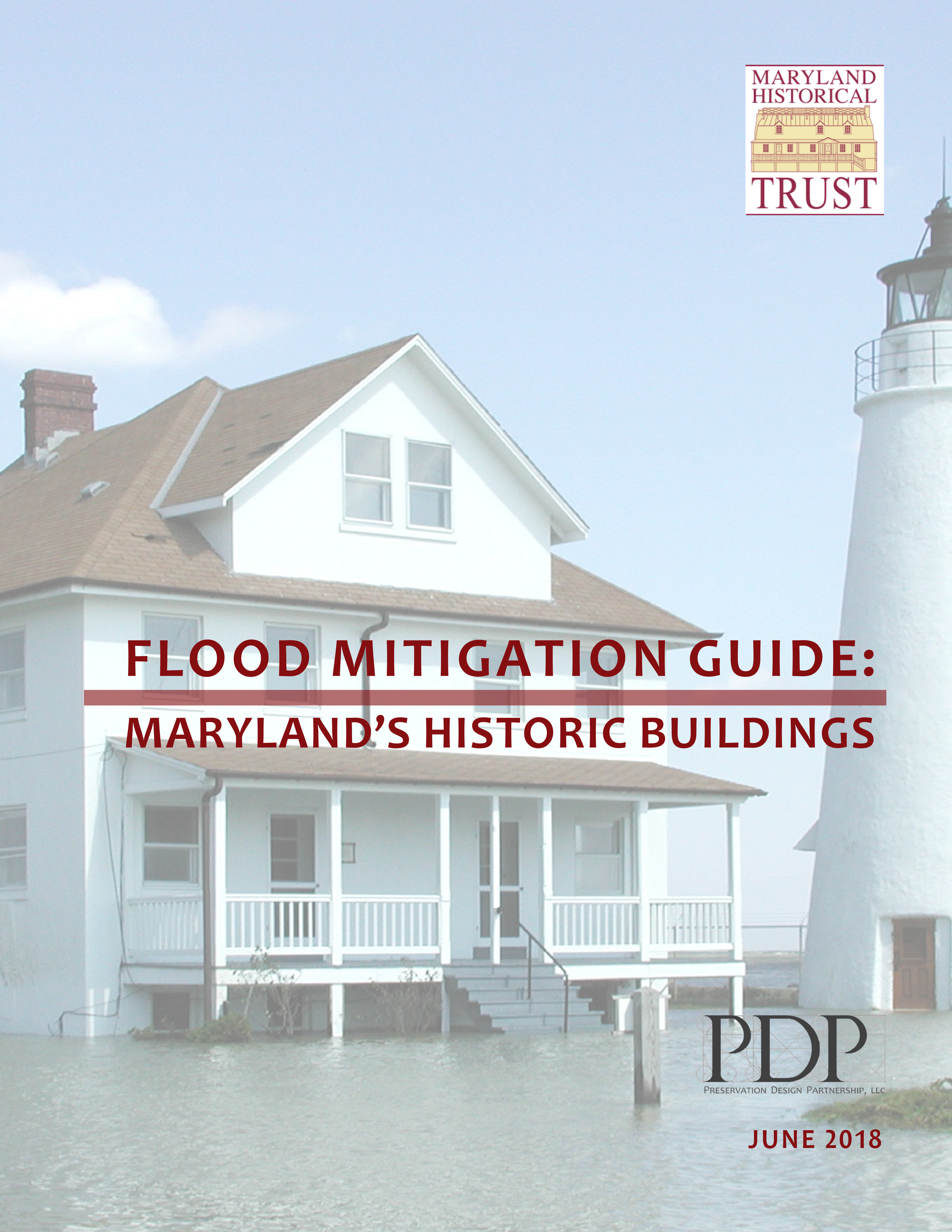

MARYLAND HISTORICAL TRUST

# FLOOD MITIGATION GUIDE:
## MARYLAND'S HISTORIC BUILDINGS

PDP
Preservation Design Partnership, LLC

JUNE 2018

This material is based upon work assisted by a grant from the Department of the Interior, National Park Service. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the Department of the Interior.



*Cover Image: Cove Point Lighthouse, 2003. Lusby, Calvert County.*

## PREPARATION

The *Flood Mitigation Guide: Maryland's Historic Buildings*, was prepared by:

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*Figure 1 - Sandy Point Shoal Light Station. Annapolis, Anne Arundel County.*

# PREFACE

## A. PROJECT GOALS

The State of Maryland, with its extensive tidal shoreline, riverine shorelines and watersheds, is highly vulnerable to flooding from rising seas, subsidence, coastal storms, flash flooding, riverine flooding, and stormwater runoff. Often developed near waterways, historic communities are particularly vulnerable to flooding, which, in many areas, is increasing in frequency and volume over historic trends due to climate change.

Today, preservation planners and advocates who wish to help historic properties withstand flooding may find themselves confused and hindered by complex and contradictory policies, regulations, and practices. To help bridge the gaps between floodplain management, emergency management, climate adaptation, and historic preservation, this *Guide* was undertaken and administered by the Maryland Historical Trust (MHT) with financial assistance provided by the National Park Service (NPS) under the Historic Preservation Fund Grants to Provide Disaster Relief to Historic Properties Damaged by Hurricane Sandy.

We have chosen to present this *Guide* in a sequence that first explains floodplain management and then follows the steps of the emergency management cycle: planning, response, recovery, and mitigation. Given the projected impacts of climate change on historic properties, we have added adaptation as an additional step. Following this sequence helps us demonstrate that the interaction of preservation and emergency management needs to occur at each of these steps to be truly successful. This *Guide* therefore creates a framework through which local preservation planners and advocates can better understand floodplain management and engage in local and state emergency management processes. As this *Guide* demonstrates, floodplain and emergency management efforts are largely locally-focused, and as such, it is largely up to local planners and advocates to ensure that historic preservation has a seat at the table.

# B. PROJECT APPROACH

## B.1 THE PROJECT TEAM

The project team was led by Preservation Design Partnership, LLC (PDP) of Philadelphia, PA with Dominique M. Hawkins, AIA serving as the Project Manager and principal author. Assistance was provided by Sarah Blitzer who conducted preliminary research and participated in site visits, as well as Mary Dempsey Lau, AIA, Sarah Ripple and Dianne Loftis, all of PDP. Wendy Lathrop, PLS, CFM of Cadastral Consulting shared her floodplain expertise with the project team. The project team was retained by MHT pursuant to a Request for Proposal process.

At MHT, the staff working group was composed of individuals representing the organization's major programs and disciplines. Working group members participated in meetings with PDP, participated in site visits for this *Guide*, provided input on drafts, and facilitated contact with local communities vulnerable to flooding:

Elizabeth Hughes, Director and State Historic Preservation Officer

Anne Raines, Deputy Director / Deputy State Historic Preservation Officer

Michael Day, Deputy Director / Deputy SHPO, Chief of Office of Preservation Services (OPS)

Marcia Miller, Chief of Office of Research, Survey, and Registration (ORSR)

Nell Ziehl, Chief of Office of Planning, Education, and Outreach (OPEO)

Beth Cole, Administrator, Review and Compliance (in OPS)

Peter Kurtze, Administrator, Evaluation & Registration (in ORSR)

Jennifer Sparenberg, Hazard Mitigation Officer (in OPEO)

The MHT working group was coordinated by Anne Raines, and Nell Ziehl, and Jennifer Sparenberg provided substantial additional content for and revisions to the *Guide*, drawing on MHT's experience via its statewide Weather It Together program, which provides funding and technical assistance to historic communities grappling with hazard mitigation, emergency response and recovery, and climate adaptation. Inspired by the pioneering work undertaken by the City of Annapolis in planning for sea-level rise, the Weather It Together program was also supported by the National Park Service under the Historic Preservation Fund Grants to Provide Disaster Relief to Historic Properties Damaged by Hurricane Sandy.

## B.2 METHODOLOGY

The preparation of this *Guide* occurred between September 2015 and June 2018 in three phases:

- **Phase I: Research and Data Collection** – The project team reviewed reports and publications related to past flooding in Maryland; the existing federal and State of Maryland regulatory framework related to emergency management and historic preservation; the current hazard mitigation process; and examples of best practices for flood mitigation from the United States and abroad. A synopsis of the team's findings is presented in *Appendix B - Annotated Bibliography*.

- **Phase II: Site Visits / Local Outreach** – For the site visit phase, the project team, accompanied by representatives of MHT, visited thirteen communities with a range of flooding types and challenges across the State. Each site visit included a tour as well as a meeting with local representatives who described the changes to their communities, past flood events, and any strategies being implemented to address flooding. The findings from each community, as well as potential mitigation strategies, are included in section *Appendix A - Case Studies: Maryland's Historic Communities*.

- **Phase III: Preparation of this Guide** – Following the research and site visit phases, the project team worked closely with MHT to prepare the body of this *Guide*. The *Guide* draft was then circulated for feedback to representatives of state agencies and organizations with experience in flooding and historic preservation, and revised with input from these reviews.

Although MHT recognizes the vulnerability of archaeological sites and landscapes to flood damage, the focus of this *Guide* is the long-term protection of historic buildings. Some strategies regarding the collection of threatened archaeological resources are addressed in the Shady Side site visit report in *Appendix A - Case Studies: Maryland's Historic Communities*. MHT intends to prepare more thorough guidance for archeological sites and natural hazards as a follow-up to this *Guide*.

# C. FUTURE PLANS

This *Guide* will be used to inform MHT programs, including the technical assistance offered by MHT through its Weather It Together program, as well as multi-agency state efforts through the Maryland Commission on Climate Change's Adaptation and Response Working Group. MHT intends to update the *Guide* as state and federal policies and regulations change. Ideally, in time, the *Guide* will help underpin educational efforts and local policies geared towards property owners who wish to protect their individual historic properties.

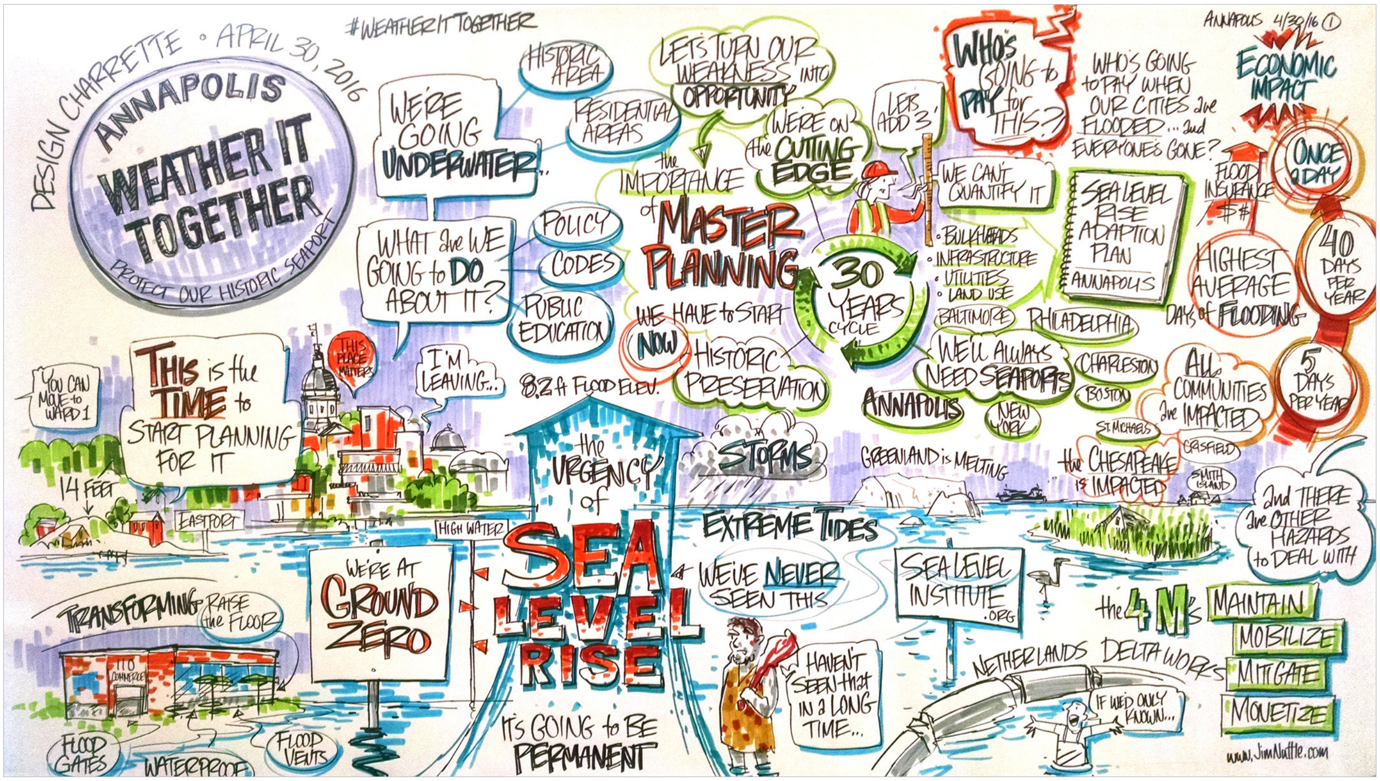


*Figure 2 - Photograph of storyboard from the Annapolis Weather It Together Design Charrette held on April 30, 2016. Illustration by Jim Nuttle.*


*Figure 3 - August 2017 public meeting for Annapolis's Weather It Together initiative.*

# HOW TO USE THIS GUIDE

## *What is it?*

This *Guide* is a "road map" to help local governments and preservation advocates protect historic properties in their communities from flooding. While it addresses specific strategies such as floodproofing and elevating buildings that may be useful for property owners, the *Guide* focuses on what communities can do before, during, and after a flood to ensure that historic preservation is considered within the ongoing process of emergency management. To that end, the *Guide* provides a primer on issues such as flooding, floodplain management, and the emergency management cycle, and each section of the *Guide* illustrates ways to incorporate and address the protection of historic buildings within the existing regulatory framework. The *Guide* does not prescribe specific treatments, but rather suggests and analyzes options for decision-making.

## *Who is it for?*

Although geared primarily toward local preservation planners, the *Guide* should benefit anyone attempting to meet the combined goals of historic preservation and emergency management, including state and local planners, floodplain managers, emergency managers, historic preservation consultants, preservation advocates, and public officials. The Maryland Historical Trust (MHT) will use the *Guide* to inform its own programs, including project review, local government assistance, and incentives.

## *Where do I start?*

The *Guide* can be read cover-to-cover or according to the needs and interests of the reader. Each section is relatively self-contained. For instance, a local government prone to storms and occasional, devastating floods may wish to start with Response and Recovery, to ensure that historic preservation is considered within its emergency response plans. *(Refer to Response & Recovery, page 2.39.)* The five-year hazard mitigation plan update required by FEMA is the perfect time to implement some of the recommendations outlined in Planning and Preparedness. *(Refer to Planning & Preparedness, page 2.3.)*

Historic preservation commission staff confused about property owner requests to reduce flood insurance premiums can read up on floodplain management and the National Flood Insurance Program. *(Refer to Floodplain Management, page 1.15, and National Flood Insurance Program, page 1.17.)* And for planning offices considering code updates or specific mitigation treatments for historic properties, the *Guide* offers advice in the sections related to Mitigation and Adaptation. *(Refer to Mitigation, page 2.49, Adaptation, page 2.65, and Chapter 3: Selecting Preservation-Sensitive Mitigation Options.)*

Within each chapter, major sections begin with a content description to help the reader identify the most appropriate starting point. The following is a summary of each chapter.

**1.0 Flooding & Floodplain Management** provides an overview of the history of Maryland's waterfront development, major storm events in Maryland, types of flooding, trends, and effects. This chapter describes floodplain regulation and flood insurance, explains how flood maps are used, and outlines potential conflicts between flood insurance requirements and historic preservation.

**2.0 Historic Preservation & Emergency Management** describes ways to consider and plan for historic properties within the emergency management cycle (planning and preparedness, response and recovery, mitigation), as well as climate adaptation. It also includes a brief introduction to the emergency management regulatory context and key players at all levels of government.

**3.0 Selecting Preservation-Sensitive Mitigation Options** describes and outlines the pros and cons of different treatments, on both a community-wide level and for individual properties.

**Appendix A. Case Studies: Maryland's Historic Communities** provides snapshots of thirteen Maryland communities, describing the types of flooding they experience, the effects of this flooding, and, in some cases, their flood mitigation strategies. Because the featured communities are geographically dispersed with a variety of historic property types, and are prone to flooding from a variety of sources, the case studies will help readers understand how flood mitigation strategies can function in a range of settings.

## *Where can I learn more?*

For readers who wish to explore the *Guide's* topics in more depth, the Annotated Bibliography includes a range of reports and publications related to the history of flooding in Maryland; the federal and State of Maryland regulatory framework for flooding and historic preservation; documents related to flooding and the hazard mitigation process; and examples of best practices for flood mitigation from the United States and abroad. *(Refer to Appendix B: Annotated Bibliography.)* Most of the publications included are available on the internet, facilitating in-depth review. As part of its Weather It Together program, MHT provides training materials, case studies and other resources for local governments engaged in historic preservation, emergency management and climate adaptation. Readers are also welcome to contact MHT for technical assistance and information on training opportunities.

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# FLOODING & FLOODPLAIN MANAGEMENT

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## INTRODUCTION

**KEY QUESTION:**

***How do Maryland's waterways relate to the settlement patterns and development within the state?***

The State of Maryland has an unusual shape and geography, with many of its boundaries defined by water. The Atlantic Ocean forms its easternmost shore. The Chesapeake Bay, America's largest estuary, separates the Eastern Shore of Maryland and Virginia from the "western shore." The south bank of the Potomac River defines Maryland's southern border with Virginia and West Virginia. Coursing across the state from the mountainous west to the low elevations of the east is a network of rivers, streams, creeks, and brooks. With proximity to water, of course, comes flooding, and Maryland's history of human settlement along these waterways has shaped the state's development overall and, in many cases, determined its vulnerability.


*Figure 1.1 - Rivers of Maryland.*

For thousands of years, within Maryland's current borders, Native Americans established settlements near water sources, leaving an untold number of archeological sites now threatened by shoreline erosion and riverine flooding. For ease of transit and transport, as well as access to food and water, European settlers followed a similar pattern and established Maryland's colonial capitals, Saint Mary's City (1633) and Annapolis (1694), at convenient landing points on the Chesapeake Bay. Numerous other towns grew around the Bay and its tributaries: Elk Landing, settled in 1694 at the head of the Bay, became Elkton (1787); Charlestown (1742) was Cecil County's first seat; Chestertown, founded 1706 on the Chester River, became Maryland's second leading port by the mid-18th century; St. Michaels, laid out in the 1770s, an early center of shipbuilding; Cambridge, settled in 1684, became an important center of agricultural commerce on the Eastern Shore; and Crisfield, which grew from a 17th century fishing village on Tangier Sound to a major hub of the seafood industry. The broadening of the Patapsco River at its confluence with the Bay created a protected harbor ideal for early industrial and maritime pursuits, giving rise to Baltimore Town (founded in 1729), where a scattered settlement soon evolved into dense urban neighborhoods.

Early European settlements were located close enough to waterways for easy access but distant enough to avoid flooding. With low populations, limited footprints, and little built infrastructure, these towns tended have a relatively light impact on the environment. The settlements connected to each other via waterways and a few roads, which were often adapted

*Figure 1.2 - Ferry service is available in historic waterfront towns like Whitehaven, Wicomico County.*

## KEY QUESTION:

***What kinds of historic communities and properties may be particularly at risk of flooding?***

from Native American trails and sometimes paved with oyster shells. As time passed and technology improved, water facilitated transportation and commerce via steamboats, ferries, and canals – most notably the Chesapeake & Ohio Canal, which transported coal and other cargo between Washington, DC and Cumberland, Maryland from 1831 until 1924 (now maintained as the Chesapeake & Ohio National Historical Park). Convenient transportation via waterways also lead to the development of "river towns" like Port Deposit and Havre de Grace on the Susquehanna (the latter sited where the river flows into the Chesapeake Bay). Although roads now serve as the primary transit routes, parts of the historic system of small-scale ferries continue to serve travelers today, and ferry landings contribute to the character of historic waterfront towns like Oxford, Bellevue, and Whitehaven.

Throughout Maryland, water power spurred the development of mill communities. Some of these communities persist and some do not: for example, Ellicott City (1772) and Oella (1810) have survived, while the town of Daniels (1810) on the Patapsco River, marking the Howard/Baltimore county line, has vanished. In Baltimore, the Jones Falls, which bisected the early city, provided power for 19th-century textile mills, several of which were established in the flood plain of the stream valley and supported workers' housing on its slopes.

By the early-20th century, communities had established formal zoning, planning, and construction requirements that set standards for new development. Simultaneously, the ability to engineer the environment improved, allowing previously undevelopable land such as marshes and wetlands to be infilled, reshaped, paved, and developed. Over time, this confluence of factors altered the natural mechanisms for managing water that existed when the settlements were first formed. With industrialization, water began flowing from spigots rather than being collected by pail.

Because waterways have historically determined the state's settlement patterns, development, industries, and recreation, the present-day increase in precipitation, severe storm events, and relative sea level has made large areas of Maryland highly vulnerable to flooding. In many cases, particularly in more developed areas, flooding is exacerbated by the operational failure or insufficient capacity of aging infrastructure and by large areas of impermeable surfaces such as pavement and roofing. (Refer to Flooding, page 1.5.) Hurricanes routinely threaten coastal and Bay communities such as Crisfield, the "Oyster Capital of the World" in the late-19th century. (Refer to Flooding in Maryland, page 1.9.) A few miles off Crisfield in the Chesapeake Bay, Smith Island supports Maryland's most intact historic island communities; several other inhabited islands have vanished. (Refer to Maryland's Lost and Disappearing Islands, page 1.12.) In Dorchester County, shoreline erosion has exposed burial vaults at Anchor of Hope Cemetery, as well as Calverton, seat of Calvert County from 1669 to 1724, along with many other archeological sites. In Western Maryland, a network of rivers and streams carries runoff from the mountain slopes, and seasonal flooding is a common occurrence in communities located within the Youghiogheny and Potomac drainages.

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

### KEY QUESTION:

***How can local planners and preservation advocates learn more about the effects of flooding and floodplain management on historic properties?***

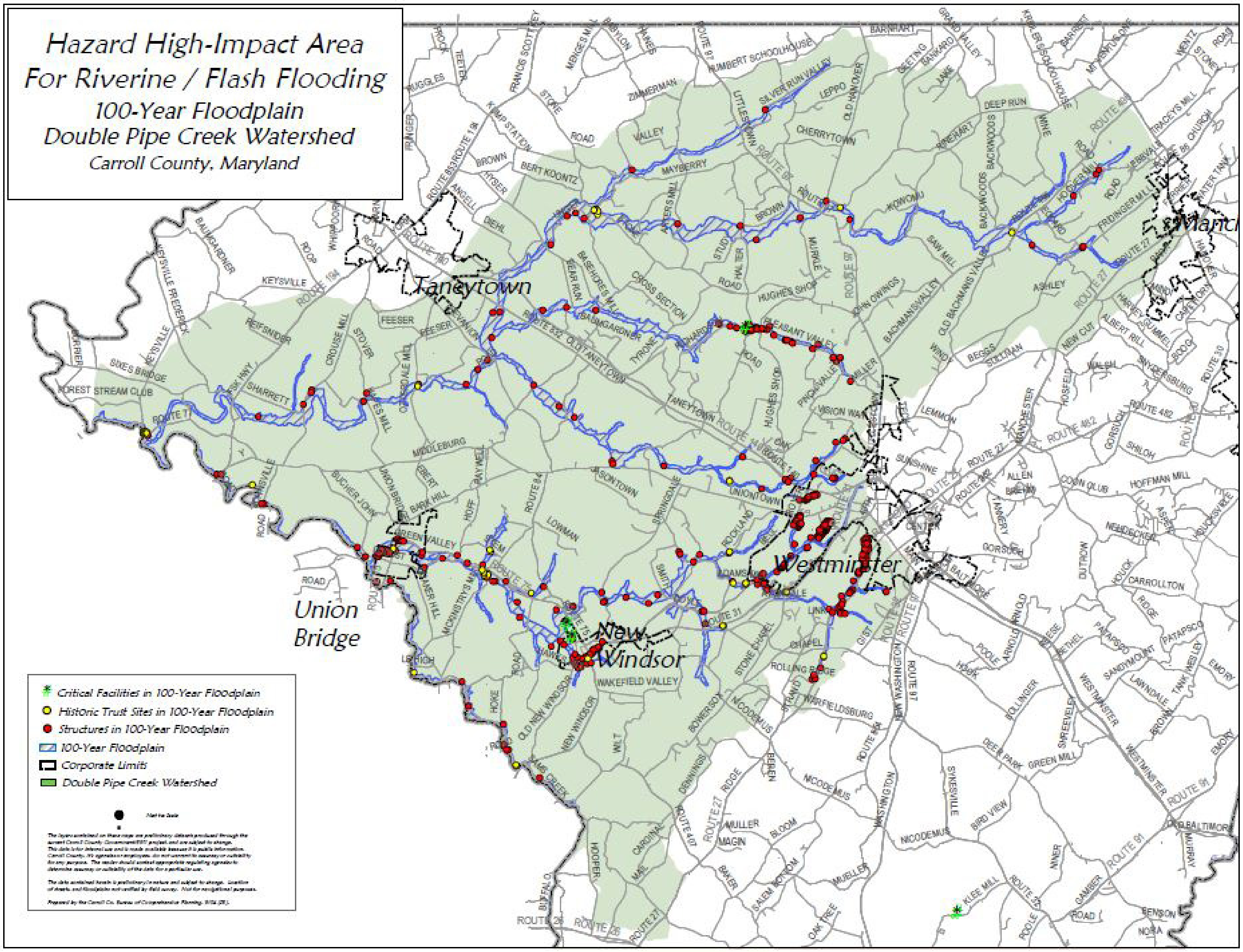



*Figure 1.3 - Carroll County's Hazard Mitigation Plan maps a high-impact area for riverine and flash flooding that identifies the locations of historic properties.*

and how the regulatory framework related to flooding may impact historic properties. ***To assist, this chapter of the Guide introduces some key concepts about flooding, provides a context for loss due to storm events and submersion, and explains how historic properties fit into floodplain management, including the National Flood Insurance Program.*** Readers who wish to get started on planning for vulnerable historic properties should consult *Chapter 2: Historic Preservation & Emergency Management*.

# A. FLOODING

**KEY QUESTION:**

***What factors can cause and exacerbate 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, and elimination or modification of natural ecosystems. The most severe flooding occurs when multiple factors are at play.

## A.1 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 that is plagued by persistent flooding is struck by an event flood, such as a hurricane or flash flood, the combined effect can be devastating.

### a. 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 whether 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 Chesapeake Bay and Atlantic Ocean.

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

- **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 Chesapeake Bay and Atlantic Ocean, to experience more frequent flooding.
- **Overdevelopment and impervious surface increase** limit the ability of the soil to absorb stormwater.
- **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.

#### PERSISTENT FLOODING

In Annapolis, persistent flooding has increased 925 percent over the past 50 years. The city experiences this kind of flooding – usually corresponding to high tides – nearly 50 times a year. In the next 50 years, Annapolis may encounter persistent flooding every day.

### b. Event Flooding

***Event flooding is occasional flooding that has a specific cause, typically a storm or a devastating failure of infrastructure.*** Event flooding an 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 Chesapeake 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 Maryland, 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.

## A.2 THE INCREASING THREAT OF FLOODING

**KEY QUESTION:**

***Is flooding getting worse?***

***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 Chesapeake 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.

### a. Climate Change and Precipitation

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).

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.

### b. Sea Level Rise and Subsidence

The relationship between the height of the land and the height of the water is changing along Maryland'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. As a result, in addition to overwhelming stormwater facilities, pressure from saturated soil puts underground construction at risk, including building foundations, utilities, archeological sites, and burial sites.

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 disappearance and reshaping of islands in the Chesapeake Bay. *(Refer to Maryland's Lost and Disappearing Islands, page 1.12.)*

In its 2016 Annual Report, the Maryland Commission on Climate Change recommends planning for a relative increase in sea level in the Chesapeake Bay of 2 feet by 2050, understanding that by the end of the century the number could reach 4.1 feet or higher with unrestrained growth in global emissions. ***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 Timeframe for Planning Goals, page 2.20.)*

## c. Reduced Capacity in Stormwater Management

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 Chesapeake 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.

## A.3 FLOODING IN MARYLAND

> *"We discovered the wind and waters so much increased with thunder, lightning, and rain that our mast and sail blew overboard, and such mighty wave over racked us… we were forced to inhabit these uninhabitable Isles which for the extreme of gust, thunder, rain, storms and ill weather, we called Limbo."*
>
> - Captain John Smith, *The General Historie of Virginia, New England & the Summer Isles* (1624)

The earliest European settlers in Maryland recorded flooding and flood events, and Marylanders have developed a cultural legacy of adaptation. The manner and extent to which each community is impacted varies based upon local conditions and circumstances. ***This Guide recommends that local governments and property owners consider a community's history of adaptation when evaluating how best to address future flooding.*** *(Refer to Document & Assess Flood Risks to Historic Properties, page 2.21.)* To provide some context for the history of extreme flooding statewide, the following sections describe major storm events as well as the documented permanent inundation of land in the Chesapeake.

**KEY QUESTION:**

***How have storms, rising sea levels, and subsidence affected Maryland's communities in the past?***

### a. Major Storm Events in Maryland's History

Maryland's recorded storm history begins in 1649 when an unnamed coastal storm cut inlets through the coast along the barrier island where Ocean City is now located (Dawson, 2008). While all areas in Maryland have experienced flooding due to hurricanes, intense rainfall, and winter storms, these types of events have increased in frequency. A comparison of the number of recorded flood or storm events in the last half of the 20th century to the events recorded for the early-21st century is staggering. *(Refer to Maryland Flood Events, below.)*

MARYLAND FLOOD EVENTS

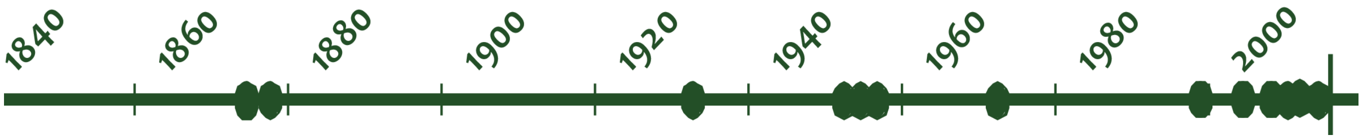
| Event Type | Number of Occurrences Recorded : 1950 to 1999 | Number of Occurrences Recorded : 2000 to 2016 | Percent Increase |
|---|---|---|---|
| Coastal Flooding | 21 | 90 | 329 |
| Flash Flood | 151 | 500+ | 231 |
| Flood | 15 | 455 | 2933 |
| Hurricane | 15 | 0* | 0 |
| *Tropical Storm* | 12 | 59 | 392 |

*Table 1.1: Maryland Flood Events. Table Source - NOAA Storm Events Database.*
**Note: All hurricanes occurring thus far in the 21st century were downgraded to tropical storms before they struck Maryland.*

## TIMELINE: DOCUMENTED FLOOD EVENTS IN MARYLAND


This list highlights key hurricane and coastal storm events to provide historical context in illustrating the severity and increasing frequency of particularly destructive storm events. More information on storms that were declared disasters can be found on FEMA's website (FEMA, 2018).

- **1667**: The "Dreadful Hurry Cane of 1667." Reportedly the hurricane destroyed an estimated 10,000 houses and roughly two-thirds to four-fifths of the crops due to flooding and hail throughout the tidewater region of the Chesapeake Bay (Dawson, 2008 and Mountford, 2005).
- **September 2-3, 1775**: The "Independence Hurricane" brought heavy rain that caused damage in coastal areas and winds that tore the dome from the State House in Annapolis (Dawson, 2008).
- **September 2-3, 1876**: The Centennial Storm caused tides nearly eight feet above normal in some areas in the Bay and cut Sharps Island in two (Dawson, 2008).
- **October 23, 1878**: An unnamed Category 2 hurricane was the strongest storm to have impacted the Baltimore-Washington region since storm record-keeping began in 1851 (National Weather Service, 2012).
- **1920**: An unnamed coastal storm caused tides 6.5 feet above normal in Ocean City and cut an inlet through Assateague Island (Dawson, 2008).
- **August 23-24, 1933**: Chesapeake Bay Hurricane caused record high tides on the western side of the Bay when the storm surge funneled up the Potomac River, resulting in an 11-foot storm surge in Washington, DC. On the Eastern Shore, the storm recorded 60 mph winds with heavy rainfall, producing the highest tide in the history of Crisfield, Maryland. The storm caused $79 million (adjusted to 1969) worth of damage in the region (National Weather Service, 2012; The Crisfield Times, 1933).
- **October 15, 1954**: Hurricane Hazel had reported gusts near 100 mph with a track through Western Maryland, near Hagerstown (Dawson, 2008; National Weather Service, 2012).
- **August 13, 1955**: Hurricane Connie, downgraded to a Tropical Storm when it reached Maryland, brought heavy rainfall (nearly 10 inches across the southern portion of the state) and flooding, with a track up the Eastern Shore (Dawson, 2008; National Weather Service, n.d.).
- **August 18, 1955**: Hurricane Diane, downgraded to a Tropical Storm when it reached Maryland, brought heavy rains and flooding across Central Maryland, particularly along the Potomac River. Following so closely after Hurricane Connie, many river systems were already at flood stage when Diane dropped an additional 1.48 to 2.67 inches of rain across the region (U.S. Weather Bureau, 1955).
- **June 22, 1972**: Hurricane Agnes dropped 10 to 14 inches of rain across Virginia, Maryland, and Pennsylvania, causing flooding along the Potomac River Basin as well as other major river systems. The storm surge in Washington, DC was estimated at 15.5 feet. In Maryland, the storm caused 19 fatalities and $110 million in damages (National Weather Service, 2012).
- **September 16, 1999**: Hurricane Floyd brought 12 to 14 inches of rain and wind gusts of up to 50 to 70 mph. The storm resulted in one fatality and left more than 250,000 customers without power. Storm surge in the Bay was estimated at 2 to 3 feet. Minor flooding occurred across southern Maryland. Under the Major Disaster Declaration, $5.4 million (1999 dollars) was obligated under FEMA Public Assistance for Anne Arundel, Calvert, Caroline, Cecil, Charles, Harford, Kent, Queen Anne's, Somerset, St. Mary's, and Talbot Counties (FEMA, 2018; National Weather Service, 2012).




- **September 19, 2003**: Hurricane Isabel only dropped 2 to 6 inches of rain across Maryland, but its large field of high wind toppled trees, which brought down powerlines and destroyed nearly 8,000 houses throughout Virginia, Maryland, and Pennsylvania. Isabel also caused substantial flooding due to its unusually high storm surge in the Chesapeake Bay and Potomac River Basin: 6 to 8 feet above normal tides, the highest levels since the Chesapeake Bay Hurricane of 1933. The storm surge in Annapolis reached 6.44 feet above mean sea level and in Baltimore reached 7.35 feet above mean sea level. Isabel prompted a Major Disaster Declaration in Maryland with $33 million dollars (2003 dollars) approved under FEMA Individual Assistance and $40.6 million dollars (2003 dollars) approved under FEMA Public Assistance for all 23 counties and the City of Baltimore (FEMA, 2018; National Weather Service, 2012).
- **August 27-28, 2011**: Hurricane Irene hit Maryland as a Category 1 hurricane with sustained winds of 85 mph accompanied by a large swath of rain that dropped 5 to 11 inches across the state. St. Mary's County received the largest amount of rainfall, roughly 8 to 11 inches, causing massive flooding throughout the county. The storm's high winds brought down trees, damaging nearly 1,000 homes in Virginia and Maryland and causing power outages for around 850,000 customers in Maryland. A Major Disaster Declaration was declared with $20 million (2011 dollars) obligated under FEMA Public Assistance for Baltimore City, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Queen Anne's, St. Mary's, Somerset, Talbot, Wicomico, and Worcester Counties (FEMA 2018; National Weather Service, 2012).
- **September 6-9, 2011**: The remnants of Tropical Storm Lee spread out across the Mid-Atlantic States as a large stationary swath of rain. Heavy rainfall was recorded throughout Maryland: 18.88 inches at Elkton; 12.07 inches in Bowie; 11.93 inches in Waldorf; 11.08 inches in Ellicott City; 10.22 inches in Gaithersburg, and 7.32 inches at Baltimore-Washington International Airport. Compounded by a wet summer and rain from Hurricane Irene, Lee's remnants caused massive flooding along the Susquehanna River. The storm's remnants also spawned several tornadoes, one of which touched down in southern Maryland on September 7th. A Major Disaster Declaration was declared with $9.7 million (2011 dollars) obligated under FEMA Public Assistance to Anne Arundel, Baltimore, Cecil, Charles, Harford, Howard, and Prince George's Counties (Brown, 2011; FEMA, 2018).
- **October 29, 2012**: Hurricane Sandy brought heavy rainfall in the extreme eastern portion of the state, which received 5 to 12 inches of rain, with a peak amount of 12.83 inches in Bellevue. The storm surge along the coast was 2 to 4 feet above ground level. The rain, combined with the storm surge, produced flooding along the Chesapeake Bay. High winds from the storm downed trees and powerlines. A Major Disaster Declaration was declared with $2.5 million (2012 dollars) approved under FEMA Individual Assistance for Somerset County and $32.2 million (2012 dollars) obligated under FEMA Public Assistance for 23 counties and the City of Baltimore (Blake, 2013; FEMA, 2018).
- **July 30, 2016**: A torrential rainstorm passed through Montgomery, Howard, and Baltimore Counties, causing flash flooding in and near Ellicott City and along the Jones Falls in Baltimore City. Nearly 6 inches of rain fell within two hours over Ellicott City. The ensuing flash flood caused two fatalities, destroyed six houses, damaged 91 houses, and damaged 90 commercial buildings, mainly within the National Register Historic District. A Major Disaster Declaration was declared with $2.1 million approved under FEMA Public Assistance for Howard County (National Weather Service, 2016).
- **May 27, 2018**: A torrential rainstorm caused about 8 inches of rain in a couple of hours in and around Ellicott City. "In under three hours, the river rose over 16.5 feet to a new record high of 24.36 feet. From 4:15- 5:30 p.m., the river rose nearly 3 feet every 15 minutes. The river went from normal to major flood stage in a little over an hour, an extremely short amount of time." (www.climate.gov) There was one fatality.

*Figure 1.4 - Marshland creeping closer to a house on Tylerton, Smith Island, Somerset County.*

## b. Maryland's Lost and Disappearing Islands

The long-term effects of increasing persistent flooding and erosion in Maryland may be best illustrated by the histories of inhabited islands, primarily in the Chesapeake Bay, that are now submerged. Hundreds of islands have disappeared since the 1600s; primarily due to a combination of sea level rise, subsidence, and the erosion of protective coastlines and natural buffers. More than 500 named islands are recorded as lost in William Cronin's book *The Disappearing Islands of the Chesapeake*, which includes Maryland and Virginia.

Some islands had permanent settlements or were occupied year-round. Until the 1700s, many islands were used by Native Americans as temporary camps for collecting oysters and fishing, sometimes as part of a larger seasonal settlement that included villages on the larger islands. In time, European settlers occupied islands with early colonial farmsteads, often consisting of one or two houses. Others, like Holland Island, had thriving fishing and farming communities into the early-20th century, often including churches, schools, post offices, and general stores. Communities that still exist may have recent or cultural memories of nearby islands and their abandonment.

Many of Maryland's currently inhabited islands experience routine and increased impacts from flooding, loss of landmass by erosion, and loss of arable land as salt water intrusion kills trees and converts marshland to open water. *(Refer to Appendix A: Case Studies - Maryland's Historic Communities, Hoopers Island and Taylors Island.)*

*Figure 1.5 - Trees killed by salt water intrusion as arable land is converted to marsh and open water, Taylor's Island, Dorchester County.*

## DORCHESTER COUNTY

- Occupied since 1669, Hoopers Island has supported farmers, boatbuilders, the seafood industry, and the canning industry. Of those vibrant lifeways, only the seafood industry remains, supplemented by charter sport fishing businesses. Hoopers Island experiences the greatest rate of erosion in the Bay, with a loss of about 24 acres/year (Cronin, 2005). By 2005, the island had been reduced to roughly 1/8th its size in 1683 (2005).
- In 1659, residents of Taylors Island were primarily farmers growing corn and tobacco. By the 19th century, boatbuilding and the seafood industry arose as the predominant occupations for islanders. Today the island is still farmed and still supports a small seafood industry, and it has become a hunting destination. Taylors Island is actively eroding, losing roughly 4 acres/year, which equates to about five percent of its landmass over the 20th century (Cronin, 2005).

## SOMERSET COUNTY

- Settled in the 17th century, both Deal and Little Deal Islands were home to farmers and fishermen. The mid-19th and early-20th centuries saw the rise and fall of the canning industry and oyster-shucking houses. Softshell crabbing and the seafood industry still provide livelihoods for island residents. Between 1948 and 1998, Deal Island lost 330 acres, an average loss of 6.6 acres/year, while Little Deal Island lost 171 acres, more than 10 percent of its landmass, for a rate of loss of about 3.4 acres/year (Cronin, 2005). Residents of the island are actively engaged in planning to adapt to their changing environmental conditions to remain on-island for as long as possible. *(Refer to Adaptation, page 2.67.)*
- Settled in 1686, Smith Island is the last inhabited Bay island in Maryland that is reachable only by water. Island residents traditionally subsisted through farming and the seafood industry; now only the seafood industry remains, as marshes have claimed the available farmland. With a peak population of more than 800 in the early-20th century, the island now hosts fewer than 200 permanent residents (U.S. Census, 2010). From 1855 to 2005, Smith Island lost 277 acres, which equates to roughly 2 acres/year (Cronin, 2005). After Hurricane Sandy swept through the Bay in 2012, residents of Smith Island formed a nonprofit entity, Smith Island United, to conduct long-range planning for the survival and revitalization of the three island communities: Ewell, Rhodes Point, and Tylerton. The Smith Island Vision Plan, adopted as an amendment to the Somerset County Comprehensive Plan, outlines strengths, challenges, opportunities, and strategies for growing and sustaining watermen's culture; maintaining and improving the island's economy; developing and maintaining infrastructure; and increasing the year-round island population.

## TALBOT COUNTY

- Once a thriving community dependent on boatbuilding and the seafood industry, the traditional lifeways of Tilghman Island have declined, and the island has reinvented itself as a vacation destination. The island has lost more than 670 acres over the past 150 years, at a rate of roughly 4.4 acres/year (Cronin, 2005).

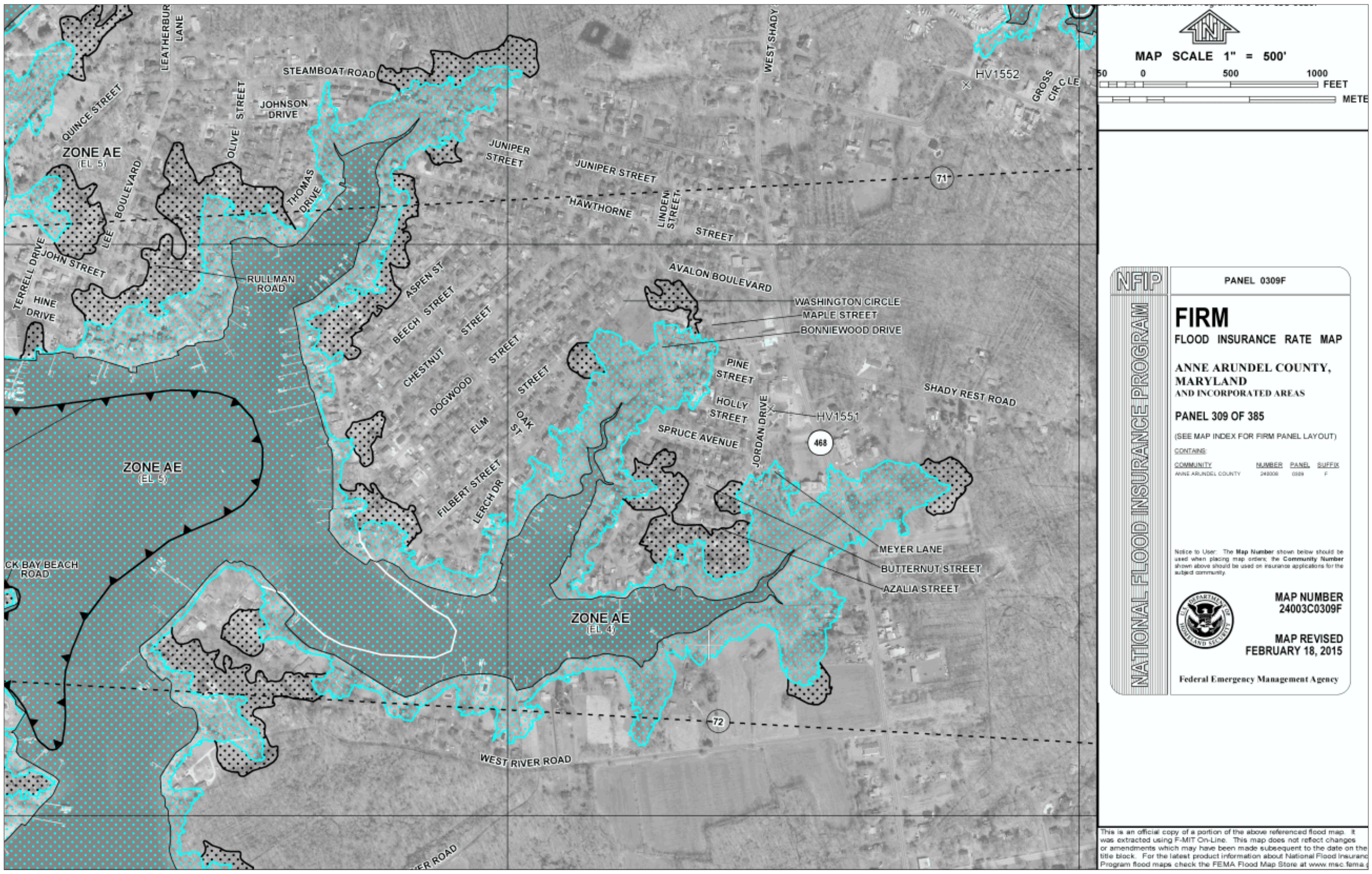



*Figure 1.6: The pale blue dots on this Flood Insurance Rate Map indicate the Special Flood Hazard Areas (SFHAs). The SFHA (also known as the 1% annual chance flood, 100-year flood and base flood zone), has historically been subject to a 1% chance of flooding during any given year. In this case, the 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 the climate change. (Map obtained through FEMA's Map Service Center.)*

## B. FLOODPLAIN MANAGEMENT

**KEY QUESTION:**

***Who is responsible for managing development within the floodplain?***

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 Maryland Department of the Environment (MEMA), the Maryland Department of the Environment (MDE), 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.***

Local 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 community 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 MDE can verify a local government's participation in the NFIP and provide contact information for the local floodplain administrator.

