic districts. The surrounding landscape is often an integral part of a historic property. Not only can significant archeological remains be destroyed during the course of construction, but the landscape, designed or natural, may be irreparably damaged, and caution is advised whenever major physical intervention is required in an extant building or landscape. The [Antiquities Act](#) (<http://www.nps.gov/whd/historical/antiquitiesact.htm>) established the public mandate to protect these resources.

Some practical and/or intangible benefits of historic preservation include:

- Retention of history and authenticity
 - Commemorates the past
 - Aesthetics/aesthetics.php texture, craftsmanship, style
 - Probationary visitor appeal
 - Contextual and human scale
- Increased commercial value (Economic Benefits)
 - Materials and ornaments that are not affordable or readily available
 - Durable, high quality materials (e.g., old growth wood)
- **Retention of building materials/resources/energy** ([http://www.wbdg.org/whd/historical/energy.php](#)) (refer also to [WBDG Sustainable Construction](#))
 - Less construction and demolition debris
 - Less hazardous material debris
 - Less need for new materials
 - Enabling suitable space—higher occupancy
 - Rehabilitation often costs less than new construction
 - Reuse of infrastructure
- **Energy savings/energy consumption** ([http://www.wbdg.org/whd/historical/energy.php](#))
 - No energy used for demolition
 - No energy used for new construction
 - Reuse of embodied energy in building materials and assemblies

Following passage of the NHPA, the Secretary of the Interior established [Standards for the Treatment of Historic Properties](#) (<http://www.nps.gov/whd/historical/standards.htm>) to promote and guide the responsible treatment of historic structures and to protect irreplaceable cultural resources. Today, the Standards are the guiding principles behind sensitive preservation design and practice in America.

- [Apply the Preservation Process Successfully/apply_process.php](#)—The preservation process involves five basic steps: Identify, Investigate, Develop, Execute, and Evaluate. Successful preservation design requires early and frequent consultation with a variety of organizations and close collaboration among technical specialists, architects, inventors, and preservation professionals.

Work on historic properties requires specialized skills. The Secretary of the Interior has identified professional [qualification standards](#) (<http://www.nps.gov/whd/historical/standards.htm>) for a variety of preservation disciplines.

Four Treatment Approaches

Within the Secretary of the Interior's Standards for the Treatment of Historic Properties there are Standards for four distinct approaches to the treatment of historic properties: preservation, rehabilitation, restoration, and reconstruction.

[Preservation](#) (<http://www.nps.gov/whd/historical/standards/treatment/preservation.htm>) focuses on the maintenance, stabilization, and repair of existing historic materials and interior of a property's form as it has evolved over time.

[Rehabilitation](#) (<http://www.nps.gov/whd/historical/standards/treatment/treatment-rehabilitation.htm>) acknowledges the need to alter or add to a historic property to meet continuing or changing uses while retaining the property's historic character.

[Restoration](#) (<http://www.nps.gov/whd/historical/standards/treatment/treatment-restoration.htm>) depicts a property at a particular period of time in its history, while removing evidence of other periods.

[Reconstruction](#) (<http://www.nps.gov/whd/historical/standards/treatment/treatment-reconstruction.htm>) re-creates vanished or non-surviving portions of a property for interpretive purposes.

https://www.wbdg.org/design/historic_pres.php

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BRIEF GUIDE TO UNDERSTANDING REPAIRS TO HISTORIC HOMES DAMAGED BY HURRICANE KATRINA AND OTHER RELATED FLOODS

Brief Guide to Understanding Repairs to Historic Homes Damaged by Hurricane Katrina and Other Related Floods

Written by Mike Logan, with thanks to Camille Agricola Bowman and the Alabama Historical Commission's Guide for Owners of Alabama's Historic Houses

Your historic house is worth saving! Despite the drastic circumstances, it is built better than anything that can be built new. It is worth protecting its historic materials and working with the historic house, despite the overzealous advice that you might get from well-intentioned helpers that come along. This guide is meant to be brief and a quick aid to assessing the damage that you are encountering in your home as a result of hurricane and flood damage.

Preservation Trades Network
PO Box 249
Amherst, New Hampshire 03031-0249
www.PTN.org and www.IPTW.org

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Ellcott City Restoration Foundation
Historic Ellcott City, Inc.
Preservation Howard County

This publication was made possible through a partnership of the World Monuments Fund and the Preservation Trades Network

MIKE LOGAN

No Date

<http://ptn.org/sites/default/files/docs/katrina-handbook.pdf>

Date Accessed: 23 December 2019

Intended for Gulf Coast homeowners affected by flooding, this guide is meant to serve an introduction to methods for repairing historic homes. It begins with a brief overview of the advantages of repairing and restoring over demolition, highlighting the superior quality and durability of historic buildings over new construction.

The guide discusses foundation and roof repair in detail, elucidating concerns that are specific to historic homes, such as:

- Consistency of mortar used for repointing masonry
- Suitability of cleaning products for different historic materials
- Appropriate flashing for roofing

The guide concludes with an extensive list of additional resources, including a summary of *The Secretary of the Interior's Standards for Rehabilitation of Historic Properties*. As promised in the introduction, this is a short guide whose aim is to introduce homeowners to appropriately repairs for historic homes.



PLANNING BEFORE DISASTER STRIKES: AN INTRODUCTION TO ADAPTATION STRATEGIES

ANN D. HOROWITZ

2016
APT Bulletin, Vol. XLVII No. 1

Planning before Disaster Strikes: An Introduction to Adaptation Strategies

Ann D. Horowitz




Fig. 1. Galveston Island, Texas, built between 1902 and 1904, 1910-1920. Courtesy of Library of Congress, Prints and Photographs.

The debilitating effects of sea-level rise — flooding, storm surge, and coastal erosion — are projected to alter the natural and built environments, forever changing the lives of millions of coastal residents around the world. The longer-term impacts from Hurricanes Katrina and Sandy illustrate this point. Understandably, the protection of critical infrastructure, emergency facilities, and transportation links are at the forefront of climate-change adaptation discussions. The vulnerability of cultural heritage, however, must not be overlooked; many significant historic resources are located along low-lying tidal shorelines. Without evidence of their cultural heritage, communities relinquish their unique identities and jeopardize the quality of life of their residents, both of which are critical to community resilience.

As the guardian of historic resources, the historic-preservation community must become involved in the planning discussion on adaptation through partnerships with multi-disciplinary teams of decision-makers and stakeholders — city planners, engineers, policymakers, coastal scientists, emergency-preparedness professionals, and residents — to ensure that historic resources are included in protection proposals. The historic-preservation community's role in the collaborative-planning effort is to stress the importance of property-risk assessments, as well as advocate for property protection in place, relocation

The future of historic properties on tidal shorelines is uncertain unless the preservation community implements methods to protect them from sea-level rise.

Defines the purpose of adaptive methods: “minimize climate-change effects or create situations where areas benefit from the changing climate.” (41) Horowitz emphasizes that these adaptation strategies are a viable and proactive alternative to relocation and elevation of a structure. The article provides summaries for preservation professionals on a variety of strategies for adapting to climate change. These summaries include discussion on the advantages and disadvantages of these strategies.

SEA-LEVEL RISE VULNERABILITY ASSESSMENT OF COASTAL RESOURCES IN NEW HAMPSHIRE

PERMAFROST THAW AND ABORIGINAL CULTURAL LANDSCAPES IN THE GWICH’IN REGION, CANADA

Sea-Level Rise Vulnerability Assessment of Coastal Resources in New Hampshire

Benjamin Curran, Michael Mulukutla, Gopal Mulukutla



Fig. 1. Coastal town in New Hampshire, showing houses and beach. Photo by Benjamin Curran.