### B.1 FLOOD INSURANCE RATE MAPS

**KEY QUESTION:**

***How can floodplain administrators measure a property's vulnerability to flooding?***

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 Timeframe for Planning Goals, page 2.20.)*

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 Base Flood Elevations 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 though FEMA's Map Service

### "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" 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," especially in public outreach. *(Refer to Establish a Timeframe for Planning Goals, page 2.20.)*

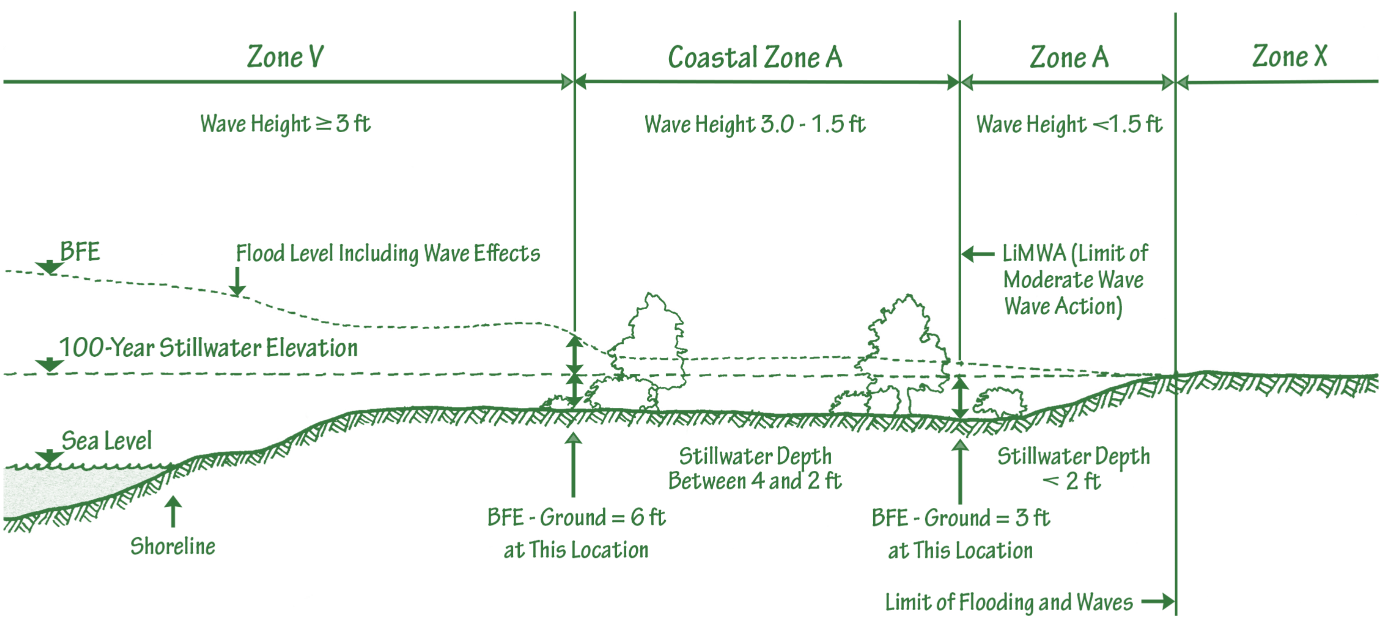



*Figure 1.8 - Relationship between the stillwater elevations, BFE, wave effects, and flood hazard zones. (Base diagram obtained from FEMA.)*

Center. The Maryland Department of the Environment (MDE) maintains a GIS-mapping platform with Digital Flood Insurance Rate Maps (DFIRMs), for reference and planning use only. The DFIRM mapping platform allows the user to add various informational map layers over the SFHA, such as sea level rise and storm surge. The mapping application also allows the user to locate resources in the floodplain such as properties listed in the Maryland Inventory of Historic Properties (MIHP), the Maryland Historical Trust's (MHT's) easement properties, and properties listed in the National Register of Historic Places. For preservation planners and advocates, the DFIRMs will likely serve as the most useful tool for understanding which historic properties fall in within the regulated floodplains. The local floodplain administrator and/or staff at MDE can provide assistance in using the mapping tools.

## B.2 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 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 left.)* 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

### 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.

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 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 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 the full responsibility of the owner.

***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 Elevation, page 3.22.)* Alterations can jeopardize the historic character and integrity of a building. 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 State & Local Floodplain Regulations & Ordinances, below. To consider specific options for reducing flood vulnerability at historic properties, refer to Identify, Evaluate & Prioritize Mitigation Options for Historic Properties, page 2.32, Mitigation, page 2.51, and Chapter 3: Selecting Preservation-Sensitive Mitigation Options.)*

## B.3 STATE & LOCAL FLOODPLAIN REGULATIONS & ORDINANCES

To participate in the NFIP and allow property owners to take advantage of federal flood insurance, a local jurisdiction 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 1.15.)* ***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 local level, with standards, assistance, and guidance from state and federal governments.*** *(Refer to Community Rating System, page 1.25, and Participate in the Community Rating System, page 2.59.)*

The Maryland Department of the Environment (MDE) 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. MDE 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 Planning & Preparedness, page 2.3.)*

MDE also developed the Maryland Model Floodplain Management Ordinance, which integrates NFIP and state permitting requirements and contains additional provisions that are more stringent than the federal regulations (MDE, 2014). Nearly all communities in Maryland have adopted the model ordinance or some of its language. The local 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 community'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 Community Rating System. *(Refer to Community Rating System, page 1.25.)* ***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.***

**KEY QUESTION:**

***How are historic properties regulated within the floodplain, and what are some of the potential effects?***

## a. Floodplain Ordinances and Historic Properties

***Floodplain 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 1.25, and Participate in the Community Rating System, page 2.59.)*

Both NFIP's and Maryland'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 local floodplain administrator determines, via the permitting process, that a proposed alteration to a building is a "Substantial Improvement" (MDE, 2014) or that the proposed alterations to repair a building to its pre-damage condition indicate that the building has been "Substantially Damaged" (MDE, 2014). 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.

***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 and or the MHT to describe historic and cultural properties (based on, but not limited to, the criteria for listing in the National Register of Historic Places).*** In Maryland, local jurisdictions may set their own criteria defining what properties are or are not "historic." This means that properties designated "historic" under local 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, jointly administered by the National Park Service and the MHT.

The state's model ordinance provides local governments with two methods, or alternatives, that can be adopted into floodplain

## MARYLAND MODEL FLOODPLAIN ORDINANCE DEFINITIONS

### ALTERNATIVE 1

**Alternative 1** requires property owners to seek a variance for any improvements (e.g., repair, alteration, or rehabilitation) to their "historic structure" that will trigger the substantial improvement requirements. For the variance to be considered, the application for the variance must include a determination that the proposed work will not preclude the structure's eligibility or designation as a "historic structure." Further, the documentation must be obtained from a source that is authorized to make such determinations (MDE, 2014).

Using the variance alternative, communities can place additional conditions to make "historic structures" more flood-resistant, so long as such conditions allow the building to continue to qualify as "historic." For example, a community could require that a variance be allowed only if the work meets other criteria, such as "not causing an increase in the elevation of the base flood" or that "all materials below the DFE/BFE meet the requirements of dry or wet floodproofing (as codified in the ordinance)." In this way, the variance alternative can be used to balance preservation and protection.

### ALTERNATIVE 2

**Alternative 2** excludes "historic structures" from complying with substantial improvement requirements so long as proposed alterations will not preclude the structure from meeting FEMA's definition of "historic." The model ordinance requires a property owner to provide documentation that the work as proposed will meet this standard.

ordinances to exempt from "historic structures" (as defined by FEMA) from alterations that are incompatible with historic preservation practice. *(Refer to Maryland Model Floodplain Ordinance Definitions, page 1.20.)* To understand how historic properties may be regulated, local preservation planners and advocates should know which of the two Alternatives their local jurisdiction has adopted.

On its face, **Alternative 2** 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 belief that the flood risk is somehow reduced or eliminated.

Without guidance for how to reduce a property's vulnerability to flooding, Alternative 2 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.

## b. Repetitive Loss and 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 local 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 community'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 and demolition are other typical mitigation actions for severe repetitive loss properties with similarly negative impacts on historic properties.

***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 2.36.)* 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 community 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).

## B.4 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.

### 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:** The elevation of the "design flood," including the wave height, relative to the datum specified on the community's legally designated flood hazard map.

**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.

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.*** Communities 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 in the floodplain and the building's foundation type.

## a. Horizontal and 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 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, page 1.22.)* ***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

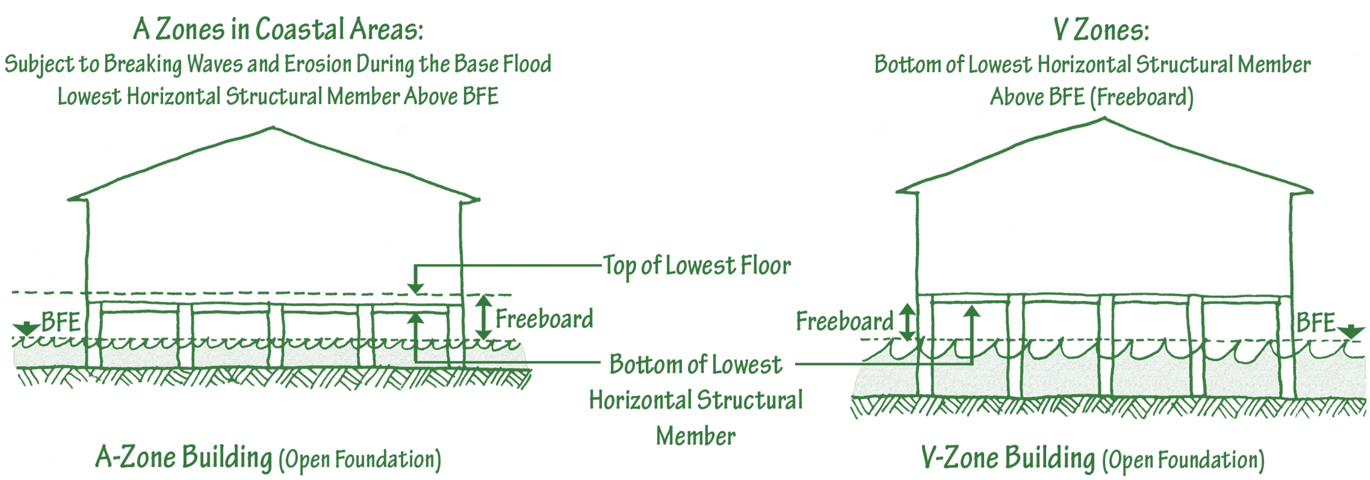



*Figure 1.9 - NFIP minimum elevation requirements: A Zones – elevate top of lowest floor to or above BFE; V Zones – elevate bottom of lowest horizontal structural member to or above BFE. In both V Zones and A Zones, many people have decided to elevate a full story to provide below-building parking, far exceeding the elevation requirement. See Fact Sheet No. 1.2 for more information about NFIP minimum requirements in A Zones and V Zones. (Base diagram obtained at FEMA.gov.)*

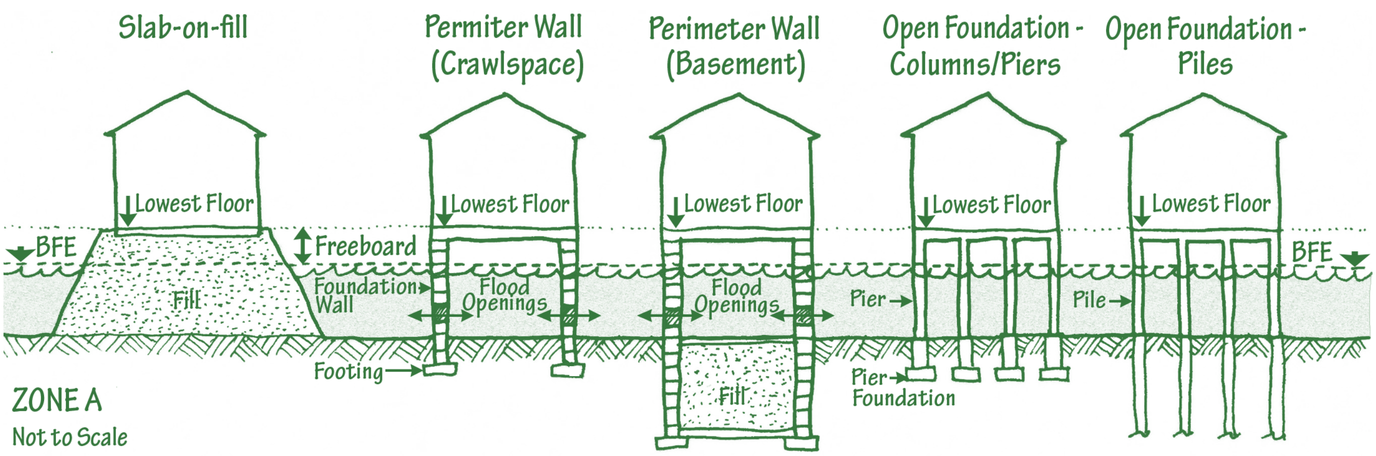



*Figure 1.10 - Examples of NFIP-compliant homes in Zone A where the top of the lowest floor is located above the BFE. (Base diagram obtained from FEMA.)*

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 1.25, and Participate in the Community Rating System, page 2.59.)* This extra height requirement is called "freeboard." In Maryland, communities 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 one community has a three-foot freeboard requirement. ***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.***

### b. 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 1.15.)* 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 3.24.)*

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.

> **KEY QUESTION:**
>
> ***What can local planners and preservation advocates do to protect historic properties and help property owners reduce their flood insurance rates?***

> **MARYLAND CRS USERS GROUP**
>
> The Maryland Department of the Environment (MDE) established the Maryland CRS Users Group to provide a forum for participating communities and communities considering application to the program to exchange lessons learned, encourage collaboration, and access technical support. For those seeking more information, the Maryland CRS Users Group hosts quarterly meetings and periodic workshops around the state (FEMA, 2018).

## B.5 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 local governments 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; or
- 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.*** Examples of more extreme compliance which would affect historic structures include:

- Requiring higher Design Flood Elevations (DFE);
- 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. Similarly, if the property has received or anticipates receiving funding or permits from state or federal governments, it is best to contact the MHT prior to undertaking any work to verify review requirements. *(Refer to Historic Property Project Review sidebar, page 2.36, and City of Baltimore - Community Rating System, below.)*

## CITY OF BALTIMORE - COMMUNITY RATING SYSTEM

A leader in community floodplain management, the City of Baltimore achieved Class 5 under the Community Rating System in 2016, making property owners eligible for flood insurance discounts of 25% for properties located in Special Flood Hazard Areas and 10% for lower-risk properties. Becoming a CRS classified community was one of the goals identified in the City's combined hazard mitigation and climate adaptation plan, DP3: the Disaster Preparedness and Planning Project Plan.

To achieve a class 5 rating, Baltimore adopted a more stringent floodplain ordinance than the minimum standards contained in the NFIP or the higher standards set by the State, conducted massive outreach to promote resiliency, and integrated these efforts with other planning and preparedness activities. One of those higher standards is how the City's floodplain regulations treat properties that meet the definition of "historic structure." Rather than granting a variance outright to historic structures to relieve historic property owners from meeting substantial improvement requirements, Baltimore's floodplain ordinance states, in §5.8. Historic structures, "A variance may be issued for the reconstruction, rehabilitation, or restoration of an historic structure only if:

(1) the activity does not cause an increase in the elevation of the base flood;

(2) all construction efforts are made to meet the intent of the provisions of this Division I that deal with the elevation of electric, plumbing, mechanical, and other facility and utility systems;

(3) all materials below the flood-protection elevation meet the requirements of this Division I for dry or wet floodproofing; and

(4) the reconstruction, rehabilitation, restoration, or other activity will not preclude the structure's continued designation as an historic structure. (City Code, 1976/83, art. 7, §7(i); 2000, art. 7, §5-8.) (Ord. 88-188; Ord. 14-208.)"

In going beyond what is required for historic structures to receive a variance, the City is investing in the protection of historic properties to ensure that these buildings are more resilient to flood damage and that they continue to survive for future generations to enjoy. It should be kept in mind that compliance with the City's floodplain ordinance does not guarantee that any work done to historic structures to provide flood protection would be eligible for historic preservation financial incentives, including tax credits; nor does it guarantee approval under MHT's Easement Program.

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# 2 HISTORIC PRESERVATION & EMERGENCY MANAGEMENT

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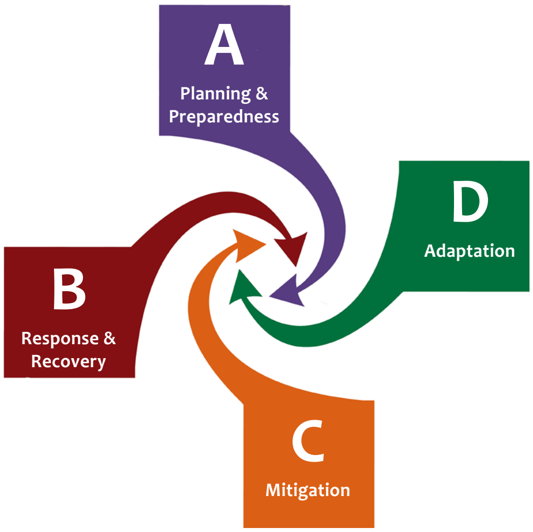



*Figure 2.1 - The Emergency Management Cycle, modified to include adaptation.*

## INTRODUCTION

Federal, state, and local governments engage in emergency management to reduce the loss of life, minimize the effects of damage and loss, and protect the community from threats and hazards, including flooding. Although local governments may not initially prioritize historic properties and cultural resources in flood mitigation planning, the protection and recovery of these special places can be critical to restoring a community's well-being and quality of life in the aftermath of a disaster. Moreover, historic properties are often integral to a community's economic success, fueling heritage tourism, anchoring Main Street commercial districts, and providing attractive housing stock. Although planning for historic and cultural resources can include objects, sites, and structures such as bridges, as well as archeological remains, this *Guide* primarily addresses emergency management as it relates to flooding and its effects on historic buildings and districts.

**KEY QUESTION:**

***What is the emergency management cycle?***

The Emergency Management Cycle consists of four phases: planning/preparedness, response, recovery, and mitigation. Given the increasing threat of frequent, intense precipitation and sea level rise, this *Guide* includes climate adaptation, as related to flood mitigation, as an additional phase of the cycle. The cyclical nature of emergency management means that it never ends: at any point in the cycle, there are always actions to be taken. Between disasters, local governments should be planning and preparing in case a disaster strikes, and conducting mitigation activities to enable the community to withstand and recover from hazards like flooding. When a disaster strikes, or is predicted to strike, communities should prepare, respond, recover, and conduct mitigation based on lessons learned during the response and recovery. In this way, a community constantly strives to become more resilient and learns to adapt to changing threats and new hazards.

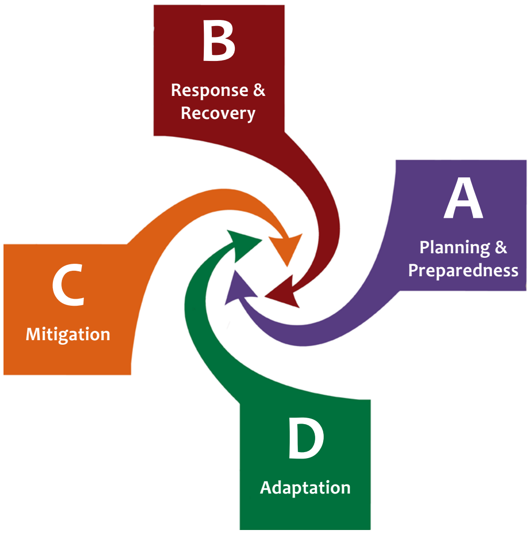
**KEY QUESTION:**

***Who is responsible for emergency management?***

Many agencies at all levels of government contribute to, and are involved in, the Emergency Management Cycle, including planning, transportation, public works, health and human safety, and housing and community development. An office of emergency management typically leads local the process, in concert with a team of individuals representing diverse skills and expertise. State and federal agencies, as well as preservation organizations, private sector partners, and non-governmental organizations, can provide additional support and technical assistance. This chapter of the *Guide* provides options and recommended strategies for planners and others interested in addressing historic preservation goals and protecting historic properties within the emergency management context. *(Refer to Key Players in Emergency Management and Their Roles, page 2.77.)*

**KEY QUESTION:**

***How does emergency management relate to historic properties?***




**Identify Historic Properties**
**Identify Flood Risk**
**Establish Preservation Priorities**
**Prepare Emergency Response Plan**

# A. PLANNING & PREPAREDNESS

### KEY QUESTION:

***What local government planning efforts can help protect historic properties threatened by hazards?***

### COMMUNITY HAZARD MITIGATION PLANNING FOR HISTORIC PROPERTIES

The City of Tulsa, Oklahoma, and the City of Annapolis, Maryland, were the first communities to conduct hazard mitigation planning for historic properties following the FEMA model. Annapolis's Weather It Together project serves as a model for other local governments in Maryland.

***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 the level of threat and ways to reduce harm from flooding (flood mitigation), consider the efficacy and potential impact of mitigation options on historic properties, select appropriate mitigation measures, and develop a prioritized plan for implementation within a specific timeframe. This process can be completed via a hazard mitigation plan as well as through other local planning efforts. *(Refer to Evaluate Options for Planning, page 2.4)*.

Recognizing the importance of historic properties to the character and quality of life in communities throughout the country, the Federal Emergency Management Agency (FEMA) produced a publication titled *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning* (FEMA, 2005), on which this *Guide* draws. While not intended to replace FEMA's guidance, this *Guide* contains information based on the planning experience of the Maryland Historical Trust (MHT) as well as Maryland-specific resources. Users should consult both documents.

***The planning process also provides an opportunity for communities to evaluate their historic preservation, zoning, and building regulatory framework and implement improvements to better protect historic properties.*** Protection can be preventative, such as developing design guidelines for property owners to improve their flood resilience in a manner that is sensitive to the historic integrity of the community. *(Refer to Develop Design Guidelines for Flood Mitigation, page 2.55.)* Protection can also be responsive, by establishing protocols to protect historic properties following a flood event. *(Refer to Emergency Operations Plans, page 2.8.)*

A local government may initiate the planning process in response to known threats (often highlighted by a disaster and recovery) or include planning for historic properties within a mandated plan update. Although this *Guide* recommends working within the hazard mitigation planning process described below, local governments should consider all options for planning and select the type that best meets their needs.

## A.1 EVALUATE OPTIONS FOR PLANNING

***Although the hazard mitigation planning process can be challenging to navigate, it is the most effective tool for community planners and historic preservation commissions to use to prepare for and respond to flooding and natural disasters.*** It is critical for the planning team to ensure that all planning efforts support rather than contradict each other; for example, the local hazard mitigation plan must link into the State Hazard Mitigation Plan, and hazard mitigation plans and preservation plans should have consistent recommendations. *(Refer to Hazard Mitigation Plans, page 2.4, and Preservation Plans, page 2.7.)* Wherever possible, hazard mitigation and other local plans should tie into program requirements for funding incentives, such as the Maryland Department of Housing and Community Development's Sustainable Community Plans.

In some cases, independently or as a result of a local planning effort, a community may elect to update its regulatory framework for planning or create more specific plans for disaster response and recovery or climate adaptation. *(Refer to Implement Protective Actions, page 2.52; Emergency Operations Plans and Climate Adaptation Plans, page 2.8; Planning for Response & Recovery, page 2.35; and Adaptation, page 2.67.)* Because these targeted efforts require their own planning and public outreach, it makes sense to streamline processes as much as possible, so that input for all measures is obtained as part of cohesive planning for flood resilience.

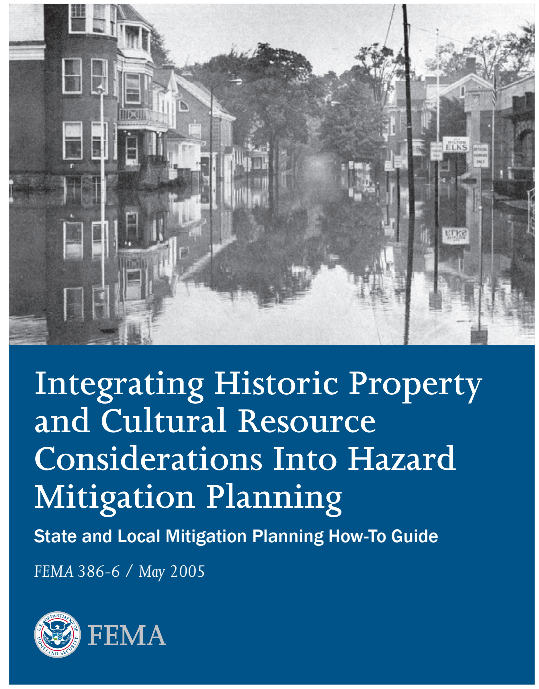



*Figure 2.2 - FEMA 386-6 is a useful tool for integrating historic and cultural resources into the hazard mitigation planning process. However care should be used to ensure the requirements of recent legislation are considered as part of the implementation process, including the Biggert-Waters Flood Insurance Reform Act of 2012 and the Homeowners Flood Insurance Affordability Act of 2014.* *(Refer to National Flood Insurance Program, page 1.17.)*

### a. Hazard Mitigation Plans

The State of Maryland and all twenty-three of its counties, as well as the City of Annapolis, the City of Baltimore, and the Town of Ocean City, have FEMA-approved hazard mitigation plans. ***Local hazard mitigation plans are prepared every five years by a team, usually including paid consultants under the direction of city or county staff; jurisdictions within a county have representatives on the team.*** Through the process, the team identifies vulnerable populations, properties, and infrastructure, and prioritizes mitigation projects to reduce those vulnerabilities. These mitigation projects then serve as the foundation for funding requests for subsequent planning projects (e.g, documentation and risk assessment of vulnerable historic resources) or mitigation projects which may alter landscapes, infrastructure, or structures to reduce flood vulnerability in a community. ***The Maryland State Hazard Mitigation Plan includes projects related to historic properties and archeological sites which could be revised to fit local needs and included in a local hazard mitigation plan.***

At a minimum, local hazard mitigation plans in Maryland address risks from flooding, coastal hazards (coastal storms,

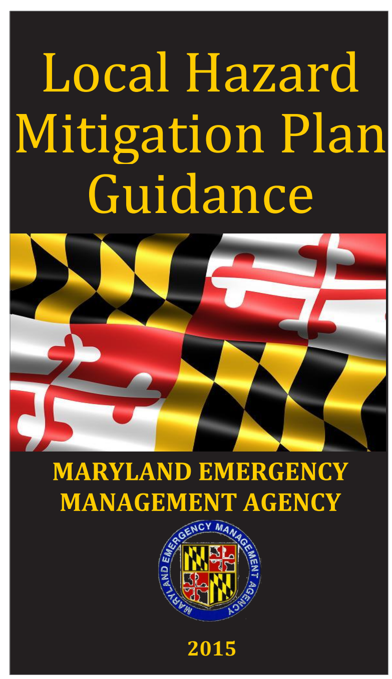



*Figure 2.3 - Local Hazard Mitigation Plan Guidance pamphlet is available on the MEMA website.*

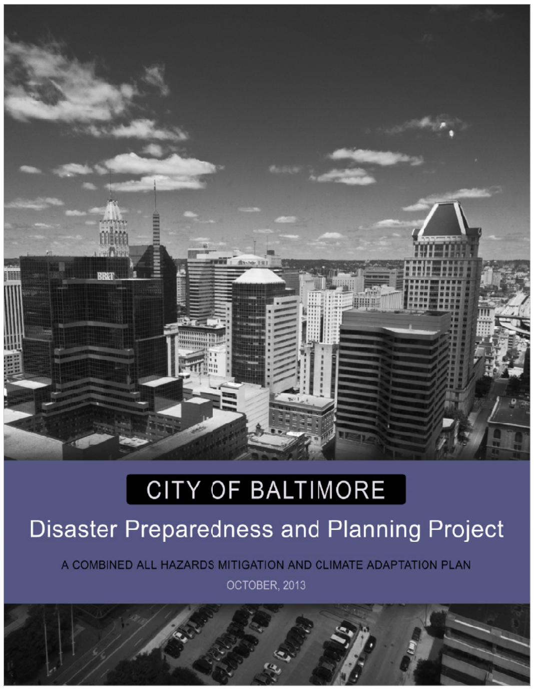


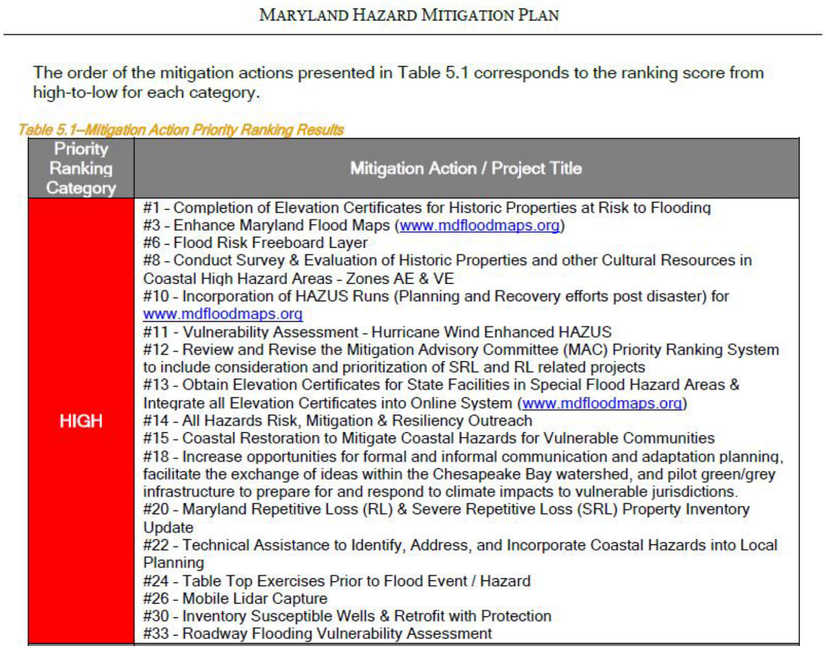

*Figure 2.4 - The City of Baltimore's Disaster Preparedness and Planning Project Plan (DP3) is a proactive approach to planning that both addresses existing hazards and prepares for the predicted effects of climate change. The plan addresses infrastructure, buildings, natural systems, and public services and includes strategies and actions to improve resiliency and sustainability while adapting for anticipated future conditions. DP3 also takes another step beyond traditional hazard mitigation plans by requiring city departments to align capital improvement project requests with plan actions and strategies.*

storm surge, hurricanes, tropical storms, Nor'easters, sea level rise, and coastal erosion, where applicable), winter storms, tornadoes, and wind. This *Guide* focuses on flood hazards, although many of the tools and processes can be adapted for other hazards. Flooding is often accompanied by secondary hazards such as contamination, fires, and high wind, particularly in areas vulnerable to hurricanes; however, this *Guide* does not address secondary impacts.

If the planning team elects to work within the hazard mitigation planning framework, information and recommended actions can be prepared as an annex, or standalone component, of the larger hazard mitigation plan, or as a chapter within the plan. There are advantages and disadvantages to each option. ***The annex approach, recommended by this Guide, allows greater focus on the protection of historic resources and a greater opportunity for input from the preservation planner and the public.*** However, the chapter approach ensures the integration of historic resource protection within the larger community plan and ensures consideration of preservation-friendly recommendations within that context, potentially providing greater community buy-in. Although the annex approach is recommended here, the team should ensure that the recommendations are well supported within the larger planning process, and both options should reinforce and not conflict with actions identified in the remainder of the hazard mitigation plan.

Draft plans must be reviewed by the Maryland Emergency Management Agency (MEMA) for completeness and consistency with the State Hazard Mitigation Plan. Following MEMA's approval and prior to local adoption, plans are submitted to FEMA. Approval by FEMA confers eligibility for Hazard Mitigation Assistance Program funding for projects included in the plan. Because communities continuously evolve, due to changes in development, infrastructure, industry, and impacts from hazards and 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 activities driven by updates on this cyclical basis.

***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 for floodplain management, and neither framework mandates that local governments address climate change impacts.*** *(Refer to The Increasing Threat of Flooding, page 1.7, Establish a Timeframe for Planning Goals, page 2.20, and Adaptation, page 2.67.)* In many regards, this *Guide* may help bridge that gap; however, it should be noted that the integration of climate change into planning continues to evolve as predictions improve and best practices emerge.



Maryland Hazard Mitigation Plan

The order of the mitigation actions presented in Table 5.1 corresponds to the ranking score from high-to-low for each category.

*Table 5.1–Mitigation Action Priority Ranking Results*

| Priority Ranking Category | Mitigation Action / Project Title |
|---|---|
| HIGH | #1 - Completion of Elevation Certificates for Historic Properties at Risk to Flooding<br>#3 - Enhance Maryland Flood Maps (www.mdfloodmaps.org)<br>#6 - Flood Risk Freeboard Layer<br>#8 - Conduct Survey & Evaluation of Historic Properties and other Cultural Resources in Coastal High Hazard Areas - Zones AE & VE<br>#10 - Incorporation of HAZUS Runs (Planning and Recovery efforts post disaster) for www.mdfloodmaps.org<br>#11 - Vulnerability Assessment - Hurricane Wind Enhanced HAZUS<br>#12 - Review and Revise the Mitigation Advisory Committee (MAC) Priority Ranking System to include consideration and prioritization of SRL and RL related projects<br>#13 - Obtain Elevation Certificates for State Facilities in Special Flood Hazard Areas & Integrate all Elevation Certificates into Online System (www.mdfloodmaps.org)<br>#14 - All Hazards Risk, Mitigation & Resiliency Outreach<br>#15 - Coastal Restoration to Mitigate Coastal Hazards for Vulnerable Communities<br>#18 - Increase opportunities for formal and informal communication and adaptation planning, facilitate the exchange of ideas within the Chesapeake Bay watershed, and pilot green/grey infrastructure to prepare for and respond to climate impacts to vulnerable jurisdictions.<br>#20 - Maryland Repetitive Loss (RL) & Severe Repetitive Loss (SRL) Property Inventory Update<br>#22 - Technical Assistance to Identify, Address, and Incorporate Coastal Hazards into Local Planning<br>#24 - Table Top Exercises Prior to Flood Event / Hazard<br>#26 - Mobile Lidar Capture<br>#30 - Inventory Susceptible Wells & Retrofit with Protection<br>#33 - Roadway Flooding Vulnerability Assessment |

*Figure 2.5 - Hazard Mitigation Plans should include prioritized mitigation actions. This excerpt from the Maryland Hazard Mitigation Plan identifying high-priority mitigation actions, including one related to historic preservation: #8 - Conduct Survey & Evaluation of Historic Properties and other Cultural Resources in Coastal High Hazard Areas - Zones AE & VE.* *(Refer to Flood Insurance Rate Maps, page 1.15.)*

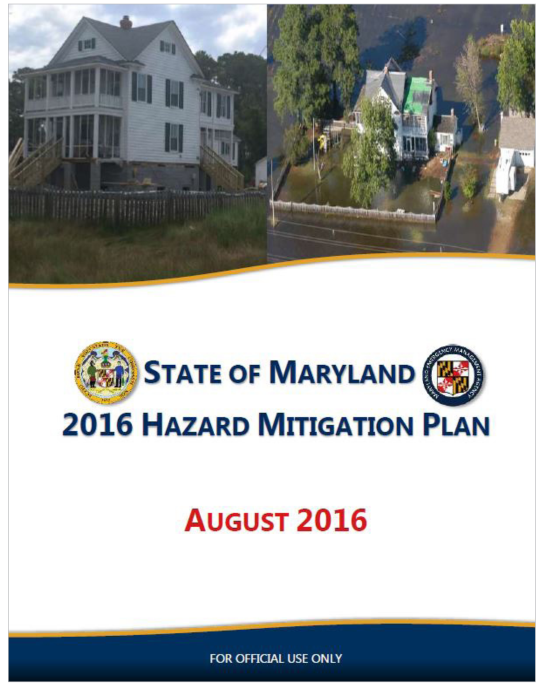



*Figure 2.6 - State of Maryland: 2016 Hazard Mitigation Plan.*

## b. Other Local Plans

In addition to a hazard mitigation plan, communities can also use other existing planning processes to foster preparedness. Comprehensive plans, preservation plans, and several smaller but nonetheless important initiatives (e.g, the development of design guidelines for flood mitigation) can augment an existing hazard mitigation plan. ***It is critical that all plans for an area share consistent goals and strategies.*** *(Refer to Develop Design Guidelines for Flood Mitigation, page 2.55, and Implement Protective Actions, page 2.52.)* A review of the community's flood risk should also be reviewed by looking at a community's Flood Insurance Risk Map (FIRM), the Maryland Commission on Climate Change's Updating Maryland's Sea-level Rise Projections (MCCC, 2013), and any other GIS mapping that the State or community has developed to identify additional areas of risk and projected risk. *(Refer to The Increasing Threat of Flooding, page 1.7 and Flood Insurance Rate Maps, page 1.15.)*

### i. Comprehensive Plans

Through comprehensive 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 use comprehensive plans as tools for guiding how communities and historic properties can adapt to natural hazards, climate change, and increasing vulnerability to flooding. Jurisdictions are required to protect streams and their buffers, the Special Flood Hazard Area (SFHA), habitats of threatened and endangered species, steep slopes, wetlands, and agricultural and forest lands intended for resource protection or conservation. *(Refer to Flood Insurance Rate Maps, page 1.15.)* Like hazard mitigation plans, comprehensive plans set goals, objectives, and actions related to floodplain management and, when included, historic properties.

When possible, comprehensive plans should identify historic properties as valuable community assets and identify actions for their long-term protection, with attention being given 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 a strategic framework to meet a community's goals for protection. *(Refer to Document & Assess Flood Risks to Historic Properties, page 2.21, Create an Expedited Review Process for Disaster Response, page 2.36, Modify Zoning Ordinance, page 2.54, and Modify Building Code Requirements, page 2.58.)*

The comprehensive planning process may provide a more accessible forum for community participation than the hazard mitigation planning process. To the degree possible, the team should follow the planning steps described in this section *(Planning & Preparedness)*, to ensure consistency with the hazard mitigation approach. Because both comprehensive plans and hazard mitigation plans establish the framework for a community'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 for hazard mitigation plans and ten years for comprehensive plans, allow a community to regularly evaluate, anticipate, and align goals. 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.

ii. **Preservation Plans**

Typically developed by preservation planners and/or historic preservation commissions, preservation plans describe a local government's historic and cultural resources, identify preservation goals, and recommend actions. Just as preservation elements are not mandated in a comprehensive plan, preservation plans are not mandated, nor do they have specific content requirements.

Like comprehensive plans, preservation plans 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, preservation plans can have regulatory authority similar to comprehensive plans.

As with comprehensive plans, preservation plans can be used to set goals, objectives, and actions specifically related to flood vulnerability, hazard mitigation, and historic properties. The preservation planning team should utilize the planning process described in this *Guide* to the degree that makes sense for the community and its resources. Counties and municipalities without a separate preservation plan should rely on their comprehensive plan to address local historic preservation concerns, either via a preservation element or integrated into the plan.

**iii. Emergency Operations Plans**

All levels of government have Emergency Operations Plans, which describe how to respond to disasters and emergency events. An Emergency Operations Plan 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 Response & Recovery, page 2.39.)*

**iv. Climate Adaptation Plans**

The Maryland Commission on Climate Change has developed a Climate Action Plan (MCCC, 2008) and a Greenhouse Gas Emissions Reduction Act of 2009 Plan (MCCC, 2015) to guide the State's adaptation efforts. Agencies involved in climate adaptation efforts report each year on implementation; however, these efforts are always evolving. Although the State offers tools for climate and resilience planning and has developed *Infrastructure Siting and Design Guidelines*

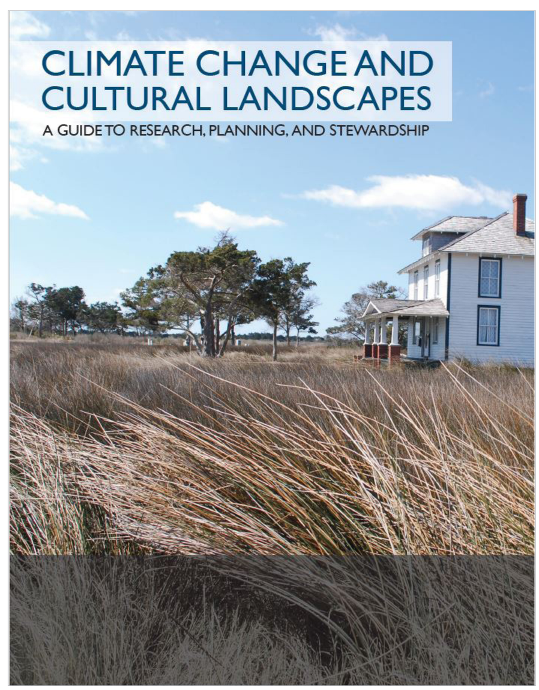



*Figure 2.7 - Climate Change and Cultural Landscapes: A Guide to Research and Planning Stewardship.*

(MCCC, 2014) for its own investments, it has not issued formal guidance for jurisdictions wishing to pursue climate adaptation. *(Refer to The Increasing Threat of Flooding, page 1.7.)* In time, climate adaptation may necessitate multi-county or regional approaches. This *Guide* encourages consideration of climate change effects related to flooding, such as sea level rise and increased precipitation, as part of the hazard mitigation planning process. *(Refer to Adaptation, page 2.67.)*

## A.2 RECRUIT A TEAM

Flood mitigation and historic preservation are both specialized fields, and they overlap little in their purpose and daily function. Historic preservation professionals or advocates, for example, are rarely represented in the typical hazard mitigation planning process led by emergency management. Until integration of these disciplines becomes more widespread and established, planners and emergency managers must collaborate and tap a range of 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.

**KEY QUESTION:**

***How can preservation planners and advocates participate in the local hazard mitigation planning process?***

***To engage in the process, preservation planners, members of the historic preservation commission, and/or representatives of local preservation groups should request the opportunity to participate as members of the technical team for the next hazard mitigation plan update.*** It may not be logistically possible for the local emergency management office to include all interested parties on the technical team, and participants who are included should be prepared for the significant time commitment required. The preservation advocates on the technical team should also be sure to coordinate and share information with groups that are interested but unable to participate.

As an alternative, local historic preservation commissions, preservation planners, or advocacy groups could consider developing a separate hazard mitigation plan for cultural resources, either as an official addendum to the local hazard mitigation plan or as guiding recommendations within another plan. *(Refer to Other Local Plans, page 2.6, and Annapolis Hazard Mitigation Plan for Cultural Resources, page 2.16.)*

Valuable team members will hail from many different disciplines, experiences, and points of view. Although communities will all have different 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 members;
- Preservation planners or planners with an interest in preservation;


*Figure 2.8 - Local participation should be included throughout the Emergency Management Planning process. Annapolis, Anne Arundel County. (Source: Alicia Moran.)*

- Local government personnel responsible for review and permitting;
- GIS mapping specialists;
- Emergency managers;
- Floodplain administrators;
- Professional preservation architects, landscape architects, and archeologists;
- Representatives of local historical and archeological 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;
- Maryland Historical Trust (the State Historic Preservation Office);
- Local Heritage Area;
- Main Street program managers, staff, or volunteers; and
- Local colleges and universities with programs related to historic preservation or cultural heritage.

As part of the planning process, local team members can help identify tools and strategies to address the long-term protection of flood-prone historic properties within the jurisdiction. To give just a few examples, they can:

- Evaluate the current regulatory framework and existing support for historic properties and floodplain management *(refer to Modify Zoning Ordinance, page 2.54, and Modify Building Code Requirements, page 2.58)*;
- Identify ways to integrate flood mitigation for historic properties into community planning goals *(refer to Evaluate Options for Planning, page 2.4)*;
- Review existing data about historic properties and flood vulnerability to identify areas where information is lacking *(refer to Identify Known Historic Resources, Flood Hazards & Capabilities, page 2.13)*;
- Evaluate implementation of goals identified in the Community Rating System (CRS) and potentially revise local zoning and building codes to reduce floodplain development and, thereby, flood impacts *(refer to Community Rating System sections, page 1.25, and Participate in the Community Rating System, page 2.59)*;
- Develop a framework of preferred options for landscape improvements appropriate to local conditions to mitigate flooding *(refer to Landscape Improvements, page 3.20)*;
- Develop design guidelines for flood mitigation which are appropriate to the local character *(refer to Develop Design Guidelines for Flood Mitigation, page 2.55)*;
- Prepare information on protective measures for historic properties and distribute to owners in advance of a flood as part of preparedness activities; and
- Develop a process for coordinated local response to protect historic properties following a flood *(refer to Planning for Response & Recovery, page 2.35)*.

The local team can also play an important role in developing and implementing a public engagement strategy. *(Refer to Engage the Public, page 2.17.)*

Forming the planning team and beginning the planning process can happen either in conjunction with or prior to the update to a community's hazard mitigation plan. ***Even if the local plan update was recently completed and did not include historic properties, it is nonetheless advantageous to move forward with planning for historic and cultural resources to get "ahead of the game."*** Ideally, when it is time for the next plan update, the planning team will have information in hand and public sentiment behind the inclusion of cultural resources in the hazard mitigation plan.


*Figure 2.9 - The entire town of Whithaven is located within the Special Flood Hazard Area. The town is a National Register Historic District with individual properties are designated on the Maryland Inventory of Historic Properties have Preservation Easements with the MHT.*

## A.3 IDENTIFY KNOWN HISTORIC RESOURCES, FLOOD HAZARDS & CAPABILITIES

To get a better sense of how to prioritize its efforts, a community seeking to protect historic properties from flooding should begin with an analysis of its current data, programs, resources, and potential threats. This initial analysis – the starting point for any planning process – will help the team:

- Establish parameters for planning, including the type of plan(s) as well as mitigation and funding opportunities to pursue;
- Direct available energy and resources towards the overall goal of protecting historic properties;
- Reveal deficiencies in current information, processes, and resources and indicate opportunities for improvement; and
- Identify potential partners who can assist in various aspects of the work – such as the MHT, which can provide guidance on planning strategies and priorities for data collection and, in some cases, provide funding.