As the impacts of sea-level rise increase for coastal communities, so too will the toll on the built heritage that has come to distinguish them. Hurricanes and sea-level rise, along with rising temperatures, rainfall, storm surge, and sea level, will have a profound and lasting impact on the built heritage of coastal communities. As sea-level rise increases, the ability of historic resources to survive the impacts of sea-level rise will be increasingly challenged. Many historic resources are located in low-lying coastal areas, making them particularly vulnerable to the impacts of sea-level rise. The National Historic Preservation Act (NHPA) requires that historic resources be protected from the impacts of sea-level rise. This report provides a vulnerability assessment of coastal resources in New Hampshire, identifying those resources that are most at risk from the impacts of sea-level rise.

Permafrost Thaw and Aboriginal Cultural Landscapes in the Gwich’in Region, Canada

Thomas D. Andrew, et al.



Fig. 1. A large melting spring that has formed in the Gwich'in region of Canada. Photo by Thomas D. Andrew.

In Canada's Northwest Territories, where continuous permafrost underlies close to 80 percent of the landscape and temperatures are increasing at a rate significantly greater than the global average, cultural resources are in jeopardy. The melting of permafrost is causing significant damage to cultural resources, including archaeological sites and traditional knowledge. This report provides a vulnerability assessment of cultural resources in the Gwich'in region, identifying those resources that are most at risk from the impacts of permafrost thaw.

BENJAMIN CURRAN, MICHAEL ROUTHIER AND GOPAL MULUKUTLA - 2016
APT Bulletin, Vol. XLVII No. 1

THOMAS D. ANDREW, ET. AL. - 2016
APT Bulletin, Vol. XLVII No. 1

CLIMATE CHANGE AND NON-MECHANICALLY VENTILATED INTERIORS



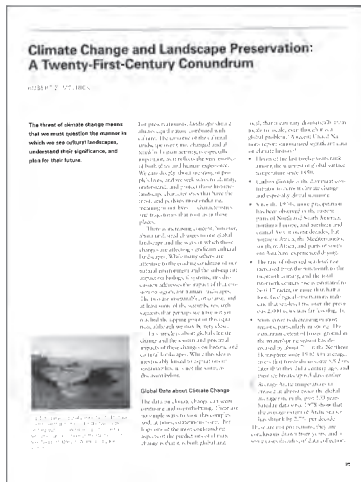
WATER MANAGEMENT FOR TRADITIONAL BUILDINGS: ADAPTATION FOR A CHANGING CLIMATE



PETER BRIMBLECOMBE AND CAROLINE BRIMBLECOMBE - 2016
 APT Bulletin, Vol. XLVII No. 1

ROGER CURTIS - 2016
 APT Bulletin, Vol. XLVII No. 1

CLIMATE CHANGE AND LANDSCAPE PRESERVATION: A TWENTIETH-CENTURY CONUNDRUM



REFINING CLIMATE CHANGE THREATS TO HERITAGE



ROBERT MELNICK - 2009
<http://www.apti.org/clientuploads/pdf/Melnick-40-3-4.pdf>

PETER BRIMBLECOMBE - 2014
<http://www.tandfonline.com/doi/pdf/10.1080/19455224.2014.916226>
 Date Accessed: 23 December 2019

AFTER SANDY: ADVANCING STRATEGIES FOR LONG-TERM RESILIENCE AND ADAPTABILITY



URBAN LAND INSTITUTE

2013

<http://uli.org/wp-content/uploads/ULI-Documents/AfterSandy.pdf>

Date Accessed: 23 December 2019

Prepared in the aftermath of Hurricane Sandy, this Urban Land Institute document provides a summary of 23 recommendations to be considered in planning for long-term resilience. The recommendations are in the following categories:

- Land Use and Development
- Infrastructure, Technology, and Capacity
- Finance, Investment, and Insurance
- Leadership and Governance

The document was prepared for the New York – New Jersey region, and provides recommendations that address big city resiliency in New York, in addition to the small towns and coastal communities in Long Island and New Jersey.

RISK & RESILIENCE IN COASTAL REGIONS

UWE BRANDES AND ALICE LE BLANC

2013

<http://uli.org/wp-content/uploads/ULI-Documents/CoastalRegions.pdf>

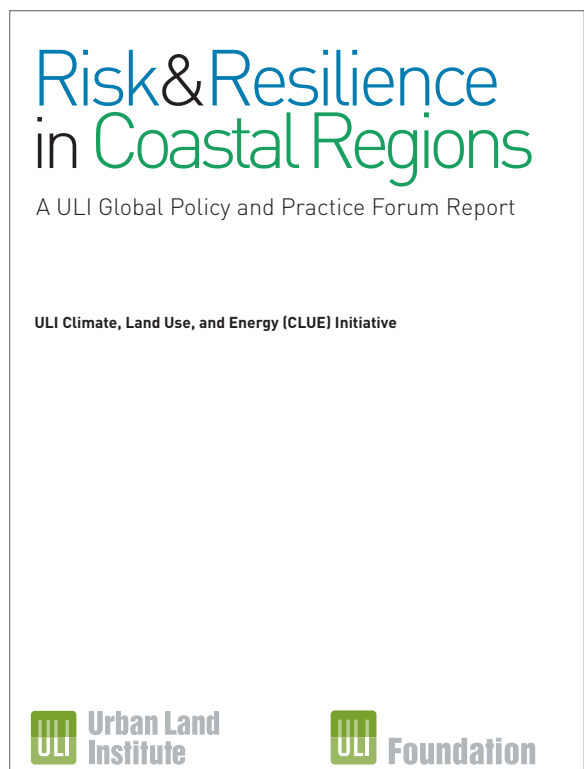
Date Accessed: 23 December 2019

This report presents the themes and subsequent discussions of a panel on coastal development and climate change. Broken into two parts, themes and summaries, the intent is to represent lessons from the panel. Themes addressed include:

- Climate change as a new source of coastal market risk
- Uncertainty in preparing for future events
- Resilience as interdisciplinary and systems based

Panel summaries include an overview of the discussion in addition to a list of key points. Topics of the summaries include:

- Dimensions of community decision-making
- Assessing risk across regions and markets
- On site: Mitigating risk in the project



TEN PRINCIPLES FOR COASTAL DEVELOPMENT

MICHAEL PAWLUKIEWICZ, PREMA KATARI AND CARL KOELBEL

2007

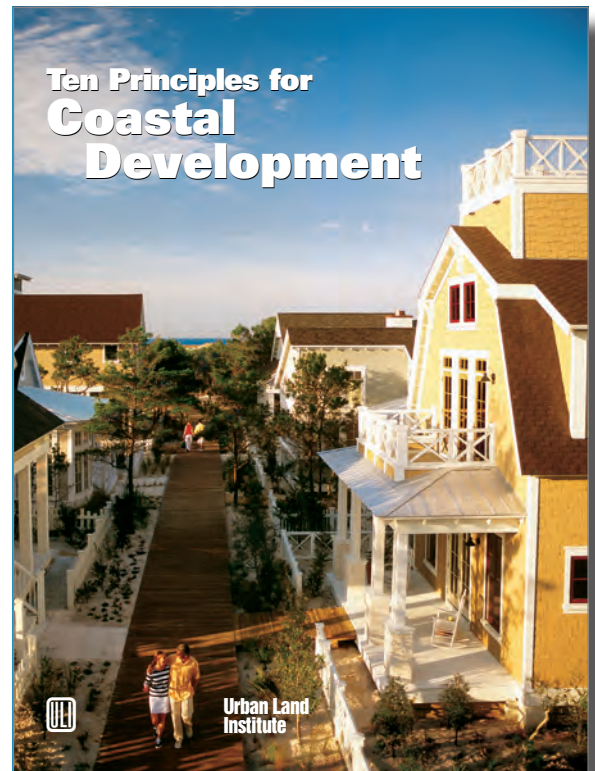
<http://uli.org/wp-content/uploads/ULI-Documents/Ten-Principles-for-Coastal-Development.pdf>

Date Accessed: 23 December 2019

A publication of the Urban Land Institute, *Ten Principles for Coastal Development* is geared toward a wide audience of planning professionals, policy makers and the public. The product of a collaborative efforts of experts, this report provides ten methods for addressing issues related to climate change and sea-level rise, such as:

- Lower risk by exceeding standards for siting and construction
- Address social and economic equity concerns
- Protect fragile water resources on the coast
- Commit to stewardship that will sustain coastal areas

The report concludes with a list of case studies for the reader to pursue further.



POST-SANDY INITIATIVE



AMERICAN INSTITUTE OF ARCHITECTS NEW YORK CHAPTER

May 2013

http://postsandyinitiative.org/wp-content/uploads/2013/05/Post-Sandy-Report_Full.pdf

Date Accessed: 23 December 2019

Geared toward professionals in design, this report emphasizes that design approaches should be site-specific, whether the project is new construction or rehabilitation. A city can be resilient in the face of disaster when it can take site-specific solutions along with standardized, system-wide changes.

The report focuses on four different areas, or opportunities, for increased resilience:

- Transportation and infrastructure
- Housing
- Critical and commercial buildings
- Waterfront

Each chapter discusses the findings of the American Institute of Architects New York Chapter resulting from a series of charrettes, as well as key concepts and next steps.

BUILDINGS AT RISK: FLOOD DESIGN BASICS FOR PRACTICING ARCHITECTS

AMERICAN INSTITUTE OF ARCHITECTS

No Date

http://www.aia.org/aiaucmp/groups/ek_members/documents/pdf/aiap014821.pdf

Date Accessed: 8 January 2016

Part of a series of publications produced for the American Institute of Architects (AIA), Smith's Buildings at Risk provides an overview of issues related to flooding, including a discussion on the different kinds of flooding and expected damage. In addition to "Type of Floods and Their Causes," Smith also provides:

- An Overview of Floods and Flood Management in the U.S.
- How Floods Damage Buildings and Their Contents
- Assessing Flood Hazard and Establishing Goals for Flood Damage Reduction
- Flood-Resistant Design Strategies

As a publication of the AIA, Buildings at Risk is geared toward educating design professionals.



A HIGHER TIDE

MADELINE BODIN

Planning

August-September 2015, 44-46

Date Accessed: 23 December 2019

Bodin's article is an introduction to the challenges of sea-level rise as well as the tools and resources that respond to these challenges. After outlining the causes of sea-level rise, Bodin points to a number of efforts to mitigate its impact. These efforts include:

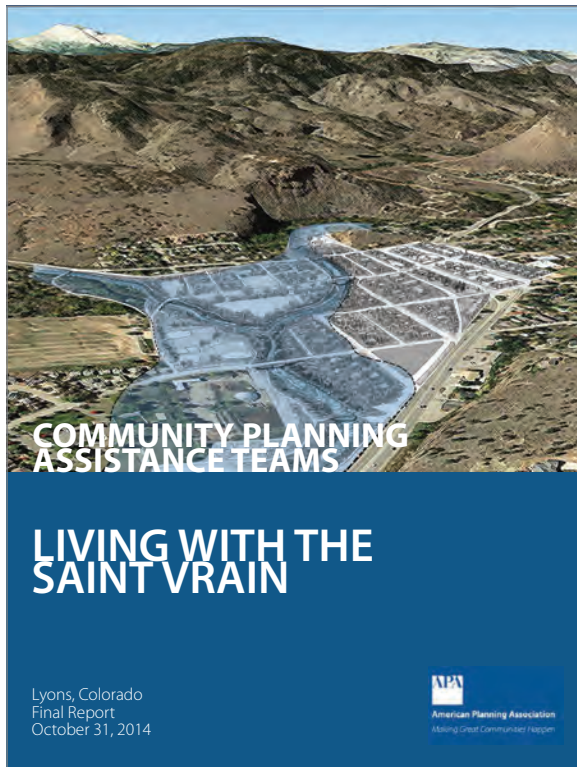
- The Georgetown Climate Center's Sea-Level Rise and Coastal Land Use Adaptation Toolkit
- The Southeast Florida Regional Climate Change Compact
- The South Carolina Small Business Chamber of Commerce's South Carolina Businesses Acting on Rising Seas project

In addition to such efforts, Bodin provides a short summary of tools to enact to mitigate the effect of sea-level rise, such as:

- Natural solutions for coastal protection
- Zoning overlays
- Conservation easements



LIVING WITH THE SAINT VRAIN



COMMUNITY PLANNING ASSISTANCE TEAMS

October 31, 2014

<http://www.apacolorado.org/article/living-saint-vrain-report-lyons-cpat>

Date Accessed: 23 December 2019

Following flash flooding of the Saint Vrain Creeks and the destructive effects on Lyon, Colorado, this report details the recommendations of a collaborative review process involving the American Planning Association's Community Planning Assistance Team, the State of Colorado, officials from Lyon, and the Federal Emergency Management Agency. The recommendations are the result of conversations with residents, reviews of existing plans and site visits.

These recommendations are presented as design- or policy-related.

Design-related options include:

- Living with the river, including its assets and risks
- Use of vacant lots in the flood plain

Policy-related options include:

- Providing disaster reconstruction guidance
- Adopting higher floodplain management standards: Strategic disinvestment in the floodplain
- Enhancing existing plans to improve resilience

PREPARING FOR THE NEXT BIG ONE: PLACES THAT PUT 'RESILIENCE' IN THEIR FUTURE



JON DAVIS

Planning

August-September 2015, 22-26

Date Accessed: 23 December 2019

Beginning with a short summary of the American Planning Association's report *Planning for Post-Disaster Recovery*, Davis's article examines the positive impact resilience planning can have on a community after disaster strikes. Davis provides several examples of cities that have implemented resiliency plans in response to both flooding and sea-level rise, though the author makes it clear that there are still many definitions of resilience. Time will tell which of these plans is successful.

Davis's article also stresses the role that state governments can play in a town or city's disaster preparedness. Leadership is an important factor in a city's recovery.

PAS REPORT 576 PLANNING FOR POST-DISASTER RECOVERY: NEXT GENERATION

JAMES C. SCHWAB

December 2014

<https://planning-org-uploaded-media.s3.amazonaws.com/publication/online/PAS-Report-576.pdf>

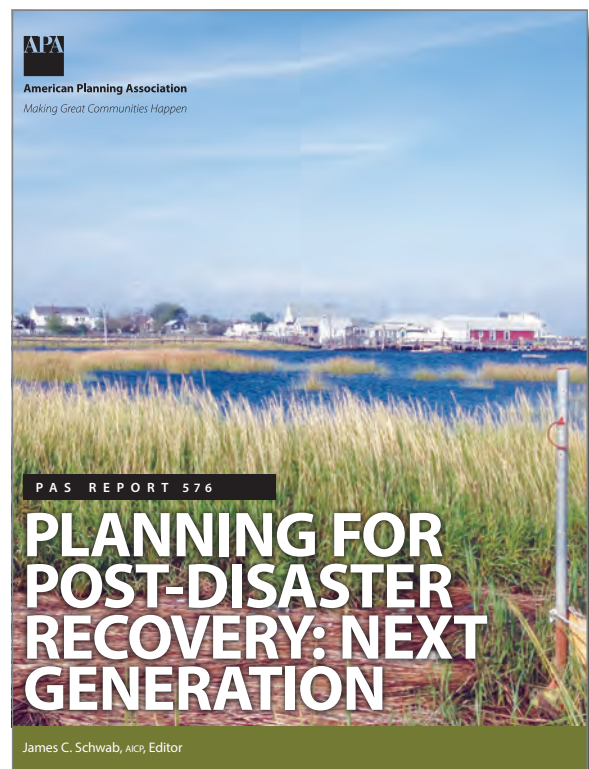
Date Accessed: 23 December 2019

An update to a previous report by the American Planning Association (APA) on disaster recovery, this report is targeted toward planners in an effort to prepare professionals for addressing what comes after a disaster.