The initial analysis will identify both strengths and weaknesses. For example, communities that have already experienced flooding might have a robust hazard mitigation plan or floodplain management plan and dedicated resources towards flood mitigation. Other communities may not yet have experienced damaging floods but may have a vested interest in protecting historic districts that fuel their tourism-based economies or establish their sense of place. By gathering this initial information, community funding and personnel efforts can be directed toward areas that need improvement, and the team can decide how best to integrate historic preservation into emergency management and vice versa. The initial analysis should include the following topics:

### a. Existing Plans

As part of its outreach to state and local partners, the team should collect planning documents and maps to help understand what guidelines and strategies have already been established regarding the identification and protection of historic properties. Although relevant documents will vary depending on the type of plan being pursued, they can include:

- State and local hazard mitigation plans;
- Floodplain management plans;
- Disaster response and recovery plans;
- State and local historic preservation plans and preservation elements within comprehensive plans;
- Heritage Area Management Plans;
- Comprehensive plans;
- Community or site-specific master plans;
- Economic development plans, including for Main Streets and Arts and Entertainment Districts; and
- State and local transportation plans, including Scenic Byways.

## RESOURCES TO IDENTIFY HISTORIC PROPERTIES VULNERABLE TO FLOODING

Preliminary data on historic properties should be collected, as appropriate, from the entities described below.

- **Local Historic Preservation Commissions** – Local historic preservation commissions 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. To regulate properties for design review or other purposes, local preservation commissions must designate properties according to local criteria; the Maryland Historical Trust does not track which properties are locally designated. These designations will inform what can and cannot be done for mitigation, under the existing regulatory framework.

  **Note:** Local preservation commissions 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-level plan, it is important to consult with all preservation commissions within the county's boundaries, as well as with the county commission.

- **Maryland Historical Trust** – As the State Historic Preservation Office, the Maryland Historical Trust (MHT) maintains the Maryland Inventory of Historic Properties (MIHP), a repository of information on districts, sites, buildings, structures, and objects of known or potential value to the prehistory and history of the state. The MIHP includes data on more than 13,000 archeological sites and 40,000 historic and architectural resources. These records are merely informational but often serve as the basis for local preservation planning and inventories.

  MHT also maintains records for Maryland properties listed on or eligible for listing on the National Register of Historic Places. In the event of a state or federal undertaking, including mitigation efforts funded by FEMA, MHT consults with the state or federal agency to avoid, minimize, or mitigate harm to these historic properties through the historic property review process. Medusa, the MHT's online cultural resource information system, has GIS-linked records for properties included in the MIHP as well as National Register listed and eligible properties.

- **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 comprehensive plans, small area plans governing specific sites or similar planning initiatives. *(Refer to Other Local Plans, page 2.6.)*

- **Local Historical Societies and Museums** – Many local historical societies and some regional museums maintain archives including photographs and other records about historic sites and properties, as well as oral histories and documents related to storm and flooding events.

- **Maryland Heritage Areas Program** – Thirteen Heritage Areas operate throughout the state, encouraging residents and tourists to experience the unique stories and physical characteristics that define Maryland's communities and countryside. Each Heritage Area operates according to a management plan that identifies tourism themes and properties with heritage tourism potential (for example, tobacco barns in Southern Maryland or the story of religious freedom on the Eastern Shore).

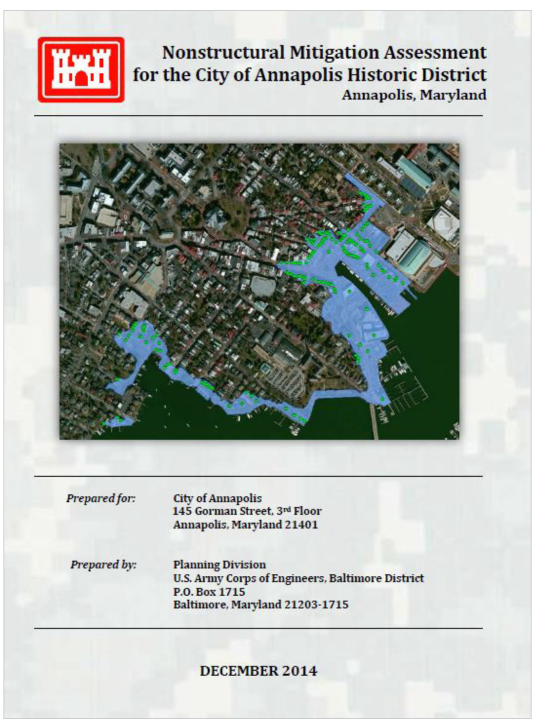
- **Local, State & Federal Agencies with Community Cultural Resources** – A variety of agencies collect and maintain information regarding historical and cultural resources. For example, through the State Highways Administration, Maryland's Department of Transportation (MDOT) runs the state's Scenic Byways Program. As with Heritage Areas, the state's 18 scenic byways encompass landscapes, viewsheds, and historically and culturally significant places that may not be documented elsewhere.

## b. Potential Levels of Flood Vulnerability

An area's flood vulnerability will vary based upon geographic location, geology, hydrology, hydraulics, and the specific types and locations of historic properties. Infrastructure stability and capacity, including transportation, utilities, and water supplies, as well as sewage treatment and stormwater management, will influence both risk and recovery. As part of the initial analysis, each community should gather preliminary information on flood risks, with the understanding that levels of risk may be unique to each resource. *(Refer to Chapter 1: Flooding & Floodplain Management.)*

***Although not required, FEMA and the State of Maryland encourage local communities to consider climate projections for sea level rise, increased precipitation, and other factors, depending on the location and the available timeframe for planning.*** In 2016, the Maryland Commission on Climate Change recommends planning for a relative sea level rise of 2 feet or more by 2050 and 4.1 feet or higher by 2100. Data layers for sea-level rise are available online via the Maryland Department of the Environment (MDE). *(Refer to The Increasing Threat of Flooding, page 1.7, Establish a Timeframe for Planning Goals, page 2.20, and Adaptation, page 2.67.)*

The Maryland Department of the Environment's Flood Risk Application contains GIS map layers with data on floodplains, storm surge, sea level rise, coastal erosion, and other natural hazards related to flooding. The local floodplain administrator or the contractor updating the local hazard mitigation plan are also resources for aid in using the Flood Risk Application or mapping the intersection of historic properties with flood hazards. *(Refer to Evaluating a Property's Flood Risk, page 1.22, and Document and Assess Flood Risks to Historic Properties, page 2.21.)*



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

*Figure 2.10 - The U.S. Army Corps of Engineers completed a assessment of flood risk for the City of Annapolis in December 2014.*

## c. 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 of Historic Places, properties documented in the Maryland Inventory of Historic Properties (MIHP), properties identified in local inventories (via local preservation planners or historic preservation commissions), and properties identified as culturally or historically significant in existing planning documents. Unfortunately, many communities in Maryland have incomplete or outdated information regarding historic properties, so additional documentation is often necessary as part of the planning process. *(Refer to Document & Assess Flood Risks to Historic Properties, page 2.21.)*

***Ideally, data on historic properties will be comprehensively linked to Geographic Information System (GIS) mapping***

***software; communities without GIS capability may have written documents or survey files on historic properties.*** In either case, the community should compare its local information with the data and documentation available through Medusa, the MHT's online cultural resource information system. Documentation of individual properties' flood vulnerability may or may not exist at the beginning of the process; Elevation Certificates and related information should be gathered as part of this initial analysis. *(Refer to Evaluating a Property's Flood Risk, page 1.22.)*

## d. Preservation Regulatory Framework

Some communities have a regulatory framework with a strong preservation focus, supported by 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 will help prioritize mitigation efforts for historic properties. A strong framework may include: Certified Local Government (CLG) designation; an active historic preservation commission, as well as a robust historic district ordinance with a permit review process; active preservation non-profits and advocates; and/or a preservation plan or component of a master plan, as well as supporting directives such as preservation design guidelines. *(Refer to Implement Protective Actions, page 2.52, and Develop Design Guidelines for Flood Mitigation, page 2.55.)*

## e. Availability of Personnel and Financial Resources

Financial resources and knowledgeable, committed preservation and emergency management personnel are necessary for the successful protection of historic properties. 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 is visibly supported by a dedicated team of community leaders and volunteers. Ideally, preservation-friendly local officials can advise or participate in the planning team. *(Refer to Recruit a Team, page 2.9.)*

## f. Degree of Community Support

Political will often reflects the degree of existing community support for an issue and can make the difference between the protection or loss of historic properties. Some communities have a good understanding of citizen support or lack thereof; others will need to research public opinion as part of the public engagement strategy. At the outset, the planning team should evaluate what is known about community sentiment, consider opportunities for engagement and potential partners for engagement, and identify an outreach strategy for marginalized or vulnerable communities that may be difficult to reach. *(Refer to Engage the Public, page 2.17.)*


### 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 MHT has adapted the tagline and logo for its statewide programs related to historic preservation and emergency management.


*Figure 2.11 - Developed by Marin County, California, "Game of Floods" can help planners and the general public understand flood risks and trade-offs in hypothetical scenarios.*

## A.4 ENGAGE THE PUBLIC

Successful plans require robust public input and support. ***Engagement strategies should attempt to reach the widest range of affected citizens and stakeholders, and special consideration should be given to communities that may be particularly vulnerable to flooding or may have historically or culturally significant properties that have not been adequately documented (for example, areas that have suffered from disinvestment or have a high population of low-income, minority, or elderly residents).***

Ongoing outreach can educate citizens about the potential effects of flooding and the potential effects of mitigation measures on historic properties that matter to them. It can extend beyond the hazard mitigation planning process to address special initiatives, as well as planning and preparedness issues relevant to the community. ***In addition to education, public engagement provides a valuable opportunity for the community to provide feedback and share knowledge about places that are important to them but that may not be included in any inventories.*** This feedback may help to identify significant properties that meet the criteria for listing in the National Register of Historic Places or for local designation, or those that are culturally valuable to the community, with or without designation.

***When developing a public engagement strategy, the planning team should clearly define goals, and structure the outreach to inform citizens/stakeholders of the planning process at regular intervals.*** The planning team might consider the key moments when public input will be valuable, such as in the identification of

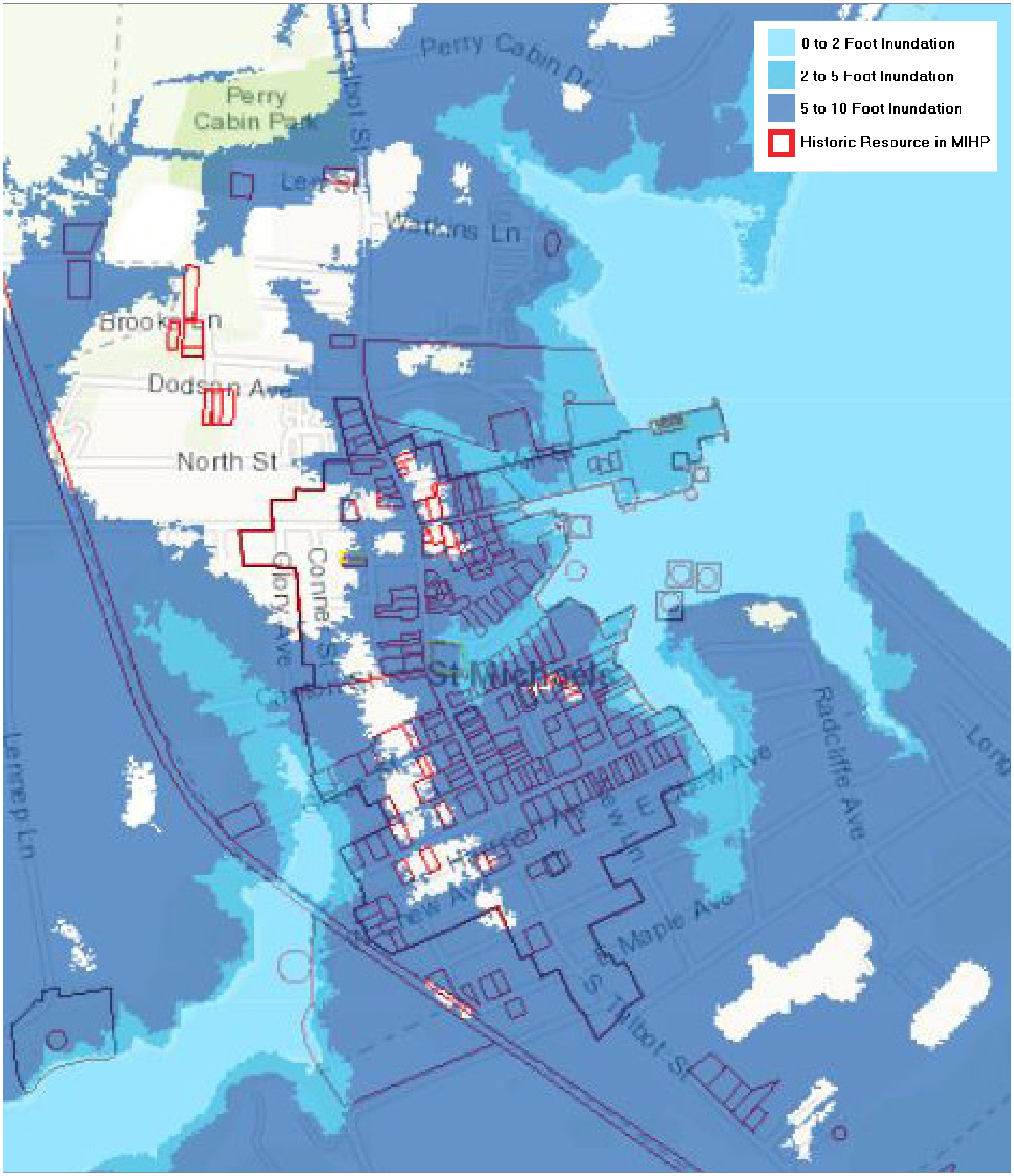



*Figure 2.12 - This map depicts the projected impact of sea-level rise on historic resources in St. Michaels, Talbot County. The Maryland Commission on Climate Change recommends planning for a relative increase in sea level in the Chesapeake Bay of 2 feet by 2050.* *(Refer to The Increasing Threat of Flooding, page 1.7.)*

local priorities, and when public updates are appropriate. *(Refer to Establish Local Preservation Priorities, page 2.28.)* The team can then develop an overall schedule with meeting dates and subjects, allowing community members to plan ahead. The schedule should adaptable and flexible to accommodate change and incorporate new opportunities as they arise.

Public engagement for hazard mitigation planning can take various forms, including meetings, mailings, questionnaires, websites, social media, surveys, tours, email blasts, news articles, video streaming, pamphlets, list-serves, workshops, and conferences. To maximize participation, the planning team should consider creative strategies to increase attendance: holding meetings in various locations, scheduling outside of standard work hours, ensuring adequate access by public transportation, providing interpretation for non-English speaker, providing food, or including child-friendly activities, and/or childcare. Funding opportunities may be available specifically for engagement, separate from sources dedicated solely to hazard mitigation planning.

Some issues to consider regarding public engagement include:

- What are the characteristics of 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 already been identified? Are they vulnerable to flooding? Have citizens been given the opportunity to weigh in on what is locally important?
- What is the community's threshold for risk? What is its relationship to water?
- What defines the sense of place? How can the community change and still protect what's meaningful? Are all neighborhoods and all citizens represented in this evaluation?
- On what is the community willing to compromise in terms of historic integrity, and how does that influence preferences for mitigation actions? What can be compromised and what cannot be compromised to maintain the 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? Do these projects have impacts on neighboring properties?
- Should 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 meaningfully incorporate the preservation and protection of historic properties. Ideally, however, engagement should reach beyond the formal hazard mitigation meeting process. Community updates can be a regular agenda item in a monthly or quarterly meeting, such as a historic preservation commission, historical society, business association or civic association meeting, or incorporated into a public gathering or event.


CRISFIEL

# CRISFIELD AND THE ENTIRE EASTERN SHORE SWEPT BY TERRIFIC STORM; HIGHEST TIDE IN HISTORY OF CITY

**Sixty-Mile An Hour Gale With Heavy Rains And Exceptionally High Tides Cause Large Amount Of Damage Wednesday**

**Entire City Completely Under Water—Was Over Two Feet Deep In Many Stores**

**BAY LINE STEAMER AGROUND NEAR HERE**

of Tangier Sound, out of the storm, but lost his way and ran aground in eight feet of water. All passengers were reported safe.

No mail or daily papers from Northern cities was received in Crisfield all day Thursday.

**MARION CARDINALS DEFEAT NANTICOKE**

**Homer In Ninth Inning Breaks Tied Score**

**HAVE THREE GAMES SCHEDULED THIS WEEK**

In the ball game between the Mar-

*Figure 2.13 - Crisfield Times coverage of an unnamed storm, August 25, 1933.*

## A.5 ESTABLISH A TIMEFRAME FOR PLANNING GOALS

As noted previously, 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. FEMA's Flood Insurance Rate Maps (FIRMs), the most important baseline for flood management, provides information about the most vulnerable areas within a community's floodplain based only upon historical data. *(Refer to Flood Insurance Rate Maps, page 1.15.)* Communities that wish to include projections for sea level rise and storm surge in their vulnerability assessments can utilize the Maryland Department of the Environment's DFIRM (Digital Flood Insurance Rate Maps) mapping tools. Official guidance does not currently exist to help communities plan for increased precipitation over time, but representatives from MEMA and the Maryland Department of the Environment (MDE) can provide community assistance for consideration in their planning efforts.

Because of the anticipated change in flood risk over time, a community should establish timeframes 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 reason to pass the problem on to future property owners or generations. If too short, the timeframe may not allow for adequate long-term protection, thereby requiring ongoing planning and implementation of additional mitigation to reduce future threats. To encourage the implementation of mitigation measures by private property owners, communities might consider a timeframe of 30 years, the length of most homeowners' mortgages. A 30-year timeframe would also allow communities to plan for the additional 2 feet recommended to accommodate anticipated sea level rise by 2050. *(Refer to Potential Levels of Flood Vulnerability, page 2.15.)*

## A.6 DOCUMENT & ASSESS FLOOD RISKS TO HISTORIC PROPERTIES

**KEY QUESTION:**

***What are planning "best practices" for historic properties threatened by flooding?***

To address the flood risk to historic properties, it is critical to understand their location, characteristics, and flood vulnerability. ***Using the information collected at the beginning of the planning process combined with feedback from stakeholders and the public, the team can develop a plan to document and assess flood risks to historic properties following the steps outlined below.*** *(Refer to Identify Known Historic Resources, Flood Hazards & Capabilities, page 2.13.)* ***Ultimately, all vulnerable historic and cultural resources should be identified as part of the hazard mitigation planning process.*** When sufficient local government 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 be built up over a number of years.

*Figure 2.14 - Chesapeake & Ohio Canal Cushwa Warehouse (constructed circa 1790 – 1810) located at the canal's edge has historical high watermarks visible in white block on the face of the building noting the depth of flooding from five food events from the mid-19th to early-20th century. Williamsport, Washington County.*

### a. Examine the Community's Relationship to Water

In planning for the future, it is important to consider historic and contemporary relationships to water on the community, district, and neighborhood levels. Layered with social, cultural, historical, and physical dimensions, these relationships can inform an understanding of historic resources in context. ***Although this Guide focuses on historic buildings, it is important to acknowledge that many kinds of historic and cultural resources reflect a community's relationship to water.*** These resources can include wharves and docks, lighthouses, cultural landscapes, archeological sites, and cemeteries, as well as intangible heritage associated with water-based industries, recreation 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 following factors.

- **Past Flood and Storm Events.** With many of Maryland's historic communities located adjacent to waterways, it may be useful to gather information about previous flood or storm events (for example, high watermarks demarcating the depth of floodwaters from previous flood 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.***
- **Source of Flooding.** 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, covering over or developing streams and wetlands will contribute to flooding, and restoring these areas can contribute to mitigation efforts. *(Refer to Mitigation, page 2.51.)* ***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.*** Of course, the relationship to water will continue to change, particularly in locations vulnerable to sea level rise. Therefore, it is also pertinent to consult mapping products that depicted the projected sea level rise for a community (e.g, MDE's Flood Risk Application with Maryland Sea Level Rise Vulnerability layer added to viewer).

- **Living with Water.** An understanding of past mitigation or adaptation measures can suggest options for the future. Research should include identifying unofficial adaptations by residents to the realities of living with persistent flooding, flooding events, and/or climate change. Analyzing a community's maritime heritage to ascertain how industry and recreational activities have changed and adapted can also inform decisions about mitigation options. *(Refer Adaptation, page 2.67, and Chapter 3: Selecting Preservation-Sensitive Mitigation Options.)*
- **Community Infrastructure.** In any given community, an infrastructure concern or other 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 habitation. If access to these resources is compromised long-term, people will be unable to remain in the community. Understanding which systems are vulnerable to events, as well as the timeframe and likelihood of restoration, may dictate a timeframe for planning and/or place system upgrades at the top of the priority list for mitigation. *(Refer to Adaptation, page 2.67.)*

### ADAPTATION STRATEGIES: DORCHESTER COUNTY

In Dorchester County, some residents have constructed low berms around their property to keep nuisance flooding out. Others have built mounds to park their cars. Some pre-position their cars when they know a high tide will cover a roadway, or they modify their work schedule so they are not commuting during high tides. These are all forms of adaptation that are not due to any policy by the local government.

## b. Identify Gaps in Historic Property Documentation and Vulnerability Assessments

As a first step in identifying gaps, the planning team should review records in the Maryland State Department of Assessment and Taxation (SDAT) database to get a rough estimate of properties over 50 years old (a common threshold for National Register eligibility) and then compare these findings to existing data on historic properties. *(Refer to Identify Known Historic Resources, Flood Hazards & Capabilities, page 2.13.)* ***Although the properties identified through SDAT may be dated incorrectly and will not necessarily meet criteria for historic significance, this comparison will help give a sense of possible locations for additional properties for study.*** Through public outreach and further investigation, the planning team can compile additional information about historic or culturally significant properties that may not have previously been documented. *(Refer to Engage the Public, page 2.17.)* The team may also wish to gather additional information on known historic properties if the existing documentation is out of date or insufficient.

Once the team has located potentially unrecorded properties, the next step is to overlay this data set preferably through


*Figure 2.15 - Talbot County completed a Historic Resources Survey for water oriented villages in 2017.*

GIS mapping, with the known historic properties and Flood Insurance Rate Maps to see what additional properties fall within the SFHA or other areas vulnerable to storm surge or sea level rise. *(Refer to Identify Known Historic Resources, Flood Hazards & Capabilities, page 2.13.)* This mapping exercise is a good point to begin setting goals for documentation and risk assessment, and even envisioning potential mitigation actions.

***The most useful assessments evaluate flood vulnerability on a structure-by-structure basis, not just via FIRMs and other generalized mapping tools.*** This is particularly true for historic buildings, which frequently have unique materials and characteristics. Since it provides information on a building's vertical and horizontal location in the floodplain, an Elevation Certificate provides the data needed to determine flood risk; however, it does not account for how the building is constructed, nor whether the building is historic. *(Refer to State & Local Floodplain Regulations & Ordinances, page 1.18, and Evaluating a Property's Risk, page 1.22.)* Not all buildings in a flood-prone community or within the SFHA will have completed Elevation Certificates. It is likely that the community will also need to conduct vulnerability assessments for historic structures as part of its planning process. The local floodplain administrator retains copies of completed Elevation Certificates.

## c. Document and Assess the Vulnerability of Historic Properties

***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. Likewise, preservation planning funds, such as those available through the Certified Local Government program, administered by the MHT, can be used to conduct vulnerability assessments in tandem with historic property documentation.

The combined documentation/assessment process includes many of elements familiar to preservation professionals but also includes information about the likelihood and potential financial impact of floods. In addition to location within the 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, all of which are used in determining a property's flood insurance rate and premium. *(Refer to Evaluating a Property's Flood Risk, page 1.22.)* If possible, separate assessments should be performed for each historic resource on a property (i.e, the main house and the carriage house). In completing hazard assessments for individual buildings, there are several areas, outlined below, which call for particular attention.

- **Building Condition**. Identify whether the building is in good, fair, or poor condition. Buildings in fair to poor condition are likely to also be poor candidates for mitigation, as they are not likely to be able to withstand the modifications needed to protect the building from flooding. For example, a building in poor condition may not be able to withstand being raised on cribbing in preparation for the construction of an elevated foundation. Maintenance needs should be identified, since a well-maintained property can provide the best investment to reduce the potential damage from hazards such as flooding. *(Refer to Encourage Property Maintenance, page 2.52.)*
- **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. Vulnerability to flood damage can increase with changes to historic materials and building construction, such as the solid infilling of the area between piers and the finishing of basements. This can be exacerbated by the replacement of historic materials with newer materials, which can be more susceptible to damage from flood water than traditional historic materials. Basements now sometimes 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.

  The vulnerability assessment should also note the presence of potentially damage-resistant historic materials such as wood, lime based mortar or plaster, stone, and brick, as

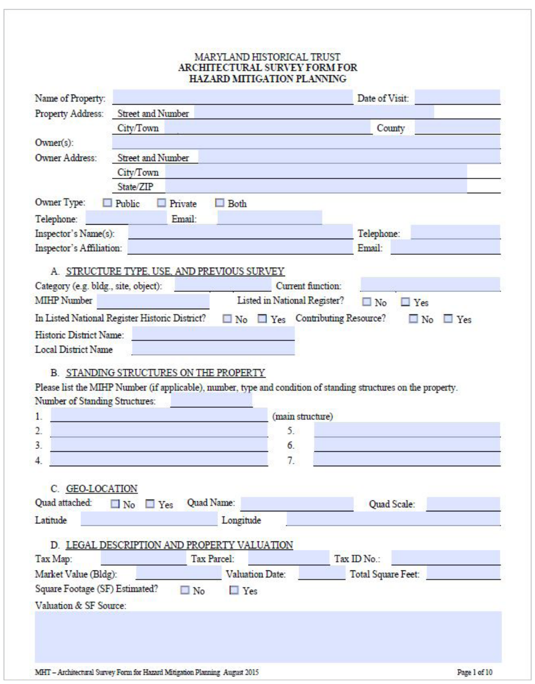

*Figure 2.16 - Understanding prior flood history is critical in assessing vulnerability. Westernport, Allegany County.*

well as substitute or 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. *(Refer to Wet Floodproofing, page 3.24.)*

- **Prior Flood History**. Documentation of prior flood history at a specific property may be available from several sources, including reports or records from FEMA's National Flood Insurance Program 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 of significant events can be a good resource for identifying prior flooding for organizations such as religious institutions, house museums, or clubs. *(Refer to Examine the Community's Relationship to Water, page 2.21.)*
- **Secondary Hazards and Risks.** In locations where flooding is a primary risk, there are often secondary risks associated with a disaster. Coastal storms are often accompanied by high winds, which can result in toppled trees and flying debris, impacting historic properties. Downed electrical lines can result in loss of power and potential fire threat. Fire can also be caused by ruptured gas lines as well as disconnected or damaged appliances and propane tanks.

## KEY QUESTION:

***What resources has the State of Maryland developed to assist?***


MARYLAND HISTORICAL TRUST
ARCHITECTURAL SURVEY FORM FOR
HAZARD MITIGATION PLANNING

Name of Property: Date of Visit:
Property Address: Street and Number
City/Town County
Owner(s):
Owner Address: Street and Number
City/Town
State/ZIP
Owner Type: ☐ Public ☐ Private ☐ Both
Telephone: Email:
Inspector's Name(s): Telephone:
Inspector's Affiliation: Email:

A. STRUCTURE TYPE, USE, AND PREVIOUS SURVEY
Category (e.g. bldg., site, object): Current function:
MIHP Number Listed in National Register? ☐ No ☐ Yes
In Listed National Register Historic District? ☐ No ☐ Yes Contributing Resource? ☐ No ☐ Yes
Historic District Name:
Local District Name

B. STANDING STRUCTURES ON THE PROPERTY
Please list the MIHP Number (if applicable), number, type and condition of standing structures on the property.
Number of Standing Structures:
1. (main structure)
2. 5.
3. 6.
4. 7.

C. GEO-LOCATION
Quad attached: ☐ No ☐ Yes Quad Name: Quad Scale:
Latitude Longitude

D. LEGAL DESCRIPTION AND PROPERTY VALUATION
Tax Map: Tax Parcel: Tax ID No.:
Market Value (Bldg): Valuation Date: Total Square Feet:
Square Footage (SF) Estimated? ☐ No ☐ Yes
Valuation & SF Source:

MHT – Architectural Survey Form for Hazard Mitigation Planning August 2015 Page 1 of 10

*Figure 2.17 - MHT has developed an Architectural Survey Form for Hazard Mitigation Planning.*

***To document multiple properties within larger areas or districts, MHT has developed a process which combines survey district documentation for the Maryland Inventory of Historic Properties (MIHP) with a hazard mitigation vulnerability assessment.*** 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, 2005).

MIHP documentation can provide the framework for a future National Register historic district nomination, should one be desired. Recording survey districts (a grouping of properties that may have potential for historic designation) also helps identify resources that may be individually eligible for inclusion in the National Register of Historic Places. While MHT 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 desired. 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 State & Local Floodplain Regulations & Ordinances, page 1.18.)*


*Figure 2.18 - The map generated using the Hazus-MH Riverine flood model indicates this historic house, located on the Eastern Shore, is located outside of the 100-year floodplain, or Special Flood Hazard Area (SFHA).*

To access the greatest potential benefits, 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. National Register designation (and local designation, depending on the local regulatory framework) may provide:

- Recognition of what is locally significant, with potentially 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.

As described in *Chapter 1: Flooding & Floodplain Management*, 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 protection. *(Refer to State & Local Floodplain Regulations & Ordinances, page 1.18.)*

Although a comprehensive documentation and assessment is preferable, most communities will not have the resources to address all vulnerable properties as part of a single planning effort. Some information can be gathered by volunteers or preservation professionals, while other information must be completed by trained professionals, who may include architects, structural engineers, civil engineers, hazard mitigation planners, and environmental planners. For communities that are not able to simultaneously identify historic properties and complete vulnerability assessments, a historic resources survey can be completed first, increasing awareness and local appreciation of historic properties while providing the framework for a later assessment. Whenever possible, this information should be integrated into local GIS mapping to open up the most possibilities for analysis and future applications.

### d. Estimate Economic Losses

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. 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 local government's GIS staff. ***Keying historic and cultural property information to a GIS database through a historic resources inventory facilitates the HAZUS documentation process.*** *(Refer to Evaluating a Property's Flood Risk, page 1.22, and Document*

**ESTIMATING ECONOMIC LOSS**

Economic losses to historic properties can be estimated using other methods that may depend on the damage a municipality expects to incur. For example, the City of Annapolis planned for a flood event at a height that would damage the first floor of buildings in the flood hazard area. Therefore, the City's formula for calculating building damages was limited to replacement of first floor fixtures and finishes. Other municipalities may want to calculate the total loss of a building, or the building's replacement cost.

*& Assess Flood Risks to Historic Properties, page 2.21.)* 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 training materials available on MHT's web site and in *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning* (FEMA, 2005).

## A.7 ESTABLISH LOCAL PRESERVATION PRIORITIES

It is logistically and financially impossible to protect all the vulnerable historic properties within a community from flooding; therefore, a planning team must identify which resources are the most important and consider the feasibility of mitigation for those properties. While it is tempting to say that everything is important, the loss of certain properties would irrevocably alter the look and feel – the sense of place – of the community. ***The process of prioritization 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 historic resources contribute to the area's economic vitality***.

Establishing preservation priorities for flood-prone properties does not occur in a vacuum. For example, other state and local planning documents may contain prioritizations of historic properties that should be consulted and considered. *(Refer to Other Local Plans, page 2.6.)* Aligning priorities across planning documents will help develop mitigation actions for historic resources that are integrated with existing programs and initiatives and may also help to identify potential sources of funding for mitigation actions. Because these other plans have also gone through a vetting and approval process, it may be easier to garner support for the mitigation actions developed based on a previously prioritized list of historic resources.

However, even established preservation priorities should be vetted and confirmed within the hazard mitigation planning process, and many communities will not have established preservation priorities through a hazard mitigation planning process. ***To that end, this Guide suggests a simple approach that utilizes four factors to determine the overall importance of historic properties to the community. This four-factor method shifts the prioritization decisions from a top-down approach, focused on planners and professional preservationists, to a more balanced approach that can incorporate meaningful community input.***

- **Critical to Sense of Place.** What resources contribute to the community's sense of place, identity, and cultural heritage? The public's answer to this question may not adhere precisely to definitions of "historic resources" as employed by preservation professionals but should still be considered. Examples of critical resources could include a Main Street or residential streetscape, a historic neighborhood, a town plan, a community center, a park, or a school.
- **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. For example, high risk could be the range between complete destruction of the building and 50% or more damaged (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 could be less than 50% damage; and low risk could be little or no damage. A second option is to define risk relative to location in a floodplain. High risk could then be defined as all resources in SFHA; moderate risk as all resources in the 0.2% annual chance floodplain; and low risk as all properties beyond the 0.2% annual chance floodplain. 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 chance floodplain. For any study of vulnerability, the local government should also consider and, ideally, integrate climate projections, which are not reflected in the FIRM classifications. *(Refer to Flood Insurance Rate Maps, page 1.15.)*
- **Economic Contribution**. Does the property contribute to the community's economy? Is it an economic driver in the community, such as a tourist destination, historic neighborhood, or downtown where revitalization is occurring? Examples of properties that contribute economically to a community could be a historic marketplace such as the Annapolis Market House, a destination like the Chesapeake Bay Maritime Museum, or a historic Main Street.
- **Other Considerations**. This factor is meant to be user-defined and adapted to local circumstances, based upon community input, to provide flexibility in evaluating attributes that are not captured by the other three evaluation factors. For example, 'Other Considerations' could be used to assign value to undocumented historic properties without known historic and architectural significance, or properties identified as important by the community but not designated, 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 that 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 with structures 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, a contributing property within a National Register district, or locally designated, or was it evaluated and not designated because it did not meet National Register criteria?

Public engagement will help rank and identify a prioritized list of resources to be protected. *(Refer to Engage the Public, page 2.17.)* 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 the community 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. The properties that receive the highest rank or score represent the community's top priorities for protection. This community-based prioritization can help foster public support for historic resource FEMA presents an alternate prioritization approach in *Integrating Historic Properties and Cultural Resources Considerations into Hazard Mitigation Planning* (FEMA, 2005), 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 or unstudied cultural resources; and

## RANKING HISTORIC RESOURCE VALUE TABLE

| Resource | Critical | Vulnerable | Economic | Other | Priority Score |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

*Table 2.1: A table can be a useful tool to establish preservation priorities in the protection of historic resources.*

- Shifting resource prioritization heavily towards a top-down approach and away from the public.

***There is no "right" or "wrong" method for a community to choose to prioritize its cultural resources: different methods have different biases, advantages, and disadvantages.*** The alternative approach presented above and FEMA's approach are two ways of many. A community may even develop their own approach to meet their own needs.

## A.8 DEVELOP MITIGATION GOALS & OBJECTIVES

Mitigation goals related to the protection of historic properties 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;
- 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 Other Local Plans, page 2.6.)* 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, public engagement is required to establish common goals between local government 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 2.17)*;
- Promote regular maintenance to reduce vulnerability *(refer to Encourage Property Maintenance, page 2.52)*;
- Assess appropriate mitigation options for individual properties *(refer to Property-Specific Mitigation, page 2.62)*;
- Develop design guidelines to clarify appropriate mitigation options *(refer to Develop Design Guidelines for Flood Mitigation, page 2.55)*; and/or
- Provide property owners with information about existing financial programs to assist in mitigation implementation *(refer to Engage the Public, page 2.17)*.

***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 and meet the objectives of the local population.*** Public engagement also provides an opportunity to address differences of opinion prior to investing time developing appropriate mitigation options.

### PUBLIC ENGAGEMENT TO BUILD SUPPORT FOR MITIGATION

To help communicate the threat of sea-level rise and tidal flooding to the National Historic Landmark district, the City of Annapolis benefited from pro bono assistance from the University of Florida's preservation program, Envision Heritage, which laser-scanned the vulnerable area and produced a video illustrating different flooding scenarios. The raw data from this project can also be used to augment historic property documentation.

## A.9 IDENTIFY, EVALUATE & PRIORITIZE MITIGATION OPTIONS FOR HISTORIC PROPERTIES

Hazard mitigation options can range from regulatory updates and identified future planning actions to large-scale community projects to smaller, property-specific mitigation projects. Mitigation options will have varying ease of implementation, level of support, financial requirements, and implementation timelines. 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 and its surroundings. Actions at an individual property may affect the integrity of a historic district. Similarly, community-wide mitigation strategies will have effects on both the district and on individual properties.***

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

- **History of Adaptation**. Communities with a long history of flood vulnerability may also have a history of adaption, including actions such as the relocation, floodproofing, or elevation of buildings. Continuing this traditional adaptation approach in a manner that is consistent with the historic precedent may minimize the impact of the proposed mitigation.
- **Community-Wide Strategies**. Community-wide mitigation projects such as infrastructure improvements have the benefit of protecting multiple properties, both historic and non-historic. However, some community-wide options can alter or destroy historic and cultural resources and their context, requiring careful consideration and evaluation. Because they protect multiple properties, they often have the added benefit of community support. They can also support vulnerable populations and their cultural heritage, particularly in communities where financial means for implementing individual property mitigation projects are limited. *(Refer to Community-Wide Mitigation, page 2.60, and Chapter 3: Selecting Preservation-Sensitive Mitigation Options.)*
- **Options that Meet Multiple Goals**. In evaluating mitigation options, particularly community-wide strategies and those at large-scale properties, it may be possible to improve flood resistance while meeting other goals. 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. Similarly, it might be possible to sensitively integrate parking into the occupancy-evacuated ground floor of a building, allowing for the replacement of surface parking with landscaping. An additional benefit may be that the project allows the community to capture additional credits in the Community Rating System, if the community participates in the program, which may help the community to achieve a higher classification. *(Refer to Community Rating System, page 1.25, and Mitigation, page 2.51.)*

*Figure 2.19 - Carroll Creek Park, Frederick, Frederick County.*

### CARROLL CREEK PARK - FREDERICK, MD

The Carroll Creek Flood Control Project, or Carroll Creek Park, is an example of how the City of Frederick revitalized its historic downtown through an innovative approach to flood control. The flood control project has been ongoing since 1976, incorporating about 1.3 miles of 20 foot by 20 foot underground conduits, funneling floodwaters while maintaining a visible stream of water at the surface. It was modeled on the Riverwalk in Austin, Texas, with meanders, spaces for pedestrians to walk or sit, and areas for gathering like a small amphitheater along the stream, all within a block or two of retail, restaurants, and housing in the historic downtown of Frederick.

The cost to date is roughly $60 million dollars, with $20 million contributed by the City and the rest by the State and Frederick County. The project completely removed downtown Frederick from the mapped, regulatory floodplain and spurred revitalization. The City of Frederick's Office of Economic Development estimates that the City receives 1.7 million visitors from more than 50 miles away and that the project led to the creation of 405,000 square feet of office space, 150,000 square feet of retail space, 1,500 new jobs, and more than $150 million dollars in private investment.

- **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.

***To evaluate and select specific mitigation options as part of the planning process, the planning team should consult** Mitigation (page 2.51) **of this Guide and** Chapter 3: Selecting Preservation-Sensitive Mitigation Options**. The planning team should consider multiple options simultaneously, from large-scale, expensive projects to readily achievable, short-term options that can be implemented quickly or incrementally.***

By balancing local preservation priorities and cost-effectiveness alongside the STAPLEE Evaluation, the planning team can select the best mitigation options for the community. *(Refer to STAPLEE Evaluation, below.)*

- **Aligned with 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 2.28, and Chapter 3: Selecting Preservation-Sensitive Mitigation Options.)*
- **Cost Effectiveness**. Mitigation options must be cost-effective. If the value associated with the implementation equals or is lower than the flood loss, FEMA considers the mitigation option to be cost-effective, qualifying the option for potential FEMA funding. Often, the planning team can illustrate cost-effectiveness by comparing the cost of implementation to the cost of the potential damage if nothing is done. The cost associated with the do-nothing approach includes:
  - ¤ The values calculated as part of a historic property hazard assessment *(refer to Document & Assess Flood Risks to Historic Properties, page 2.21)*; and
  - ¤ Projected cost of the damages if the mitigation action is not implemented. *(Refer to Estimate Economic Losses, page 2.27.)*
- **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 favorability. The STAPLEE Action Evaluation Table is included in *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning*. (FEMA, 2005). Each potential mitigation option is evaluated by ranking it for multiple factors in a STAPLEE table devoted to that option.

Evaluating options using these criteria will narrow potential mitigation options to those most appropriate and feasible to implement in a community. MHT is available for consultation during the STAPLEE review process to assist in the evaluation and provide feedback about whether proposed mitigation options are consistent with historic preservation best practices and project review criteria. *(Refer to Historic Property Project Review sidebar, page 2.36.)*

Using the results of this evaluation, the hazard mitigation planning team, under the guidance of the local emergency management office, will prioritize and then select mitigation options that they deem best for the community. Selected mitigation options should be clear, achievable, and consistent with the local government's overall hazard mitigation plan goals.

## A.10 WRITE, ADOPT & IMPLEMENT THE PLAN

The local hazard mitigation plan will detail how and when a community will advance mitigation options, including estimated project costs and schedules. Developing sound strategies for implementation will include consulting with stakeholders to identify potential funding sources and partnership opportunities. ***If proposed mitigation options will negatively impact the integrity of historic properties, preservation professionals and advocates, including MHT, can suggest ways to minimize that impact.*** In addition, seeking MHT's early review of mitigation options can help establish community-wide criteria for state review of individual applications, such as building elevations, during the project review process. Early coordination may also assist in MHT's review of applications for historic preservation tax credits and easements.

The local hazard mitigation plan is typically prepared under the guidance of the local emergency management office. The role of preservation planners in the preparation of the plan will vary from conferring with the larger group to writing the chapter or annex devoted to the protection of historical and cultural resources, depending on the level of participation in the process. However historic properties are addressed, hazard mitigation plans for cultural resources will 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 public engagement conducted for the preservation component of the plan.

The emergency management office must ensure the support of partners and local leaders, shepherd the plan through the approval process adoption by ordinance, 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 comprehensive plans and preservation plans. *(Refer to Evaluate*

*Options for Planning, page 2.4.)* Prior to submission to FEMA for approval, the plan must be submitted to MEMA for 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, the plan is adopted by the local municipality, or in the case of a county-prepared plan, by each municipality by ordinance. With adoption, the mitigation projects within the plan are eligible to receive Hazard Mitigation Assistance Program funding.

Hazard mitigation planning is a cyclical process that is never "done." Local hazard mitigation plans must be updated at least every five years, 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 historic 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.

*Figure 2.20 - Flooding on Main Street after Hurricane Irene, 2011. Port Deposit, Cecil County. (Source: Town of Port Deposit)*

## A.11 PLANNING FOR 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 community's resources and avoid the unnecessary loss of historic materials.*** This includes the 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.

## a. 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 communities 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 properties, it is necessary that building code staff be familiar with historic preservation requirements and able to access preservation representatives in an emergency.***

An expedited historic property review process can include the identification of stabilization measures and minor repairs that can be completed without formal historic preservation commission 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 2.55.)* This could expedite stabilization and provision of a weather-tight building enclosures and reduce the administrative burden on property owners during the recovery process.

## b. Identify Preservation Partners to Assist in Post-Flood Review Process

***Prior to a flood event, it is important to identify preservation organizations and volunteers 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 timely responses to property owners. These partners can include representatives from adjoining communities as well as from MHT and FEMA.

## c. Include Historic Properties in the Debris Management Plan

Flooding and high winds disperse debris comprised of exterior building components and interior features. Some vulnerable building components include porches, railings, windows, shutters, and fences. 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 off-the-shelf alternative.

***One of the best tools for minimizing the loss of historic materials is to include a process to handle the salvage of these materials in the debris management plan.*** This can also be promoted as a sustainable alternative to disposal. To be effective, the 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.

### HISTORIC PROPERTY PROJECT REVIEW

Prior to undertaking any improvements, it is important to understand whether alterations to a property are subject to historic preservation review. Communities must provide property owners with clear direction as to whether they are subject to historic preservation project review through a historic preservation commission. When recovering from a flood, it may be beneficial to waive formal local review in some circumstances to expedite recovery. *(Refer to Create an Expedited Review Process for Disaster Response, at left.)*

Regardless of local review procedures, MHT review will be required for properties receiving state or federal funding or permits, seeking financial incentives such as tax credits, and those under easement to the MHT. These projects will be reviewed to ensure that, to the degree possible, proposed alterations do not affect the property's historic character, integrity, and eligibility for funding.

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 must consult with the MHT in advance of any further work being undertaken.

### d. Develop Recovery Information for Historic Property Owners

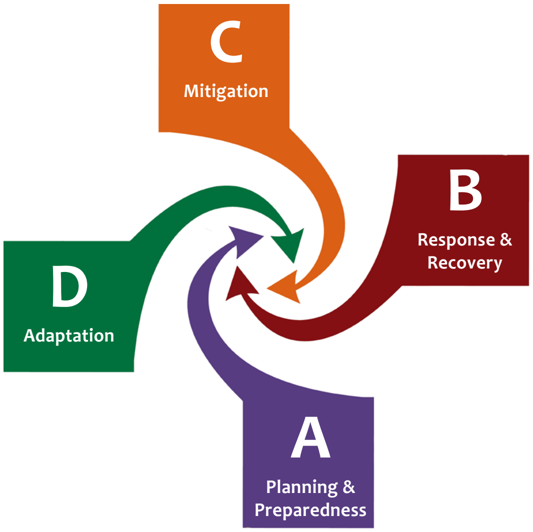
Immediately after a disaster, historic property owners will seek guidance about recovery, including what they should and can do to protect their properties and return to "normal." This includes everything from who should verify structural stability to how to document damage and prevent secondary damage, 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 on recommended strategies for mitigation and historic property repairs must be provided to encourage property owners to conduct sensitive repairs and reduce the unnecessary loss of historic materials.*** Websites should be prepared and brochures or handouts should be printed, readily available, and distributed to historic property owners in the immediate aftermath of an event. These materials should clarify that careful consideration must be given to properties subject to preservation easements or receiving preservation financial incentives such as grants and tax credits when evaluating flood stabilization and mitigation measures. *(Refer to Historic Property Project Review sidebar, page 2.36.)* While municipalities are encouraged to develop information specific to their circumstances, the MHT continues to develop resources that specifically address the relationship between flooding and historic properties and makes those resources available on their website.