Drawing on lessons from past disasters, the report emphasizes that, if approached from the appropriate angle, disasters present an opportunity to introduce resiliency measures into a community's plans.

In eight chapters, the report goes in-depth into a variety of concerns that planners must address, including:

- Anticipating Disruption
- Disaster Recovery Planning: Expectations versus Reality
- The Federal Framework for Disaster Recovery
- Long-Term Recovery Planning: Goals and Policies



WATER WARRIOR

MATT WEISER

Planning

August-September 2015, 32-35

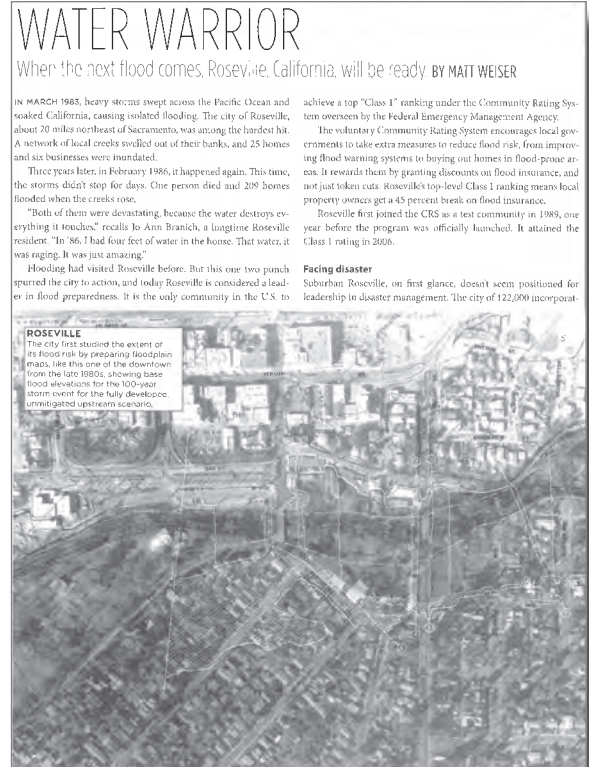
Date Accessed: 23 December 2019

Weiser's article is a case study of Roseville, California. After addressing repeated flooding of the Dry Creek, Roseville became one of the only cities in the United States to achieve a Class 1 rating under FEMA's Community Rating System (CRS).

This article details the planning, research, and costs undertaken by Roseville to improve the town's resiliency and achieve Class 1 status. Roseville employed several methods for controlling the impact of flooding including:

- Elevating homes
- Purchasing and demolishing high-risk homes
- Constructing new flood walls

In addition to Roseville's efforts, Weiser details how a community can participate in, and benefit from, the CRS.



CLIMATE ADAPTATION AND SEA-LEVEL RISE IN THE SAN FRANCISCO BAY AREA

LAURA TAM

January 2012

<https://www.planning.org/planning/2012/jan/waterwarriorsside2.htm>

Date Accessed: 23 December 2019

Tam's article examines the effects of, and mitigation efforts against, climate change in the Bay Area. As Tam explains: "Mitigation and adaptation are related." (1) The article continues with methods and considerations for planning during uncertain times, which requires a degree of flexibility and adaptability.

After detailing how climate change will manifest itself in San Francisco, Tam outlines mitigation and adaptation strategies. These strategies are grouped into four categories:

- Physical strategies for sea-level rise
- Governance of sea-level rise
- Managing public health
- Managing infrastructure



THE DEVIL IS IN THE DELTA



PAUL SHIGLEY - January 2012
<https://www.planning.org/planning/2012/jan/waterwarriorsside1.htm>
 Date Accessed: 23 December 2019

PROTECTING CULTURAL RESOURCES IN COASTAL U.S. NATIONAL PARKS FROM CLIMATE CHANGE

MARIA CAFFREY AND REBECCA BEAVERS

2008
<http://www.georgewright.org/252caffrey.pdf>
 Date Accessed: 23 December 2019

Caffrey and Beavers provide a quick investigation into how the National Park Service is addressing the effects of climate change.

In addition to a short literature review and a summary of the predicted impact of climate change, Caffrey and Beavers provide two case studies of sites threatened by sea-level rise: Fort Massachusetts, Mississippi and Cape Hatteras Lighthouse National Historic Landmark, North Carolina. The study examines the difficulties involved in enacting protective measures and the success of those measure once executed by park managers.

Protecting Cultural Resources in Coastal U.S. National Parks from Climate Change

Maria Caffrey and Rebecca Beavers

THE U.S. NATIONAL PARK SERVICE MANAGES OVER 84 MILLION ACRES OF LAND on which are located around 26,000 historic structures. One hundred fifty areas under Park Service management are designated as “cultural landscapes.” The impact of climate change on cultural resources will challenge many resource managers, in particular those responsible for protecting America’s heritage in national parks. Rising sea level and projected increases in average annual temperatures will undoubtedly impact many parks’ natural resources, which have led some to ask, “What is being done to protect cultural resources from climate change?”

This paper will discuss what steps have already been taken to uphold the Park Service’s mission to “preserve unimpaired the natural and cultural resources and values of the national park system...” (NPS 2007a). In particular, we discuss how cultural resources are being impacted by observed changes in climate and discuss how we expect cultural resources to be affected over the next century, based on projections by the Intergovernmental Panel on Climate Change (IPCC).

Fort Massachusetts in Gulf Islands National Seashore and Cape Hatteras Lighthouse in Cape Hatteras National Seashore will be used here as examples of large-scale measures that are being taken to preserve cultural resources that would otherwise be lost to a changing climate.

Literature review

When many of us think of climate change and cultural resources, we may think of the cultural resources that are currently endangered by rising sea level in

some of the oldest cities of the world, such as Venice or London. In early 2007, UNESCO listed twenty-six examples of World Heritage sites (out of 830 total) that are threatened by climate change (UNESCO 2007). These sites represent areas of global significance that are immediately at risk from changing climatic conditions. The list is categorized based on whether the sites are (1) glaciers, (2) areas of high marine biodiversity, (3) areas of high terrestrial biodiversity, (4) archeological sites, or (5) historic cities and settlements.

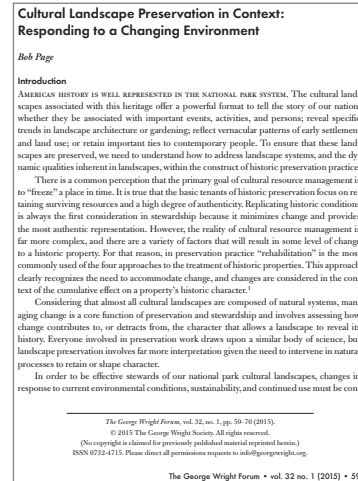
While these sites are important, they are merely examples of well-known sites that need protection. The question of how we protect those sites has been the subject of a number of reports and research conducted by various players, including those at multinational (e.g., UNESCO 2006, 2007), national (e.g., Cassar 2005) and academic (e.g., Dietz et al. 2003; Wallach 2005; Hassler 2006) scales. However, while the ecological impacts of climate change have been discussed extensively in the liter-

CLIMATE CHANGE AND CULTURAL HERITAGE: LOCAL EVIDENCE, GLOBAL RESPONSES



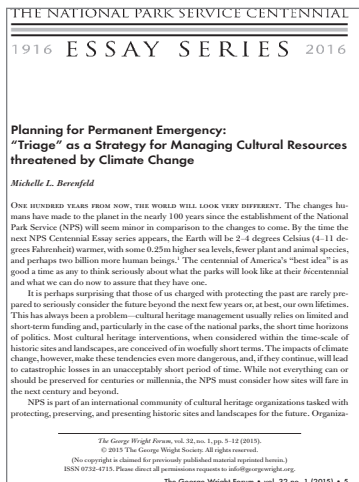
MICHELLE L. BERENFELD - 2008
<http://www.georgewright.org/252berenfeld.pdf>
 Date Accessed: 23 December 2019