### e. Establish a Demolition Delay Process

One challenge for local communities in the recovery process will be to temper eagerness to demolish flood-damaged historic buildings that could be stabilized and saved. The loss of significant community landmarks or significant numbers of properties in a historic district can greatly alter the character of an area. In addition, replacement buildings would need to be constructed to meet new building flood requirements, which often restrict habitable floors to higher elevations incompatible with a historic context. *(Refer to Understanding Repairing/ Rebuilding Requirements, page 2.45.)*

One tool that can buy time for a careful evaluation of threatened buildings is a demolition delay ordinance. ***In some communities, demolition delay ordinances are passed to allow time for owners of otherwise unprotected historic buildings to re-consider their options.*** In the aftermath of a flood event, this can provide time for qualified architects, engineers, and contractors to assess and stabilize a building. To protect public safety, one of the key provisions of a demolition delay ordinance is identifying a process by which a building official can approve the immediate demolition of a building or structure that is so compromised that it poses an immediate hazard or threat.


*Figure 2.21 - Building Tagged as "Unsafe Rear" by an assessment team. The rear wall of the first floor was blown out due to floodwater entering the front of the building. Ellicott City, Howard County, 2016.*




**Life-safety**
**Assess Damage**
**Stabilize Historic Resources**
**Plan for Rebuilding**

# B. RESPONSE & RECOVERY

## B.1 RESPONSE

> **KEY QUESTION:**
> *What is the role of local government?*

> **KEY QUESTION:**
> *What are the primary goals of the government response immediately before and immediately after a flood event?*

***Emergency response focuses primarily on life safety and, secondarily, on limiting property damage, although sometimes they are not mutually exclusive. As a result, historic preservation ranks lower among responders' priorities.*** Response is always a local effort: the local emergency manager oversees the process, including the coordination of different departments and agencies, direction of damage assessments, and allocation of resources.

The immediate response will include:

- Establishing communications among local, state, and federal government agencies;
- Gathering information about 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 structurally unsound buildings;
- Providing a safe location to meet basic human needs for food, water, shelter, and medical care; and
- Restoring essential community services.

MEMA encourages local governments to declare a local State of Emergency prior to requesting assistance from MEMA for response and recovery efforts. The local declaration, which can occur in advance of or following a disaster, triggers local policies, procedures, and plans that facilitate operations outside of normal activities. Typically, local governments utilize existing Memoranda of Understanding with neighboring jurisdictions to supplement their own resources; they may also use the Maryland Emergency Assistance Compact to request resources from any Maryland county (MEMA, 2015). The State may provide assistance when local response resources are exhausted or the jurisdiction requires resources that it does not possess.

If there is adequate notice in advance of a flood event, response can include evacuation and mobilization to protect buildings. Local government should advise property owners to proactively undertake activities including:

- Relocating possessions and equipment to the upper floors of a building or to higher ground;
- Relocating or secure outdoor furnishings and equipment;
- Clearing gutters, downspouts, and storm drains;
- Ensuring that sump pumps are functional and power supply is above projected flood water height;
- Clearing and securing floor drains;
- Installing automatic or closing manual anti-backflow valves to prevent interior damage;
- Disconnecting electrical appliances;
- Installing window protection if high winds are anticipated; and/or
- Placing sandbags and activate flood barriers.

Depending on the nature of the emergency, coordination with multiple entities may be required. Response to larger-scale events may include the establishment of an emergency response center 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; ideally a preservation planner would be available at the emergency response center once it is activated.*** If the local government is overwhelmed by the response, the emergency manager can request assistance from other jurisdictions and MEMA. If the scale of disaster warrants, Maryland's governor can request a Disaster Declaration from the President.

The Maryland Department of Planning serves as the lead agency in the State's emergency management activities that relate to cultural resources, and the Maryland Historical Trust (MHT) works directly with federal, state, and local partners to provide technical assistance during response and recovery operations. ***If local jurisdictions have impacted or potentially affected historic buildings and other cultural resources, they should consider requesting technical assistance from the MHT.*** The local government may also appoint a preservation representative at a local level, such as a local or county preservation officer or planner, to assist in identifying resources to protect historic properties.

In the immediate aftermath of a flood, response activities focus on rescue and providing medical services. After life safety operations cease, the focus of response shifts towards meeting basic human needs, such as food and shelter, identification of unsafe conditions, restoring essential infrastructure such as electricity, and clearing


*Figure 2.22 - The MHT and Howard County employees conduct damage assessments after the 2016 flash flood. Ellicott City, Howard County.*

> **KEY QUESTION:**
>
> ***How can planners and advocates help ensure that historic properties are protected during the response phase?***

roadways. ***Historic preservation interests begin to be involved when the response activities shift towards damage assessment and debris clearance.*** At that time, the identified partners and debris management plan can be utilized to assist in the retention and protection of historic resources and fabric with the emergency manager's authorization. *(Refer to Create an Expedited Review Process for Disaster Response and Include Historic Properties in a Debris Management Plan, page 2.36.)* Some functions that can be performed by historic preservation professionals and advocates, and for which MHT can provide assistance, include:

- Performing initial inspections and damage assessments of historic properties (this can utilize newer technologies including drones and laser scanning, *refer to Planning for Response & Recovery, page 2.35*);
- Using the results of the initial inspections and damage assessments to conduct triage – for example, determining high priority (which buildings need stabilization), medium priority (which need actions to protect against the elements, such as tarping over holes in roof, plywood fastened over broken windows), and low priority (which require little or no action to protect building during response and recovery operations);
- Identifying procedures to collect, label, and store displaced building elements for reinstallation rather than disposal *(refer to Include Historic Properties in a Debris Management Plan, page 2.36)*;
- Assisting with debris sorting to ensure that historic building components and other cultural resources are retained and not disposed of as waste;

## ELLICOTT CITY CASE STUDY

Immediately after a flash flood decimated the historic district of Ellicott City on the evening of July 30, 2016, MHT staff mobilized quickly to assist. Staff reached out to sister agencies to loop into response and recovery operations and arrived on site within 48 hours of the flood to view the damage firsthand, including to properties in the National Register Historic District. Field teams then spent a week and a half completing individual assessments of every historic property affected by the flood. Once finished, approximately 170 damage assessment forms were completed and over 1,500 photographs were taken. Through MHT's participation in the Maryland Silver Jackets program, staff were invited to join engineers from the Baltimore District of the US Army Corps of Engineers on the site visit to evaluate potential flood mitigation options for historic buildings. Overall, MHT spent more than 400 hours on flood assistance.

To help with the response and recovery effort, the statewide non-profit Preservation Maryland brought structural engineers from Keast & Hood to assess damaged properties, erect emergency support systems and save buildings from demolition. At the same time, the group helped to bring in the firm Direct Dimensions, which used photogrammetry software to create 3D models of the historic buildings, as well as Elevated Element, a leader in drone surveying technology that created special software specifically for this mission. Through these projects, historians and planners will have extremely accurate documentation of the district to aid in future decisions. Finally, Preservation Maryland opened a Preservation Resource Center on Main Street to serve Ellicott City, providing technical assistance, guidance, and support to property owners as they navigate the complicated process of restoring and repairing their flood damaged historic buildings.

As a result of these combined efforts, Ellicott City's historic buildings have had a better chance at recovery, and the County is better equipped to offer technical assistance and responses to questions from historic property owners about the rehabilitation of their buildings.


*Figure 2.23 - A tree was found lodged in the storefront during initial damage assessments after the 2016 flash flood in Ellicott City. Although the storefront glazing system was lost, its cornice and the transom windows above can be stabilized and retained in the rebuilding process.*

- 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 historic properties, etc.; and/or
- Providing information about funding opportunities to repair or rehabilitate historic properties.

## B.2 RECOVERY

**KEY QUESTION:**

***What are the primary goals of the recovery phase after a flood event?***

Recovery entails restoring and rebuilding a community's physical, social, and economic structure following a disaster such as flooding. Post-disaster recovery generally falls into three categories:

- Short-term needs, including restoration of essential services such as water and electricity;
- Intermediate needs; and
- Long-term needs including provision of temporary housing, repair of existing structures, and addressing social, and economic needs.

Like response, recovery is also the purview of local government. ***The jurisdiction's local Emergency Operations Plan, which describes strategies and procedures for coordinating the recovery effort across all departments and agencies, will guide the operations.*** Through a series of 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 2.8.)*

Historic preservation falls under the Natural and Cultural Resources Recovery Support Function, primarily implemented by the local office of planning and zoning. Through this function, the agency provides information and assistance to communities to aid them in preserving, protecting, conserving, rehabilitating, recovering, and restoring natural resources and historic and cultural properties during the recovery stage. The Recovery Support Function annex lists supporting local agencies; state agencies such as the MHT, among others; FEMA Office of Environmental Planning and Historic Preservation for Region III; and non-governmental partners.

The emergency manager or the director of the planning and zoning office should have a copy of the Natural and Cultural Resources Recovery Support Function, which may be activated with or without a Presidential Disaster Declaration and supplements, rather than supplants, the recovery effort. ***Even if a local jurisdiction does not follow this process, there are recovery actions that affect historic properties and communities; these should involve historic preservation.***

## a. Stabilize Structures

After the floodwaters recede, initial assessments of buildings are conducted to identify safety issues before property owners are permitted to return. During this assessment, a building may be determined to be structurally unsafe or unsound. ***Preservation professionals can assist in the evaluation process and provide guidance on appropriate stabilization measures to protect historic properties.*** A local or county preservation officer typically leads these efforts with the assistance of preservation partners and technical assistance from the MHT. In the event of a Presidential Disaster Declaration, FEMA's Environmental and Historic Preservation team conducts preliminary disaster assessments.

Once public safety has been assured, affected historic properties 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 utilizing available expertise, preservation professionals, architects, engineers, and contractors can conduct assessments of historic properties.*** As needed, assessments should be immediately

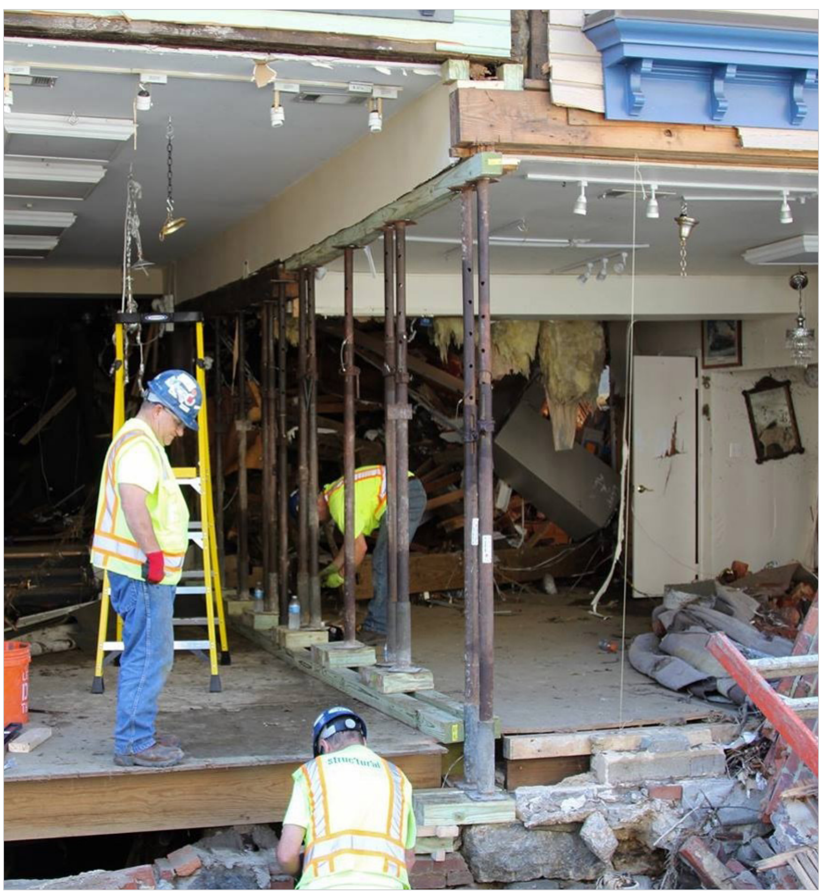


*Figure 2.24 - Stabilizing buildings in Ellicott City, Howard County, 2016. (Source: Preservation Maryland.)*

followed by structural stabilization and quick, temporary solutions to minimize further damage, such as tarping open roofs. Efforts should then be made to prevent or limit secondary damage to the building by providing ventilation to minimize mold and securing the building to prevent vandalism. Following stabilization efforts, property owners will be responsible for managing the recovery efforts for their buildings and parcels. *(Refer to Property-Specific Mitigation, page 2.62.)*

***In addition to supporting the local preservation planning team on-site in the aftermath of a flood, the MHT can also provide technical assistance and share historic resource documentation available from the Maryland Inventory of Historic Properties.***

### b. Understand Repairing/Rebuilding Requirements

> **KEY QUESTION:**
>
> ***What is the role of state and local government?***

The administrative requirements for repairing and rebuilding historic properties can be daunting, and without preparation, historic preservation concerns can be lost in the fray. ***By working with local officials in advance of a flood event, local planning and/or historic district commissions can implement zoning ordinance modifications to limit building heights, prepare design guidelines to encourage compatible alterations and construction within a historic context, and modify building codes to improve the resilience of historic buildings in a manner that maintains their historic integrity.*** *(Refer to Modify Zoning Ordinance, Develop Design Guidelines for Flood Mitigation, and Modify Building Code Requirements, pages 2.54-2.58.)* 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 and available through the MHT.

As individual property owners plan to repair or rebuild their historic properties following a flood, several factors may influence the types of required reviews and approvals. Some examples are described 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." Repairing this damage will require that the property also be brought into compliance with local floodplain regulations. However, the local floodplain ordinance may identify potential exceptions for properties that meet the ordinance's definition of "historic structures." *(Refer to State & Local Floodplain Regulations & Ordinances, page 1.18.)*
- **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 local floodplain regulations. Local floodplain ordinance may identify potential exceptions for properties that meet the ordinance's definition of "historic structure." *(Refer to State & Local Floodplain Regulations & Ordinances, page 1.18.)*

- **Local Building Code Requirements**. Work to repair the building will likely require compliance with the municipal building code. Compliance could require that code violations be corrected and/or the building be brought up to meet current building codes. The International Building Code and local amendments may include exemptions for buildings that meet the code's definition of historic structure, so long as lack of compliance will not constitute a life safety hazard. *(Refer to Modify Building Code Requirements, page 2.58.)*
- **Local Floodplain Regulation Requirements**. Whether a building meets the local floodplain regulation's definition of "historic structure" will affect the degree to which that building must comply with the regulations. Regardless of whether a property is exempt from floodplain requirements in the local floodplain ordinance, a permit would still be required for any development in the SFHA. *(Refer to Maryland Model Floodplain Ordinance Definitions: Alternative 2, page 1.20, and State & Local Floodplain Regulations & Ordinances, page 1.18.)*
- **Local Historic Preservation Requirements**. If the property falls within a locally designated historic district, it may be subject to more stringent standards or criteria in the municipality's zoning code and review by a historic preservation commission for compliance with design guidelines and zoning prior to receiving a permit. *(Historic Property Project Review sidebar, page 2.36, and Mitigation, page 2.51.)*
- **Funding Source or Easement Requirements**. Grant funds and loans frequently have conditions and restrictions governing their use. For example, funding from the National Park Service and the MHT 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 2.36.)* 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 agency and the MHT. *(Refer to Historic Property Project Review sidebar, page 2.36.)*
- **Flood Insurance Policy Requirements**. Different requirements may be triggered depending on whether or not a damaged

property is covered by flood insurance. For example, FEMA-funded mitigation requires property owners to purchase and maintain flood insurance as a condition for receiving funding. *(Refer to National Flood Insurance Program, page 1.17.)*

**KEY QUESTION:**

***How can planners and advocates help ensure that historic properties are protected during the recovery phase?***

***Whenever possible, local governments or preservation advocates should prepare preservation-specific information in advance and make it available for distribution to historic property owners immediately after a flood to streamline the review process and facilitate recovery.*** *(Refer to Develop Recovery Information for Historic Property Owners, page 2.37.)* Based upon the requirements of the floodplain ordinance as well as the level of damage and proposed improvement, these materials should include information about when additional code requirements may be triggered, including recovery activities that may impact eligibility for the National Register of Historic Places. *(Refer to State & Local Floodplain Regulations & Ordinances, page 1.18, Understanding Repairing/Rebuilding Requirements, page 2.45, Seek Funding, page 2.48, and Modify Building Code Requirements, page 2.58.)*

***Repairing and rebuilding may also provide an 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 (BFE), improving structural connections between building components, and providing floodwater evacuation pathways for low-lying areas. *(Refer to Modify Building Code Requirements, page 2.58.)* On a larger scale, previously underutilized or poorly maintained historic buildings can be rehabilitated incorporating flood resilience measures, giving them new life. This might include the rehabilitation of historic commercial buildings along a Main Street corridor or the adaptive reuse of 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 before commencing work. In the long run, this can save both time and money.

### c. Community Recovery

Community recovery projects, particularly those for which state and federal funding is required, will largely be based upon the mitigation projects identified in the local 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 2.34.)*

The recovery process can also provide an opportunity to conduct surveys to assess the risk of flooding at historic properties. *(Refer to Document & Assess Flood Risk for Historic Properties, page 2.21, and Community-Wide Mitigation, page 2.60.)* ***Documentation projects that also examine flood risk and provide actions for mitigating that risk may be identified***

***in local hazard mitigation plans.*** The MHT is available to assist communities in the identification of documentation or risk assessment projects. *(Refer to Document & Assess Risk for Historic Properties, page 2.21.)* The Maryland State *Hazard Mitigation Plan* (MEMA, 2016) also includes projects related to documentation and risk assessment of historic properties and archeological sites, which may make it possible for local governments to access support for these activities.

## d. Seek Funding

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 MEMA (approximately half of all declared disasters receive FEMA funding, with the remainder ineligible). Other financial assistance from public and private entities may be available, including:

- Flood insurance, limited to affected properties with an active policy;
- U.S. Department of Housing and Urban Development; and/or
- U.S. Small Business Administration.

Although all affected properties may be eligible for certain types of federal funding, such as FEMA's Hazard Mitigation Assistance Program, some funding sources will be limited to identified or designated historic properties, with eligibility requirements varying among programs. Following stabilization, the local government should contact emergency management lead and support agencies, including MEMA, the MHT, and the Maryland Department of Housing and Community Development, for assistance. Potential sources of funding specifically directed towards historic properties include the MHT and the National Park Service.

***Emergency funding may be available for projects from the MHT. 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 reaching out to 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 throughout the life of the property regardless of whether the ownership of the property changes. Therefore, it

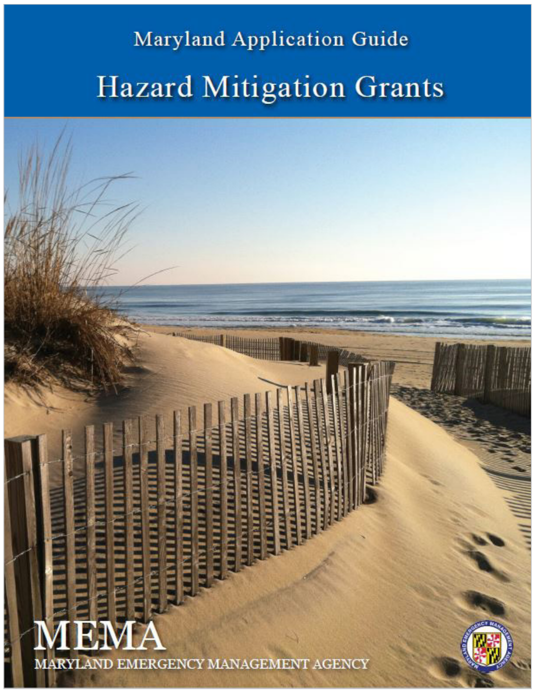



*Figure 2.25 - The Maryland Emergency Management Agency offers hazard mitigation grant funding.*

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 2.31.)*

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 MHT. *(Refer to Historic Property Project Review sidebar, page 2.36.)* 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 MHT 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 Document & Assess Flood Risk to Historic Properties, page 2.21.)*

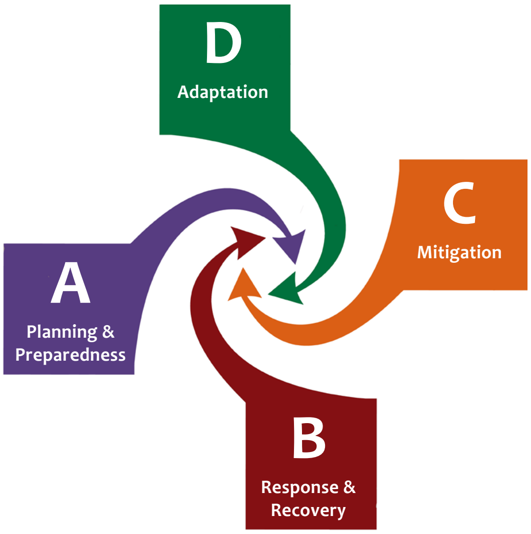
When pursuing funding, consideration should be given to:

- 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 local government 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 State & Local Floodplain Regulations & Ordinances, page 1.18.)*




**Implement Protective Actions**
**Community-Wide Mitigation**
**Property-Specific Mitigation**

## C. MITIGATION

**"MITIGATION" = REDUCE HARM**

**PRESERVATION MITIGATION**

... reduces impact on historic resources when undertaking a project.

**HAZARD MITIGATION**

... reduces potential damage from a catastrophe.

**CLIMATE MITIGATION**

... reduces the long-term risk and hazards to human life and property.

***After a flood event, there is a tendency to strive to return to "normal" pre-flood conditions. Although this response is often the most emotionally comfortable, 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.*** This is particularly true in areas susceptible to increasing flooding and impacts associated with rising sea levels, subsidence, increased precipitation, and overdevelopment. In the best of circumstances, the community makes decisions about flood mitigation during the hazard mitigation planning process, and the resulting recommendations are implemented prior to a flood event to eliminate or reduce the water's impact. *(Refer to Planning & Preparedness, page 2.3.)*

Flood mitigation for historic properties can occur in response to changes in the community's regulatory framework or incentives, or via specific projects, such as improving local infrastructure or replacing flood-damaged materials in a building with flood-resistant materials and building systems. *(Refer to Implement Protective Actions, page 2.52, Community-Wide Mitigation, page 2.60, and Property-Specific Mitigation, page 2.62.)* ***While mitigation can reduce the effect of flooding on historic properties, it will be impossible to protect all historically and culturally significant properties.*** Financial and personnel resources, as well as funding, are limited, requiring hard choices. In any mitigation project, a key challenge will be balancing flood protection with the preservation of historic character and integrity.

This section of the *Guide* is designed to give an overview of mitigation actions that may be part of the hazard mitigation plan or proposed outside the planning process in response to concerns about flooding. Communities actively evaluating options for mitigation should also consult *Chapter 3: Selecting Preservation-Sensitive Mitigation Options*, which provides a detailed menu of interventions as well as advantages and disadvantages to consider from a preservation perspective.

*Figure 2.26 - A pedestrian path with pervious paving provides a recreational amenity for the community while facilitating stormwater absorption in the event of a flood. Williamsport, Washington County.*

## C.1 IMPLEMENT PROTECTIVE ACTIONS

Subsequent to or outside of the hazard mitigation planning process, there are a number of actions that a community can pursue to help protect historic properties. Many of these require public engagement which can, if appropriate, be merged with the outreach conducted during the planning process. *(Refer to Engage the Public, page 2.17.)*

### a. Encourage Property Maintenance

***In many ways, a well-maintained property can provide the best investment to reduce the potential damage from hazards such as flooding.*** All materials deteriorate over time, but without regular repair, deterioration will accelerate. Maintenance can slow natural deterioration and reduce potential risks associated with flood hazards, helping to protect historic properties and collections, and, more importantly, human life. Fostering long-term preservation of a historic property is an aspect of good stewardship. Examples of simple maintenance that reduce the vulnerability of historic properties to natural hazards include:

- Grading land to promote positive drainage away from historic buildings (although this should be approached with caution in areas with archeological protection or potential);
- Trimming overhanging tree limbs that might crash through a roof or take down electric and telephone lines in a storm;

**KEY QUESTION:**

***What types of activities can help mitigate the damage of flooding to historic properties?***

- 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 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;
- 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 windborne debris;
- Replacing cracked window glass that can shatter in a wind storm and allow water infiltration;
- 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.

*Figure 2.27 - Historic building in floodplain that would benefit from minor maintenance. Dorchester County.*

## b. 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**. Local 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, 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.

**KEY QUESTION:**

***What planning tools are available to help protect historic communities?***

*Figure 2.28 - The building on the left has been elevated, but retains its context with neighboring properties. Whitehaven, Wicomico County.*

- **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.
- **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 community. 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 3.12.)* 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.

## c. 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 properties from flood-related damage. As is often the case, many off-the-shelf solutions are not sensitive to the unique characteristics of historic buildings. ***Wherever possible, community-preferred mitigation alternatives should be identified prior to property owners***

***exploring individual solutions.*** Ideally, the hazard mitigation planning process will proactively identify options appropriate to local properties based upon the type and level of flood risk. Preservation advocates will often be the front line in determining appropriate flood mitigation at historic properties, particularly in those communities with a formal historic preservation commission review process.

As a starting point, preservation advocates, stakeholders, and historic preservation commissions should identify clear policies that address flood mitigation in their communities. 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 Property-Specific Mitigation, page 2.62)*;
- Define acceptable building elevation heights relative to the Base Flood Elevation (BFE) or Design Flood Elevation (DFE) *(refer to Location Definitions sidebar, page 1.22)*;
- Identify appropriate materials and design considerations for common options such as higher foundations, extended stairs, flood barriers, and flood openings; and
- Identify acceptable damage-resistant materials or treatments for flood-prone areas.

Local governments should include these statements in comprehensive plans and preservation plans to increase their impact on the local decision-making process. *(Refer to Other Local Plans, page 2.6.)*

***Historic preservation commissions 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 historic preservation commissions prepare design guidelines to provide guidance to property owners, architects, and contractors for proposed exterior alterations to designated properties. These guidelines


ca. 1900

Elevated 7'

Good example.

Elevation wall has open latticework at grade and the dark brown shingle siding above it matches the color and scale of the upper body of the house, in keeping with the character-defining features of this style.

*Figure 2.29 - Excerpt from Division for Historic Preservation (NYSHPO) Elevation Guidelines.*

**KEY QUESTION:**

***What questions should planners consider when evaluating mitigation options for historic properties?***

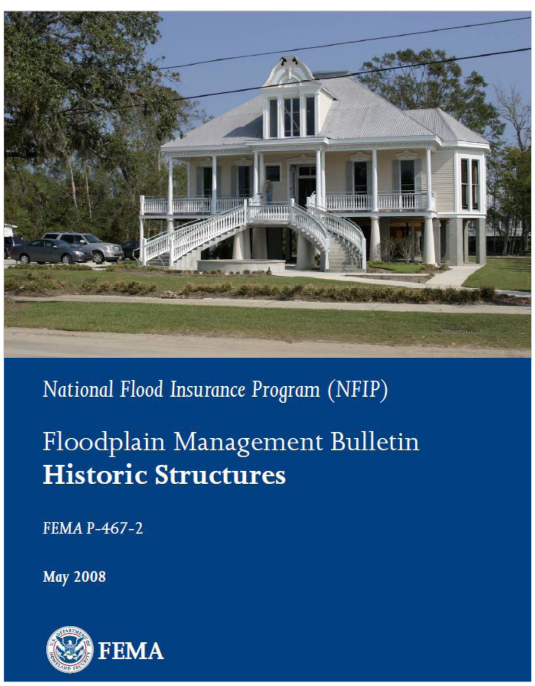



*Figure 2.30 - The National Flood Insurance Program provides guidance regarding Historic Structures in Bulletin P-467-2.*

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 properties in the community;
- Location of historic properties relative to the 1% and 0.2% floodplains;
- Height of the floor levels relative 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 code, zoning, and design requirements;
- Flood design requirements (some municipalities impose more stringent requirements than the National Flood Insurance Program) *(refer to Participate in the Community Rating System, page 2.59)*;
- Site mitigation options *(refer to Landscape Improvements, page 3.20)*;
- Building mitigation options *(refer to Building Mitigation, page 3.21)*; 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 incorporated into 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.

***Design guidelines should reflect the 2017 update to The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings, which contains several sections that address resilience to natural hazards.*** Within the document, the National Park Service indicates that more materials and guidance on this topic will be forthcoming; therefore, preservation planners and historic preservation commissions that wish to address resilience should ensure that they have the most up-to-date guidance available. In addition, if the community is a Certified Local Government, the Maryland Historical Trust (MHT) should be provided the opportunity for review early in the process or, at a minimum, prior to local adoption, to confirm that the proposed recommendations will not negatively impact the integrity of the resources or result in de-listing or ineligibility for financial incentives such as tax credits or grants.

## d. Modify Building Code Requirements

As with zoning codes, building code compliance is typically triggered by submission of a building permit application to construct a new building or modify an existing building. Local governments can impose building code regulations stricter than state requirements for flood resistance for new or substantially improved buildings. More stringent building code requirements also benefit local governments that participate in the Community Rating System. *(Refer to Participate in the Community Rating System, page 2.59, and State & Local Floodplain Regulations & Ordinances, page 1.18.)*

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 damage-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 elevation or relocation is typically required for substantially improved or substantially damaged buildings to comply with National Flood Insurance Program requirements. *(Refer to Maryland Model Floodplain Management Ordinance Definitions, page 1.20.)*

Most municipalities utilize the International Building Code, potentially with local modifications. The International Code Council and FEMA developed *Reducing Flood Losses Through the International Codes: Coordinating Building Codes and Floodplain Management Regulations*, 4th Edition (2014) to provide guidance to municipalities considering code modifications.

***Although some building code-required modifications may be appropriate for most properties, others may be at odds with the preservation of historic buildings. Requirements that affect portions of buildings below the BFE/DFE can be particularly contentious.*** For example, as a consequence of limiting the use of lower floor levels, property owners may be more likely to want to elevate the entire building, build an addition or extra story, or modify interior floor heights and, consequently, window heights. Care should be taken to balance the requirements for compliance and the preservation of historic properties. *(Refer to Building Mitigation, page 3.21.)* Additionally, the construction of code compliant new construction within historic districts can have a negative impact on the streetscape and context and affect the character of the district.

**KEY QUESTION:**

***What can local governments do to promote and incentive good mitigation practices?***

**FINANCIAL INCENTIVES**

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.

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.

### e. Participate in the Community Rating System

The Community Rating System (CRS) is a voluntary incentive program within the National Flood Insurance Program (NFIP) that recognizes and encourages community floodplain management efforts that exceed the minimum NFIP requirements. *(Refer to Community Rating System, page 1.25.)* Local governments participating in the CRS adopt more stringent floodplain regulations and undertake activities to better quantify their flood risk. They also conduct outreach related to floodplain regulation, flood mitigation, and insurance, as well as undertake mitigation projects to reduce their flood risk. In turn, the community receives reduced flood insurance rates for properties located in the Special Flood Hazard Area (SFHA).

### f. Develop Incentives to Encourage Sensitive Property Mitigation

***In the same way that federal and state agencies provide financial incentives for hazard mitigation actions, local jurisdictions can develop financial incentives to promote sensitive property mitigation.*** While historic preservation tax credits are traditionally used to preserve, restore, or rehabilitate historic buildings, they could also be used to incentivize historic property owners to modify buildings for hazard mitigation. ***Should a local government choose to develop or expand a tax credit to include hazard mitigation for historic properties, careful consideration should be given to defining allowable mitigation building adaptations that are consistent with character of the community and traditional or historic adaptations to flood hazard.*** If the incentive encourages modifications that may affect a property's historic integrity and/or eligibility for the National Register of Historic Places, participation may affect a property's eligibility for historic preservation financial incentives.

Local incentive programs that help to fund building maintenance for properties that meet specific conditions – for example, historic properties located in economic development zones or areas that have suffered disinvestment – could motivate historic property owners to undertake relatively inexpensive and easily implemented actions to reduce the impact of nuisance level flooding at their property. Similarly, a program that addresses the reduction of stormwater runoff could offer a grant towards landscape enhancements like the purchase and planting of shade trees, purchase of rain barrels, installation of pervious pavers, and landscaping improvements that restore native plantings. Programs should be coordinated with the local preservation planner or historic district commission liaison to ensure that the program is aligned with historic district guidelines or historic overlay zones.

Rebates can be another effective financial incentive, especially when coupled with other financial incentives, such as building permit rebates linked to property maintenance grants or rebates for installing pervious surfacing and landscaping linked to a stormwater runoff reduction program.

*Figure 2.31 - The water's edge includes large rocks (structural shoreline protection) and a marsh (natural shoreline protection), to mitigate erosion along the St. Mary's River and protect the bluffs of Historic St. Mary's City. St. Mary's City, St. Mary's County.*

## C.2 COMMUNITY-WIDE MITIGATION

As the name implies, community-wide mitigation projects are intended to protect multiple properties and large areas of land. Community-wide projects are generally favored by property owners because their implementation may reduce or eliminate the need for individual property mitigation efforts, thus reducing personal expenditures and inconvenience.

Because of their larger scale, community-wide projects typically require supplemental funding from outside of the municipality and access to or acquisition of property for implementation. Identifying community-wide mitigation projects in the hazard mitigation plan can not only reveal logistical issues and potential solutions, but can also make the projects eligible for mitigation funding through FEMA's Hazard Mitigation Assistance grant programs (MEMA, 2016). ***Another advantage of prior planning is that large-scale projects can be coordinated with adjacent municipalities that share similar flood vulnerabilities.*** For example, shoreline protection could extend for the length of the vulnerable coastline rather than be truncated at a municipal border. A lack of coordination may have the unintended consequence of negatively impacting a neighboring municipality or of adjoining municipalities constructing conflicting solutions.

***From a historic preservation perspective, community-wide mitigation projects tend to be preferred since they typically have less impact on the historic integrity of individual properties. However, they can impact the historic context of resources and have the potential to destroy historic landscapes and archeological remains.*** *(Refer to Chapter 3: Selecting Preservation-Sensitive Mitigation Options for the potential preservation impact for a range of mitigation measures.)*

It is important to note that community-wide options can have substantial environmental, economic, and social impacts. In addition to preservation and flood mitigation considerations, the planning team should identify and evaluate these effects, particularly as they relate to communities that are vulnerable (e.g, children, the elderly) or have suffered from disinvestment.

In evaluating strategies to address threats, some goals may be broadly stated, but the implications of those choices will need to be carefully considered. Issues that should be considered include the following:

- Are there specific mitigation projects identified in the hazard mitigation plan that will address the identified flood concern? If not, in a comprehensive plan or preservation plan? Is there consistency between the plans? Is an implementation timeline identified for the project? Are other projects identified as a higher priority? Is it possible to prioritize projects that maximize protection of historic and cultural resources?
- Floodplain boundaries can shift with the reissuance of Flood Insurance Rate Maps (FIRMs), so property flood zone classifications are subject to change. Does the mitigation project utilize current vulnerability assessments to identify the scope and extent? Does it anticipate changes in areas of vulnerability based upon predicted future trends?
- Does the proposed project require property acquisition? Are the affected properties historically or culturally significant? What is the impact on historic properties including buildings, structures, landscapes, and archeological sites? Does implementation require demolition? Is documentation possible prior to implementation? Will future development be limited?
- What is the timeframe for implementation? Is the timeframe consistent with the hazard mitigation plan, comprehensive plan, and preservation plan? If the money was available today to implement the project, how long would it take for it to be designed and constructed? How does the timeframe relate to the level of risk? Could interim measures alleviate flood risk until full implementation is possible?
- Will the community's real estate tax base be affected with the loss of revenue from affected properties? Will this require tax increases for other residents? Will municipal services and future projects need to be curtailed?
- Is there a plan for the long-term maintenance of the mitigation project? Structural projects will require intermediate inspections and possible reinforcement, while landscape projects require regular maintenance. Are there sufficient, dedicated resources for upkeep?

Large-scale structural interventions, such as shoreline protection, are typically major construction projects that can require decades to complete. ***Smaller-scale community mitigation projects can often be implemented on an incremental basis and at a faster pace, rather than all at once, such as a shoreline protection project. Implementation of these measures might provide a more immediate benefit that could***

***be sufficient to address the current level of threat and supplement a larger future intervention.*** Some mitigation strategies benefit from participation by individual property owners and may be better suited to suburban and rural settings rather than to dense urban development. Municipalities can encourage participation by individual property owners through incentives or through penalties for lack of participation.

***Eligibility for FEMA funding typically requires a community to have a FEMA-approved local hazard mitigation plan that identifies the proposed intervention as a community goal.*** *(Refer to Write, Adopt & Implement the Plan, page 2.34.)* Therefore, it is critical for communities to evaluate and identify larger scale mitigation projects in their hazard mitigation plans. If a plan's proposed mitigation measures have the potential to impact historic properties or other cultural resources, a local government should request the MHT's review as soon as possible, and at a minimum prior to the finalization of the hazard mitigation plan. Among other benefits, MHT's familiarity with the proposal in advance can assist in the required Section 106 review process, should the community pursue the project. *(Refer to Historic Property Project Review sidebar, page 2.36.)*

*Figure 2.32 - Rain gardens provide an efficient means of minimizing stormwater runoff and can often be integrated into existing landscaping. Shady Side, Anne Arundel County.*

## C.3 PROPERTY-SPECIFIC MITIGATION

Individual owners can also implement various mitigation projects to reduce the effects of flooding on their properties; these projects may address specific vulnerabilities and/or supplement community-wide projects. Property-specific mitigation options generally fall into one of three categories:

- **Landscape improvements**, ranging from simple, low-cost projects to complex, expensive interventions;
- **Basic improvements**, or simple, low-impact strategies that are relatively easy and inexpensive to implement; and
- **Building mitigation**, complex projects that often require the assistance of a design professional and typically have the greatest impact on historic integrity.

Although not applicable to dense, urban settings, landscape improvements at individual properties are often scaled-down versions of community-wide strategies, such as shoreline protection, on-site water storage, or berms and swales. Like community-wide options, when landscape improvements are completed at one property, they can negatively impact a neighboring property. This is particularly true in cases in which stormwater is directed to a neighboring property or when shoreline protection projects are completed only for a small area of shoreline, causing scour and erosion in the unprotected areas.

Basic improvements encompass a variety of actions that can include capturing, reducing, or slowing the discharge of stormwater runoff at a property by using rain barrels, native plantings, and/or rain gardens. Other basic improvements include creating positive drainage away from a building, elevating and anchoring exterior HVAC equipment above flood levels, installing check valves on sewer lines to prevent backflow of sewage due to floodwaters, or installing a sump pump in a basement. ***In aggregate, smaller improvements will help reduce flooding to a certain extent but are more effective for occasional nuisance flooding than for larger events like base flood or storm surge.***

Building and property mitigation projects, such as relocation of critical systems and equipment above flood-prone elevations or the installation of solar collectors to provide electrical independence after a storm, are generally initiated by owners seeking to reduce flood insurance premiums, reduce potential damage from flooding, or improve resilience after a flood event. ***Building mitigation projects are often complex, costly, and have an impact on the historic character of a building.*** Although building mitigation can be voluntary and proactive, it can be required following a flood or as part of major building improvement. *(Refer to Understand Repairing/Rebuilding Requirements, page 2.45.)* Building elevation tends to be one of the more common responses, but it is typically at odds with historic preservation. *(Refer to Elevation, page 3.22.)* Communities that establish zoning code requirements prior to a flood event to limit extreme elevations are in a better position to respond to property owner requests that are inconsistent with local character. *(Refer to Implement Protective Actions, page 2.52.)*

Depending on the level of damage, nature and extent of improvements, and funding sources for different projects, review requirements for individual properties will vary. *(Refer to Understand Repairing/Rebuilding Requirements, page 2.45.)* In communities that have adopted historic district ordinances, alterations to locally designated historic properties may require

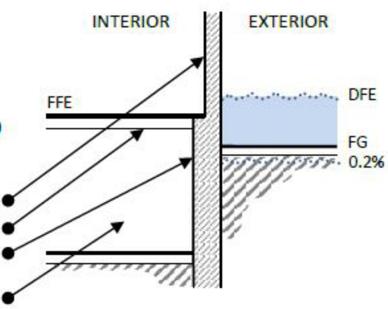
## IDENTIFY BEST PRACTICES FOR BUILDING TYPOLOGY

Many historic communities have characteristic building typologies: for example, the iconic Federal brick rowhouses of Baltimore; the Craftsman-style bungalows ubiquitous in smaller cities and suburbs; or the utilitarian crab-packing houses of the Eastern Shore. Where possible, communities should develop mitigation recommendations based on building typologies, achieving an economy of scale when it comes to design review. The U.S. Army Corps of Engineers (USACE) Baltimore District engineers have taken a building typology approach to flood mitigation in three historic Maryland municipalities: Annapolis, the City of Baltimore, and Ellicott City.

For prototypical historic buildings (as defined by local planners with the USACE), the USACE conducted assessments to identify potential "best practices" for building modifications to protect against flooding. The assessments contain an analysis of the flood risk to each building type and provide a variety of floodproofing options for each historic building type that balance preservation and mitigation. Each option is accompanied by a description of the advantages and disadvantages relative to flood mitigation. Options vary by typology but frequently include the installation of flood barriers; relocation of electrical panels and equipment above predicted flood levels; installation of backflow preventers on sewage lines; repointing masonry joints, sealing around building penetrations, and completion of basic maintenance on buildings to create a weather-tight building envelope; and the installation of sump pumps in below grade areas.

**Structure Information/Data**

| | |
|---|---|
| Name/Description: | Row Home Residence |
| Location: | 912 S Fell St. |
| Floodplain: | Baltimore Harbor/Tidal |
| Occupancy type: | Single-Family Dwelling (Residential) |
| No. of Stories: | 3 |
| Building Construction: | |
| Exterior Walls: | Brick Masonry.......................... |
| Floor Construction (1st Flr): | Wood Frame.......................... |
| Foundation: | Masonry/Concrete .................... |
| Grade/Crawlspace/Basement: | Basement (6.3' height to underside of floor framing) .......... |




**BUILDING SECTION (at Grade)**
Not to Scale

**Structure/Flood Elevations Table:**

| FG | LO | FFE | ΔFFE-FG | 1% | 0.2% | DFE | ΔDFE-FG | ΔDFE-FFE |
|---|---|---|---|---|---|---|---|---|
| 7.8' | 8.3' | 9.0' | 1.2' | 5.3' | 7.5' | 9.5' | 1.7' | 0.5' |

Abbreviations: FG – Finished Grade; LO – Low Opening; FFE – Finished Floor Elevation; Δ – Delta/Difference; 1%/0.2% - Annual chance of exceedance of the given flood elevation; DFE – Design Flood Elevation

**Structure Photographs:**

**1. North Elevation (Front)**

**2. Foundation wall and basement access (Front)**

**3. South Elevation (Rear)**

*Figure 2.33 - Excerpt showing flood risk analysis from U.S. Army Corps of Engineers, Baltimore District, Baltimore City Nonstructural Analysis Interagency Project, 2016.*

historic preservation commission review. Alterations to properties that have or are seeking state or federal funding or permits, or are subject to an easement held by MHT, will require MHT review. Property owners who proceed with a project that negatively impacts historic integrity will forfeit eligibility for preservation financial incentives such as tax credits and grants and may be required to repay any incentives previously received. *(Refer to Seek Funding, page 2.48.)*

In some cases, locally designated properties may be exempt from compliance with local floodplain ordinances and may be relieved from requirements related to substantial improvement. *(Refer to Maryland Model Resource Floodplain Management Ordinance Definitions, page 1.20.)* Although many property owners see this as a benefit, they may not understand that the lack of a compliance requirement does not diminish a property's vulnerability and may increase flood insurance premiums for properties where the lowest floor is below the Base Flood Elevation (BFE). In fact, if they choose to rebuild after flood damage or improve their property, they are likely increasing their personal financial risk. *(Refer to National Flood Insurance Program, page 1.17.)*

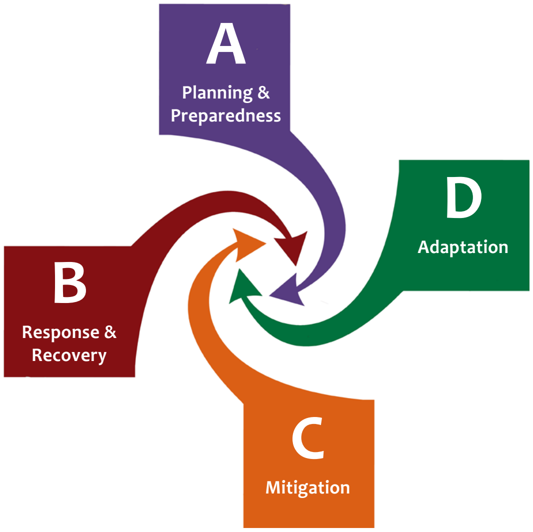
***As noted previously in this chapter, this Guide recommends that local governments establish parameters for flood mitigation that both provide a reasonable level of increased protection and are consistent with the community's character.*** Parameters can be established through design guidelines; zoning ordinance modifications, either on a community-wide basis or as a historic district overlay; or specific language in their floodplain ordinance. *(Refer to Modify Zoning Ordinance, page 2.54, and Develop Design Guidelines for Flood Mitigation, pages 2.55.)* This will help avoid the unintended consequence of property owners seeking different mitigation solutions and implementing them at different times. Within a historic district, this can result in visual inconsistency along a streetscape that was harmonious at the time of designation, fundamentally changing its character and potentially resulting in a loss of integrity.

When reviewing options for mitigation measures at individual historic properties, local governments and property owners should consider the following factors:

- Is the mitigation project being implemented at a property with a significant flood risk? Will it reduce the potential flood impact?
- Will the project negatively impact historic character? Will it impact the property's definition as a historic structure under the local floodplain ordinance or its eligibility for listing on the National Register of Historic Places? *(Refer to State & Local Floodplain Regulations & Ordinances, page 1.18.)* Will the project affect the property's local historic status?
- Will the work alter the property in a manner that limits comfortable occupancy? For example, raising a building above flood water might be prohibitive for those with mobility limitations, while prohibiting occupancy below grade may prove too restrictive to available habitable space.

- Will implementation exceed the owner's financial means or the property's long-term value?
- Is the project eligible for funding through tax credits, grants, or local incentives? If preservation funding was previously received for the property, will the project negatively impact historic integrity and require repayment of those funds?
- Will the project increase the flood risk at neighboring properties? Is it possible to work with neighbors for a unified approach?
- Will the completed project significantly exceed the community infrastructure's ability to withstand a flood? Is the life expectancy of the community's infrastructure, i.e. fresh water, sewage, electricity, and vehicular access, similar to that of the proposed project? Are neighbors and local businesses abandoning properties? Is the community well positioned to continue providing essential services like police, fire fighting and schools? *(Refer to Adaptation, page 2.67.)*

Where possible, communities should provide property owners with information, guidance, and parameters so they may make choices that are consistent with the local character. *(Refer to Implement Protective Actions, page 2.52)*. Unfortunately, there is no "right" answer. Because of the unique characteristics of every situation, property owners should make every attempt to make informed choices, which will undoubtedly take into account the emotional attachment to the property, neighborhood, culture, and community.




**Community Appropriate Adaptation**
**Migration**
**Accepting Loss & Moving Forward**

## D. 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 Maryland 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, 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: comprehensive plan, hazard mitigation plan, preservation plan, economic development plan, among others, as well as planning for capital improvement projects. *(Refer to Other Local Plans, page 2.6.)* 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.

*Figure 2.34 - House constructed on a higher foundation in the 1930s after an unnamed coastal storm. Ewell, Smith Island, Somerset County.*

## D.1 MARYLAND'S HISTORY OF ADAPTATION

Maryland has an advantage that other states may not: its communities have been adapting to escalating flood hazards for hundreds of years. A study of the loss of community on Holland Island revealed that migration off-island was an individual choice as families were forced to relocate due to loss of landmass. While migration off-island was at first slow and sporadic, once the school, church, post office, and businesses on-island closed, the loss of


*Figure 2.35 - Dorchester County addresses historic and cultural resources in a 2018 addendum to their 2017 Hazard Mitigation Plan Update.*

services resulted in a more rapid and total abandonment of the island (Gibbons and Nicholls, 2006 and Cronin, 2005). In their study of off-island migration, Arenstam Gibbons and Nicholls found that several houses, the church, and the school were dismantled and moved to the mainland (2006). Several of the houses relocated from Holland Island were moved to Crisfield and are known to locals as having been relocated from the island (Sherri Marsh Johns, personal communication, 2017). Elevation has also been a traditional adaptation to flooding and coastal storms. This is evident in both Crisfield and on Smith Island, where many houses were constructed with higher foundations in the 1930s after an unnamed coastal storm tore through the area (Sherri Marsh Johns, personal communication, 2017).

Residents of communities located on the Deal Island peninsula in Somerset County are facing a similar situation to the residents of Holland Island; however, they are addressing the situation on a community-wide basis, rather than as individuals. The Deal Island Peninsula Project (DIPP) is a collaborative effort between local, state, and federal government, nonprofit organizations, institutions, and residents to improve resiliency in the face of marsh conversion, erosion, and increased flooding. European settlement of the Deal Island peninsula began in the 17th century, and many residents are descended from those early settlers. The economy of the peninsula communities is maritime-driven: either watermen or businesses that support watermen.

Part of the DIPP involves researching and documenting the marine heritage of the peninsula communities, including their socio-cultural traditions, practices, and places. Discussions with residents also revealed the importance of preserving the historic resources and landscape that connected to the communities' Methodist heritage and history. One of the goals of the project is to develop adaptation plans that will enhance the resiliency of the communities' environment, heritage, and socio-economic conditions.

Using anthropological research methods (e.g. ethnographic field methods, interviews, pile-sorting, and prioritization analysis), team members identified and studied key existing resiliencies and vulnerabilities in the community and used that knowledge to help the communities strengthen their ability to adapt to changing climatological conditions. The communities on the peninsula have been responding to environmental and ecological changes for centuries, and resiliency and self-reliance are inherent to their community identity and culture. These communities have a higher risk tolerance, and as Gibbons and Nicholls predicted, that higher tolerance and the resources brought to bear under the DIPP are part of what drives decisions about how residents will adapt to maintain their communities in place for as long as possible (2006).

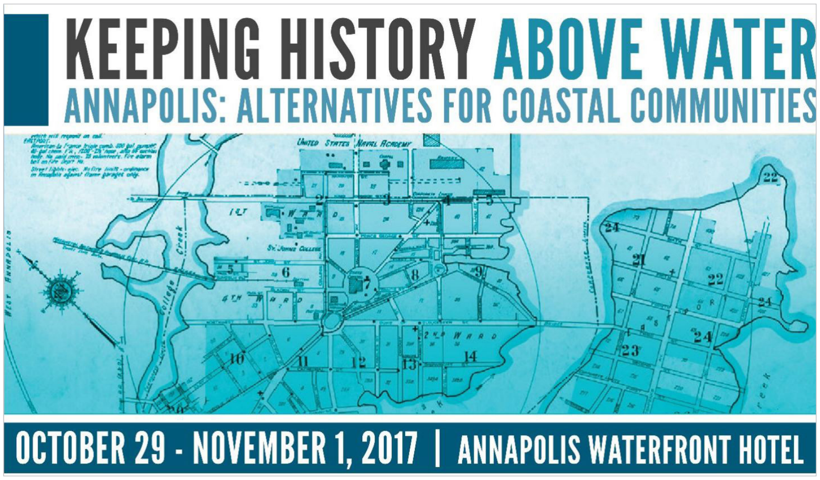



*Figure 2.36 - As greater numbers of communities are challenged by flooding of historic resources, professional workshops, conferences, and seminars are being offered to share ideas and approaches to better address the issues.*

## D.2 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 Annapolis and Baltimore, 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. In some cases, stakeholders within the same community will have very different perceptions of the problem, making planning and decision-making extremely challenging.

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

**KEY QUESTION:**

***How does climate adaptation relate to the emergency management cycle?***

**KEY QUESTION:**

***How might changes in the climate impact historic communities?***

- Coastal storms have storm surges that are deeper and reach further inland 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. As part of the planning process, local governments should keep in mind that the State of Maryland, through the Maryland Commission on Climate Change, has developed guidance for state investment, published as the CoastSmart Council's *Infrastructure Siting and Design Guidelines* (MCCC, 2014). Communities considering alternatives for long-term adaptation should consult with MEMA and, if appropriate, the CoastSmart Council, to understand and plan for the future of state investment in their jurisdictions. Communities may also wish to develop their own guidance for future local investment based upon the state guidelines.

**KEY QUESTION:**

***What options can local governments pursue to help protect historic properties and cultural heritage threatened by increasing flooding?***

***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, restoring channelized and submerged or buried streams, 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 Maryland 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 context 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.


*Figure 2.37 - Acceptance of building flooding: the earliest portion of this building, originally a warehouse, dates to the turn of the 19th century. The building was adapted to be a visitor center despite the risk of flooding. Flood openings are visible beneath the unpainted brick along the river-facing façade. Williamsport, Washington County.*

## D.3 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 to natural hazards, including flooding. *The Secretary of the Interior's Standards and Guidelines* (2017) now address 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.

Most local governments and the Maryland Historical Trust (MHT) 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 Maryland 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 adaption required to balance the desire to maintain historic fabric with the need to sustain building occupancy.

**KEY QUESTION:**

***How can communities address loss, given that some places will become uninhabitable over time?***

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.

## 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:

- **Maryland Inventory of Historic Properties (MIHP) 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 MHT to complete an MIHP form, including all required supporting documentation, and submit the information to MHT.
- **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 MHT.
- **Local Inventory Collection.** Where properties would benefit from local designation, or if data collected is not sufficient to support a submission to the MIHP 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 (W. Bohler and A. Marbs, 2002).

***To document historic places and cultural heritage threatened by flooding, communities should consider a combination of traditional historic property documentation, more informal community-based methods of documentation, and, in some cases, technological documentation techniques that require the help of a specialized contractor.*** 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 2.73.)*

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 set 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.***

*Figure 2.38- Elevation in progress of a late-19th century historic home on St. George Island, St. Mary's County. The building was elevated to the BFE plus three feet of freeboard. (Source: MEMA)*

## D.4 MIGRATION

Migration is already occurring across Maryland, for example, on the Eastern Shore, 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:

**COMMUNITY IMPACT OF FLOODING**

In addition to affecting historic properties, flooding can remove the intangible qualities traditionally associated with a community. In Westernport, floodwater decimated the principal shopping corridor, shifting the central focus of the town. On Taylors Island, the intrusion of brackish water has altered what can grow and the amount of arable land and farming is disappearing. At Hoopers Island, the tradition of the watermen and oystermen is disappearing, and young families are choosing to move where there are more opportunities.

- 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. As occurred in the past on Maryland's Bay islands, historic communities may need to relocate wholesale. This is already occurring elsewhere in the United States among Native American communities, most notably in Louisiana and Alaska. 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).

*Figure 2.39 - Abandoned historic home on Hooper's Island, Dorchester County.*

## D.5 ACCEPTING LOSS AND 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 and 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 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 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.

# KEY PLAYERS IN EMERGENCY MANAGEMENT AND THEIR ROLES

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 players, primarily representative of federal and state levels, and their associated roles in the emergency management cycle. It is important to keep in mind that the specific functions and programs offered by the key players 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 MHT is available to provide guidance, particularly as local communities consider appropriate mitigation measures to protect cultural resources.

### a. 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 following:

*Planning/Preparedness:*

- Publishes Flood Insurance Rate Maps (FIRMs) to identify areas most likely to flood *(refer to Flood Insurance Rate Maps, page 1.15)*
- Administers the National Flood Insurance Program *(refer to National Flood Insurance Program, page 1.17)*
- Funds and approves updates to state and local hazard mitigation plans *(refer to Write, Adopt & Implement the Plan, page 2.34)*
- 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
- Coordinates federal agencies during response and recovery *(refer to Response & Recovery, page 2.39)*

*Mitigation:*

- Provides pre- and post-disaster mitigation planning and project funding
- Provides guidance on how to retrofit and protect buildings against natural hazards

### b. 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 Maryland through their Baltimore District and the Maryland Silver Jackets.

- **Maryland Silver Jackets** – Begun in 2010, the Maryland Silver Jackets is comprised of a team of federal, regional, state, county, academic, and non-profit organizations, who conducts education and outreach activities for the public on flood risk and hazard mitigation. The Silver Jackets also share data and work cooperatively on mitigation projects to comprehensively to address flood risks across the state. FEMA, MEMA, MDE, MD DNR, MD SHA, and MHT are all members. The USACE Baltimore District is the lead agency for the Maryland Silver Jackets.

*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, flood proofing, and elevating structures. (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

## c. Maryland Emergency Management Agency

The Maryland Emergency Management Agency (MEMA) is the State equivalent of FEMA. Its mission is to "Coordinating people, organizations, resources, and information to ensure the preparedness and resilience of the people, businesses, communities, and infrastructure of Maryland."

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

*Planning/Preparedness:*

- Produces state-wide preparedness plans (e.g. Maryland *Hazard Mitigation Plan* and Maryland *Response Operations Plan*)
- 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 Maryland 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
- Develops and oversees mitigation projects in local communities

## d. Maryland Department of the Environment

The Maryland Department of the Environment (MDE) focuses on flood planning/preparedness and has the responsibility of administering the National Flood Insurance Program (NFIP) in the State. *(Refer to National Flood Insurance Program, page 1.17.)* MDE provides technical assistance to local floodplain administrators regarding floodplain mapping activities and permits associated with development in floodplains on an as-needed basis.

MDE is also a Cooperating Technical Partner (CTP) with FEMA to revise the Flood Insurance Rate Maps (FIRMs) and associated Flood Insurance Studies (FIS) in Maryland. Because of that partnership, MDE has been successful in leveraging existing datasets, including Light Detection and Ranging (LiDAR) elevation data, to improve the mapping. In addition, updating the hydrology using GISHydro (a program used to assemble and evaluate hydrologic models for watershed analysis) and incorporating bridge and culvert data into the Hydrologic Engineering Center's River Analysis System models, has improved the mapping in areas labeled as Zone A where BFEs previously did not exist. This has resulted in the development of model-backed A Zones that is available as an additional dataset. MDE's DFIRM Flood Risk Application was created to provide local government with a planning tool for floodplain management, and for as an interface for the public to help understand their property's flood risk.

Based on Maryland's hydrology, MDE has developed a Model Floodplain Management Ordinance that meets all federal and state requirements for participation in the NFIP. *(Refer to State & Local Floodplain Regulations & Ordinances, page 1.18.)* Almost all communities in Maryland that participate in the NFIP have adopted the Model Ordinance or portions of the Model Ordinance.

As part of administering the NFIP, MDE also encourages communities to participate in the Community Rating System (CRS) to reduce the flood risk in their community and property owners' flood insurance premiums. *(Refer to Participate in the Community Rating System, page 2.59.)*

*Planning/Preparedness:*

- Administers the National Flood Insurance Program *(refer to National Flood Insurance Program, page 1.17)*
- Assists local floodplain administrators in efforts to reduce risks associated with development in floodplains

## e. Maryland Department of Planning

The Maryland Department of Planning (MDP) is responsible for comprehensive planning throughout the state and provides technical assistance to local governments to assist their long-range planning activities. MDP can assist local governments with policy language to include in comprehensive plans to help local governments prepare for worsening hazards due to climate change, including the threats of those hazards to historic structures.

*Planning/Preparedness:*

- Supports state emergency operations by providing current and project data and analyses on demographic, economic, housing, and social characteristics of the state population

*Response & Recovery:*

- Providing technical assistance to state and federal agencies during disaster response activities
- Coordinates assistance programs to restore local government and help them to implement recovery

*Mitigation:*

- Reviews and prioritizes federally-funded hazard mitigation projects

## f. Maryland Historical Trust

The Maryland Historical Trust (MHT), an agency of the Maryland Department of Planning, 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, MHT ensures that Maryland's cultural resources are considered in emergency management decisions, hazard mitigation planning and sound floodplain management.

MHT 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, MHT 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

## g. Maryland Resiliency Partnership

The Maryland Resiliency Partnership (MRP) includes various state agencies to provide a holistic approach to hazard mitigation planning by working collaboratively to increase the ability of buildings and infrastructure to withstand natural hazards and the effects of climate change. This includes supporting day-to-day decision making and long-term strategic planning to address hazard mitigation, floodplain management and coastal and climate resiliency, as well as encouraging activities that improve water quality across the state.

*Planning/Preparedness*

- Provides tools to help local governments assess their vulnerability to natural hazards and climate change, lending their expertise where needed to support local mitigation projects and planning efforts
- Provides information to property owners and local government about mitigation, floodplain management, flood insurance, and protecting Maryland's history and diverse environment

*Mitigation:*

- Funds multidisciplinary projects that apply mitigation and resiliency grants across different sectors

### h. Maryland Department of Natural Resources – Maryland CoastSmart Council

In 2014, the State of Maryland established the CoastSmart Council under the Maryland Department of Natural Resources (DNR) to establish criteria for State-funded spending on planning and capital improvement projects to mitigate potential sea level rise, coastal flooding, and storm surge. As part of its strategy to reduce the state's vulnerability to climate change, DNR prepared *Maryland at Risk: Sea-level Rise Adaptation & Response*, which recommends the following call to action:

> The Comprehensive Strategy to Reduce Maryland's Vulnerability to Climate Change, a key component of Maryland's *Climate Action Plan*, sets forth the actions necessary to protect Maryland's people, property, natural resources, and public investments from the impacts of climate change. The vision for future preparedness is targeted at:
>
> 1) reducing impact to existing built environments, as well as to future growth and development;
> 2) shifting to sustainable investments and avoiding financial and economic impact;
> 3) enhancing preparedness to protect human health, safety, and welfare; and
> 4) restoring and protecting Maryland's natural resources and resource-based industries.

*Planning/Preparedness:*

- ¤ Provides training for local government and links to support materials through its website

*Mitigation:*

- ¤ Provides funding through grants

### i. Local 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, 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 local 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 comprehensive 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 part of the planning team in updating the hazard mitigation plan. *(Refer to Planning & Preparedness, page 2.3.)*

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

*Planning/Preparedness*

- ¤ Educating and conducting outreach to communicate disaster/hazard event preparedness information to citizens, businesses, and communities
- ¤ Acting as team lead in the preparation of local hazard mitigation, Continuity of Operations, and Emergency Operations plans
- ¤ Conducting training and exercises to ensure the plans are functional and, if not, revise the plans
- ¤ Operating watch and warning systems

*Response & Recovery:*

- ¤ Running the local Emergency Operations Center and taking the lead in incident management, and guiding and coordinating response and recovery efforts

*Mitigation:*

- ¤ Serving as the leader for implementing the mitigation actions in the local hazard mitigation plan, and managing and conducting mitigation projects

### j. Local Volunteers

Although not formally part of the emergency management process, local volunteers, including historic preservation commissions, 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 2.17.)*

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# 3 SELECTING PRESERVATION-SENSITIVE MITIGATION OPTIONS

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## INTRODUCTION

### KEY QUESTION:

***What are the main types of flood mitigation options?***

Flood mitigation benefits from a holistic approach. When rebuilding following a flood, individual property owners may seek to make improvements to lessen potential damage from future floods. Community-wide mitigation strategies are often expensive and may take longer to complete than individual property mitigation, but they can alleviate the need for drastic changes at the individual property level. *(Refer to Planning & Preparedness, page 2.3, and Mitigation, page 2.51.)* ***Most communities will benefit from a combination of community-wide mitigation strategies that provide protection to multiple properties, as well as property-specific measures implemented by property owners to address specific needs.*** Communities that, prior to a flood event, establish parameters for change through zoning code requirements or design guidelines for flood mitigation will be in a better position to react to property owner requests. *(Refer to Modify Zoning Ordinance, page 2.54, Develop Design Guidelines for Flood Mitigation, page 2.55, and Zoning Options, page 3.12.)* In some cases, flood mitigation efforts help protect one property or area while increasing flood vulnerability of unprotected adjacent properties and areas. ***As a result, it is often 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.***

The practice of flood mitigation, although intended to protect life and property, is often at odds with historic preservation. Flood mitigation strategies tend to require change, often radical change, that can damage or destroy the integrity or character of historic properties. As with all proposed physical alterations to historic buildings, *The Secretary of the Interior's Standards for the Treatment of Historic Properties* (2017) provides the best guidance in the evaluation of flood mitigation options, but many situations will require trade-offs. To help balance the needs of flood mitigation and historic preservation, local preservation planners and advocates should be involved in the hazard mitigation planning process. *(Refer to Planning & Preparedness, page 2.3.)*

**Historic integrity** is the authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property's prehistoric or historic period. Historic integrity is the composite of seven qualities: location, design, setting, materials, workmanship, feeling, and association.

**Character** refers to all those visual aspects and physical features that comprise the appearance of every historic building.

***This chapter of the Guide will help planners, preservation advocates, and others who are engaged in hazard mitigation planning for individual properties or communities and wish to evaluate potential strategies with both flood mitigation and historic preservation goals in mind.*** Property-specific mitigation options are determined by individual property owners within the requirements of the National Flood Insurance Program (NFIP), if applicable, as well as local zoning, floodplain ordinances, and the local historic preservation commission. *(Refer to National Flood Insurance Program, page 1.17, and Understanding Repairing / Rebuilding Requirements, page 2.45.)* Community-wide strategies are typically determined through the hazard mitigation planning process and ideally benefit from extensive public engagement and vetting. *(Refer to Engage the Public, page 2.17.)* Readers who are beginning the hazard mitigation planning process or who are interested in the process of evaluating and selecting options should refer to *Chapter 2: Historic Preservation & Emergency Management* of this *Guide.* *(Refer to Planning & Preparedness, page 2.3, and Mitigation, page 2.51.)*

## KEY QUESTION:

***How does flood mitigation relate to historic preservation, and how are flood mitigation decisions made?***

Flood mitigation options typically have the following goals:

- **Mitigate direct impacts** such as erosion, high wave action, high-velocity water flow, and debris impact;
- **Mitigate secondary impacts** such as rain and wind impacts that can damage buildings; and
- **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 these goals and protect historic properties, planners and preservation advocates should have an in-depth knowledge of:

- The location, significance, 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;
- How 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; 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 Planning & Preparedness, page 2.3.)*

The following chapter is divided into two main sections: *Community-Wide Mitigation Strategies* and *Property-Specific Mitigation Strategies*. Each section provides a discussion of alternatives, including potential benefits and conflicts with preservation. ***The hazard mitigation planning team and/or property owner should consider these alternatives as they relate to locally established goals for flood mitigation and the local context for historic preservation, as outlined above.***

## KEY QUESTION:

***How should readers use this section of the Guide?***

*Figure 3.1 - Streetscape in the Whitehaven National Register Historic District with elevated property (yellow house). Whitehaven, Wicomico County.*

## A. COMMUNITY-WIDE MITIGATION STRATEGIES

**KEY QUESTION:**

***What are the goals and benefits of community-wide 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 large numbers 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.

**KEY QUESTION:**

***How do these strategies relate to historic preservation concerns?***

The appropriate strategies to consider for each community will depend on the risk management timeframe as well as the level of threat or vulnerability. *(Refer to Establish a Timeframe for Planning Goals, page 2.20.)* In addition, it is valuable to consider implementation of a variety of options simultaneously, to increase the likelihood of effectiveness. Some large-scale options adjacent to historic properties 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 towards community-wide implementation include:

- Shoreline or bank protection;
- Stormwater management systems upgrades;
- Utility and infrastructure improvements; and
- Roadway and bridge improvements.

Before evaluating 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.
- Many strategies can be costly to implement, and implementation must be balanced against other community needs.
- 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 complete the project.
- Significant time might 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.
- 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 present lower overall maintenance requirements.*** In addition, from a preservation point of view, natural strategies may provide a more historically appropriate setting. Many of the natural approaches are also scalable, in that they can be adapted to a single property or across a city, where they can provide equal protection to entire areas irrespective of property values or the means of individual owners.

When evaluating these options, it important to consider the potential preservation implications, direct and long-term costs associated with maintenance, and the potential impact of reduced property tax revenue. *(Refer to pages 3.5 to 3.15 for descriptions and sidebars for each mitigation option.)* The *Community-Wide Mitigation Options Matrix* provides a framework for making choices by identifying potential strategies and related flood mitigation benefits and issues. *(Refer to Community-Wide Mitigation Options Matrix pages 3.16 to 3.18.)*

*Figure 3.3 - Shoreline armoring and natural protection (rock in front of marsh) preventing erosion along the St. Mary's River to protect the bluffs where Historic St. Mary's City is located. St. Mary's City, St. Mary's County.*

*Figure 3.2 - Rip-rap shoreline protection (rocks in center of photograph) preventing further erosion of the shoreline along the West River, protecting the fisherman's village of Shadyside, Anne Arundel County.*

## A.1 SHORELINE PROTECTION

Shorelines occur along all bodies of water, including oceans, bays, rivers, and streams. During flood events, water levels will typically rise and sometimes be compounded by wave action, storm surge, or high-velocity water flow threatening adjacent communities. 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 more natural mechanisms.

### a. Structural Shoreline Protection

Hard adaptations are structural elements constructed to protect shorelines from wave impact-induced erosion, as well as 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. Seawalls, bulkheads, and revetments are all examples of shoreline (or coastal) armoring. Shoreline armoring protects development by reinforcing the shoreline to prevent it from retreating or eroding.

#### i. On-Shore

There are a number of structural protective measures that can be constructed parallel to a shoreline to fortify it against potential flood-related damage.

- **Seawalls** 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 (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 (basically the same 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** provide access through a flood barrier, and must be operational to control the retention and equalization of water levels.

*Figure 3.4 - Embankment with structural protections (concrete wall and embankment) to prevent erosion and stabilize the bank of the Potomac River. Westernport, Allegany County.*

## STRUCTURAL SHORELINE PROTECTION

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

***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 archeological 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 archeological resources, both on land and in the water and historic landscapes

ii. **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 connected to the shoreline. *(Refer to Oyster Reef Breakwaters, page 3.8.)* 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.
- **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 rivers discharge 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.

*Figure 3.5 - Natural shoreline protection of marsh infill behind small rocks to protect historic buildings. St. Michaels, Talbot County.*

## b. Natural Shoreline Protection

Natural shoreline protections, also known as nonstructural 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.

i. **On-Shore**

There are several natural protective measures 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 has the ability to filter water and promote ground absorption. In a flood event, it can store floodwater as well as reduce the effects of storm surge.
- **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 3.10.)*
- **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 its 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.

ii. **Off-Shore**

Similar to their structural counterparts, natural off-shore options, including oyster shell breakwaters, can limit the effects of storm surge and wave action.

- **Oyster reef breakwaters** (a natural, living breakwater) are similar to traditional breakwaters (usually constructed out of concrete, stone, or other building materials) in that they are formed in a linear or curvilinear form, with one end connected to the shoreline, utilizing oyster shells in lieu of boulders or rocks. *(Refer to Breakwaters, page 3.7.)* 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,***

### NATURAL SHORELINE PROTECTION

Similar to 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 archeological 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 archeological 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

***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.

*Figure 3.6 - Drainage ditch to convey stormwater runoff away from historic houses along the main road in the historic village of Royal Oak, Talbot County.*

## A.2 STORMWATER MANAGEMENT IMPROVEMENTS

In addition to flooding along the 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.

### a. Engineered Options

- **Drainage ditches** are a surface drainage system to remove 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 an intersecting road, driveway, railroad, etc.

¤ **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 increased development and significant storm events. When the water treatment facility is overwhelmed, untreated stormwater, and in some municipalities also sewage, is discharged directly into the waterway 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 during 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 as well as reduce developable land.

Like structural shoreline protection, inland structural or engineered improvements can provide equal protection to a large number of properties in an affected area. However, they share some common issues including that capacities may need to be increased over time as conditions worsen and development increases the amount of impervious surface in the watershed.

## b. 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

### ENGINEERED OPTIONS

As with other options that provide large-scale protection, engineered options face similar issues, as well as those specific to these systems:

- High cost to upgrade systems
- Necessity for regular maintenance
- Most systems require to handle 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 impacts
- Increased effectiveness when used in combination with green infrastructure, which can result in lower project costs

***Potential Preservation Challenges:***

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

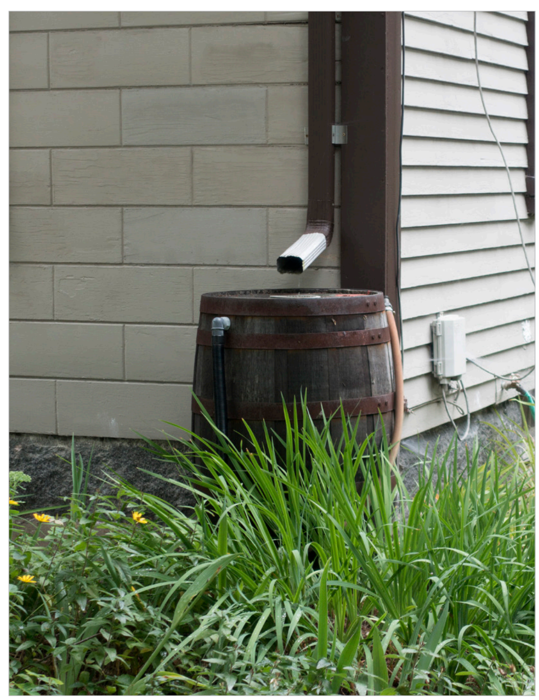

*Figure 3.7 - Rain barrel unobtrusively located at rear of a historic building.*

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 3.34.)*

*Figure 3.8 - Engineered drainage system to convey stormwater to a rentention area away from historic cottages. Shady Side, Anne Arundel County.*

- **Swales** are either natural or man-made depressed landscaped channels used to manage stormwater runoff and promote infiltration. Similar to 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** provide 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 3.12.)*
- **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.

### LANDSCAPE OPTIONS

***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 surfaces

***Potential Preservation Challenges:***

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

- **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.
- **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.

*Figure 3.9 - Zoning requirements can include limiting stormwater run-off through the use of pervious paving. Shadyside, Anne Arundel County.*

## c. 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 the overburdening of 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 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 of historic properties, communities should consider providing design parameters to ensure that changes protect the historic character and integrity of the buildings. *(Refer to Develop Design Guidelines for Flood Mitigation, page 2.55.)*

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;

### ZONING OPTIONS

***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

*Figure 3.10 - Zoning requirements can include limiting stormwater run-off through the use of drainage ditches and rain gardens. Shadyside, Anne Arundel County.*

- Removing street curbs and installing drainage ditches and/or rain gardens along roadways;
- Requiring an on-site dry well to promote slow stormwater infiltration where the capacity of the land area is incapable of natural absorption at a sufficient rate; and
- Increasing the use of native plantings with 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 2.54.)*

## d. 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 2.58.)*

## e. Floodplain Management Ordinance 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 1.17.)* 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

### BUILDING CODE OPTIONS

***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 ORDINANCE OPTIONS

***Potential Preservation Benefits:***

- Reduces the potential for flood-related damage

***Potential Preservation Challenges:***

- Depending on how the volume for capturing the compensatory storage is constructed, it could be an adverse effect to a historic district or adjacent historic properties higher standards in the floodplain ordinance is the potential to capture additional credits for communities that participate in the Community Rating System. *(Refer to Community Rating System, page 1.25, and Participate in the Community Rating System, page 2.59.)*

## A.3 UTILITY INFRASTRUCTURE IMPROVEMENTS

Utility Infrastructure provides access to necessities such as 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 upgrades 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.

*Figure 3.11 - Utility infrastructure improvements can be challenging to fund for small municipalities. Westernport, Allegany County.*

*Figure 3.12 - An old outfall (left) and a potentially unpermitted discharge from a nearby property (center) that discharge into a ditch which could be retrofitted to allow for a stormwater filtration best management practice such as bioretention a swale, or a manufactured filtration device to improve water quality downstream. Williamsport, Washington County.*

### UTILITY INFRASTRUCTURE IMPROVEMENTS

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 need to be provided during an upgrade
- May require additional adaptation if conditions worsen
- 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 archeological resources

***Potential Preservation Challenges:***

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

## TRANSPORTATION INFRASTRUCTURE IMPROVEMENTS

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 considered necessities rather than visually obtrusive
- Potential to protect historic buildings, structures, settings, and archeological 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 to impact historic landscapes and archeological resources due to installation of new or elevated transportation infrastructure
- Possible destruction or alteration of cultural resources, particularly archeological resources and historic landscapes, through construction activities
- Alteration of the physical and visual relationship of the historic properties to the landscape through construction

*Figure 3.13 - Maintaining the main route to Taylors and Hoopers Islands could be challenging as the height of the Bay continues to increase and renders portions of the road impassable. Dorchester County.*

## A.4 TRANSPORTATION INFRASTRUCTURE IMPROVEMENTS

Transportation infrastructure, including roadways, bridges, and causeways, provides 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.

## A.5 COMMUNITY-WIDE MITIGATION OPTIONS 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, Blukheads, Reventments, Rip-Rap | Shoreline / Structural | • Provide protection from wave action<br>• Stabilize shoreline | • Encouragement of continued development closer to the shoreline – possibly providing a false sense of security<br>• Possible increased shoreline damage at nearby unprotected areas<br>• Adaptability necessary to allow modification with increased threat |
| Flood Barriers – Levees, Dikes, Embankments | Shoreline / Structural | • Provide protection from high floodwaters | • Water velocity increase in creeks, streams, and rivers<br>• Continued development encouraged – possibly providing a false sense of security<br>• Possibly increased shoreline damage at nearby unprotected areas<br>• Adaptability necessary to allow modification with increased threat |
| Breakwaters, Jetties | Shoreline / Structural | • Decrease shoreline wave impact<br>• Provide added benefit of creating a potential harbor | • Adaptability necessary to allow modification with increased threat |
| Establishment of Wetlands | Shoreline / Natural | • Promotes water absorption<br>• Dissipates storm surge | • Fewer issues with installations that do not require property acquisition or abandonment<br>• Acquisition and/or abandonment of property possibly necessary if significant land area required to be effective |
| Floodplain Restoration | Shoreline / Natural | • Promotes water absorption<br>• Reduces the velocity of running water<br>• Reduces the potential for downstream flooding | • Possibly costly acquisition and/or abandonment of property<br>• Reduction of tax base growth with prevention of future development |
| Dunes | Shoreline / Natural | • Reduce inland flooding<br>• Reduce the effects of storm surge | • High susceptibility to damage in a storm event |

| Strategy | Type | Potential Flood Benefits | Potential Issues |
|---|---|---|---|
| Beach Nourishment | Shoreline / Natural | • Reduces inland flooding<br>• Reduces the effects of storm surge | • High susceptibility to damage in a storm event |
| Oyster Reef Breakwaters | Shoreline / Natural | • Decrease shoreline wave impact<br>• Provide added benefit of creating a potential harbor | • Adaptability necessary to allow modification with increased threat |
| Drainage Ditches | Inland Structural Improvements | • Remove excess water from land surface<br>• Reduce reliance on stormwater management system<br>• Potentially increase infiltration | • Possible direction of untreated stormwater directly into waterway |
| Stormwater Management Systems/ Pumping Stations | Inland Structural Improvements | • “Invisibly” collects stormwater and removes it from developed areas, diverting it to treatment facilities | • Difficulty of upgrading older systems - often near or at capacity due to increased development and combined stormwater/ sewage<br>• Susceptibility of older systems to failure due to aging infrastructure<br>• Possible untreated sewage discharge into waterway or back-up during flood events<br>• 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 | • Increase infiltration<br>• Decrease runoff | • Low impact if within public realm<br>• Possible necessity to acquire and/or abandon of property if significant land area is required to be effective |
| Levees, Berms | Inland Structural Improvements / Landscape | • Divert stormwater<br>• Protect from flooding<br>• Contain stormwater to encourage infiltration if continuous | • Diversion of problem water to other areas |
| Swales | Landscape | • Divert stormwater<br>• Contain stormwater to encourage infiltration | • Diversion of problem water to other areas |

| Strategy | Type | Potential Flood Benefits | Potential Issues |
|---|---|---|---|
| Reduce Impervious Surface Coverage | Landscape / Zoning | • Increases infiltration<br>• Decreases runoff | • Low impact within public realm<br>• Reduction of tax base growth with prevention of future development<br>• Possible high cost of acquisition and abandonment and/or limited development potential of property |
| Rain Gardens | Landscape | • Increase infiltration<br>• Decrease runoff | • Low impact within public realm |
| Rain Barrels | Landscape | • Collect storm water from roof drains for future use<br>• Decrease runoff or stormwater system discharge | • Low impact |
| Native Plants | Landscape | • Increase water absorption<br>• Minimize supplemental watering and care | • Low impact |
| Zoning Regulation Improvements | Zoning | • Increase infiltration / decrease runoff<br>• Establish height for building elevation<br>• Maintain streetscape rhythms | • Reduction of tax base growth with prevention of future development<br>• Possibly costly acquisition and/or abandonment of property |
| Building Code Modifications | Compliance with some / all NFIP regulations or local requirements if more stringent | • Reduce the potential for flood-related damage | • Possibly difficult implementation at existing buildings |
| Utility Infrastructure Improvements – Water, Sewage, Electric | Inland Structural Improvement | • Possibly make systems more resistant, allowing continued functionality of water sewer and electrical systems via replacement, modification, or hardening | • Low impact if within public realm<br>• Adaptability necessary to allow modification with increased threat |
| Transportation Infrastructure Improvements | Structural Improvement | • Maintain access to historic communities and resources<br>• Provide increased clearance for floodwater by removal of or raising bridge or causeway | • Low impact if within public realm |

*Figure 3.14 - The Captain Salem Avery House was relocated further from the water's edge. Shadyside, Anne Arundel County.*

## B. PROPERTY-SPECIFIC MITIGATION STRATEGIES

**KEY QUESTION:**

***What are the goals and benefits of property-specific mitigation strategies?***

**KEY QUESTION:**

***How do these strategies relate to historic preservation concerns?***

While local governments 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:

- Landscape improvements;
- Basic improvements; and
- 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 properties***. Proposed mitigation measures at designated historic properties may be subject to historic preservation commission or Maryland Historical Trust (MHT) review. *(Refer to Historic Property Project Review sidebar, page 2.36, and Mitigation, page 2.51.)*

*Figure 3.15 - Rain garden with native plants.  Shady Side, Anne Arundel County.*

## B.1 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 Community-Wide Mitigation Strategies, page 3.3.)* 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.

## B.2 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 2.52)*;
- 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.

*Figure 3.16 - Elevating mechanical and electrical equipment above the BFE is a basic improvement that may prevent the need for replacement in the event of a flood. Shady Side, Anne Arundel County.*

## B.3 BUILDING MITIGATION

In addition to landscape mitigation measures, building alterations 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 local floodplain regulations is required for new construction, repair of "substantially damaged" buildings and buildings that are "substantially improved." *(Refer to Understanding Repairing/Rebuilding Requirements, page 2.45.)* ***Unfortunately,***

***alterations may also compromise the historic integrity of a property to such an extent that it may no longer be considered historic (either according to the criteria of the National Register of Historic Places or via local designation criteria).*** *(Refer to Mitigation, page 2.51.)*

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 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. With minimal guidance available on the appropriateness of extreme building elevations, significant additions to existing buildings, or elevated new construction within the historic context, these mitigation options are often the most challenging for local planners, historic preservation commissions, and citizens trying to protect their historic communities.

Examples of building mitigation options include elevation, wet floodproofing, dry floodproofing, perimeter barriers, relocation, and/or acquisition and demolition. *(Refer to Adaptation, page 2.67; each of these treatments is described in detail in the following subsections.)* ***If local planners are considering these options, this Guide recommends establishing limits under existing local ordinances including zoning and historic preservation.*** *(Refer to Modify Zoning Ordinance, page 2.54, and Develop Design Guidelines for Flood Mitigation, page 2.55.)* Policy statements and/or design guidelines 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. *(Refer to Location Definitions sidebar, page 1.22.)* 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.

## a. Elevation

Building elevation is raising a building to or above the BFE to achieve the desired level of protection. Elevation typically involves abandoning basements and crawlspaces, raising the first floor level, and constructing a new foundation. 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, outlined below, that must be addressed.

- **Feasibility**. Some buildings might be extremely difficult to elevate due to size, configuration, or construction type, such as row houses with common party walls, or whether or not they are sufficiently sound and stable to lift.
- **Appearance**. The greater the height of the elevation, the greater the exposed foundation, altering the appearance of the building and its relationship to its neighbors along the streetscape.

## 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, and fencing
- The visual relationship between 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 integrity
- 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 require 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 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

*Figure 3.17 - Sensitive elevation of historic building. Whitehaven, Wicomico County.*

- **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. Exterior equipment should be located above the BFE/DFE and 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 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, and storm surge. As a result, lateral reinforcing or stronger, non-traditional building materials may be required, such as foundations of 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, which could visually reduce the impact of the higher foundation.

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

¤ Removal of abandoned equipment and hazardous materials before infilling a 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 foundation 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, and fenestration patterns. Similarly, conformance with floodplain regulations typically requires that new buildings, and significant additions to existing buildings, be constructed in a manner that at a minimum meets current elevation requirements. As a result, they can have similarly detrimental impacts on a historic streetscape.

## b. 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 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 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 very large or complex buildings, or buildings that share party walls,

### ELEVATION

***Potential Preservation Challenges (continued):***

- 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

*Figure 3.18 - Flood openings are barely visible within the elevated concrete block foundation along the second course of blocks just above the ground level, minimizing their impact on the house's character. The darker, higher openings are crawlspace vents. Crisfield, Somerset County.*

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.

i. **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. To be considered floodproofed, all building systems must be located above the BFE/DFE. In the case of existing buildings, modification and/or abandonment of lower floor levels to comply with a community's floodplain regulations can include the following options:

*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.

*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 or kitchens.

ii. **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, 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" including asphalt, ceramic and linoleum tile, and non-ferrous metals including aluminum, copper, and zinc tiles (FEMA, 2008).

Both FEMA and the International Building Code require that flood damage-resistant materials be used in the SFHA to a the minimum BFE/DFE height (FEMA, 2015). In the case of the International Building Code, such 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 classification. *(Refer to Flood Insurance Rate Maps, page 1.15.)*

iii. **Flood Openings**

Flood openings allow the passage of floodwater in and out of a 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

### 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.

## 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 is 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 be 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

*Figure 3.19 - The brick headers that conceal flood vents reduce the opening size of the vent, and may impeed the flow of floodwaters out of the crawlspace. Whitehaven, Wicomico County.*

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.

iv. **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, 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. Some equipment can be protected 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 3.28.)*

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 and switches. 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.

### c. 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 in order for dry floodproofing to be considered a feasible alternative. Dry floodproofing 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, it would not reduce the residential property owner's flood insurance premium and there are many issues to consider when dry floodproofing a residential property.

Dry floodproofing, that is, keeping floodwater out of a building, is only viable as an option in situations that 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 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 or 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 3.31.)*
- 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 and determine whether it can withstand flood-related forces.

i. **Construction Types**

***As a general rule, only masonry bearing wall and concrete buildings are potential candidates for dry floodproofing.*** *(Refer to Document & Assess the Vulnerability of Historic Properties, page 2.23.)*

- **Masonry buildings** include stone, brick, and block construction, and have walls composed of masonry units bonded with mortar, grout, or sealant. The wall

*Figure 3.20 - Dry floodproofing is hidden behind the building's façade at the Recreation Pier. Fells Point, Baltimore City.*

composition tends 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 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 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.***

iii. **Wall and 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 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.

### iii. 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 crevices 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.***

*Figure 3.21 - Metal flood barriers for covering exterior doors are stored inside the Mount Vernon Mill #1, Baltimore City.*

### iv. Barriers and Shields – Windows and 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 two- to three-feet of floodwater.

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

Property owners and planners should consider the following factors when contemplating utilizing barriers and shields at windows and doors:

- 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 locations prone to flash floods.
- 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 require substantial available materials, onsite trained personnel to properly stack bags, and appropriate disposal methods if contaminated by floodwater.
- The Association of State Floodplain Managers in collaboration with the 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 materials properties, consistency of manufacturing, and resistance to water forces. 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.

**v. 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.***

*Figure 3.22 - Accumulated flood water is evacuated through floor grates and a sump pump at Mount Vernon Mill #1, Baltimore City.*

**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

**vi. 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 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 3.24.)*

**vii. Maintenance**

One of the key requirements of a dry floodproofing option is a well-maintained building. *(Refer to Encourage Property Maintenance, page 2.52.)* 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.

**viii. 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.

*Figure 3.23 - 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.*

### d. Perimeter Barriers

An alternative to wet or dry floodproofing is providing a continuous barrier to keep the floodwater away from the perimeter of a building, or group of buildings, either permanently or immediately preceding a flood event. Permanent barriers can be a constructed masonry or concrete floodwall or levee. (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 floodwater;
- 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.

**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

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; these 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.

*Figure 3.23 - Historic house on cribbing with a cradle of steel I-beams to stabilize the structure in preparation for relocation. Lewes, Delaware.*

### e. 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.***

Property owners and planners should consider the factors below when evaluating how difficult it will be to move a building.

- **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.

The actual process of moving the building is similar to building elevation in that it generally involves the building being lifted 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 (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 with minimal 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 to allow reassembly at the new site;
- Inserting a structural support system under the building, detaching the building 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.

### f. 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:

**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

## 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 archeological resources

*Figure 3.24 - Demolition rubble from a historic cottage.*

- Potential replacement of a non-flood-compliant building with a flood-compliant building, with all that entails, including 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;
- Disconnecting utilities at the existing site;
- 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 retuned 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 Adaptation, page 2.67.)*

Documentation should precede the demolition of any historic property and should be a requirement in a historic preservation 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 detailed enough to meet the standards of the Historic American Buildings Survey (HABS). Whenever possible and appropriate, documentation should be shared with the MHT for inclusion in the Maryland Inventory of Historic Properties (MIHP) to provide a lasting contribution to the understanding of the state's architecture, engineering, archeology, or culture. *(Refer to Historic & Cultural Resource Documentation, page 2.73.)*

## B.4 PROPERTY-SPECIFIC 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 | • Size, configuration, or materials may make elevation cost prohibitive<br>• Vertical extension of building foundation and building elements such as chimneys<br>• Extension of building systems, equipment, and associated connections – Removal of abandoned equipment and hazardous materials<br>• Abandonment of former basements – Potential need for infill and grading or wet floodproofing and removal of windows and doors<br>• Extension of access stairs and potentially ramps and elevators | • Level of alteration required for effective/desired implementation might compromise historic integrity<br>• Relationship between building and ground plane as well as adjacent buildings will be altered<br>• Significant elevation change can alter stylistic proportions<br>• More foundation will be exposed<br>• Basement-level openings will be lost<br>• Modification of stairs, ramps, and potentially porches necessitated<br>• Property owners might desire higher elevation than required to provide off-street parking<br>• Excavation around foundation to accommodate cribbing and elevation equipment may damage or destroy archeological resources |
| | Elevate ground plane with building or structure | • Sufficient area required around building to berm-up to raised foundation or construct retaining walls to provide a "plinth"<br>• Grading to prevent runoff onto adjacent parcels<br>• Vertical extension of building foundation and building elements such as chimneys<br>• Extension of building systems, equipment, and associated connections – Removal of abandoned equipment and hazardous materials<br>• Abandonment of former basements – Potential need for infill and grading or wet floodproofing and removal of windows and doors<br>• Removal and reinstallation of paving at new elevated grade | • Relationship between building and adjacent buildings will be altered<br>• Site regrading may impact historic landscapes or archeological resources<br>• Berming or retaining walls may be inconsistent with historic context<br>• Minimal impact to archeological 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 | • Modification of basement to allow floodwater to enter and drain from building<br>• Installation of flood openings and potentially ventilation<br>• Modification of basement window and door openings to accommodate floodproofing<br>• Relocation of building systems and equipment above DFE | • Basement windows and doors must be modified<br>• Flood and ventilation openings must be provided<br>• 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 | • Modification of basement and 1st floor structures to address lateral and buoyancy forces<br>• Installation of raised 1st floor level – modification of stairs<br>• Modification of windows and doors at basement and potentially 1st floor<br>• Installation of flood openings and potentially ventilation<br>• Replacement of existing materials with flood damage-resistant materials<br>• Relocation of building systems and equipment | • Basement windows and doors must be modified<br>• Flood and ventilation openings must be provided<br>• Existing materials must be removed and replaced with flood-damage-resistant materials<br>• Exterior systems and equipment must be elevated |
| | Abandon basement and 1st floor | • Modification of basement and 1st floor structures and 1st floor walls to address lateral and buoyancy forces<br>• Removal of all functions with the exception of storage, garage, and entry at residential<br>• Modification of windows and doors at basement and 1st floor<br>• Installation of flood openings and potentially ventilation<br>• Replacement of historic materials with flood damage-resistant materials<br>• Relocation of building systems and equipment | • Basement and 1st floor windows and doors must be modified<br>• Garage doors may be added<br>• Flood and ventilation openings must be installed<br>• Historic materials may be removed and replaced with flood-damage-resistant materials that do not retain the appearance, workmanship, etc. of the original material<br>• Exterior systems and equipment may be elevated |

| Strategy | Potential Design Option | Potential Issues | Additional Considerations |
|---|---|---|---|
| Dry Floodproofing | Sealing walls and slabs | • Possible requirement for trenching of building perimeter to apply sealer material below-grade<br>• Possible requirement for new basement slab with secondary drainage system below<br>• Structural modifications to address lateral and buoyancy forces<br>• Application and maintenance of joint sealers at all openings and penetrations<br>• Relocation of building systems and equipment | • Trenching may damage or destroy archeological resources<br>• Wall sealers may trap moisture in wall system or promote condensation<br>• Windows and doors may require modification to withstand lateral loads and prevent seepage<br>• Exterior systems and equipment may be elevated |
| | Window and door barriers and shields | • Pre-installation of anchors or channels adjacent to each affected opening<br>• Installation of barriers and shields in an accessible location<br>• Installation training and practice in preparation for flooding, and regular inspection and maintenance of anchors, channels, and panels<br>• Emergency operations plan to address installation in advance of flood event and protocol for building evacuation<br>• 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 | • Channels and anchors can be visible at building exterior |
| | Fenestration modification | • Installation of waterproof infill in openings or portions of openings able to withstand force of lateral loads | • 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** | Site walls and levees | • Sufficient available land around building(s) and structure(s)<br>• Sufficient soil capacity to withstand water forces<br>• Limited opening for walkways or driveways – Requires installation of barriers or shields in advance of flood event<br>• Secondary drainage system with emergency power to remove seepage during flood event | • Historic landscapes and archeological resources may be affected<br>• Site wall or levee might not be appropriate in historic context<br>• Stormwater may be trapped at perimeter of building foundation, degrading materials |
| | Temporary barriers | • Effectiveness up to 2 feet<br>• Installation in advance of flood event | • None |
| **Relocation** | Relocate on same or different parcel | • Preparation of new building location, foundation, and utility hook-ups<br>• Clearance of a path to move building – Move building<br>• Abandonment of former location with removal of utilities, hazardous materials, foundations, and paving<br>• New paving and landscaping at new location | • Building will be severed from historic context, which may be difficult to recreate at new site<br>• Loss of building at former site may create a "hole" in the streetscape<br>• Historic landscapes and archeological resources may be affected<br>• Secondary buildings and structures might not be relocated, altering historic relationship |
| **Demolition** | Site Abandonment | • Abandonment of location, removal of utilities, hazardous materials, foundations, and paving – Provide appropriate landscaping | • Historic resource will be lost<br>• Historic context, particularly along a streetscape, will be lost |
| | Replacement with compliant building | • New construction meeting all regulatory requirements | • Compliant building might be incompatible with historic context |
| **Do Nothing** (Not Mitigation) | Limited to properties not required to have flood insurance | • Financial burden for flooding on property owner | • Existing conditions are maintained until potential flood impact or change of ownership<br>• Likelihood is increased for more significant damage if and when flooding occurs |

# REFERENCES

**Note:** All references are available online. References that are only available as online resources are noted as "online resource."