CULTURAL LANDSCAPE PRESERVATION IN CONTEXT: RESPONDING TO A CHANGING ENVIRONMENT



BOB PAGE - 2016
<http://www.georgewright.org/321page.pdf>
 Date Accessed: 23 December 2019

PLANNING FOR PERMANENT EMERGENCY: "TRIAGE" AS A STRATEGY FOR MANAGING CULTURAL RESOURCES THREATENED BY CLIMATE CHANGE



MICHELLE L. BERENFELD - 2015
<http://www.georgewright.org/321berenfeld.pdf>
 Date Accessed: 23 December 2019

A DECISION FRAMEWORK FOR MANAGING CULTURAL LANDSCAPES IMPACTED BY CLIMATE CHANGE: A PRELIMINARY REPORT



ROBERT Z. MELNICK, OLIVIA BURRY-TRICE AND VERONICA MALINAY - 2015
<http://www.georgewright.org/321melnick.pdf>
 Date Accessed: 23 December 2019



NATIONAL LANDMARKS AT RISK: HOW RISING SEAS, FLOODS, AND WILDFIRES ARE THREATENING THE UNITED STATES' MOST CHERISHED HISTORIC SITES



DEBRA HOLTZ, ET AL

May 2014

http://www.ucsusa.org/sites/default/files/legacy/assets/documents/global_warming/National-Landmarks-at-Risk-Full-Report.pdf

Date Accessed: 23 December 2019

Published by the Union of Concerned Scientists, this report is a collection of case studies that illustrates the impact of climate change, specifically on National Landmarks. Each case study summarizes how climate change impacts has already begun to manifest at the site and details the cultural resources at risk.

The report emphasizes that climate change is not a future threat. It is a present threat that requires action, the absence of which presents the risk of losing these Landmarks. The report does not present any clear guidance for adapting historic sites in response to climate change. It is instead a call for action, highlighting that, although an individual may not be directly impacted by climate change, there will be consequences for everyone's tangible cultural heritage.

In its final chapter, the report includes a general explanation of the science behind climate change and how related consequences are predicted. The report concludes with a call to action, not only to protect historic sites but to reduce greenhouse gases.

SURVIVING AND THRIVING IN THE FACE OF RISING SEAS BUILDING RESILIENCE FOR COMMUNITIES ON THE FRONT LINES OF CLIMATE CHANGE



RACEL CLEETUS, ET AL - November 2015

<https://www.ucsusa.org/sites/default/files/attach/2015/11/surviving-and-thriving-full-report.pdf>

Date Accessed: 23 December 2019

ENCROACHING TIDES HOW SEA LEVEL RISE AND TIDAL FLOODING THREATEN U.S. EAST AND GULF COAST COMMUNITIES OVER THE NEXT 30 YEARS



ROBERT Z. MELNICK, OLIVIA BURRY-TRICE AND VERONICA MALINAY - 2015

<https://www.ucsusa.org/sites/default/files/attach/2014/10/encroaching-tides-full-report.pdf>

Date Accessed: 23 December 2019

REBUILD BY DESIGN

JOHN GENDALL, CONSULTANT EDITOR

2015

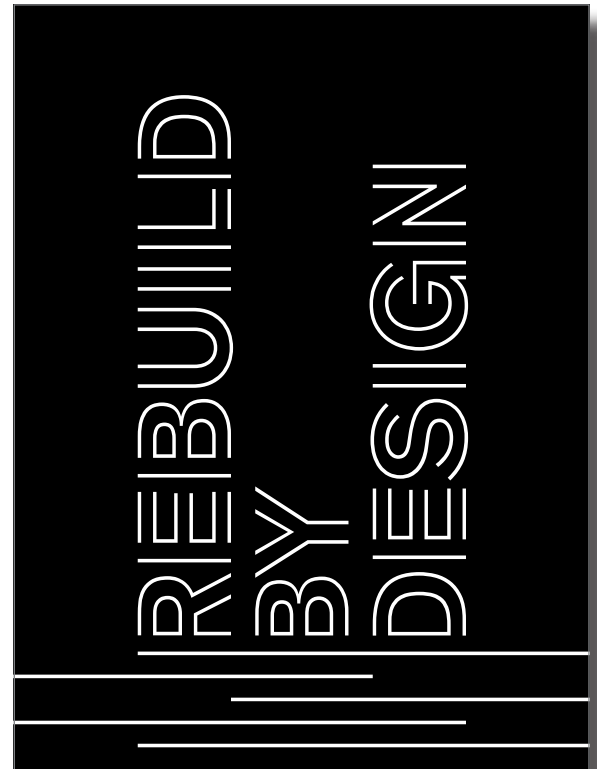
<http://www.rebuildbydesign.org>

Date Accessed: 23 December 2019

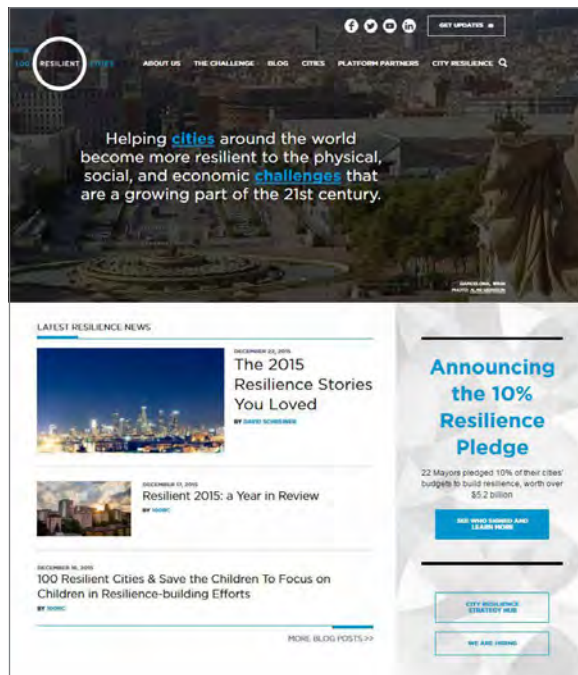
Rebuild by Design was an undertaking, spearheaded by HUD Secretary Shaun Donovan, to rethink the response to Hurricane Sandy and to develop tools for resiliency that can be implemented in areas affected by the storm. This eponymous book documents the research and final proposals of the ten teams that participated.

Proposals differed in terms of location and scope. Each team aimed to produce innovative approaches to flooding in New York City and northern New Jersey.

The Rebuild by Design effort also includes a discussion on resilience policy.



100 RESILIENT CITIES



2016

www.100resilientcities.org

Date Accessed: 23 December 2019

Supported by the Rockefeller Foundation, 100 Resilient Cities is a network that offers cities resources for creating resiliency plans. As described on the organization's website, there are "four main pathways" to achieving resilience:

- Financial and logistical guidance
- Expert support
- Access to solutions, service providers and partners from the private, public, and NGO sectors
- Membership in a global network of member cities

The Rockefeller Foundation's goal is to encourage resilience planning at the city level. The organization does not define resilience only in terms of disaster preparation, but as a means of responding to stresses that include violence, high unemployment, and overburdened transit systems.

A RAINREADY NATION: PROTECTING AMERICAN HOMES AND BUSINESSES IN A CHANGING CLIMATE



HARRIET FESTING, ET AL

January 2015

http://www.cnt.org/sites/default/files/publications/CNT_RainReadyNation_0.pdf

Date Accessed: 23 December 2019

Festing's report on flooding touches not just on flooding due to climate change but "urban flooding" which she defines as flooding that results when water overwhelms the existing water management infrastructure. The intent of this report is to review the issues and related challenges of flooding and to provide solutions. The Center for Neighborhood Technology, the organization responsible for publishing this report, also outlines what makes a "rainready" home and recommends improvements to reduce the occurrence of floods.