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FEMA. *Highlights of ASCE 24-24 Flood Resistant Design and Construction* (2015).

FEMA. *Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program, Technical Bulletin 2* (2008).

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Maryland Historical Trust (MHT). *Maryland Inventory of Historic Properties [Medusa]*, online resource.

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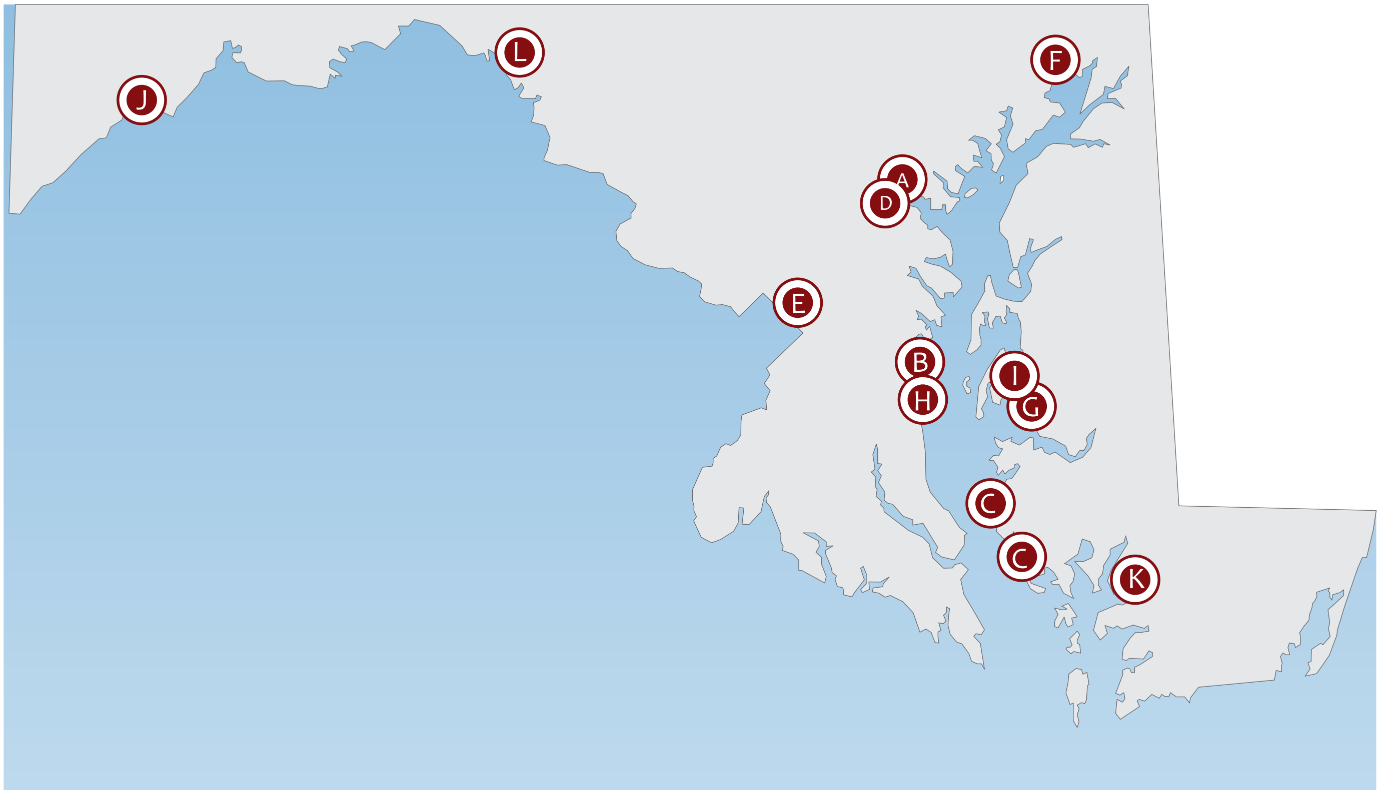


# CASE STUDIES: MARYLAND'S HISTORIC COMMUNITIES

A

**A.** Fells Point - Baltimore

**B.** Galesville

**C.** Hoopers Island & Taylors Island

**D.** Jones Falls - Baltimore

**E.** North Brentwood

**F.** Port Deposit

**G.** Royal Oak

**H.** Shady Side

**I.** St. Michaels & Columbia Beach

**J.** Westernport

**K.** Whitehaven

**L.** Williamsport

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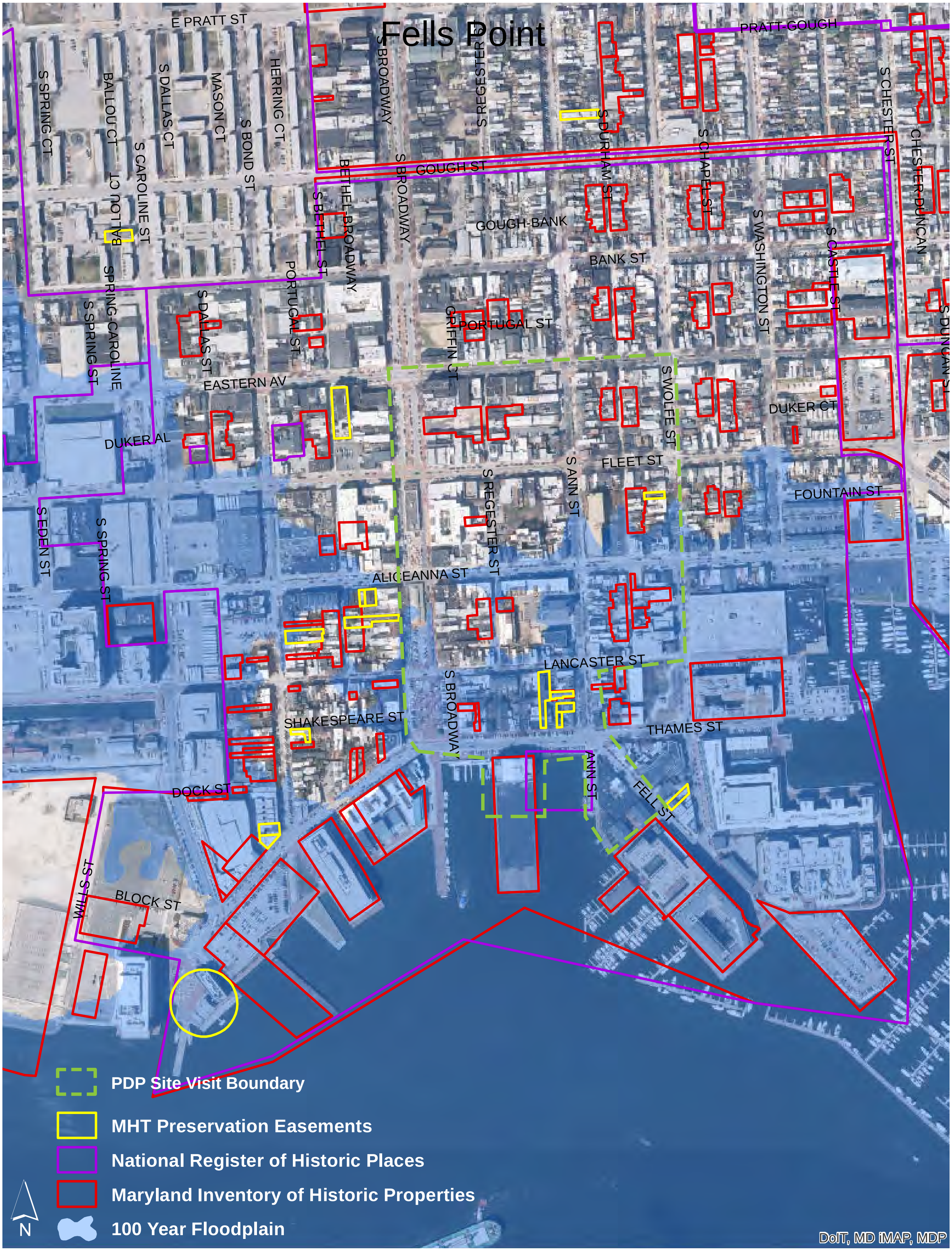
# A

## FELLS POINT - BALTIMORE



Fells Point
E PRATT ST
PRATT-GOUGH
S SPRING CT
BALLOU CT
S DALLAS CT
MASON CT
S BOND ST
HERRING CT
S BROADWAY
S REGESTER ST
S DURHAM ST
S CHAPEL ST
S CHESTER ST
CHESTER-DUNCAN
GOUGH ST
S CAROLINE ST
BETHEL-BROADWAY
S BETHEL ST
GOUGH-BANK
S WASHINGTON ST
S CASTLE ST
BANK ST
PORTUGAL ST
S DALLAS ST
S SPRING ST
SPRING-CAROLINE
GRIFFIN CT
S DUNCAN ST
EASTERN AV
S WOLFE ST
DUKER CT
DUKER AL
S ANN ST
FLEET ST
FOUNTAIN ST
S EDEN ST
ALICEANNA ST
LANCASTER ST
SHAKESPEARE ST
THAMES ST
ANN ST
FELL ST
DOCK ST
WILLS ST
BLOCK ST
PDP Site Visit Boundary
MHT Preservation Easements
National Register of Historic Places
Maryland Inventory of Historic Properties
100 Year Floodplain
N
DoIT, MD iMAP, MDP

**PROFILE**

County: City of Baltimore

Population:

- City of Baltimore: 620, 961

Flood Risk: Tidal flooding, storm surge, sea level rise

Average household income: N/A

Owner-occupied housing: 24.8%

**HISTORIC DESIGNATIONS**

- Fells Point Historic District*

  * National Register and local historic district

**LOCAL HISTORIC PRESERVATION REGULATORY CONTROL**

Baltimore City Commission for Historical & Architectural Preservation (CHAP)

# A. FELLS POINT - BALTIMORE

## HISTORICAL DEVELOPMENT

- Fells Point was settled in 1761 as the deepest harbor in the Baltimore, thus ensuring its place at the city's central port in the 18th and 19th centuries (*FPHD Nomination*, 7-1)
- Baltimore's growth can be attributed to the "flour mills and other processing businesses rather than from the tobacco culture that was the economic basis of the early Chesapeake society" (*FPHD Nomination*, 8-67)
- Historically a maritime center, Fells Point evolved from an industrial center into a commercial center, serving as the intersection for trade, shipping, food processing, and canning (*FPHD Nomination*, 3)
- The district is characterized by a mix of 19th and 20th century warehouses, industrial buildings, and rowhouses (*FPHD Nomination*, 3)
- Fells Point is at sea level and historic homes were often built with raised basements or in "the two-story-plus-attic style of row house" (*FPHD Nomination*, 7-3)

## HISTORICAL SIGNIFICANCE

- Significant for its role in the evolution of the City of Baltimore, anchoring the city as an early industrial and commercial hub on the Chesapeake Bay (*FPHD Nomination*, 7-1)
- The harbor's deep bay attracted shipping and maritime-related activities, followed by industries including food processing and packing (*FPHD Nomination*, 7-1)
- The historic district's *Nomination* cites the significance of the dense mix of residential buildings that grew up along with the commercial and industrial use of the port, an early example of the mixed use streetscape (*FPHD Nomination*, 7-1)

## BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- Modern sewers were introduced in the 20th century - Until that point, Fells Point struggled with public health problems caused by open sewers and cesspools (*FPHD Nomination*, 7-3)
- Several State facilities are located in Baltimore's 100-year floodplain in Fells Point (*CBDPP Project*, 123)
- The City estimates that, in the event of a 500-year flood, there would be $10 billion in damage to critical facilities across the Baltimore (*CBDPP Project*, 123)

## ACCESS TO ROADWAYS AND BRIDGES

- Within the City of Baltimore, 15.08 miles of major roads are located on 100-year floodplains, 22.93 miles are located on 500-year floodplains (*CBDPP Project*, 121)

## POPULATION'S PROFILE

- Since the 1950s, Baltimore has experienced a decrease in population as individuals and families have left the city for more suburban areas (*CBDPP Project*, 26)

## INDUSTRY

- Baltimore is the largest seaport in the country and is almost completely urbanized (*Flood Study*, 4)
- Primary industries in the city: primary metals, transportation equipment, food and kindred products, apparel, and fabricated metal products (*Flood Study*, 4)
- 35% of the city's major employers are located along the waterfront (*CBDPP Project*, 35)

## RESOURCES


*City of Baltimore Disaster Preparedness and Planning Project.* (*CBDPP Project*) October 2013 http://www.baltimoresustainability.org/plans/disaster-preparedness-plan/.

*Flood Insurance Study City of Baltimore, Maryland.* (*Flood Study*) Federal Emergency Management Agency. 30 November 2012. https://www.rampp-team.com/county_maps/maryland/baltimore_city_coastal/baltimore_city_md_fis_tables_cpmr.pdf.

Thompson, Priscilla M. and Franklyn Thompson. *Fells Point Historic District Nomination.* (*FPHD Nomination*) The History Store. November 1985.

*National Register of Historic Places Inventory Nomination Form Fells Point Historic District.* March 1969.


### HISTORY OF FLOODING

Major flood events in Baltimore are riverine in nature, caused by flooding of the Patapsco River and tributaries (*CCBDPP Project*, 52)

Flooding is caused by "urbanization, [...] stream channel encroachments, [...] undersized railroad and roadway bridges, [...] and inadequate storm sewer drainage" (*CBDPP Project*, 52)

Major floods have occurred in 1817, 1837, 1863, 1868, 1933, 1955, 1972, and 1975 (*CBDPP Project*, 52)

August 1817 - water levels rose 12 to 20 feet and damaged homes, bridges and killed livestock (*CBDPP Project*, 52)

July 1923 - recorded flood damage was immense (*CBDPP Project*, 52)

1966 - flooding in Baltimore resulted in 39 fatalities (*Flood Study*, 5)

June 1972 - flooding Tropical Storm Agnes was twice as high as "the 100-year recurrence interval" (*CBDPP Project*, 57)

September 2003 - Hurricane Isabel brought flooding to predicted 100-year tidal flood levels (*CBDPP Project*, 57)

There are 52 repetitive loss properties in Baltimore City (*CBDPP Project*, 55)

In addition to river flooding, Baltimore City experiences tidal flooding, following a storm event, which can be accompanied by high velocity flooding (*CBDPP Project*, 57)

A direct hit from a hurricane can result in severe flooding, pushing flood levels 15 to 20 feet above normal levels (*Flood Study*, 5)

### MITIGATION MEASURES

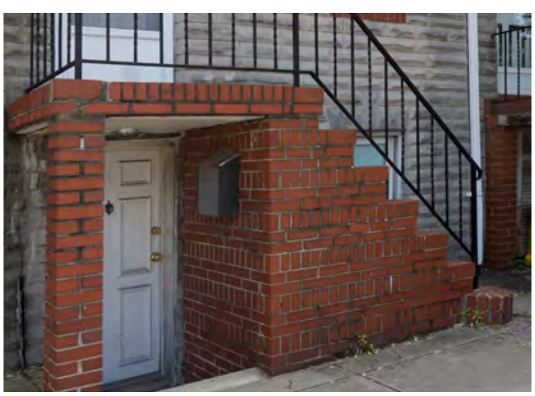
*The CBDPP Project* recommends retrofitting existing buildings in designated flood area to increase resiliency including: installing backflow preventers; installing permeable paving; maintaining streams; providing redundancy in operating systems and critical facilities; strengthening zoning codes with regard to resiliency and flooding; amending floodplain requirements; purchasing repetitive loss properties; maintaining a current list of repetitive loss properties

### COMMUNITY RATING CLASSIFICATION: 5

*Two- to three-story rowhouses with commercial uses at the ground floor are along Thames Street.*

*The former Fells Point Recreation Pier is being redeveloped as a hotel.*

*Windows can provide a path for flood water entering a basement.*



*Although the primary floor is raised, the lower level, which appears occupied, is susceptible to flooding.*

## SITE VISIT - MAY 24, 2016

**Attendees:**

Stacy Montgomery, CHAP
Lauren Schiszik, CHAP
Walter Gallas, CHAP
Jennifer Sparenberg, MHT
Anne Raines, MHT
Nell Ziehl, MHT
Dominique M. Hawkins, PDP
Sarah Blitzer, PDP

**Overview:**

Fells Point is a waterfront neighborhood that historically served as the central port of the city and its boat building past. It has since been transformed into a popular tourist destination and residential neighborhood consisting primarily of brick rowhouses. The area along the waterfront is characterized by brick rowhouses with small scale commercial services on the inland side of Thames and Fell Streets, and larger scale buildings (e.g. warehouses) projecting out into the harbor. There were two distinct components to the site visit. The first portion of the visit included a meeting with the site managers for the hotel development located at the former Fells Point Recreation Pier, and the second component included a walking tour of the residential neighborhood.

**Challenges:**

- The majority of the neighborhood from Fleet Street to the harbor is in the 100-year floodplain and several buildings, particularly the commercial buildings along the waterfront, are prone to flooding
- The hotel redevelopment is seeking tax credits and resiliency measures needed to be balanced with preservation treatment and approach
- Many of the residential buildings have basements, some of which have occupied lower levels, areaways, or windows at or near grade

**Approach / Observations:**

**General:**

- The City of Baltimore is mandating higher resiliency requirements than found in the Flood Mitigation Plan and looking towards 500-year floodplain
- The City is currently requiring a 11-foot base flood elevation plus 7-feet of storm surge
- Sewage treatment plant is vulnerable to flooding

**Redevelopment of the Recreation Pier:** A dry flood proofing approach is being used in the redevelopment of the building, including:

- Installing waterproofed concrete flood walls to the 11-foot base flood elevation for the new addition, both at the exterior and within the courtyard, and flood doors at all grade locations - inspecting waterproofing 3 times by a third party reviewer during installation as part of the permitting process
- Raising the interior first floor height 3.5 feet above the 100-year floodplain, while maintaining the original window height dimensions - installing tempered glazing to address code concerns related to floor-level proximity
- Locating all mechanical equipment on the roof, running systems primarily along the ceilings, minimizing and waterproofing penetrations of the first floor slab, installing all electrical receptacles and devices at higher elevations
- Multiple hearings and approvals were required related to building within the 100-year floodplain, the historic designation, and the preservation tax credits
- The developer is aware that recovery from a flood has the potential to be very expensive regardless of steps to prevent damage

**Fells Point Neighborhood:**

- Ground floor commercial establishments and the lower levels of rowhouses south of Fleet Street are particularly prone to flooding, particularly those with occupied basements
- New development addresses flood mitigation by abandoning basements and treating ground floor areas as unoccupied space, and instead utilizing as parking accessed from rear alleys to maintain historic streetscape character

**Potential Mitigation Strategies:**

Rowhouse architecture provides a particular challenge related to flood mitigation in that buildings are generally built to property lines, limiting perimeter mitigation techniques, and because of shared party walls, individual buildings cannot be raised without cooperation from neighbors.

At residential buildings, mitigation measures can include:

- Raising systems and equipment out of vulnerable areas prior to a flood event
- Installing a sump pump system with a back-up power supply to remove any accumulated water
- Installing ventilation measures at lower levels to minimize the potential for mold growth
- Abandoning and wet floodproofing basements and lower levels, installing gravel / parking while retaining historic character

*Mechanical and electrical equipment installed at grade is at risk for being damaged by flood waters.*

*The basement has been abandoned and 1st floor used for parking while maintaining historic appearance.*

*The parking for the building above is accessed from the rear, allowing the streetscape to retain its character.*

*Areaways, including those that service commercial buildings, provide a path for flood water to enter a basement.*

# B
# GALESVILLE

Galesville
BAYFIELD RD
MUDDY CREEK RD
GALESVILLE RD
ANCHORS WAY
LERCH CREEK DR
SIEGERT LN
BENNING RD W
WOODFIELD RD
MULBERRY LN
BENNING RD E
MAIN ST
CHURCH LN
RIVERSIDE DR
NO NAME
CRANDELL RD
SHORE DR
E CHALK POINT RD
PDP Site Visit Boundary
MHT Preservation Easements
National Register of Historic Places
MIHP
100 Year Floodplain
N
DoIT, MD iMAP, MDP

**PROFILE**

County: Anne Arundel

Population:

- County: 537,656
- Town: 684

Flood Risk: Tidal flooding, storm surge, sea level rise

Average household income: Unavailable

Owner-occupied housing: 80.1%

**HISTORIC DESIGNATIONS**

- Galesville*
- West Benning Road Historic District

* Local historic district

** National Register eligible historic district

**LOCAL HISTORIC PRESERVATION REGULATORY CONTROL**

- Cultural Resources Division, Anne Arundel County Planning and Zoning

## B. GALESVILLE

### HISTORICAL DEVELOPMENT

- "Galesville evolved as a water-related village from the 17th through the mid-19th centuries" (*Eligibility Review*, 1)
- Henry Wilson, a former slave, reportedly built his home as the focal point of a 27.5-acre property that he began to accumulate the land for in 1865, beginning with 2 acres and adding 25.5 acres in 1871 - The house remained in the family until 1970 (http://galesville.org/wilsonhouse.shtml) - He also purchased his wife's freedom from a nearby plantation (Site visit)
- Several homes in the town were constructed by employees of the Woodfield Oyster Company in the first half of the 20th century (*Eligibility Review*, 2) - Some of the homes were also constructed by the company for use as worker's housing (*Field Guide*)
- The Galesville Rosenwald School (1929, expanded 1931) was one of 23 Rosenwald Schools constructed in Anne Arundel County between 1921 and 1932 (www.historicgalesville.org)

### HISTORICAL SIGNIFICANCE

- The Galesville Ball Field (also known as Wilson Field and adjacent to the Wilson Homestead) was the home of the Galesville Hot Sox who began playing on the field in 1929 and participated in the Negro Professional Baseball League (http://galesville.org/wilsonfield.shtml)
- Galesville is a historically African-American town supported by the Woodfield Oyster Company (*Eligibility Review*, 2)
- The Woodfield Oyster and Fish Company, founded by William F. Woodfield in 1917, was one of the largest fish and oyster oldest businesses on the bay, and employed many African Americans - The site was rebuilt following a fire (Site Visit)

## BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- Public sewer system installed by the County in 1996 (Site visit)

## ACCESS TO ROADWAYS AND BRIDGES

- The principal access road, Galesville Road, is not located within the 100-year floodplain

## INDUSTRY

- Boatyard and Pirate's Cove restaurant are located on water

## RESOURCES AND FLOOD IMPACT

- Anne Arundel County is in the process of participating in the Community Rating System (*Plan Update,* 5-10)

## POTENTIAL IMPACT ON COMMUNITY

- Much of the property along the water is dedicated to maritime activities with residences located on higher elevations
- It can be difficult to get mortgages on historic homes that have not been improved to address resiliency (Site visit)

## RESOURCES

*Anne Arundel County, Maryland – 2010 Hazard Mitigation Plan Update*. (*Plan Update*) www.aacounty.org/departments/office-of-emergency-management/forms-and-publications/2010HazardMitigationPlanSections.pdf.

*Field Guide to Galesville, Maryland*. (*Field Guide*) 2015. http://www.historicgalesville.org/Field_Guide_to_Galesville.pdf.

Galesville Community Center Organization, Inc. http://www.historicgalesville.org.

Ware, Donna M. *Maryland Historical Trust Internal NR-Eligibility Review Form; Town of Galesville*. (*Eligibility Review*) December 1992.

West River Improvement Association. http://galesville.org.

### HISTORY OF FLOODING

The county has experienced 36 flood events (*Anne Arundel County, Maryland – 2010 Hazard Mitigation Plan Update*, 6-2)

The storm surge from Hurricane Isabel (2003) resulted in considerable flood damage in the area (Site visit)

Pirate's Cove flooded several feet following Hurricane Isabel, 8'-9' above creek (Site visit)

### MITIGATION MEASURES

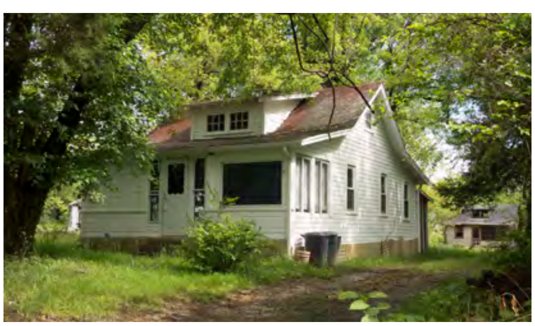
Coordinated response to Hurricane Isabel (2003) from FEMA to MEMA to the County which included financial assistance to homeowners affected by storm surge and elevation and improvements to housing compliant with flood requirements (Site visit)

### COMMUNITY RATING CLASSIFICATION: N/A

*The Henry Wilson House was elevated on brick piers. The front stair has yet to be installed.*

*Standing water is visible under the Henry Wilson House.*

*The Rosenwald School has been converted into the Galesvile Community Center.*



*There is a varierty of early-20th century housing in Galesville.*

## SITE VISIT - MAY 23, 2016

**Attendees:**

Bill Gibbons, Arundel Community Development Services, Inc.

Heather Barrett, MHT

Dominique M. Hawkins, PDP

Sarah Blitzer, PDP

**Overview:**

Galesville is a historically farming and maritime community that included oystermen and watermen, many of whom were African American. The principal industries of the area included servicing the Woodfield Fish and Oyster Company as well as the transportation of local produce to Baltimore via steamboats.

The site visit to Galesville included two distinct components. The first was a tour of Wilson Park, which includes the Henry Wilson House and adjacent ball field associated with the Negro League. The second component consisted of a driving tour of the housing and wharf associated with the Woodfield Fish and Oyster Company. The wharf is located in the 100-year floodplain while, in large part, the housing is located on the hill above the 100-year floodplain. The historic Rosenwald School, which has been converted into the Galesville Community Center, was also a stop during the visit. The driving tour included a brief conversation with a long-time Galesville resident, whose home is on West Benning Road.

**Challenges:**

- The Wilson Homestead and field, although at a relatively high elevation, were very wet with visible areas of ponding water and very wet, spongy soil although not located in 100-year floodplain
- Historically, many homes in the area, including the Wilson homestead, are wood-framed and were constructed at or near grade making them susceptible to rot, particularly sill beams and floor framing - Rot is generally exacerbated as residents limit air circulation under homes by closing vents or enclosing crawl spaces
- Many of the remaining older buildings associated with the Woodfield Fish and Oyster Company tend to flood and much of the property is now used as a boat yard
- Some abandonment of some historic buildings was visible - Primary residences are being elevated while accessory buildings, such as barns, are less likely to be addressed
- The Rosenwald School has been converted into the Galesville Community Center

**Approach / Observations:**

The Henry Wilson House was elevated and stabilized by the Arundel Community Development Services, Inc. with a grant from the MHT. The elevation raised the height of the building 16" on brick piers, matching the location of the historic supports. Standing water was visible beneath the house suggesting site grading could improve drainage. Additional stabilization work completed with the remaining available funding included replacement of the majority of the wood sills, sistering of first floor joists, installation of clapboard on two elevations (some salvaged), and securing of window and door openings. The work did not include steps to door openings, which can present a challenge related to a building's integrity when a building is raised.

*Many of the buildings associated with the Woodfield Fish and Oyster Company are susceptible to flooding.*

Much of the housing formerly associated with the oystermen and watermen from the Woodfield Fish and Oyster Company had been previously rehabilitated by the Arundel Community Development Services, Inc. Previous improvements included the introduction of indoor plumbing in 1996 and the elevation of some of the homes. A former oysterman and long-time resident on West Benning Road indicated that previous improvements have greatly improved his quality of life and the homes generally did not flood, although the Woodfield site was very susceptible to flooding.

*Standing water could be found in front of this store, whose first floor is slightly raised above grade.*

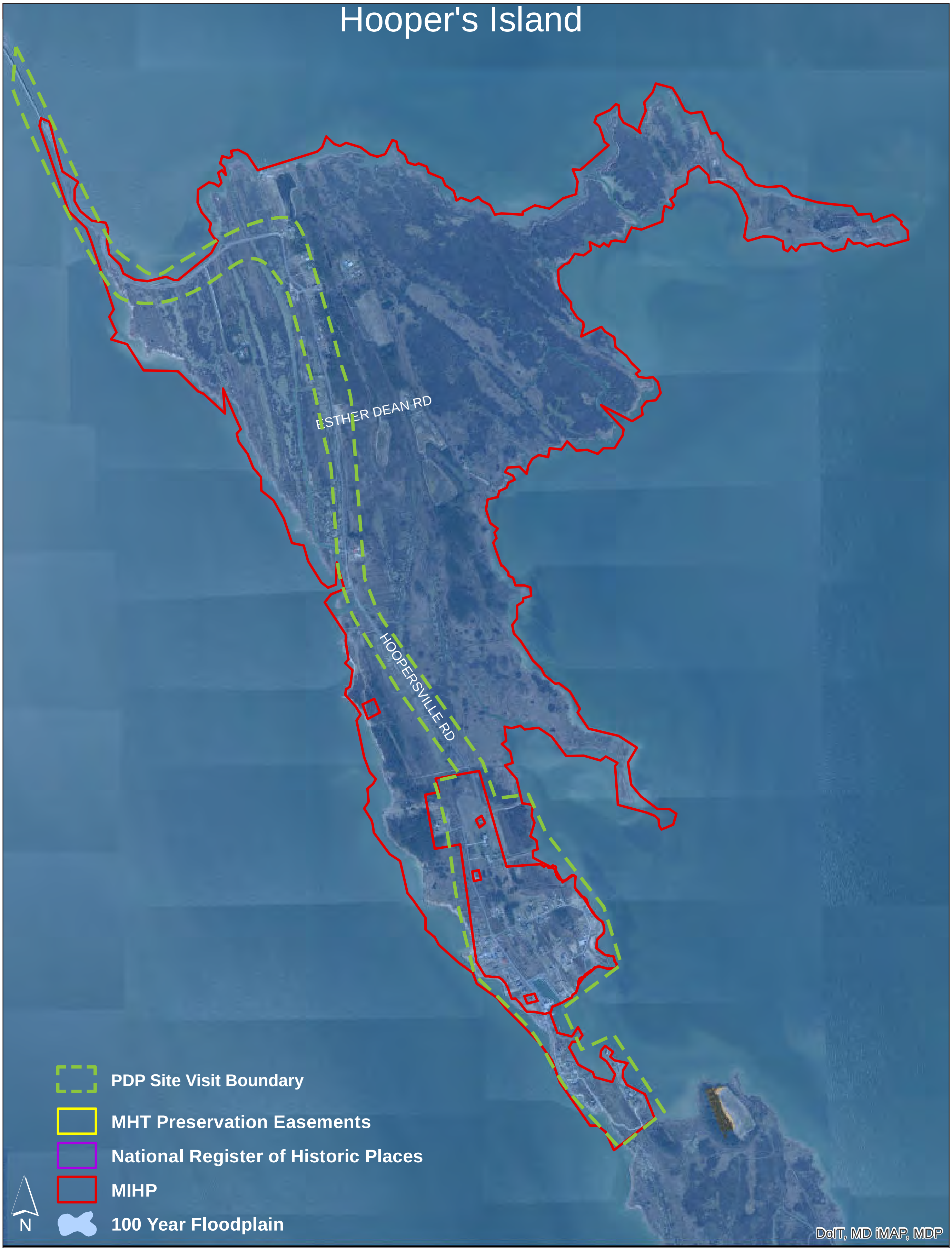
**Possible Mitigation Strategies:**

The majority of the residences are small, wood-framed cottages located above the 1% floodplain. For houses that are vulnerable, elevation by couple of feet could improve resilience without significantly impacting the overall neighborhood character. In addition, systems and equipment should be elevated out of vulnerable areas prior to a flood event.

*In 1996 indoor plumbing was installed in Galesville, including these homes on West Benning Road, improving the quality of life for its residents.*

# C

# HOOPERS ISLAND & TAYLORS ISLAND


Hooper's Island
ESTHER DEAN RD
HOOPERSVILLE RD
PDP Site Visit Boundary
MHT Preservation Easements
National Register of Historic Places
MIHP
100 Year Floodplain
N
DoIT, MD iMAP, MDP

**PROFILE**

County: Dorchester

Population:

- County: 32,618
- Town:
  Hoopers Island - 428
  Taylors Island - 263

Flood Risk: Tidal flooding, storm surge, sea level rise

Average household income: Unavailable

Owner-occupied housing:
Hoopers Island - 88.9%
Taylors Island - 85.0%

**HISTORIC DESIGNATIONS**

- Hooper Island Light Station*, Hoopers Island
- Bethlehem Methodist Episcopal Church*, Taylors Island
- Grace Episcopal Church Complex*, Taylors Island
- Ridgeton Farm*, Taylors Island

* Individually registered in the National Register of Historic Places

**LOCAL HISTORIC PRESERVATION REGULATORY CONTROL**

No review at the County level (*Dorchester County 1996 Comprehensive Plan*)

# C. HOOPERS ISLAND & TAYLORS ISLAND

## HISTORICAL DEVELOPMENT

**Hoopers Island**

- Hoopers Island is actually comprised of three islands with authentic working watermen villages (http://visitdorchester.org/hoopers-island/)
- Upper Hooper Island is comprised of four settlements (*Hoopers Island Nomination*, 2)

**Taylors Island**

- Taylors Island includes unique homes, schoolhouses, and three churches (http://visitdorchester.org/taylors-island/)

## HISTORICAL SIGNIFICANCE

**Hoopers Island**

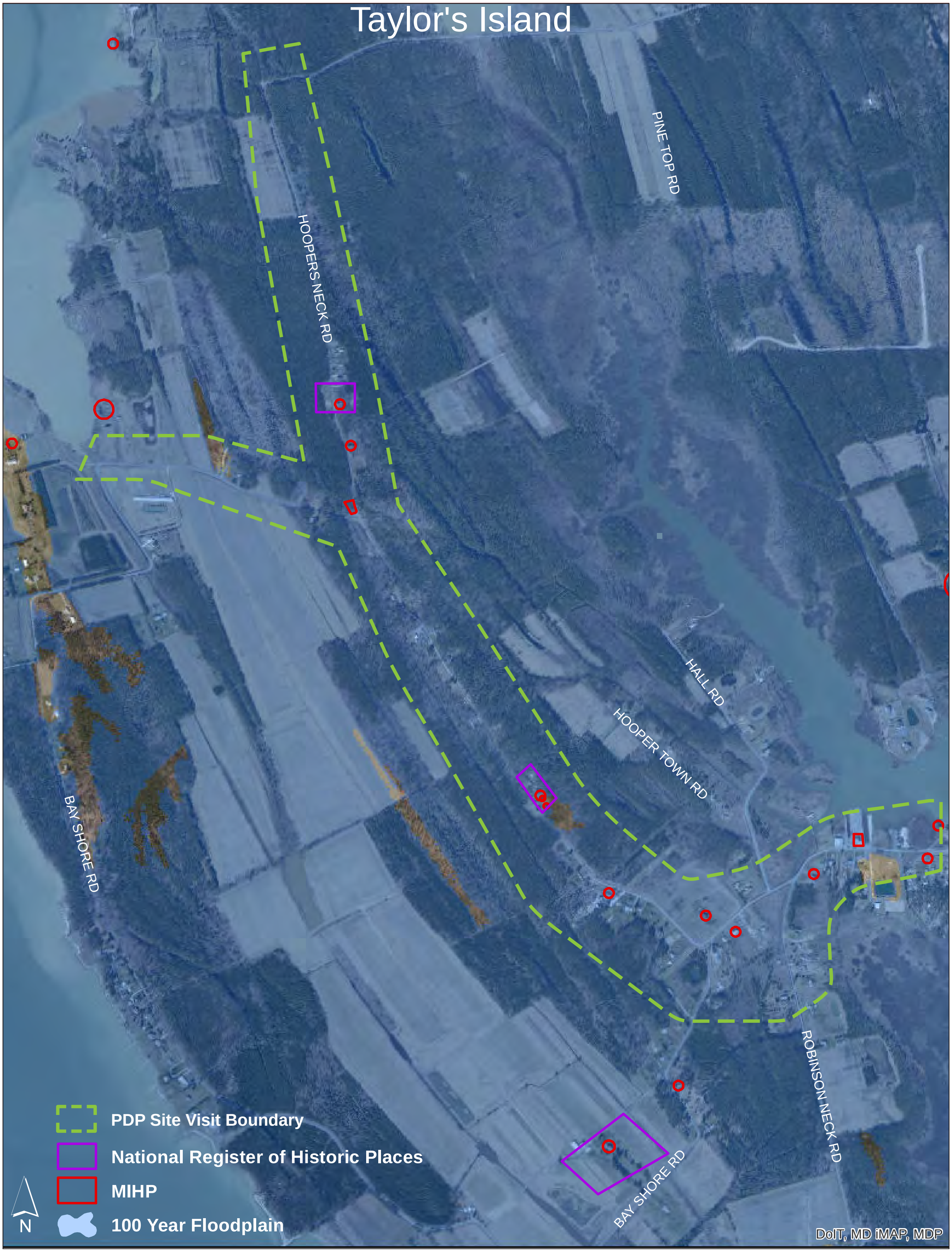
- Some properties have the earliest land grants in Dorchester County, issued in 1659, approximately 10 years before the County was established (http://visitdorchester.org/hoopers-island/)
- On Hoopers Island, most residents still make a living by working the water, catching and processing crabs, oysters, and fish (http://visitdorchester.org/hoopers-island/)

**Taylors Island**

- The tidal marshes of Taylors Island have been relatively untouched by the development of small towns and villages on the nearby shores and the island is a classic illustration of Chesapeake Bay tidal marsh habitat (http://visitdorchester.org/taylors-island/)

## BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- Properties rely on well water and septic tanks (Site visit)



Taylor's Island
PINE TOP RD
HOOPERS NECK RD
HALL RD
HOOPER TOWN RD
BAY SHORE RD
ROBINSON NECK RD
BAY SHORE RD
PDP Site Visit Boundary
National Register of Historic Places
MIHP
100 Year Floodplain
N
DoIT, MD iMAP, MDP

*A single roadway, which is prone to flooding, provides vehicular access to Hoopers Island.*

*The two graves in the foreground of this Hoopers Island graveyard appear to have new concrete crypts.*

*This home on Hoopers Island was elevated a full story and includes a new concrete block lower level.*

*The efflorescence suggests water saturation at this Taylors Island church.*

## SITE VISIT - MAY 16, 2016

**Attendees:**

Amanda Fenstermaker, Dorchester County Department of Tourism
Katie Clendaniel, Dorchester County Department of Tourism
Margaret De Arcangelis, Preservation Maryland
Anne Raines, MHT
Nell Ziehl, MHT
Jennifer Sparenberg, MHT
Dominique M. Hawkins, PDP
Sarah Blitzer, PDP

**Overview:**

Hoopers and Taylors Islands are located on the western coast of the Eastern Shore of the Chesapeake Bay. A combination of subsidence and sea level rise has altered the landscape as more brackish water encroaches further inland, impacting the loblolly tree stands and access to the bird sanctuary, as well as reducing the farmable land. The focus of the site visit was a driving tour of the northern two islands associated with Hoopers Island and Taylors Island.

**Challenges:**

- Access to Hoopers Island is by boat or a single roadway with connecting bridges that are often inundated
- Water supply is through well water, and properties rely on septic systems, both of which will be impacted as the water table continues to rise and encroach on the land
- Standing water was visible on the ground, particularly on Hoopers Island, and the soil was very wet and spongy
- Buildings are being impacted through contact with groundwater, although some buildings have been elevated and habitable areas of contemporary buildings are raised
- It appeared that graveyard crypts are experiencing upward displacement, with recent concrete replacement evident in at least one location
- There is limited documentation of the historic properties and landscapes on both Hoopers and Taylors Islands

## ACCESS TO ROADWAYS AND BRIDGES

- A single road with bridge(s) provides access to each island with the road to Hoopers Island being prone to flooding (Site visit)

## ACCESS TO PUBLIC SERVICES

- The public school on the road to Hoopers Island closes when the roadway is inundated (Site visit)

## ACCESS TO PRIVATE SERVICES

- A general store is located on Hoopers Island (Site visit)

## POPULATION'S PROFILE

- The population of the islands is aging with younger generations moving to other locations in the county, some abandoning properties, and few new residents (Site visit)
- One child resides on Hoopers Island (Site visit)

## INDUSTRY

- The number of crab houses has declined and there is high resident unemployment - WT Ruark & Company is a remaining crab picking facility on Hoopers Island who reportedly relies on migrant labor (Site visit)

## RESOURCES


*Dorchester County 1996 Comprehensive Plan.* (*DCC Plan*) http://docogonet.com/uploads/Planning&Zoning/Dorchester%20County%20Comprehensive%20Plan%20LQ.pdf.

Dorchester County Office of Tourism. (Office of Tourism) http://visitdorchester.org/.

*Floodplain Management District*. 8 Jan. 2015. http://docogonet.com/uploads/File/Planning%20and%20Zoning/Floodplain%20Management/floodplainmanagementordinance3pdf.pdf.

*Hoopers Islands Maryland Historical Trust Worksheet Nomination Form.* (*Hoopers Island Nomination*) http://msa.maryland.gov/megafile/msa/stagsere/se1/se5/027000/027600/027655/pdf/msa_se5_27655.pdf.


**HISTORY OF FLOODING**

1933 storm submerged entire island and washed out bridge connecting Upper and Middle Hooper Islands (*Hoopers Islands Maryland Historical Trust Worksheet Nomination Form*, 5)

Several properties were abandoned after Hurricane Isabel (2003) (Site visit)

Lower Hoopers Island is basically abandoned (Site visit)

**MITIGATION MEASURES**

In 2015, the County enacted the Floodplain Management District, which regulates new construction and improvements within the District (*Floodplain Management District)*

The District prescribes two feet of freeboard (*Floodplain Management District*, 9)

**COMMUNITY RATING CLASSIFICATION: 8**

*Taylors Island includes a number of historic churches and graveyards.*

*This Italianate farmhouse suggests the historic prosperity of Taylors Island.*

**Approach / Observations:**

Hoopers and Taylors Islands represent important early communities in Maryland that are facing a changing landscape and habitat as industries in the form of oystermen, water men, crabbing, and farming disappear.

The majority of the buildings are of wood-framed construction, which are susceptible to rot in wet conditions.

There are significant infrastructure challenges associated with the long-term viability of both Hoopers and Taylors Islands including access, fresh water supply and sewage, all of which would require significant financial investment to address.

**Concluding Observations:**

With the continued sea water encroachment, Hoopers and Taylors Islands are faced with not only the loss of built heritage, but also the loss of its landscape and a way of life. In addition, their locations make them highly vulnerable to a major storm event.

The ability to document these aspects of the islands will diminish as existing businesses close, aging residents move on, or if a significant storm event has a dramatic impact on vehicular access or the ability to inhabit the islands.