The report also reviews how policies can be enacted to improve flood mitigation and describes the economic benefits of preparation. Ten principles define the "rainready" approach, which include:

- Easily implementable and replicable services
- Market-based approaches
- Community-wide efforts
- Evidence-based plans

THE PREVALENCE AND COST OF URBAN FLOODING: A CASE STUDY OF COOK COUNTY, IL

HARRIET FESTING, ET AL

May 2014

http://www.cnt.org/sites/default/files/publications/CNT_PrevalenceAndCostOfUrbanFlooding2014.pdf

Date Accessed: 23 December 2019

This report, published by the Center for Neighborhood Technology, is an analysis of data collected from insurance claims (including flood insurance), geographic data and individual survey responses. For this report, the geographical area is limited to Cook County, Illinois. From this information, the report lists "key points" that the data represent:

- Flooding in the county is chronic, as are the associated costs
- Those impacted by flooding suffer social and economic consequences
- There has been no clear relationship between claims and floodplain
- All income groups are affected
- Flood insurance does not cover a homeowner's needs

Respondents to the survey could not report that any mitigation efforts were effective during the following flood event.



INTEGRATING CLIMATE SCIENCE INTO COASTAL RESILIENCE: PLANNING AND DECISION MAKING IN NEW JERSEY

KOPP, R.E., ET. AL.

October 2016

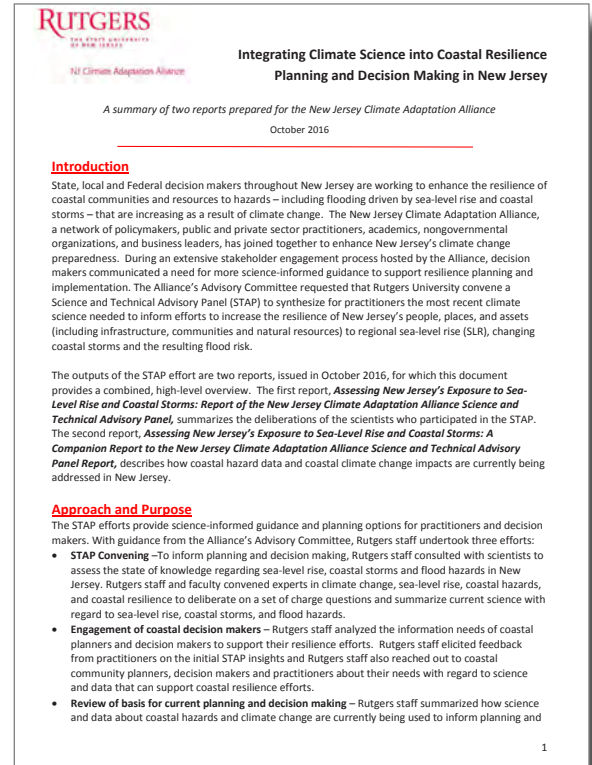
<https://njadapt.rutgers.edu/resources/nj-sea-level-rise-reports>

Date Accessed: 23 October 2019

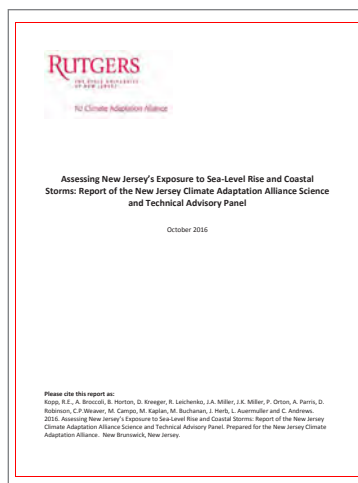
The New Jersey Climate Adaptation Alliance Advisory Committee requested that Rutgers University convene a Science and Technical Advisory Panel (STAP) to synthesize for practitioners the most recent climate science needed to inform efforts to increase the resilience of New Jersey's people, places, and assets (including infrastructure, communities and natural resources) to regional sea-level rise (SLR), changing coastal storms and the resulting flood risk.

The three documents prepared as part of this effort included:

- A scientific and technical report summarizing the deliberations of the scientists who participated in the STAP
- A description of how coastal hazard data and coastal climate change impacts are currently being addressed in New Jersey
- A summary of the two reports



ASSESSING NEW JERSEY'S EXPOSURE TO SEA-LEVEL RISE AND COASTAL STORMS: REPORT OF THE NEW JERSEY CLIMATE ADAPTATION ALLIANCE SCIENCE AND TECHNICAL ADVISORY PANEL



KOPP, R.E., ET. AL. - October 2016

<https://njadapt.rutgers.edu/resources/nj-sea-level-rise-reports>

Date Accessed: 23 October 2019

ASSESSING NEW JERSEY'S EXPOSURE TO SEA-LEVEL RISE AND COASTAL STORMS: A COMPANION REPORT TO THE NEW JERSEY CLIMATE ADAPTATION ALLIANCE SCIENCE AND TECHNICAL ADVISORY PANEL REPORT



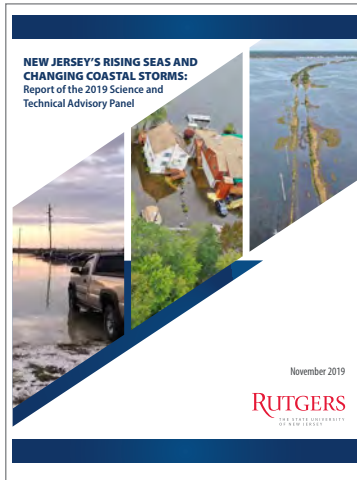
KOPP, R.E., ET. AL. - October 2016

<https://njadapt.rutgers.edu/resources/nj-sea-level-rise-reports>

Date Accessed: 23 October 2019



NEW JERSEY'S RISING SEAS AND CHANGING COASTAL STORMS: REPORT OF THE 2019 SCIENCE AND TECHNICAL ADVISORY PANEL



KOPP, R.E., ET. AL. - November 2019
https://climatechange.rutgers.edu/images/STAP_FINAL_FINAL_12-4-19.pdf
 Date Accessed: 23 December 2019

NEW JERSEY'S RISING SEAS AND CHANGING COASTAL STORMS: A SUMMARY OF THE 2019 SCIENCE AND TECHNICAL ADVISORY PANEL



KOPP, R.E., ET. AL. - November 2019
https://climatechange.rutgers.edu/images/STAP_SUMMARY_FINAL_FINAL_11-25-19.pdf
 Date Accessed: 23 December 2019

ADAPTATION TOOLKIT: SEA-LEVEL RISE AND COASTAL LAND USE

VIRGINIA INSTITUTE FOR MARINE SCIENCE

January 2013

<http://tinyurl.com/q22p77s>

Date Accessed: 23 December 2019

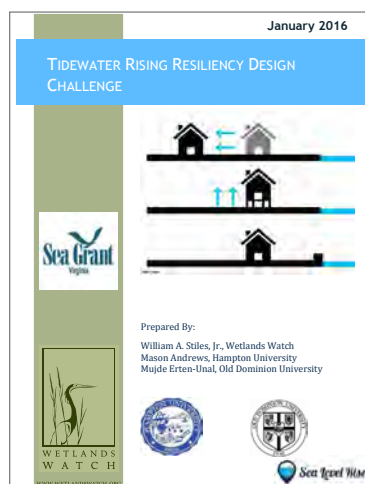
A response to the effects of greenhouse gas emissions, the Adaptation Toolkit speaks directly to policymakers. The Toolkit provides landuse methods that respond to, and limit the impact of, sea-level rise. Each of the eighteen methods, or tools, identified is examined with regard to economic, environmental, and social costs and benefits.

The Toolkit is divided into four categories:

- Planning Tools
- Regulatory Tools
- Spending Tools
- Tax and Market-Based Tools

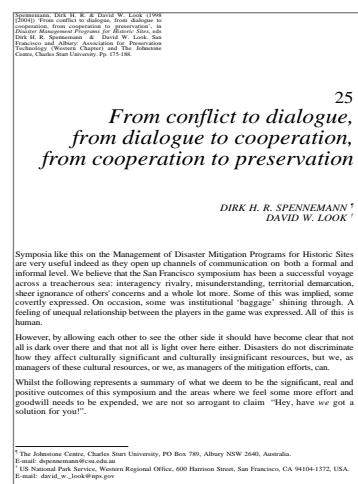


TIDEWATER RISING RESILIENCY DESIGN CHALLENGE



WILLIAM A. STILES, MASON ANDREWS AND MUJDE ERTEN-UNAL - January 2016
https://www.aswm.org/state_meeting/2016/report_chesterfield_heights.pdf
 Date Accessed: 23 December 2019

FROM CONFLICT TO DIALOGUE, FROM DIALOGUE TO COOPERATION, FROM COOPERATION TO PRESERVATION



DIRK H.R. SPENNEMANN AND DAVID W. LOOKS - 1998
<http://csusap.csu.edu.au/~dspennem/PDF-Articles/SFO-25-Final.pdf>
 Date Accessed: 23 December 2019



BUILDING RESILIENT REGIONS



THE UNIVERSITY OF CALIFORNIA BERKELEY

2013

<http://berkeley.edu/>

Date Accessed: 23 December 2019

The Building Resilient Regions project focuses on how metropolitan areas can positively impact the surrounding regions to meet the challenges faced by those regions. Although the blog has been retired, the website stands as resource for regions and policymakers. The site has been organized into five topic areas:

- Economic Insecurities
- Economic Resilience
- Infrastructure
- Governance
- Immigration

In addition to addressing key questions with which all regions must grapple, the site also provides recommended resources and publications.

AMPHIBIOUS ARCHITECTURES: THE BUOYANT FOUNDATION PROJECT IN POST-KATRINA NEW ORLEANS

ELIZABETH VICTORIA FENUTA

2010

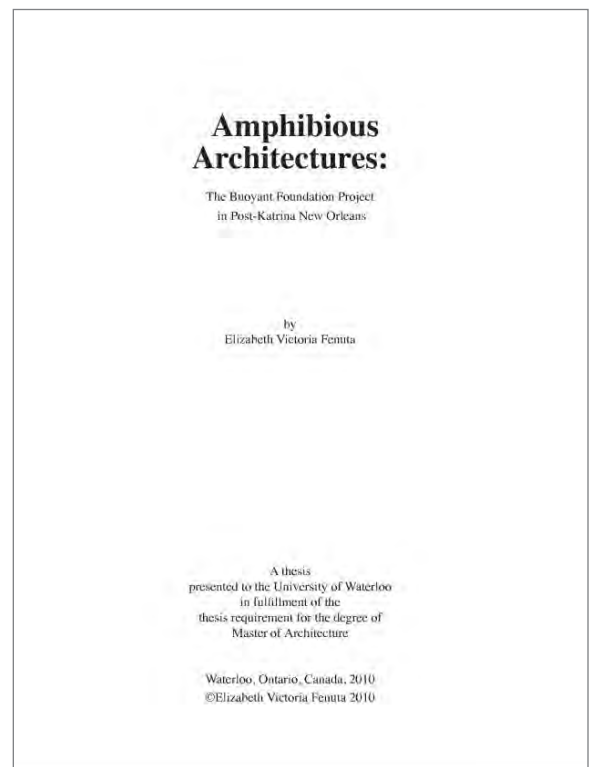
http://issuu.com/lizfenuta/docs/amphibious_architectures_thesis

Date Accessed: 23 December 2019

Fenuta's research into amphibious foundations focuses on the Lower Ninth Ward in New Orleans. In cooperation with the Buoyant Foundation Project, this investigation examines the application of an amphibious foundation system to the typical "shotgun" house.

This research intends to demonstrate the benefits of retrofitting existing structures with these foundations, benefits which include cultural, economic, and sustainability considerations. Fenuta divides her investigation into the following categories:

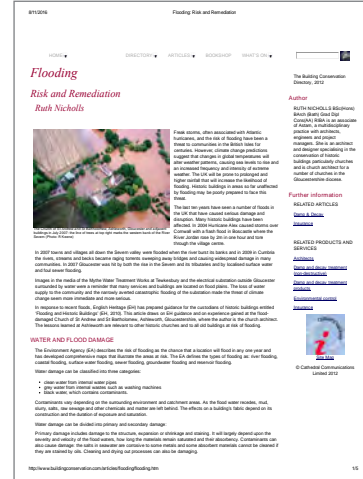
- Challenges
- Context
- The Buoyant Foundation Project
- Technical Feasibility
- Efficiency
- The Future of the Buoyant Foundation Project
- Conclusions



FLOOD DAMAGE IN HISTORIC BUILDINGS FLOODING RISK AND REMEDIATION



TIM HUTTON & CHRISTOPHER MARSH - No Date
http://www.buildingconservation.com/articles/flood/flood_damage.htm
 Date Accessed: 23 December 2019



RUTH NICHOLLS - No Date
<http://www.buildingconservation.com/articles/flooding/flooding.htm>
 Date Accessed: 23 December 2019

EMERGENCY RESPONSE AND SALVAGE WHEEL



https://store.culturalheritage.org/site/index.php?app=ecom&n_s=prodshow&ref=FAIC-1



FLOOD CONTROL PROPOSAL FOR THE FARNSWORTH HOUSE: INFLATABLE STOWABLE BARRIER

FLOOD CONTROL PROPOSAL for the FARNSWORTH HOUSE INFLATABLE STOWABLE BARRIER

Submitted by Sigrid Adriaenssens, October 27, 2015

SUMMARY

We propose to block abrupt water elevation change and inundation of the site of the Farnsworth House by protecting it with a linear, stowable, air-supported barrier, positioned at a distance from the house's perimeter. A pneumatic barrier is a flexible closed membrane that is pre-stressed by internal air and/or water pressure and loaded by external hydrodynamic and hydrostatic forces. Such a barrier can deform while retaining its functionality. When not in use, such a barrier could be stowed in a recess in the foundation constructed below ground level, and would not obstruct the views from and to the house. This minimal intervention in the landscape would not alter the original house and its site location.

PRECEDENT STUDIES

This proposal builds upon existing pneumatic barrier technology, developed for smaller dams and our research on large storm surge barriers, positioned along vulnerable populated coast lines. In our research we have demonstrated that such barriers can be successfully subjected to extreme water loads and inhibit inland flooding. Our study investigated the feasibility of such a barrier for the Rockaway Peninsula (NYC) (see figure 1a). These studies further built on the construction and operation of the only pneumatic storm surge barrier, the Ramspl Bagstuw (Netherlands, 2002), which achieves a crest height of 10m under storm surges (see figure 1b).



Figure 1a: Our visualisation of a pneumatic storm surge barrier positioned along the Rockaway Peninsula (NYC) and b the inflation of the Ramspl Bagstuw between two lakes (clockwise image credit maritiemnieuws.nl)

CONCEPT

The membrane of the inflatable barrier is stored in a recess in the foundation of the barrier. The membrane is clamped to its foundation, which is designed to also prevent water seepage underneath the barrier. In case of an expected high water level, the barrier is inflated and forms a watertight

1

SIGRID ADRIAENSSENS

27 October 2015

Adriaenssens's proposal for the Farnsworth House is an overview of an alternate method for mitigating flooding at this Historic Landmark. In her proposal, Adriaenssens explains how an inflatable barrier system would be deployed and how the system can be applied to the house. Discussion is included on how the system is anchored and describes the merits of inflating the system with air versus water.