*Standing water was present around many of the homes on Hoopers Island, which can cause significant damage to the wood-framed construction, particularly at buildings constructed close to the ground.*

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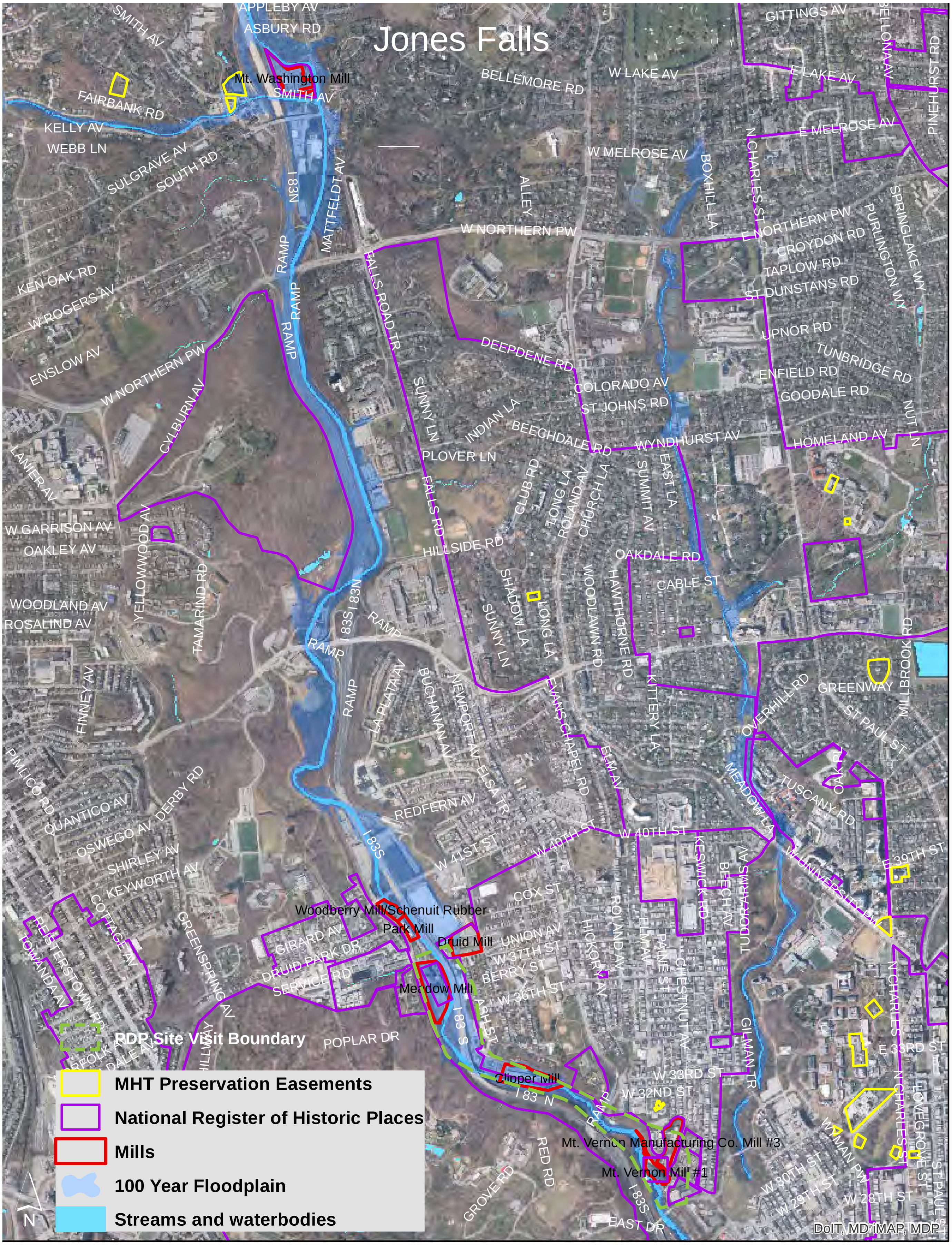
# JONES FALLS - BALTIMORE


Jones Falls
Mt. Washington Mill
Woodberry Mill/Schenuit Rubber
Park Mill
Druid Mill
Meadow Mill
Clipper Mill
Mt. Vernon Manufacturing Co. Mill #3
Mt. Vernon Mill #1
PDP Site Visit Boundary
MHT Preservation Easements
National Register of Historic Places
Mills
100 Year Floodplain
Streams and waterbodies
N
DoIT, MD iMAP, MDP
APPLEBY AV
ASBURY RD
SMITH AV
FAIRBANK RD
KELLY AV
WEBB LN
SULGRAVE AV
SOUTH RD
I 83N
MATTFELDT AV
BELLEMORE RD
W LAKE AV
GITTINGS AV
E LAKE AV
BELLONA AV
PINEHURST RD
W MELROSE AV
E MELROSE AV
BOXHILL LA
N CHARLES ST
ALLEY
W NORTHERN PW
E NORTHERN PW
CROYDON RD
TAPLOW RD
ST DUNSTANS RD
PURLINGTON WY
SPRINGLAKE WY
KEN OAK RD
W ROGERS AV
ENSLOW AV
W NORTHERN PW
CYLBURN AV
RAMP
FALLS ROAD TR
DEEPDENE RD
COLORADO AV
ST JOHNS RD
UPNOR RD
TUNBRIDGE RD
ENFIELD RD
GOODALE RD
NUTT LN
HOMELAND AV
SUNNY LN
INDIAN LA
BEECHDALE RD
WYNDHURST AV
PLOVER LN
LANIER AV
FALLS RD
CLUB RD
LONG LA
ROLAND AV
CHURCH LA
SUMMIT AV
EAST LA
W GARRISON AV
OAKLEY AV
YELLOWWOOD AV
HILLSIDE RD
OAKDALE RD
CABLE ST
WOODLAND AV
ROSALIND AV
TAMARIND RD
I 83S
SHADOW LA
SUNNY LN
WOODLAWN RD
HAWTHORNE RD
MILLBROOK RD
GREENWAY
FINNEY AV
LA PLATA AV
BUCHANAN AV
NEWPORT AV
ELSA TR
EVANS CHAPEL RD
ELM AV
KITTERY LA
OVERHILL RD
ST PAUL ST
PIMLICO RD
QUANTICO AV
DERBY RD
OSWEGO AV
SHIRLEY AV
KEYWORTH AV
REDFERN AV
W 41ST ST
W 40TH ST
MEADOW LA
TUSCANY RD
UNIVERSITY PW
E 39TH ST
COTTAGE AV
GREENSPRING AV
GIRARD AV
DRUID PARK DR
SERVICE RD
COX ST
UNION AV
W 37TH ST
BERRY ST
W 36TH ST
ASH ST
I 83 S
HICKORY AV
ROLAND AV
ELM AV
PAINE ST
CHESTNUT AV
KESWICK RD
BEECH AV
TUDOR ARMS AV
POPLAR DR
GILMAN TR
W 33RD ST
W 32ND ST
I 83 N
E 33RD ST
RED RD
GROVE RD
EAST DR
W 30TH ST
W 29TH ST
W 28TH ST
WYMAN PW
N CHARLES ST
LOVEGROVE ST
ST PAUL ST
LOWANDA AV

# D. JONES FALLS - BALTIMORE

### PROFILE

County: Baltimore City

Population: 620, 961

Flood Risk: Flash flooding and riverine flooding

### HISTORIC DESIGNATIONS*

- Mount Washington Mill Historic District
- Meadow Mill*
- Mount Vernon Mill No. 1*
- Poole and Hunt Company Buildings*

* Individually registered in the National Register of Historic Places

### LOCAL HISTORIC PRESERVATION REGULATORY CONTROL

Baltimore City Commission for Historical & Architectural Preservation (CHAP)**

** Currently there are no locally-designated historic properties in Jones Falls

## HISTORICAL DEVELOPMENT

- Jones Falls became an industrial center as the region transitioned from agriculture to manufacturing (*Mount Washington Mill Nomination*, 40)
- Beginning in the early-19th century, water-powered mills developed along the river, away from the labor pool in Baltimore, which encouraged the construction of mill complexes, including worker housing (*MWMHD Nomination*, 8-1)
- These mills were initially constructed following Thomas Jefferson's foreign trade embargo in 1807, which opened up the market to domestic production of goods (*Mount Washington Mill Nomination*, 40) - Historically, industry in the Jones Falls area evolved from flour mills to textiles - in response to the embargo (*Clipper Mill Nomination*, 1)
- Built in 1810, the Washington Cotton Manufacturing Company's mill complex, known as "Washingtonville," developed around the mill in the 1830s and 40s - When it was sold, new owners expanded the mill, including two brick buildings during and after the Civil War (*Inventory Washington Mill*, 115)
- Meadow Mill, constructed in 1877 by the Hooper family as one of five mills belonging to the Woodberry Manufacturing Company, is "reminiscent of the grant [sic] New England textile mills of the period" (*Londontown Nomination*, 3, 10)
- The Hooper family was invested in the mills' community, and constructed numerous workers' housing and "established a building and loan association for the millhands" (*Londontown Nomination*, 3)
- A significant number of workers' houses were destroyed to make way for the Jones Falls Expressway (*Inventory Washington Mill*, 118)
- Despite the capacity of these mills, they were never used to their fullest capacity in the production of textiles (*Mount Washington Mill Nomination*, 8-2)
- The Jones Falls area was slow to develop until the arrival of the Baltimore and Susquehanna Railroad in 1830 (*Inventory Washington Mill*, 118)
- Mount Vernon Mill No. 1's four buildings were built between 1873 and 1918 (*Mill No.1 Nomination*, 7-1)
- In 1845, Mount Vernon Mill No. 1 was converted from water-power to steam (*Mill No.1 Nomination*, 8-2)
- In 1898, seven companies banded together and formed a cotton duck monopoly, known as the Mount Vernon-Woodberry Cotton Duck Company (*Mill No.1 Nomination*, 8-6)

- Many, but not all, mills produced cotton duck, for the maritime and sailing ship trades (*Inventory Park Mill*, 24)
- Whitehall Mill, which burned down in the 1850s, was a water-powered flour mill - It was replaced by Clipper Mill, which milled cotton duck (*Inventory Clipper Mill*, 4)
- Woodberry Mill was constructed in 1845 as a cotton duck mill (*NR-E Woodberry*, 21)

## HISTORICAL SIGNIFICANCE

- Jones Falls is significant as a center of industry in Baltimore with several historic mills located along the Jones Falls, mills involved in milling flour and later manufacturing textiles, usually maritime industry textiles - The mills are also significant individually (*Inventory Washington Mill*, 115)
- The Washington Cotton Manufacturing Company's mill building is one of the oldest in the country and is also one of the first mills to be operated by water power (*Inventory Washington Mill*, 115)
- Meadow Mill is likely the only existing mill in the state of Maryland constructed between 1877 and World War I (*Londontown Nomination*, 2)
- Mount Vernon-Woodberry Mills is significant for its place in the workers rights movement where, in April 1923, workers went on strike protesting pay and the length of the work week, forever changing "the paternalistic system that governed mill operations" (*Mill No.1 Nomination* 8-7)

## BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- The City estimates that, in the event of a 500-year flood, there would be $10 billion in damage to critical facilities across the Baltimore (*CBDPP Project*, 123)

## ACCESS TO ROADWAYS AND BRIDGES

- Within the City of Baltimore, 15.08 miles of major roads are located on 100-year floodplains, 22.93 miles are located on 500-year floodplains (*CBDPP Project*, 121)

## INDUSTRY

- Baltimore is the largest seaport in the country and is almost completely urbanized (*Flood Study*, 4)
- Primary industries in the city: primary metals, transportation equipment, food and kindred products, apparel, and fabricated metal products (*Flood Study*, 4)
- 35% of the city's major employers are located along the waterfront (*CBDPP Project*, 35)

### HISTORY OF FLOODING

Major flood events in Baltimore are riverine in nature, caused by flooding of the Patapsco River and tributaries (*CCBDPP Project*, 52)

Flooding is caused by "urbanization, [...] stream channel encroachments, [...] undersized railroad and roadway bridges, [...] and inadequate storm sewer drainage" (*CBDPP Project*, 52)

Major floods have occurred in 1817, 1837, 1863, 1868, 1933, 1955, 1972, and 1975 (*CBDPP Project*, 52)

August 1817 - water levels rose 12 to 20 feet and damaged homes, bridges and killed livestock (*CBDPP Project*, 52)

July 24, 1868 - Jones Falls flooded with heavy loss of life (*Flood Damage*, 10)

July 1923 - recorded flood damage was immense (*CBDPP Project*, 52)

1966 - flooding in Baltimore resulted in 39 fatalities (*Flood Study*, 5)

June 1972 - flooding Tropical Storm Agnes was twice as high as "the 100-year recurrence interval" (*CBDPP Project*, 57)

- Following flooding after tropical storm Agnes in 1972, "industrial operation was choked in mud and silt [...]" (*Mount Washington Mill Nomination*, 8-5)
- The American Chain and Cable Company, occupant of the former Washington Cotton mill in 1972, was forced to shut down its factory in the wake of damage from the storm (*Inventory Washington Mill*, 119)

April 30, 2013 - last flood at Whitehall Mill (Site visit)

There are 52 repetitive loss properties in Baltimore City (*CBDPP Project*, 55)

A direct hit from a hurricane can result in severe flooding, pushing flood levels 15 to 20 feet above normal levels (*Flood Study*, 5)

Jones Falls is the most flood-prone floodplain in the city and the country, the result of the convergence of three rivers and the increased impervious surface that drains into it, and its channelization/impervious bed (Site visit: Baltimore Meadow Mill)

Jones Falls is "a recurrent flood threat to the adjacent structures [...]" with severe flooding in 2004, 2006, and 2008 (*CBDPP Project*, 55)

Jones Falls 100-year flood plain is 10 feet high, plus 2 feet of freeboard (Site visit: Baltimore Whitehall Mill)

A description of current conditions for Jones Falls from the *Flood Study*: "[...] Jones Falls flows through an underground triple-celled concrete box storm sewer. This sewer lacks adequate conveyance capacity to carry the major [...] floodwaters [...]" (*Flood Study,* 5)

The three bridges that span Jones Falls excerbate flooding (*Flood Study,* 5)

Regular flash floods Falls Road

### MITIGATION MEASURES

The CBDPP Project recommends retrofitting existing buildings in designated flood area to increase resiliency including: installing backflow preventers; installing permeable paving; maintaining streams; providing redundancy in operating systems and critical facilities; strengthening zoning codes with regard to resiliency and flooding; amending floodplain requirements; purchasing repetitive loss properties; maintaining a current list of repetitive loss properties

Portions of Jones Falls has paved channel beds to "facilitate passage of flood flows" (*Flood Study,* 6)

Several mill structures have been demolished as a flood mitigation measure (Mount Washington Mill Nomination, 8-5)

June 1972 - following Hurricane Agnes, the windows on Clipper Mill's bottom two stories were sealed and the cupola was removed (Clipper Mill Nomination, 1)

### COMMUNITY RATING CLASSIFICATION: 5

## RESOURCES


Bird, Betty and Rebecca Plant. *Mount Vernon Mill No. 1 Nomination*. (*Mill No.1 Nomination*) Betty Bird & Associates. 30 June 2000.

Black, Catharine F. *Londontown Manufacturing Company, Inc. Nomination Form*. (*Londontown Nomination*) Maryland Historical Trust. 1 November 1972.

*City of Baltimore Disaster Preparedness and Planning Project*. (*CBDPP Project*) October 2013 http://www.baltimoresustainability.org/plans/disaster-preparedness-plan/.

*Clipper Mill Nomination*.

Culhane, Kerri. *Maryland Historical Trust NR-Eligibility Review Form Mount Vernon Mill No. 1*. (*NR-E Mill No. 1*) John Milner Associates, Inc. February 2000.

Culhane, Kerri. *Maryland Historical Trust NR-Eligibility Review Form Park Mill*. John Milner Associates, Inc. August 1999.

Culhane, Kerri. *Maryland Historical Trust NR-Eligibility Review Form Woodberry Mill/Schenuit Rubber*. John Milner Associates, Inc. August 1999.

Culhane, Kerri. *Maryland Historical Trust NR-Eligibility Review Form Woodberry Mill/Schenuit Rubber #B-1035/B-1308*. (*NR-E Woodberry*) John Milner Associates, Inc. August 1999.

*Flood Insurance Study City of Baltimore, Maryland*. (*Flood Study*) Federal Emergency Management Agency. 30 November 2012. https://www.rampp-team.com/county_maps/maryland/baltimore_city_coastal/baltimore_city_md_fis_tables_cpmr.pdf.

Joyce, John M. *An Assessment of Maryland's Vulnerability to Flood Damage. (Flood Damage)* Maryland Department of the Environment. August 2005. http://www.prattlibrary.org/uploadedFiles/www/locations/central/business_science_and_technology/subject_guides/An%20Assessment%20of%20Marylands%20Vulnerability%20to%20Flooding-1%20(1).pdf.

*Maryland Historical Trust Inventory Form for State Historic Sites Survey; Clipper Mill*. (*Inventory Clipper Mill*)

*Maryland Historical Trust Inventory Form for State Historic Sites Survey; Park Mill*. (*Inventory Park Mill*)

*Maryland Historical Trust Inventory Form for State Historic Sites Survey; Mt. Vernon Mill #1*. (*Inventory Mill #1*)

*Maryland Historical Trust Inventory Form for State Historic Sites Survey; Washington Mill*. (*Inventory Washington Mill*)

*Mount Washington Mill Historic District (Boundary Increase) Nomination*. (*MWMHD Nomination*)

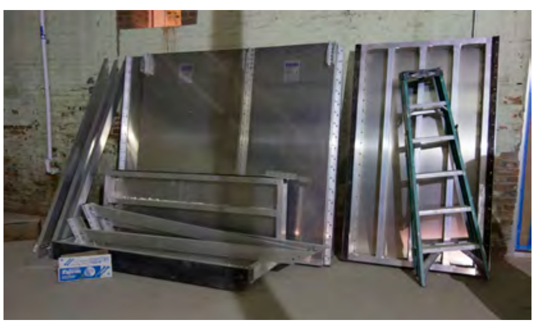
Shoken, Fred. *Mount Washington Mill Nomination*. 6 December 1989.

The lower sashes of the ground floor windows at Whitehall Mill are constructed using aquarium glass supported by a heavy-duty steel frame that is secured into the masonry, with a standard upper sash.


As viewed from the exterior, the replacement sash with the aquarium glass looks similar to a typical replacement window with applied muntins, with a slight difference occuring at the meeting rail, where the offset between the upper and lower sashes is minimized.

*The majority of the ground floor windows were not re-opened as part of the Whitehall Mill rehabilitation, particularly those at the garage.*

*Attachments for flood gates are located at door jambs and embedded in paving.*



*Flood gates must be carried to correct location and installed after the building has been evacuated.*

*Storm water from the roof drains to grade.  Also note the permeable parking pavers.*

## SITE VISIT - MAY 24, 2016

**Attendees:**

David Tufaro, Terra Nova Ventures, LLC (Whitehall Mill)

Johns Hopkins, Baltimore Heritage (Whitehall Mill)

Betty Bird, Betty Bird & Associates, LLC (Whitehall Mill)

Stacy Montgomery, CHAP (Meadow Mill)

Lauren Schiszik, CHAP (Meadow Mill)

Walter Gallas, CHAP (Meadow Mill)

Jennifer Sparenberg, MHT

Anne Raines, MHT

Nell Ziehl, MHT

Dominique M. Hawkins, PDP

Sarah Blitzer, PDP

**Overview:**

Water power was instrumental in the historical development of mills in Jones Falls, many of which are historically designated.  Given their proximity to the water, these mill buildings are also highly susceptible to flooding.  The mill buildings have become desirable locations for redevelopment, both for residential and commercial uses.  Recent and ongoing redevelopment projects require compliance with more and more rigorous flood resiliency measures, in addition to compliance with preservation standards as reviewed by the city and in association with the pursuit of historic tax credits.

The site visit included two distinct components.  The first portion of the visit included a meeting with the development team associated with the Whitehall and Mount Vernon Mill No. 1, and the second meeting was with representatives of CHAP, who addressed concerns about redevelopment in Jones Falls as a whole.

**Challenges:**

- The Jones Falls area is one of the most flood-prone areas in the county - With the confluence of three waterways and restricted drainage, a minor rain event can result in flooding
- The redevelopment of the Whitehall Mill was required to meet the most rigorous requirements outlined in the 2013 *City of Baltimore Disaster Preparedness and Planning Project* as well historic preservation standards to be eligible for tax credits - New resiliency requirements caused confusion from the development side about the process and what would ultimately be required for approvals

**Flood Mitigation Approach / Observations:**

**Redevelopment of Whitehaven Mill**

A wet and a dry flood proofing approach is being used in the redevelopment of the building, including:

- Adopting mandated evacuation and flood response flood
- Limiting the use of the ground floor to parking and commercial uses including a farmer's market and a restaurant while locating office and residential space on the second floor - Provisions for flood gates at all 15 ground floor door openings with the exception of the garage area
- Locating all mechanical, electrical, and other equipment on the roof or on the second floor - sump pumps were installed to address storm water ingress
- Limiting first floor window openings (historic openings not necessarily reopened) - installing aquarium glass with a structural steel frame designed to match historic configuration at lower sash where installed - natural light supplemented by skylights through first floor
- Preparing ground floor openings for the installation of flood gates in anticipation of a flood
- City required second means of egress resolved through installation of a bridge from 2nd floor residential wing to higher ground across the roadway

**Meadow Mill**

A previously redeveloped mill building which is prone to regular flooding and has the following issues:

- The parking area is prone to regular flooding with a minor rain event and subsidence - it is re-paved approximately every 3 years
- A 2014 flood forced many businesses to close - new flood walls and flood gates have been installed at door openings, and some window sill heights have been raised
- Several ground floor tenants in the mill complex have been displaced by flooding, some of whom have not returned - repairs after flood events can be very costly

Flood mitigation may require wet floodproofing the ground floor and limiting its use to parking and potentially elevated storage. All commercial uses should be relocated to upper floors or accept the disruption and costs associated with repairs following a flood event. The reduction in leasable space will have a financial impact on property owners.

*The waterway is highly restricted and prone to flooding in a minor rain event.*


*The parking area is repaved approximately every 3 years at the Meadow Mill due to flood-triggered subsidence.*

*"Temporary" flood protection can be found on this rear door at the Meadow Mill.*

*Following loss from a 2014 flood, the window sills were raised and flood walls installed at the Meadow Mill.*

# E NORTH BRENTWOOD

North Brentwood
PDP Site Visit Boundary
MHT Preservation Easements
National Register of Historic Places
MIHP
100 Year Floodplain
N
DoIT, MD iMAP, MDP
ALLISON ST
WINDOM RD
WALLACE RD
WEBSTER ST
VOLTA AV
UPSHUR ST
TAYLOR ST
RHODE ISLAND AV
BANNER ST
41ST AV
40TH ST
39TH PL
38TH PL
38TH ST
39TH ST
GAINES PL
38TH AV
EMERSON ST
ALLEY #5
CRITTENDEN ST
BUCHANAN ST
41ST PL
41ST ST
40TH PL
40TH AV
ALLEY #9
ALLEY #1
ALLEY #3
PENNWOOD RD
COTTAGE TE

**PROFILE**

County: Prince George's

Population:

- County: 909,535
- Town: 518

Flood Risk: Storm surge, storms Category 3 and above

Town Average Household Income: $74,167

Town Owner-occupied housing: 84.4%

**HISTORIC DESIGNATIONS***

- North Brentwood National Register Historic District

  * Several properties outside of the National Register Historic District are locally designated

**LOCAL HISTORIC PRESERVATION REGULATORY CONTROL**

Prince George's County Historic Preservation Commission

# E. NORTH BRENTWOOD

## HISTORICAL DEVELOPMENT

- The Randall family were the first to build homes in the late-19th century and the community continued to expand outward in several phases (*NBHD Nomination*, 1)
- By 1904, a one-room schoolhouse had been constructed, which was replaced by a Rosenwald school in 1924 (*NBHD Nomination*, 7-2)
- Contemporaneously with the schoolhouse, the community erected the Baptist Church and the Brentwood African Methodist Episcopal Zion Church (*NBHD Nomination*, 7-2)
- Before World War II, the community continued to build, often relying on the bungalow style to construct homes (*NNBHD Nomination*, 7-3)
- After World War II, an undeveloped plot of land was purchased and Cape Cod style homes were constructed (*NBHD Nomination*, 7-3)
- The existing built fabric illustrates the growth of the community, 75% of which was built between 1891 and 1950 (*NBHD Nomination*, 7-3)
- Historically, North Brentwood is a working class community from all trades and professions (*NBHD Nomination*, 8-14)

## HISTORICAL SIGNIFICANCE

- The town is significant as community planned for African American families by Captain Wallace A. Bartlett, a commander of the U.S. Colored Troops during the Civil War (*NBHD Nomination*, 8-1)
- Families who settled in North Brentwood purchased their own homes and, over time, developed a community that could support its own social and political institutions (*NBHD Nomination*, 8-1)
- It is the first black community incorporated in the county and it exhibits a variety of domestic styles of architecture (*NBHD Nomination*, 8-2)

## BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- Public water and sewer service provided through Prince George's County (*Plan 2035*, 235)

## ACCESS TO ROADWAYS AND BRIDGES

- Located just off Rhode Island Avenue/Route 1 and within the Beltway, North Brentwood is within the Washington metropolitan area (*Plan 2035*, 54)
- The county is linked to Washington, D.C. by a dense transit system, with the second highest number of Metrorail stations in the region - and extensive roadways I-95/495 and I-295 (*Plan 2035*, 72-3)

## ACCESS TO PUBLIC SERVICES

- In cooperation with the municipalities within the county, residents have access to "police, code enforcement, parks and recreation, public works, social services, solid waste and recycling and planning and economic development" (*Plan 2035*, 232)

## ACCESS TO PRIVATE SERVICES

- Private services available along Rhode Island Avenue, which borders North Brentwood to the southeast

## POPULATION'S PROFILE

- The county's population is expected to increase, and its median age has increased (*Plan 2035*, 55)

## INDUSTRY

- Located within the Washington metropolitan area, the county has access to the area's 3.9 million jobs (*Plan 2035*, 54)
- 71% of the county is employed in the private sector, with healthcare as the largest employment sector (*Plan 2035*, 65-6)

## RESOURCES


*North Brentwood Historic District Nomination*. (*NBHD Nomination*)

*Plan 2035 Prince George's Approved General Plan*. (*Plan 2035*) 6 May 2014. https://issuu.com/mncppc/docs/plan_2035_approved_general_plan_boo.

*US Census*. 2010 http://www.census.gov/prod/cen2010/cph-1-22.pdf.

*Review Plan Approval for Prince George's County Levee System Evaluation Reports, Prince George's County, Maryland*. (*Review Plan*) 3 July 2013. http://www.nad.usace.army.mil/Portals/40/docs/CW%20Review%20Plans/E%20AND%20C/Review%20Plan%20Approval%20-%

.


### HISTORY OF FLOODING

Potential for severe flooding from Northwest Branch (*NBHD Nomination*, 8-1)

Flood risk made the land upon which North Brentwood is constructed less desirable (*NBHD Nomination*, 8-6)

Historically, heavy rain could raise the Northwest Branch up to 8 feet (*NBHD Nomination*, 8-6)

The town continued to deal with repeated flooding until the construction of the Bladensburg Pump Station in the 1950s (*NBHD Nomination*, 8-7)

### MITIGATION MEASURES

In the 1890s, Bartlett dug ditches for drainage (*NBHD Nomination*, 8-6)

In the 1950s, the United States Army Corps of Engineers built a levee designed "to be substantially higher than the maximum flood of record at the time of construction [...]" (*Review Plan*, 2)

### COMMUNITY RATING CLASSIFICATION: 5

*View from the top of the levee towards Rhode Island Avenue.*

*Residential properties are located along the base of the levee.*

*Late-19th century wood-framed residences are located throughout North Brentwood.*

*The Bladensburg Pump Station is located at the base of the levee adjacent to the basketball court.*

## SITE VISIT - MAY 26, 2016

**Attendees:**

Dominique M. Hawkins, PDP

Sarah Blitzer, PDP

**Overview:**

A levee is located along the northeast border of North Brentwood, and Rhode Island Avenue forms the southeastern edge at the height of the levee along the Northwest Branch of the Anacostia River. The neighborhood topography is essentially forming a basin for storm water collection and appears lowest along the levee edge, generally rising towards the southwest. Much of the historic district is composed of late-19th century wood-framed residences on regularly spaced lots, with some mid-20th century brick homes located along Windom and Wallace Roads.

The site visit was conducted without the benefit of a local guide and included a walking and driving tour of the neighborhood.

**Challenges:**

- The neighborhood is built at the base of the a 1950s Army Corps of Engineers levee that appears to be approximately 20 feet tall
- It was clear that any breech of the levee could result in significant flooding of the residential area, particularly along Allison Street
- Although the houses retain their historic character, significant deferred maintenance was observed, which could make the houses more prone to damage in the event of a flood

**Approach / Observations:**

- A significant portion of the neighborhood is located within a National Register Historic District, most of which is also located within the bounds of the 100-year floodplain
- The river's water level was well below the top of the levee at the time of the site visit - as well as below the historic 8-foot water level rise associated with heavy rainfall
- The levee has vegetated banks - the top of the levee includes a walking / biking trail - a basketball court, playground and picnic pavilion are located at the North Brentwood base of the levee, providing a neighborhood amenity
- A Bladensburg Pump Station, constructed in the 1950s, is located at the base of the levee at the termination of Banner Street - It is assumed that it serves to pump out collected water at he base of levee, although not confirmed

**Possible Mitigation Strategies:**

The levee and pump station provide North Brentwood with protection from flooding. A breach in the levee or failure in operation of the pump station could be devastating to a large number of residences. Maintaining these mitigation measures is critical to the buildings in this community.

*Mid-20th century brick homes are located along Windom and Wallace Roads.*

*The North Brentwood AME Zion Church is an important locally designated landmark.*

*Although of varying form and style, there is a consistency in the scale, form, mass, setbacks and fenestration patterns of the residential buildings along the streetscape.*

# F

# PORT DEPOSIT

Port Deposit
N MAIN ST
VANNORT DR
CENTER ST
FERRY ST
OYSTER SHELL ALLEY
HIGH ST
S MAIN ST
ALLEY #5
PDP Site Visit Boundary
MHT Preservation Easements
National Register of Historic Places
MIHP
100 Year Floodplain
N
DoIT, MD iMAP, MDP

**PROFILE**

County: Cecil

Population:

- County: 101,108
- Town: 653

Flood Risk: Heavy rains, riverine, dam release

Average household income: Unavailable

Owner-occupied housing: 48.3%

**HISTORIC DESIGNATIONS**

- Port Deposit National Register Historic District

**LOCAL HISTORIC PRESERVATION REGULATORY CONTROL**

Cecil County Historic District Commission (HDC)

# F. PORT DEPOSIT

## HISTORICAL DEVELOPMENT

- Port Deposit's location on the banks of the Susquehanna River attracted industry, which also supported the town (*PDHD Nomination*, 2)
- The Town of Port Deposit was essentially developed linearly along Main Street between the railroad line and river to the southwest and the face of the granite hill to the northeast
- In 1812, the town was renamed Port Deposit and prospered as the "port of deposit for raw materials including flour, potatoes, whiskey, lumber, grain and coal" - These raw materials, shipped down the Susquehanna River, were deposited in Port Deposit and then transferred to ships en route to Baltimore (*PDHD Nomination*, 8)
- Port Deposit's quarry produced granite, which was shipped throughout the region, can be found throughout the town (*PDHD Nomination*, 2)
- Historically, buildings were built with high basements and retaining walls were constructed to protect against flood (sometimes using Port Deposit granite) (*PDHD Nomination*, 3)
- The town benefitted from Jacob Tome, a resident of Port Deposit during the 19th century, who owned businesses in lumber, grain, and finance - In addition to his economic support and the buildings associated with his home, Tome's estate established the Tome Institute, a boys' school and a gymnasium for Port Deposit (*PDHD Nomination*, 5)
- Due to its nature as a point of transfer, many inns were established in Port Deposit, some of which have been converted into apartments (*PDHD Nomination*, 4)

## HISTORICAL SIGNIFICANCE

- Port Deposit, known as Creswell's Ferry, flourished "as an exchange point for travelers" between ferry and stage coach (*PDHD Nomination*, 2)
- Historic district exhibits a variety of domestic architectural styles, including Second Empire, Eastlake, Queen Anne as well as simple rowhomes (*PDHD Nomination*, 3-4)
- The presence of the Tome Institute, which educated white children regardless of class, including orphans, made Port Deposit a center of education in the 19th century (*PDHD Nomination*, 11)

## BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- Water is sourced from the Susquehanna River - There have been system upgrades of drinking water infrastructure, though the county notes that water quality is a concern in Port Deposit (*CCC Plan*, 6-5)
- County operates one public wastewater collection and treatment system: Seneca Point Advanced Wastewater Treatment Plant (*CCC Plan*, 6-1)
- Bainbridge, a former U.S. Navy Training Center located on the former Tome School campus and overlooking historic Port Deposit, is a 1,200 acre site, of which 350 acres have been reserved for development for "employment uses" and Cecil College - The remaining 850 acres are earmarked for residential development (*CCC Plan*, 4-13)

## ACCESS TO ROADWAYS AND BRIDGES

- Route 222 [Main Street] runs through the center of Port Deposit and is "the only traffic corridor [...and] is too narrow to handle the level of certain types of automobile and truck traffic" (*The Town of Port Deposit Comprehensive Plan*, 28) with lane reconstruction identified as a county priority (*CCC Plan*, 5-7)

## ACCESS TO PUBLIC SERVICES

- The county operates 17 elementary schools, 6 middle schools, and 5 high schools (*CCC Plan*, 8-1) - None of which are in Port Deposit
- County plans to move the Port Deposit/Bainbridge Branch of the public library to a permanent facility in Bainbridge (*CCC Plan*, 8-17)

## ACCESS TO PRIVATE SERVICES

- Port Deposit's commercial area primarily serves the local community, with more significant retail activity located in Perryville (*CCC Plan*, 4-13)

## POPULATION'S PROFILE

- County population is expected to increase 49% by 2030 (*Cecil County Comprehensive Plan*, 2-6) - In contrast, Port Deposit experienced a drop in population between 1970 and 1980 and has remained flat since the 1980s (*PDC Plan*, 5)
- As of 2000, 68% of homes in Cecil County were owner-occupied (Cecil County Comprehensive Plan, 9-2) - In Port Deposit, 48.9% are owner-occupied (*PDC Plan*, 9)
- Following the Bainbridge re-development, the town estimates 300% growth, thus encouraging further development, including infill (*TPDC Plan*, 5)

### HISTORY OF FLOODING

Built on the Susquehanna River's floodplain, Port Deposit has experienced flood many times throughout its history (*PDHD Nomination*, 3)

Major flooding in 1886 destroyed the town's records (*PDHD Nomination*, 3)

August 18, 1955, Hurricane Connie: flooding of the Susquehanna (*Flood Insurance*, 5)

August 1969: Port Deposit flooded following heavy thunderstorms, which caused washouts on the Susquehanna - Unconfirmed reports that Port Deposit received 6" of rain in 2 hours (*Flood Insurance*, 6)

January, 1996, an ice jam formed on the Susquehanna River and the Conowingo Dam crested at 34.18 feet

September 2011; Combination of heavy rainfall and swelled waterways led to a voluntary evacuation of the town - The Susquehanna River crested at 33 feet

### MITIGATION MEASURES

Many buildings were elevated when first constructed and many are set back from the street and the river (*PDHD Nomination*, 3)

Cecil County's Floodplain Overlay District does not allow residential structures to be developed on floodplains and any non-commercial structures must be floodproof (*CCC Plan*, 7-5)

As of the publication of the FEMA Floodplain Study, "no major flood control structures exist in Cecil County" - The only flood protection measures that exist in the county are small ponds and channelization projects - Port Deposit relies on upstream dams to reduce flooding (*Flood Insurance*, 7)

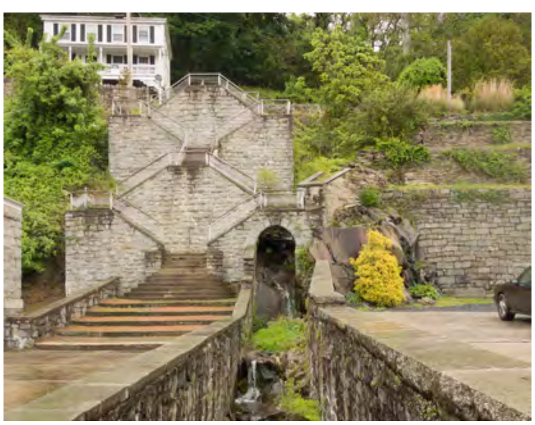
Port Deposit's 2015 floodplain overlay zone outlines Special Flood Hazard Areas, BFEs, Floodplain Administrator responsibilities and flood hazard area requirements (*Floodplain Zoning*)

Ground floor spaces recommended for commercial use (*PDC Plan*, 61)

### COMMUNITY RATING CLASSIFICATION: 8

*Port Deposit features a large variety of architectural styles, and the residences are generally of wood-framed construction atop a granite foundation.*

*The institutional buildings, including the churches, were typically constructed of masonry, most often local granite.*



*The hill northeast of Main Street is very steep incorporates some designed drainage.*

## INDUSTRY

- Tourism, agriculture and manufacturing provide significant employment in the county (*CCC Plan*, 4-7 – 4-9)
- Port Deposit is cited as a historic site that attracts tourism (*CCC Plan*, 4-8)
- The town has a higher unemployment rate, 6.4%, than the rest of the county at 2.8% - The poverty rate is also three times the county's rate of poverty (*PDC Plan*, 7)
- Based on the 2000 U.S. Census, educational, health and social services is the largest industry of employment in Port Deposit, followed by: (a) Professional, scientific, management, administrative, and waste management services, (b) Manufacturing and (c) Arts, entertainment, recreation, accommodation, and food services (*PDC Plan*, 8)

## RESOURCES


Andreve, George J. *Port Deposit Historic District Nomination*. (*PDHD Nomination*) Spring 1976.

*Cecil County Comprehensive Plan*. (*CCC Plan*) 13 April 2010. www.ccgov.org/uploads/PlanningAndZoning/General/2010ComprehensivePlan.pdf.

Federal Emergency Management Agency. *Flood Insurance Study; Cecil County, Maryland and Incorporated Areas*. (*Flood Insurance*) 8 July 2013.

Federal Emergency Management Agency. *Proposed Flood Insurance Rate Map Revision Determination*. (*Map Revision*) 1 August 2016. www.portdeposit.org/uploads/ckfiles/files/16_08_01_FloodMap_Revision_15-03-2779P-240025.pdf.

*Ordinance 2015-02 Floodplain Zoning*. (*Floodplain Zoning*) www.portdeposit.org/uploads/ckfiles/files/2015_02_Floodplain_Zoning.pdf.

*Port Deposit Flood Insurance Rate Map*. (*Port Deposit FIRM*) 4 May 2015. www.portdeposit.org/uploads/ckfiles/files/PortDeposit_FM24015C0126E_2015.pdf.

*Town of Port Deposit Comprehensive Plan*. (*PDC Plan*) August 2009. www.planning.maryland.gov/PDF/OurWork/CompPlans/Cecil/PortDeposit/09_CMP_PortDeposit.pdf.


*The elevation of the primary floor above the sidewalk can pose accessibility challenges.*

*Retail is typically at the ground floor with residential above. This building includes a side elevation, lower level entrance that is more vulnerable to flooding. Also note the new residential construction beyond the railroad tracks at the bottom left corner of the photograph.*

## SITE VISIT - 17 MAY 2016

*The primary floor of this brick, multi-family residence is elevated above the sidewalk level.*

*Some homes have been rehabilitated, highlighting their architectural character.*

*Some homes have been abandoned and have lost important features such as a front porch.*

*Most residences are located close to the sidewalk on narrow lots. Although there is variety in materials and architectural style, there is streetscape continuity.*

**Attendees:**

Vicky Rinkerman, Port Deposit

Jennifer Sparenberg, MHT

Dominique M. Hawkins, PDP

Sarah Blitzer, PDP

**Overview:**

Historic Port Deposit is uniquely situated between the north western bank of the Susquehanna River and a steep granite embankment. The historic district is approximately 1-mile in length, centered on Main Street, and generally is one property deep on each side of the street. A raised railroad line separates Main Street from the river. Two openings can be found along the railroad line that provide access to elevated, contemporary, residential development front on the river. The site visit included a meeting at Town Hall and a walking tour along Main Street by PDP.

**Challenges:**

- The historic town is subject to flooding from heavy rains coming down the face of the granite hill as well as riverine flooding
- The riverine flooding is exacerbated by discharges from the Conowingo Dam, which typically includes significant sediment and leaves a muddy residue
- The town has not recovered from extensive flooding in 2011
- The Bainbridge Navy Base located on the hill above the historic town was abandoned in 1976, a former economic driver of the town - The site was found to be contaminated with asbestos and PCBs in the 1980s - Now awaiting a remediation and a redevelopment plan
- The wastewater treatment plant is located on river and is subject to flooding - A temporary repair is scheduled for the summer of 2016, but plant is in need of general maintenance and upgrading
- Employment opportunities in the area have declined, depressing real estate values, reinvestment and the local tax base - Houses available for $10,000-$20,000 with owner abandonment for high mortgages or flood insurance rates
- Approximately 650 residents, with approximately 60% renter occupied housing
- Commercial offerings generally geared towards tourists, including restaurants and small shops - Lack of local grocery stores or banking

**Approach / Observations:**

The former prosperity of the community is reflected in the quality and range of architectural styles of its buildings. The majority of the buildings, primarily residences, were constructed with raised primary floors. Today, many of the buildings, particularly the lower levels, appear to be under-utilized. The possibility of elevating the handful of buildings that were constructed at grade is being explored.

The proximity to I-95 and quality housing stock have increased the redevelopment potential, although the current low population and depressed tax base make it challenging to provide a full range of essential infrastructure improvements and services.

The Town includes an active Historic Area Commission.

The discharges from the Conowingo Dam are driven by internal concerns, reportedly without concern for the effect on downstream communities. The transported silt reportedly forms a muddy crust as it dries, exacerbating clean-up.

Based upon a study conducted by the US Army Corps of Engineers, a storm water drainage project is currently being undertaken that will include backflow preventers, larger pipes and new outfalls. To address riverine flooding from encroaching onto Main Street, negotiations are ongoing with the railroad regarding the possibility of installing gates to allow the temporary closing of the railroad underpasses, which potentially includes installation of a slurry wall along the rail line.

Port Deposit is currently conducting a Hazard Mitigation Plan in conjunction with the Town of Elkton, Maryland.

**Possible Mitigation Strategies:**

- Improving stormwater management in the upper reaches of the watershed above the town (if possible), to alleviate flooding in town
- Increasing capacity of stormwater facilities in town
- Adding and/or improving floodproofing of the wastewater treatment plant in the course of it maintenance and upgrading
- Raising systems and equipment out of vulnerable areas prior to a flood event

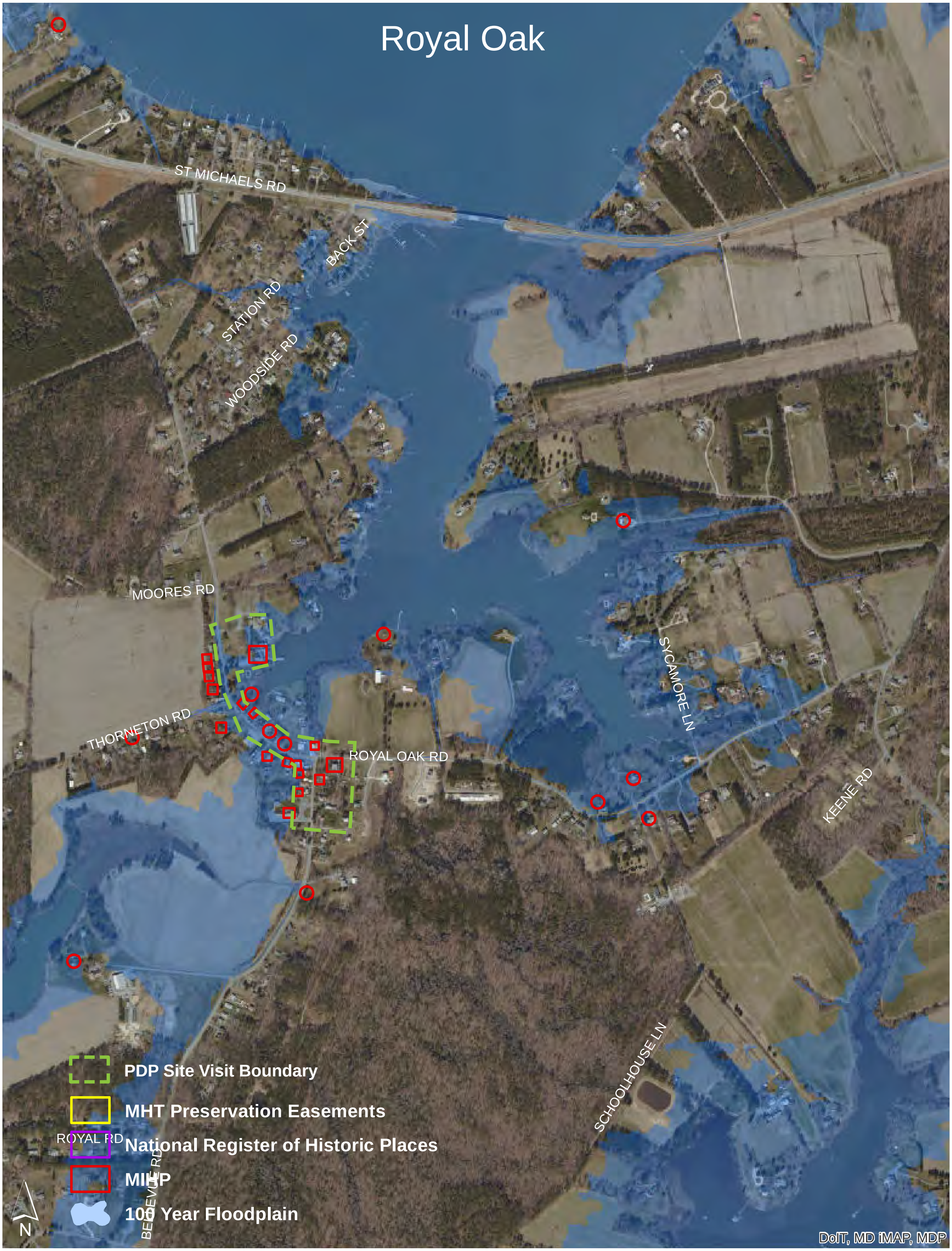
*A handful of homes were constructed with the first floor level at about the same elevation as the sidewalk.*

*This is one of two railroad underpasses that provide access between Main Street and the river.*

*The terraced landscape directs storm water runoff down the hill towards Main Street.*

*Stormwater drainage from buildings generally discharges to grade.*

# G
# ROYAL OAK


Royal Oak
ST MICHAELS RD
BACK ST
STATION RD
WOODSIDE RD
MOORES RD
THORNETON RD
ROYAL OAK RD
SYCAMORE LN
KEENE RD
SCHOOLHOUSE LN
ROYAL RD
BELLEVUE RD
PDP Site Visit Boundary
MHT Preservation Easements
National Register of Historic Places
MIHP
100 Year Floodplain
N
DoIT, MD iMAP, MDP

**PROFILE**

County: Talbot

Population:

- County: 19,577
- Town: Approximately 250

Flood Risk: Tidal flooding, storm surge, sea level rise

Average household income: Unavailable

Owner-occupied housing: Unavailable

**LOCAL HISTORIC PRESERVATION REGULATORY CONTROL**

Talbot County Historic Preservation Commission - Limited Review

## G. ROYAL OAK

### HISTORICAL DEVELOPMENT

- Area known for its quality farmland - Village surrounded by plantations and farming that relied on water for shipping of goods (Site visit)
- Royal Oak is comprised of a mixture of lot sizes, home styles, agricultural uses, various commercial enterprises, and public facilities (*Royal Oak Village Plan*)
- Royal Oak is a stable community and had 29 new homes built within the past 15 years - Several decrepit homes have been demolished and replaced with new homes - Currently there are 25 vacant lots (*Royal Oak Village Plan*)
- As you approach "downtown" from Easton on Royal Oak Road, the area is characterized by small lot (i.e., 0.10 to 0.25 acre) single family homes, some rentals, and commercial enterprises (*Royal Oak Village Plan*)

### HISTORICAL SIGNIFICANCE

- Settlement in the area that is now Royal Oak dates back to land grants made in 1659 (prior to Easton and St. Michaels) because of its proximity to Oxford, a major shipping port (*Royal Oak Village Plan*)
- Royal Oak recognized by the US government in 1837 as a town (*Royal Oak Village Plan*)
- Many lots and homes date back to 1800's (*Royal Oak Village Plan*)

### BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- The village has a public sewer system available to all properties within its boundaries as well as some peripheral areas outside the village zoning (*Royal Oak Village Plan*)

## ACCESS TO ROADWAYS AND BRIDGES

- Village roadways are subject to flooding and standing water, particularly where drainage ditches are absent (Site visit)

## ACCESS PRIVATE SERVICES

- A "Tea barn" is located in the former general store and antique and collectables stores are located at the village center (Site visit)
- The Royal Oak House Bed & Breakfast and The Oaks Inn & Conference Center host a number of events (*Royal Oak Village Plan*)

## POPULATION'S PROFILE

- The population of Royal Oak is approximately 220 adults and 30 children, in 114 households, the majority of the children attend the St. Michaels' public schools (*Royal Oak Village Plan*)
- The majority of homes are filled with full time residents and of those most are second or third generation residents - There are a few homes that are occupied by part-time or weekend occupants (*Royal Oak Village Plan*)

## INDUSTRY

- Most village residents work service jobs in the county, while some work entirely in the village - Twenty-six homes have a commercial component (*Royal Oak Village Plan*)
- Royal Oak is unusual for Talbot County, in that there has been very few demographic changes or growth in the number of households over the years, owing in part to the opportunities afforded within Royal Oak and the surrounding area (*Royal Oak Village Plan*)

## RESOURCES

Federal Emergency Management Agency. *Flood Insurance Study: Talbot County, Maryland and Incorporated Area*. (*Flood Insurance*) 5 August 2013. http://www.talbotcountymd.gov/uploads/File/P&Z/flood%2013.pdf.