As this is a novel system, Adriaenssens points to the only existing use of the system in the Netherlands as a case study, where the barriers can resist a 10 meter (approximately 33 feet) storm surge. Despite the capacity of the barriers when in use, the advantage is that, as Adriaenssens explains, the barriers do not interfere with the surrounding context when not deployed. That the system does not significantly alter its context is an important consideration for the Farnsworth House.

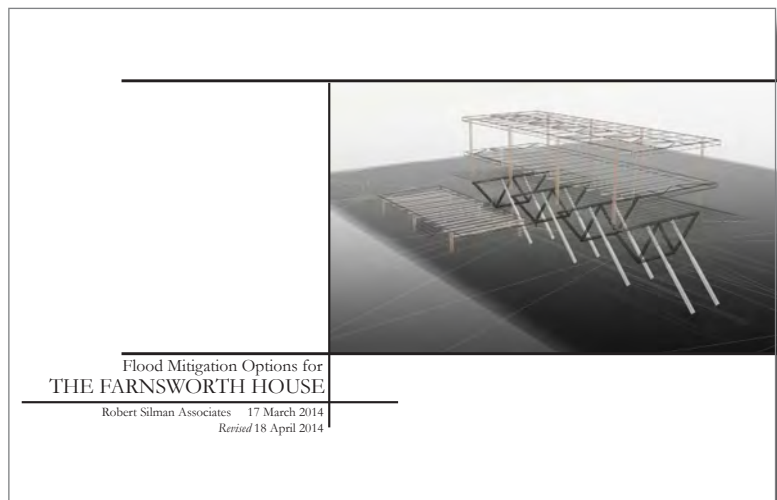
FLOOD MITIGATION OPTIONS FOR THE FARNSWORTH HOUSE

Flood Mitigation Options for the Farnsworth House is a report that examines three possible methods for alleviating flooding around Mies van der Rohe's iconic house. The three methods Robert Silman Associates reviews are:

- Raising the house
- Moving the house to a less flood-prone location
- Installing hydraulic lifts to raise the house during a flood event

Following an extended discussion regarding the implications of each option, the report finds that the most attractive solution is to install a hydraulic system under the house. It is presented as the solution that least intrudes on this Historic Landmark since any change would be temporary, only visible during a flood event.

The report includes a fairly in-depth description of how such a hydraulic system would be installed and how the system would deploy.

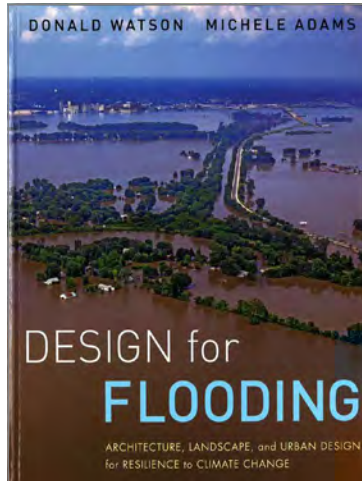


ROBERT SILMAN ASSOCIATES
2014

http://farnsworthproject.org/wp-content/uploads/RSA_Farnsworth_Report.pdf

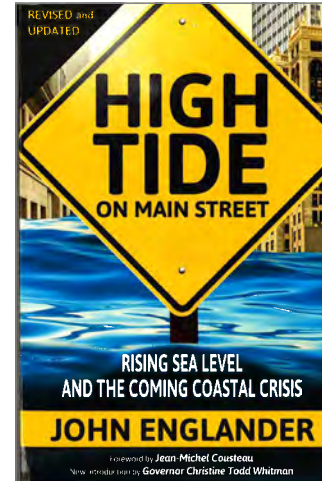
Date Accessed: 23 December 2019

DESIGN FOR FLOODING



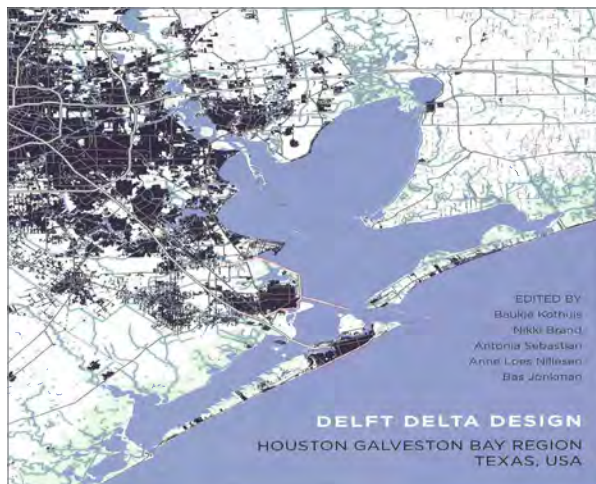
DONALD WATSON AND MICHELE ADAMS - 2011
John Wiley & Sons

HIGH TIDE ON MAIN STREET



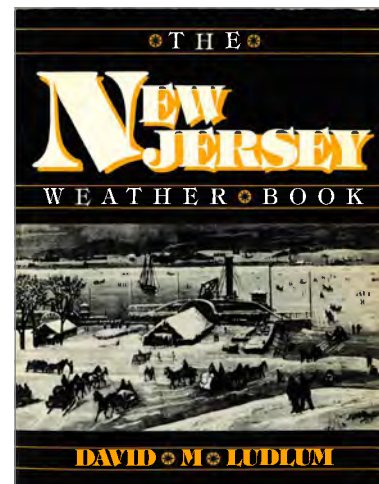
JOHN ENGLANDER - 2013
The Science Bookshelf

DELFT DELTA DESIGN: HOUSTON GALVESTON BAY REGION, TEXAS, USA



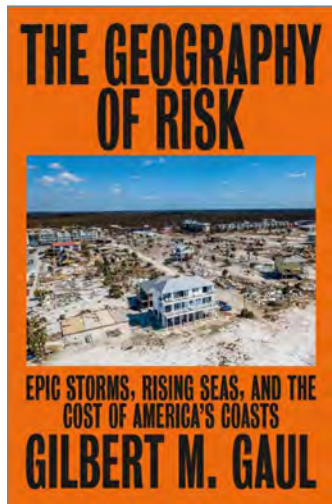
BAUKJE KOTHUIS, NIKKE BRAND, ANTONIA SEBASTIAN,
ANNE LOES NILLESEN AND BAS JONKMAN - 2015
Delft University Publishers

THE NEW JERSEY WEATHER BOOK



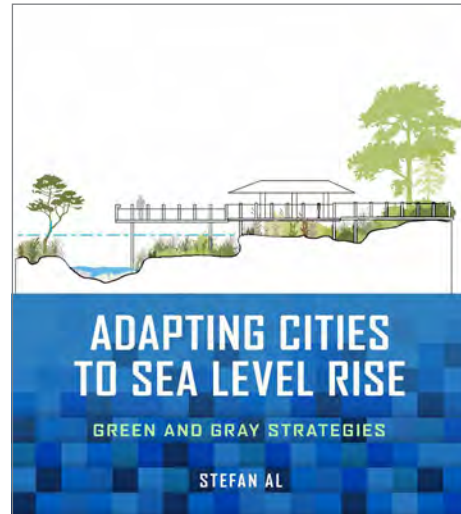
DAVID M. LUDLUM - 1983
Rutgers University Press

**THE GEOGRAPHY OF RISK: EPIC STORMS,
RISING SEAS, AND THE COST OF
AMERICA'S COASTS**



GILBERT M. GUAL - 2019
Sarah Crichton Books

**ADAPTING CITIES TO SEA LEVEL RISE:
GREEN AND GRAY STRATEGIES**



STEFAN AL - 2018
Island Press