Talbot County, Maryland. *Royal Oak Village Plan* - http://www.talbotcountymd.gov/index.php?page=village-plans.

### HISTORY OF FLOODING

Royal Oak is in a low lying area, with a high water table and poor drainage (*Flood Insurance*, 8)

Major flood events in the county happened in: 1876, 1933, 1935, 1954, 1955, 1960, 1962, 1967, 1972, and 1975 (*Flood Insurance*, 9)

### MITIGATION MEASURES

In 2013, Talbot County updated its Floodplain Management Ordinance and adopted Federal Emergency Management Agency riverine Digital Flood Insurance Rate Maps and updated Flood Insurance Study - These actions resulted in the county's rating upgrade ( http://www.talbotcountymd.gov/index.php?page=FEMA_CRS)

### COMMUNITY RATING CLASSIFICATION: 8


*The former general store at the Village crossroads is now a tea house.*

*There is a great diversity of architectural styles. Many homes in the village have been rehabilitated.*

*Several homes have water frontage at their rear yards.*

*Debris was clogging some of the storm water drains, impeding water flow.*

## SITE VISIT - MAY 26, 2016

**Attendees:**

Jeremy Rothwell, Talbot County
Michael Day, MHT
Anne Raines, MHT
Nell Ziehl, MHT
Jennifer Sparenberg, MHT
Dominique M. Hawkins, PDP
Sarah Blitzer, PDP

**Overview:**

Royal Oak was the historic center of the surrounding farming community. The "downtown" or center of the village is located at the crossroads of Royal Oak and Bellevue Roads, which includes a concentration of historic buildings, primarily residences, of varying architectural styles, located on relatively small lots. Reportedly, there is has been an influx of wealthy retirees and seasonal residents in downtown over the last 20 years, while the farming land and population has declined. Many homes have been rehabilitated by new owners, with the only known building elevation occurring at the Nesbitt House. The focus of the site visit was a walking tour along Royal Oak and Bellevue Roads, primarily reviewing the village's character and roadway drainage issues.

**Challenges:**

- There are roadway drainage issues where flanking ditches are not present, with standing water collecting at the intersection of Royal Oak and Thorton Roads - There is nowhere for the water to drain
- Flooding could be significant in a major storm or hurricane
- The county can require Historic Preservation Commission review for commercial projects

**Approach / Observations:**

- The County has adopted a strict Floodplain Management Ordinance (2013) that currently requires buildings in the 100-year floodplain undergoing substantial rehabilitation be elevated to a height that includes 2' of freeboard
- There is no local historic preservation review body, and property owners must request designation - 30 properties are registered as historic and can apply for an exemption from elevation requirements, although it is not clear that the exemption will remain
- Although many of the houses have been rehabilitated, there are several historic properties that suffer from deferred maintenance and if rehabilitated, might be subject to the new Floodplain Management Ordinance

**Possible Mitigation Strategies:**

- Improving roadway drainage including providing continuous drainage ditches that drain to waterways flanking roads
- Supplementing drainage ditches with stormwater pipes and underground storage/retention structures
- Providing the framework for review of proposed historic building elevations to encourage sensitive design appropriate for historic character
- Raising systems and equipment out of vulnerable areas prior to a flood event

*The ditches at the side of the road are not continuous.*

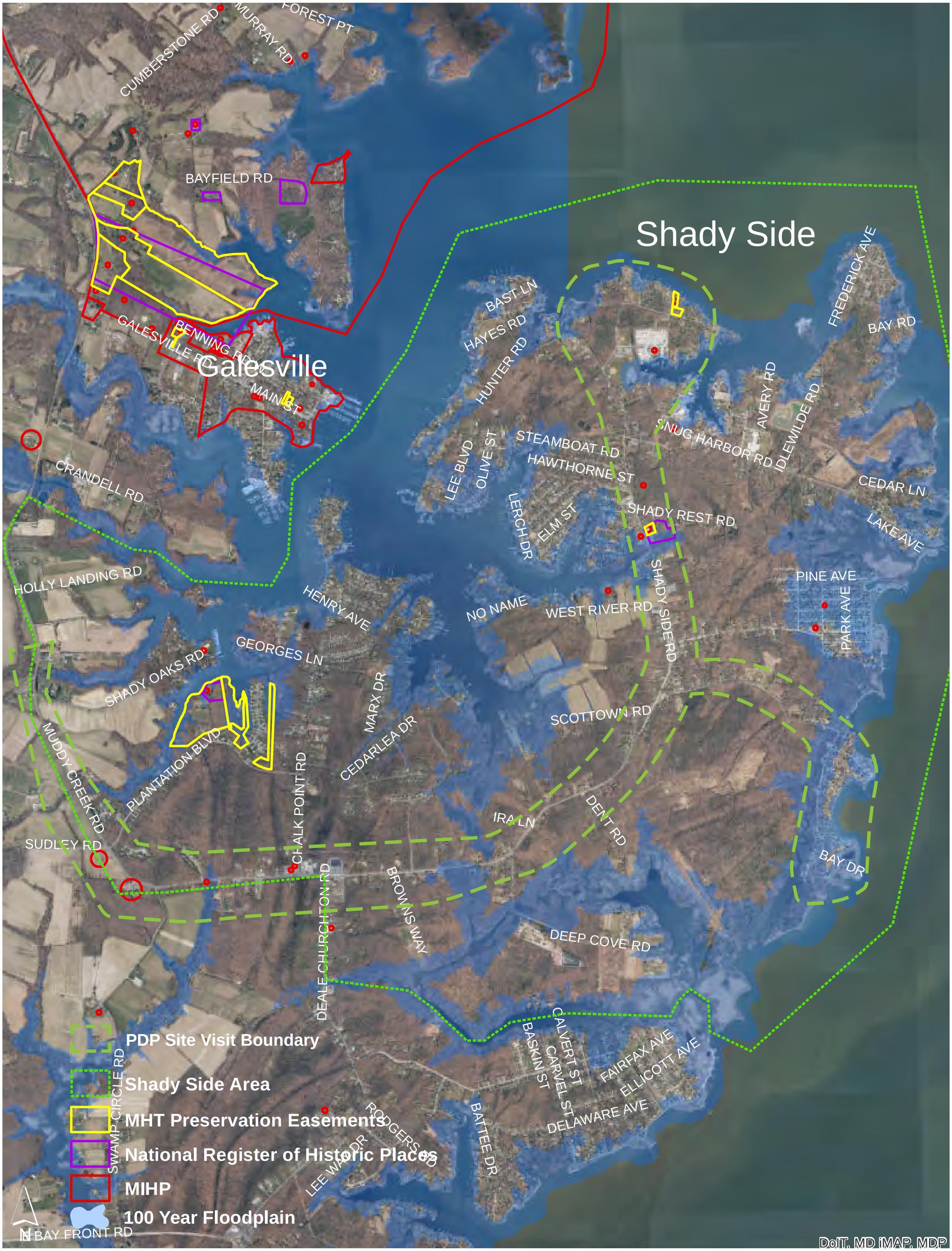
*Both piped and surface storm water is directed towards this drainage channel, which often backs-up, flooding the roadway surface.*

*Although many homes in the Village have been rehabilitated, there are several properties that appear to be abandoned.*

*This historic church is showing signs of deterioration related to deferred maintenance.*

# H

## SHADY SIDE & COLUMBIA BEACH


Shady Side
Galesville
FOREST PT
MURRAY RD
CUMBERSTONE RD
BAYFIELD RD
GALESVILLE RD
BENNING RD
MAIN ST
CRANDELL RD
HOLLY LANDING RD
HENRY AVE
GEORGES LN
SHADY OAKS RD
PLANTATION BLVD
MUDDY CREEK RD
SUDLEY RD
CHALK POINT RD
DEALE CHURCHTON RD
MARX DR
CEDARLEA DR
BROWNS WAY
IRA LN
DENT RD
SCOTTOWN RD
WEST RIVER RD
NO NAME
SHADY SIDE RD
SHADY REST RD
LERCH DR
ELM ST
HAWTHORNE ST
STEAMBOAT RD
LEE BLVD
OLIVE ST
HUNTER RD
HAYES RD
BAST LN
SNUG HARBOR RD
AVERY RD
IDLEWILDE RD
FREDERICK AVE
BAY RD
CEDAR LN
LAKE AVE
PINE AVE
PARK AVE
BAY DR
DEEP COVE RD
BASKIN ST
CALVERT ST
CARVEL ST
FAIRFAX AVE
ELLICOTT AVE
DELAWARE AVE
BATTEE DR
ROGERS RD
LEE WARD DR
SWAMP CIRCLE RD
BAY FRONT RD
PDP Site Visit Boundary
Shady Side Area
MHT Preservation Easements
National Register of Historic Places
MIHP
100 Year Floodplain
DoIT, MD iMAP, MDP

## H. SHADY SIDE & COLUMBIA BEACH

### HISTORICAL DEVELOPMENT

**Shady Side**

- Once known as "The Great Swamp" for its wetlands, the Shady Side area was important to Native Americas as fishing and hunting grounds - Traces of these activities can still be found along the coast, such as shell middens (*SAP*, 14)
- Following settlement by Europeans in the 17th century, many inhabitants converted to Quakerism and erected a meeting house (*SAP*, 15)
- Historically, the area's settlers relied on agriculture - including tobacco and grain - and shipped goods along the peninsula's many creeks and inlets (*SAP*, 15)
- In the 19th century, commerce focused on the water and the majority of the population were watermen and boatbuilders, harvesting as Native Americans had done in the past (*SAP*, 16)
- In the 20th century, oysters harvested along the peninsula could be brought to a number of processing plants that developed in the area, including Leatherbury's in Shady Side - Captain Salem Avery was part of this "community of oystermen and watermen [...]" (*SAP*, 16)
- By the 1920s, the area's fishing-related industries and agriculture had waned and today the main attraction is recreation (*SAP*, 18)

**Columbia Beach**

- Established in 1941, Columbia Beach is a historically African American beach community within Shady Side, founded to escape the summer heat and segregation of Washington, D.C. and Baltimore ("A Welcoming Enclave"; CBCIA)
- Families constructed summer cottages in the gated community and enjoyed private access to the shoreline (CBCIA)
- The community has evolved into a more diverse population, with an increase in year-round residents and new families, alongside the descendents of Columbia Beach's original families ("A Welcoming Enclave"; CBCIA)

**PROFILE**

County: Anne Arundel

Population:

- County: 537,656
- Town:
  Shady Side and associated communities: 5,803

Flood Risk: Tidal flooding, storm surge, sea level rise

Average household income: Unavailable

Owner-occupied housing: 87.1%

**HISTORIC DESIGNATIONS**

- Captain Salem Avery House*
- Lula G. Scott Community Center*

* Individually registered in the National Register of Historic Places and locally designated

**LOCAL HISTORIC PRESERVATION REGULATORY CONTROL**

Cultural Resources Division, Anne Arundel County Planning & Zoning Department

## HISTORICAL SIGNIFICANCE

**Shady Side**

- Shady Side is significant for its role in agriculture, fishing, and oystering industries (*SAP*, 15)
- The peninsula's 17th century shipbuilding industry produced many of the ships for Trans-Atlantic and West Indies trade (*SAP*, 15)
- In 1781, Shady Side was the only Revolutionary War battleground in the county (*SAP*, 15-16)

**Columbia Beach**

- Much of the built fabric that exists today, almost entirely residential, was constructed by these black families and the intangible sense of community is highly valued by current residents
- Known as a "A Welcoming Enclave" on a peninsula of the Chesapeake Bay

## BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- Public sewer and associated facilities completed in 1999 - Shady Side is not covered by County water facilities and relies on well water (*SAP*, 21)

## ACCESS TO ROADWAYS AND BRIDGES

- Existing roads are narrow, lack shoulders, and are bordered by drainage ditches (*SAP*, 11)
- It is easy to become stranded following a flooding event, due partly to the many one-way roads - The only means of egress from the community is via MD 468 (*SAP*, 84)
- Issue of access to neighborhood during flooding of major access (Site Visit: Columbia Beach)
- Major roads for access are MD 468 and MD 256, for which the *Small Area Plan* recommends constructing shoulders and traffic circles to improve safety (*SAP*, 11)

## INDUSTRY

- Overall, Anne Arundel County has experienced an increase in jobs since 1990 (*GDP*, 13)
- Shady Side benefits economically from commercial seafood harvesting, recreational fishing, and boating (*SAP*, 13)
- Many residents reside in Shady Side and commute to Annapolis, Baltimore or Washington, D.C. (*SAP*, 13)

### HISTORY OF FLOODING

The community contends with a high water table, hydric soils, and wetlands (*SAP*, 10)

Shady Side has six repetitive loss properties (*Plan Update*, 7-6)

### MITIGATION MEASURES

Refer to Site Visit Section

### COMMUNITY RATING CLASSIFICATION: N/A

## ACCESS TO PUBLIC SERVICES

- Shady Side's children are served by Shady Side Elementary (*SAP*, 68)

## ACCESS TO PRIVATE SERVICES

- As of the publication of the *Small Area Plan*, Shady Side has two grocery stores, a gas station, and several restaurants (68)

## POPULATION'S PROFILE

- Since the 1930s, the county's total population has grown, making it one of the fastest growing counties in the region (*GDP*, 11)
- Shady Side's population experienced a 14% growth, between 1990 and 2000, following the completion of the public sewer and the subdivision of lots (*SAP*, 13)

## RESOURCES

*Anne Arundel County General Development Plan. (GDP).* Anne Arundel County. 19 October 2009. http://planning.maryland.gov/PDF/OurWork/CompPlans/AnneArundel/09_CMP_AnneArundel.pdf.

*Anne Arundel County, Maryland – 2010 Hazard Mitigation Plan Update*. (*Plan Update*) http://www.aacounty.org/departments/office-of-emergency-management/forms-and-publications/2010HazardMitigationPlanSections.pdf.

"Columbia Beach Citizens Improvement Association." (CBCIA) http://www.cbcia.org/.

*Deale / Shady Side Small Area Plan*. (*SAP*) Anne Arundel County. June 2001. http://www.aacounty.org/departments/planning-and-zoning/long-range-planning/small-area-planning/forms-and-publications/DealeShadysideSAP_Final.pdf.

Meyer, Eugene L. "A Welcoming Enclave With Roots in a Snub." ("A Welcoming Enclave") *The New York Times*. 3 Sept. 2009. http://www.nytimes.com/2009/09/04/greathomesanddestinations/04Highland.html.

## SITE VISIT - MAY 23, 2016

**Attendees:**

Jane Cox, Anne Arundel County (Captain Salem Avery House)

Anastasia Poulos, Anne Arundel County Trust for Preservation, Inc. (Captain Salem Avery House)

Stephanie Sperling, Anne Arundel County

Heather Barrett, MHT

Dominique M. Hawkins, PDP

Sarah Blitzer, PDP

*The Captain Salem Avery House was used as a Jewish fishing club.*

**Overview:**

Shady Side is a peninsula situated on the western shore of the Chesapeake Bay that includes the communities of Columbia Beach, Idlewilde, Snug Harbor, and Avalon Shores. The only access to the peninsula is via Shady Side Road (MD 468).

The site visit to Shady Side included two distinct components. The first was a visit to the Captain Salem Avery House located at the northern end of Shady Side. The site visit was limited to an exterior of the building, primarily along the waterfront, and a group discussion to the overall flood-related challenges in Shady Side. The second portion of the site visit was a walking tour of Columbia Beach to review the mid-20th century and new housing, as well as shoreline and landscape improvements.

*Permeable paving facilitates storm water absorption into the soil.*

**Challenges:**

- Shady Side is a relatively flat and low land area with 6 to 8 "high spots" where beach developments were constructed in the 1910s - 1940s, some of which were segregated for African American and Jewish communities
- Flood threats include erosion, high water table, hydric (clay) soils, wetlands and water being pushed from bay towards shoreline due to changes in pressure
- There is resistance to historic designation of early-20th century architecture and developments - as a result, documentation is poor
- With the completion of the public sewer service in 1999, several homes have been rehabilitated and winterized to allow for year-round occupancy, and new infill development has proliferated
- Although the installation of public sewer has addressed the treatment of waste water, Shady Side continues to rely on well water which can be compromised by brackish water
- Recent construction is generally infill, raised from the ground (not significantly elevated) and of a larger scale and different architectural character than early- to mid-20th century housing - Housing built in the last 15 years tends to be subject to more repetitive loss flooding
- Shoreline erosion threatens the shoreline and buildings in addition to archaeological sites, particularly those associated with Native American occupation

*Rain gardens at the Avery House can provide an educational opportunity.*

*Proper ventilation of crawl spaces is important to minimize deterioration of wood floor framing.*

*The entrance to Columbia Beach has a divided roadway flanked by 1-story cottages.*

*Cottages are being rehabilitated and winterized for year-roud use.*

*The cottages in Columbia Beach are generally one-story, wood framed buildings.*

*Recent construction tends to be incompatible with the historic character of neighboring buildings.*

**Approach / Observations**

**General**

Following Hurricane Isabel, riprap was installed on a property by property basis. It has been found that this pushes erosion problems to adjacent sites, and does not necessarily address archaeological sites. "Living shorelines" and bioswales are encouraged by town planners as an alternative to riprap.

Roadways are flanked by drainage ditches that had significant standing water in sunny conditions. The drainage ditches are maintained by the County.

Local preservationists have begun the process of broadly documenting existing buildings with the aid from the 2016 Cultural Resources Hazard Mitigation Planning Grant.

The Beach Resorts Project is an ongoing oral history documentation project attempting to capture the history and sense of place of the beach communities. It includes an effort to collect personal photographs and memorabilia from long-time residents, as well as document racial discrimination.

Archaeological remains of native settlements are being lost through shoreline erosion faster than can be professionally excavated. Local residents have been trained to collect exposed artifacts when found, documenting their location, in an effort to collect information before it is lost. This balance between public and professional involvement in archaeology takes a SWAT approach and is similar to the Site Stewardship Program in Virginia. There are also partnerships between non-profits and communities that encourage community involvement.

**Captain Salem Avery House**

The c. 1860 Captain Salem Avery House was used as a Jewish Fishing Club. As the shoreline eroded, the house has been relocated further inland. Riprap has been installed along the shoreline, protecting from further erosion. A rain garden and permeable paving have been installed on the inland side of the house.

**Columbia Beach**

Columbia Beach was constructed as a gated community with a collection of approximately 150 wood-framed summer cottages built for African Americans. Many of the legacy families associated with the community gather at their cottages during summer holidays for family reunions, greatly increasing the population. Properties include yards, and street parking is prohibited, protecting water access from daily visitors. Standing water was observed in several yards.

Although many of the homes are still used by summer occupants, approximately 50% of the cottages have been rehabilitated and winterized to allow for year-round occupancy after the completion of the sewer system in 1999. There was also visible deferred maintenance at numerous properties, potentially linked to the limited summer occupancy, making them more vulnerable in the event of a storm.

Following significant damage by Hurricane Isabel, homes along the northeastern portion of the community were replaced with new structures which are out of character with their early- to mid-20th century neighbors.

These homes tend to be elevated with parking underneath, have a significantly larger footprint thus reducing the yard, and are constructed in a stylistically incompatible manner with non-traditional fenestration patterns and materials including concrete block and stucco.

Approximately 400 feet of shoreline have been lost in the last 50 years. Riprap was installed to minimize erosion after Hurricane Isabel, using a combination of low interest loans and a special tax in the community. More recently, rain gardens have been installed as well as a bioswale.

**Possible Mitigation Strategies:**

- Limiting future development of the area and establish buffer zones around existing properties
- Establishing incentives property owners to implement infrastructure improvements including storm water management
- Raising systems and equipment out of vulnerable areas prior to a flood event

*A marsh is located across the roadway from Columbia Beach.*

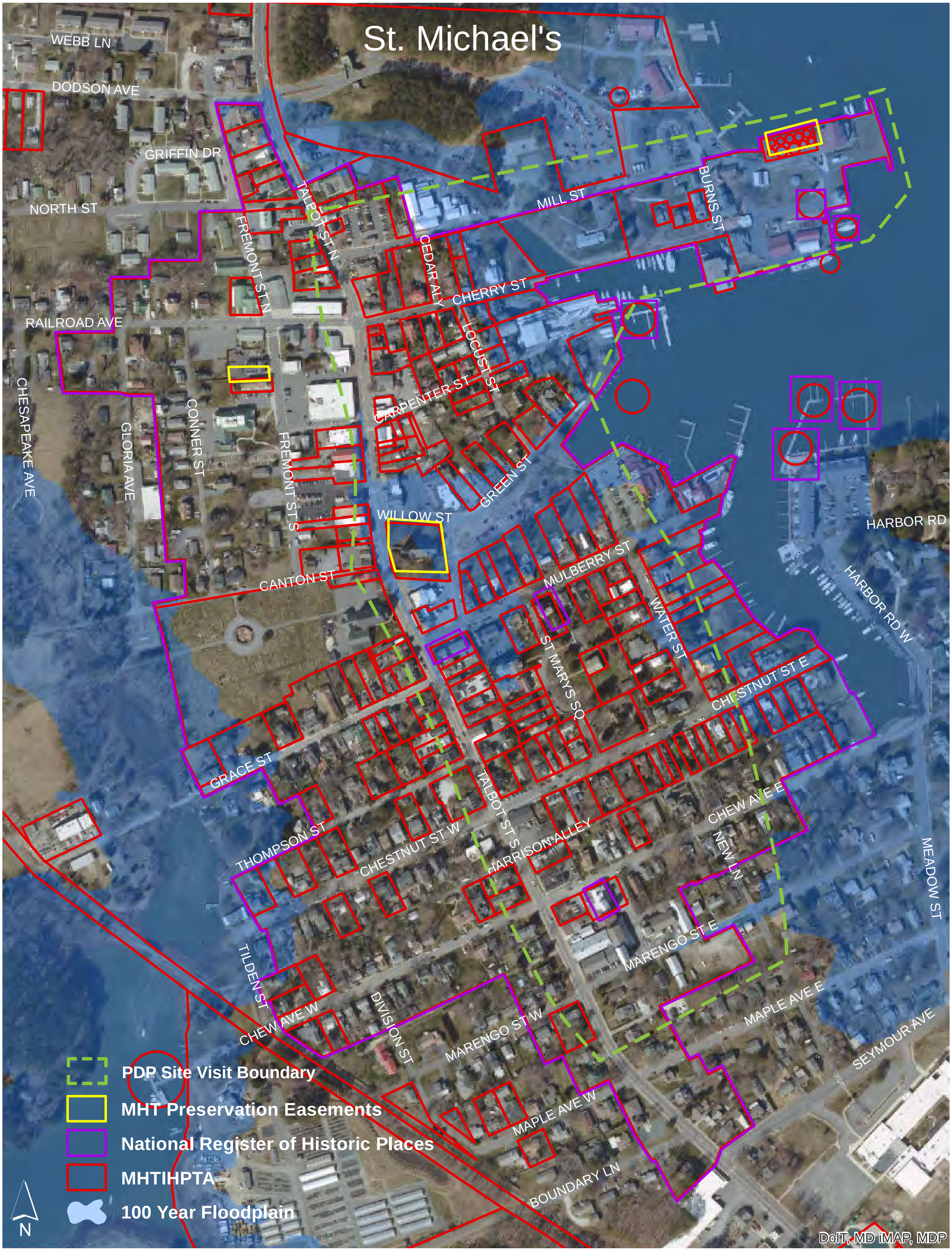
*Rain gardens have been installed in Columbia Beach.*

*Riprap along a shoreline protects the property but can increase erosion at neighboring sites.*

*Standing water was observed at several locations, including under this building.*

# I

# ST. MICHAELS


St. Michael's
WEBB LN
DODSON AVE
GRIFFIN DR
NORTH ST
RAILROAD AVE
CHESAPEAKE AVE
GLORIA AVE
CONNER ST
FREMONT ST N
FREMONT ST S
TALBOT ST N
TALBOT ST S
CEDAR ALY
MILL ST
BURNS ST
CHERRY ST
LOCUST ST
CARPENTER ST
GREEN ST
WILLOW ST
CANTON ST
MULBERRY ST
WATER ST
ST MARYS SQ
HARBOR RD
HARBOR RD W
CHESTNUT ST E
CHESTNUT ST W
GRACE ST
THOMPSON ST
HARRISON ALLEY
CHEW AVE E
CHEW AVE W
NEW LN
MEADOW ST
MARENGO ST E
MARENGO ST W
TILDEN ST
DIVISION ST
MAPLE AVE E
MAPLE AVE W
SEYMOUR AVE
BOUNDARY LN
PDP Site Visit Boundary
MHT Preservation Easements
National Register of Historic Places
MHTIHPTA
100 Year Floodplain
N
DoIT, MD iMAP, MDP

## PROFILE

County: Talbot

Population:

- County: 37,782
- Town: 1,029

Flood Risk: Tidal flooding, storm surge, sea level rise, high water table

Average household income: Unavailable

Owner-occupied housing: 58.9%

## HISTORIC DESIGNATIONS

- St. Michaels Historic District*

* National Register and locally designated historic district

## LOCAL HISTORIC PRESERVATION REGULATORY CONTROL

Town of St. Michaels Historic District Commission

# I. ST. MICHAELS

## HISTORICAL DEVELOPMENT

- St. Michaels was established in 1778 "as a speculative development for a Liverpool merchant firm", planned on a grid with a green in the center of the town (*SMHD Nomination*, 2)
- Located on peninsula between Miles River and Back Creek (*SMHD Nomination*, 7-1)
- The town grew around its Anglican church, St. Michaels (*SMC Plan*, 7)
- Historically, St. Michaels was a "watermen's and agrarian-based" community (*SMHD Nomination*, 8-15)
- The town's boat-building industry ensured the town's success following the Revolutionary War (*SMHD Nomination*, 20)
- In the 18th century, St. Michaels benefitted economically from the oyster trade as well as agriculture from the surrounding area (*SMHD Nomination*, 8-17)
- By the late-18th century, St. Michaels was remarkable for the variety of "craftsmen, commercial ventures, and industry" found in the town (*SSMHD Nomination*, 8-18)

## HISTORICAL SIGNIFICANCE

- St. Michaels is significant as an example of "18th-century town planning in Tidewater Maryland" - The original town remained as the town expanded outward and is notable for this growth pattern (*SMHD Nomination,* 17)
- The *St. Michaels Historic District Nomination* also cites the variety of architecture styles as significant (17)
- St. Michaels offers examples of Federal style domestic architecture as well as a "one-room-wide by two-rooms-deep houses," a style unique to the Eastern Shore (*SMHD Nomination,* 17)

## BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- Town draws its water from an aquifer (*SMC Plan*, 30)
- Talbot County provides wastewater treatment services (*SMC Plan*, 37)
- St. Michaels does not operate any public utilities, with the exception of the water system (*SMC Plan*, 6-3)

## ACCESS TO ROADWAYS AND BRIDGES

- St. Michaels lies along MD Route 33, the only route between Tilghman Island and Easton (*SMC Plan*, 46), which is maintained by the Maryland State Highway Administration

## ACCESS TO PUBLIC SERVICES

- St. Michaels offers an elementary and middle/high school for students (*SMC Plan 2008*, 23)
- A branch of the Talbot County Public Library is located in town (*SMC Plan*, 23)

## ACCESS TO PRIVATE SERVICES

- Hospitals are located in Easton (approximately 10 miles), Cambridge (approximately 26 miles) and Salisbury (approximately 56 miles) (*SMC Plan*, 42)

## POPULATION'S PROFILE

- Total population has been shrinking since 1980 (*HHM Plan*, 8)
- Citing the 2000 US Census, secondary homeowners have outnumbered primary homeowners and year-round occupancy has declined (*SMC Plan*, 62)
- Population largely retirees and second homes (Site visit)

## INDUSTRY

- Tourism is currently St. Michaels' main industry (*SMC Plan*, 51)

## RESOURCES AND FLOOD IMPACT

- There are 127 Flood Insurance Policies filed in St. Michaels (*SMC Draft Plan*, 45)
- In St. Michaels, 82 critical and public facilities are located in a flood zone including the following: St. Michaels Elementary School, Municipal Public Works, Office of the Town of St. Michaels, the Housing Authority (*SMC Draft Plan*, 46-9)

## RESOURCES


*Hazard Mitigation Plan Talbot County, Maryland*. (*HM Plan*) 2011. http://www.talbotdes.org/uploads/file/2011_Talbot_Hazard_Mitigation_Plan.pdf.

Touart, Paul. *St. Michaels Historic District Nomination*. (*SMHD Nomination*) 28 March 1986.

*St. Michaels Comprehensive Plan 2008*. (*SMC Plan*) http://www.mdp.state.md.us/PDF/OurWork/CompPlans/Talbot/StMichaels/08_CMP_StMichaels.pdf

*St. Michaels Draft Comprehensive Plan 2015*. (*SMC Draft Plan*) https://issuu.com/kimberlyweller/docs/2015_comprehensive_plan_for_st._mic.


### HISTORY OF FLOODING

Lies approximately 10 feet above sea level, has a high water table and poor surface drainage (*SMC Plan*, 29)

Significant threats are: winter storms, mass power outages, flash floods, tropical storms, and shore erosion (*SMC Draft Plan*, 5-2)

Hurricanes Isabel and Sandy inflicted considerable damage (*SMC Draft Plan*, 14-1)

A Category 1 hurricane is expected to flood "small portions" while a Category 3 will inundate the majority of town (*HM Plan*, 12)

The entire county's risk for flash floods and flooding is "high" (*HM Plan*, 14)

July 15, 2000 - Roads flooded during a flash flood event (*HM Plan*, 18), July 28, 2000 - East side of town flooded (18)

September 2003 - Hurricane Isabel flooded packing warehouse (Site visit)

October 27, 2006 - St. Michaels Road was closed due to flooding (*HM Plan*, 19)

September 6, 2008 - Tropical Storm Hanna flooded streets (*HM Plan*, 30)

Two properties (on Mulberry Street and East Maple Street) are classified as repetitive loss properties (*SMC Draft Plan*, 45-6)

### MITIGATION MEASURES

Comprehensive master plan includes an extensive chapter on water resources and stormwater management (*HM Plan*)

Complies with MD Stormwater Management Regulations, requiring 20% percent impervious surface coverage reduction for redevelopment areas (*SMC Draft Plan*, 25)

The town has introduced "duck bills in some storm drains that terminate in areas of high tide" (*SMC Draft Plan*, 14-1)

Elevation of homes is occuring (*SMC Draft Plan*, 14-1)

Adopted code requirements regarding freeboard venting in the floodplain (*SMC Draft Plan*, 14-1)

Town adopted a Hazard Mitigation Plan and developed an evacuation route (*SMC Draft Plan*, 14-1)

### COMMUNITY RATING CLASSIFICATION: 8

*This brick building was moved to its current site.*

*Adjacent to the Maritime Museum is a living shoreline.*

*Several of the small wood-framed workers homes have been relocated onsite, away from the street.*

*Several buildings associated with the Maritime Museum have been elevated, including the brick buildings to the left.*

## SITE VISIT - MAY 26, 2016

**Attendees:**

Sarah Abel, Town of St. Michaels

Roy Myers, Town of St. Michaels

Pete Lesher, Chesapeake Bay Maritime Museum

Michael Day, MHT

Anne Raines, MHT

Nell Ziehl, MHT

Jennifer Sparenberg, MHT

Dominique M. Hawkins, PDP

Sarah Blitzer, PDP

**Overview:**

St. Michaels is located on a peninsula between Miles River and Back Creek on the Eastern Shore and is essentially surrounded by water. Its sole vehicular access is via Talbot Street (MD 33), which provides the commercial spine through the center of town. The Chesapeake Bay Maritime Museum houses a large collection of Chesapeake Bay boats and artifacts. Several residents have elevated their homes with the guidance provided by a preservation review process. Apparently there have also been several buildings relocated over time either on or off their original sites. The site visit included an initial tour of the grounds of the Chesapeake Bay Maritime Museum followed by a tour of the town.

**Challenges:**

- The town tends to be most impacted by gradual rising of the tide rather than storm surge, in addition to seasonal high tide and a high water table
- Recently, the county floodmaps were revised, lowering the 100-year floodplain - Freeboard requirements will rise to 2 feet

**Approach / Observations:**

St. Michaels follows FEMA guidelines related to flood mitigation for all buildings, including those within historic districts. Substantial improvements to buildings triggers meeting floodplain requirements, as well as providing for the required 2-feet of freeboard. Some homeowners are proactively elevating above the minimum requirements. The historic review process provides some flexibility when traditional materials need to be replaced with non-traditional alternatives.

The town is currently applying for a Community Rating System classification.

In 2002, buildings at the Chesapeake Bay Maritime Museum were elevated to meet hurricane requirements just prior to Hurricane Isabel, and some regrading was completed to better direct storm water. Hurricane Isabel flooded the cove and some boat yard facilities; however, the historic buildings were spared as a result of mitigation measures.

Much of the shoreline is hardened with docks. Bioswales and living shorelines have been installed near the shoreline in the area of the Museum to facilitate storm water runoff. A small park on Green Street near Locust Street is prone to flooding.

Several of the small, wood-framed homes on Locust Street have been relocated away from the roadway.

**Possible Mitigation Strategies:**

- Elevating the small, wood-framed cottages above the 1% floodplain and could improve their flood resilience without significantly impacting the overall neighborhood character
- Raising systems and equipment out of vulnerable areas prior to a flood event
- Regrading streets and raising inlets to facilitate unimpeded stormwater drainage

*Elevating commercial buildings presents accessibility challenges and may require installation of a ramp.*

*These two homes were recently elevated. The entrance stair for the home on the right was modified.*

*This home was elevated as part of a rehabilitation project. Concrete block piers were clad in brick for a more historically appropriate appearance.*

*Storm water drainage is gravity-fed along the street edge to a storm drain.*

# J

## WESTERNPORT


Westernport
HILL ST
WOOD ST
NAUGHTON ST
RAILROAD ST #3
LIKENS ST
SPRING ST
RIORDAN ST
ROSS ST
MORRISON ST
WAVERLY ST
Waverly Street Bridge
CROMER ST
POPLAR ST
SPRUCE ST
DIVISION ST
FIFTH ST
ROCK ST
ALLEY #3
QUALITY ST
LINCOLN DR
NEW GEORGES CREEK RD
JOHNSON ST
LINCOLN LA
PHILOS AVE
OAKVIEW DR
HILL ST
FAIRVIEW ST
HAMMOND ST
VICTORY POST DR
ALLEY #6
MAIN ST
JAMESON ST
HOWARD ST
SMOOT ST
CLAY ST
GAY ST
VINE ST
WALNUT ST
BANK ALLEY
KALBAUGH ST
PRATT ST
1ST ST (#2)
RIVER RD
CHURCH ST
MARYLAND AVE
ALLEY #7
PDP Site Visit Boundary
MHT Preservation Easements
National Register of Historic Places
MIHP
100 Year Floodplain
N
DoIT, MD iMAP, MDP

**PROFILE**

County: Allegany

Population:

- County: 75,087
- Town: 1,888

Flood Risk: Flash flooding and riverine flooding; Backwater effects Georges Creek

Average household income: $51,700

Owner-occupied housing: 72.6%

**HISTORIC DESIGNATIONS**

- Westernport Historic District *
- Waverly Street Bridge**

* National Register eligible historic district

** Individually registered in the National Register of Historic Places

**LOCAL HISTORIC PRESERVATION REGULATORY CONTROL**

None

# J. WESTERNPORT

## HISTORICAL DEVELOPMENT

- From the town's inception, transit has been Westernport's primary driver due to its location at the confluence of the Georges Creek and the Potomac River (*WHD Nomination*, 1)
- Flatboats carrying coal, departing from Westernport, have been recorded in 1810 (*WWHD Nomination*, 48)
- Upon arrival of the railroad, Westernport became a significant outlet for coal mined in the region (*WHD Nomination*, 48)
- As coal production improved, the railroad expanded to meet demands for shipping coal (*ACC Plan*, 2-2)
- Between 1880 and 1920, the town experienced considerable population growth, attracted by the employment opportunities offered by local industries, thus forcing the West Virginia Pulp and Paper Company to build its housing on a floodplain - This pressure to develop as well as topographic restrictions forced the Company to construct as efficiently as possible in the form of rowhouses (*SWHD Nomination*, 6)
- Beginning in the late-18th century, plans developed to improve navigation of the Potomac, thus attracting new residents to Westernport (*WHD Nomination*, 48)

## HISTORICAL SIGNIFICANCE

- Town exhibits an eclectic variety of architectural styles, many popular during the 19th century, including Second Empire, Queen Anne, and Stick styles (*WHD Nomination*, 47)
- Westernport claims the only rowhouse development in the county (*WHD Nomination*, 42)
- In addition to its unique character, the rowhouse neighborhood in Westernport is significant in that there are three blocks of continuous rowhouses, creating a streetscape that "is quite uncommon for its non-metropolitan setting" (*SWHD Nomination*, 6)
- Other contemporaneous company housing is typically detached frame housing (*SWHD Nomination*, 6)

## BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- Water is sourced from Savage River Reservoir (*ACWS Plan*, 14), and a water treatment plant is located at the end of Maryland Avenue

## ACCESS TO ROADWAYS AND BRIDGES

- Westernport is traversed by State Highways 36, 135, and 825 with connecting bridges traversing the Georges Creek and North Branch of the Potomac River to West Virginia
- State Highways 36 and 135 are currently undergoing improvements (*ACC Plan*, 5-7 - 5-8)
- Historically, an electric trolley line connected Westernport to Cumberland and Frostburg - Discontinued after World War II (*ACC Plan*, 5-12)
- Westernport marks the southern-most point on CSX's southern route that follows the Potomac River Valley (*AACC Plan*, 5-11)

## ACCESS TO PUBLIC SERVICES

- County has 3 high schools, 4 middle schools, and 14 elementary schools (*ACC Plan*, 6-4)
- Westernport Town Hall, Police Department, Fire Department, and Post Office are located along Main Street in the 100-year flood plain (Site visit)
- Supermarket in Keyser, WV, 9 miles from Westernport (Google)

## INDUSTRY

- Historically, town depended on the coal industry and the railroad (*WHD Nomination*, 45)
- In the 1950s and the 1980s, the county experienced a decline in manufacturing, impacting job opportunities - The return of "energy-related jobs" as well as increased opportunities in healthcare and social services is projected (*ACC Plan*, 3-1)
- A decline in manufacturing jobs, industries such as construction is anticipated, while administrative and waste services will expand (*ACC Plan*, 3-6)

## RESOURCES


*Allegany County Comprehensive Plan*. (*ACC Plan*) Jan 29 2014. http://www.mdp.state.md.us/PDF/OurWork/CompPlans/Allegany/14_CMP_Draft_Allegany.pdf.

*Allegany County Water and Sewer Plan*. (*ACWS Plan*) http://www.gov.allconet.org/plan/docs/water_sewer/WaterSewer2007_080608.pdf.

Dorsey, David. *South Westernport Historic District Nomination*. (*SWHD Nomination*) May 1982.

Lewis, C. Andrew. *Westernport Historic District Nomination*. (*WHD Nomination*) June 10 2004.


### HISTORY OF FLOODING

Flooding in 1996, caused by Hurricane Fran, significantly damaged existing structures, eliminating eligibility for a historic district in central Westernport due to lack of continuity and "unsympathetic infill construction" (WHD Nomination, 32)

The nomination highlights the lack of continuity along Front Street, also the result of past flooding

### MITIGATION MEASURES

A concrete levee was constructed along the North Branch of the Potomac southwest of Maryland Avenue in the 1930s as part of a WPA project

Following significant flooding in 1984 and 1996, Allegany County pursued a land acquisition program, particularly along Georges Creek (*ACC Plan*, 8-6)

14 properties were purchased and razed between 2005 and 2011, largely along Georges Creek (*ACC Plan*, 8-6)

### COMMUNITY RATING CLASSIFICATION: N/A

*A view looking north across the raised railroad tracks towards the elementary school.*

*Several buildings on Main Street have been razed leaving vacant lots, some of which are parking lots.*

*The brick worker's housing in the South Westernport Historic District is unusual for this part of the State.*

*The South Westernport Historic District also includes stucco rowhouses.*

## SITE VISIT - 13 MAY 2016

**Attendees:**

Mayor Daniel Laffey

Fred Pritts

Kevin Wagner, Maryland Department of the Environment

Jennifer Sparenberg, MHT

Dominique M. Hawkins, PDP

Sarah Blitzer, PDP

**Overview:**

Westernport is located at the confluence of Georges Creek and the North Branch of the Potomac River. The focus of the site visit was to review the condition of the National Register eligible historic district and Main Street following the demolition of numerous buildings after flooding during Hurricane Fran in 1996. The site visit was conducted as a walking tour along Main Street, Maryland Avenue, a portion of the North Branch of the Potomac, and River Road east of Main Street.

**Challenges:**

- Significant deterioration of underground piping in town including rusting and internal build-up, restricting flow
- A raised railroad line runs north of and parallel to Maryland Avenue with a branch extending north along Georges Creek
- The area along Georges Creek and between River Road and the railroad line east of Main Street is located within the 100-year floodplain and is prone to flooding on a regular basis
- Numerous buildings along Main Street and Front Street were demolished in the aftermath of Hurricane Fran (1996) resulting in several vacant lots, providing the opportunity for the creation of a new park at the northern end of town but limiting retail services including local access to groceries and other necessities - Local economy makes rebuilding costs prohibitive
- Locally significant buildings and institutions located in the 100-year floodplain are abandoned including the Catholic School on River Road (demolished following the site visit)
- Employment opportunities in the area have declined, depressing real estate values, reinvestment, and the local tax base

**Approach / Observations:**

Previous efforts to address the effects of past flood events included the razing of buildings impacted by flooding principally along Main and Front Streets as well as the construction of a concrete levee along the North Branch of the Potomac southwest of Maryland Avenue as a WPA project in the 1930s. The flood wall was not breached in the 1996 flooding from Hurricane Fran.

The loss of buildings in the commercial core of the Town have altered the center of the community. Several vacant lots are present, some of which are used for parking. A small, elevated commercial building has been constructed on Main Street with parking along the street frontage which is inconsistent with the town's previous development patterns.

An elementary school, located on Church Street and within the 1% floodplain, was recently constructed to include flood protection at windows and door openings.

The rail line between Maryland Avenue and River Road is elevated approximately 2-3 feet above adjacent grade without apparent connecting drainage between the north and south sides.

Standing water was noted in a storm drain. A public piping replacement program is anticipated.

The remapping of the area removed the South Westernport Historic District from the 1% floodplain. Although there have been some alterations, the continuity of the workers housing remains intact.


*The Catholic school, now abandoned, was a focal point of the community. The school was demolished after the site visit.*


*A concrete levee is located along Georges Creek approaching the North Branch of the Potomac.*

**Possible Mitigation Strategies:**

- Adding piping beneath the railroad tracks to allow water to flow back out of lower areas on one side as floodwaters recede
- Increasing capacity of stormwater piping in existing facilities to accommodate flooding and to act as storage
- Regrading streets and raising inlets to facilitate unimpeded stormwater drainage
- Raising systems and equipment out of vulnerable areas prior to a flood event


*Standing water was noted at this storm drain, indicating a clogged drain.*


*This elevated commercial building was constructed on Main Street.*

# WHITEHAVEN


Whitehaven
WHITEHAVEN RD
CHURCH ST
LOCUST LA
CINDER LA
RIVER ST
PDP Site Visit Boundary
MHT Preservation Easements
National Register of Historic Places
Maryland Inventory of Historic Properties
100 Year Floodplain
N
DoIT, MD iMAP, MDP

**PROFILE**

County: Wicomico

Population:

- County: 98,733
- Town: 43

Flood Risk: Tidal flooding, storm surge, sea level rise

Average household income: Unavailable

Owner-occupied housing: 95.5%

**HISTORIC DESIGNATIONS***

- Whitehaven Historic District*
- Whitehaven Hotel**

* National Register and local historic district

** Individually designated on the National Register of Historic Places

**LOCAL HISTORIC PRESERVATION REGULATORY CONTROL**

Wicomico County Historic District Commission

## K. WHITEHAVEN

### HISTORICAL DEVELOPMENT

- Ferry across the Wicomico River has been operating since 1688 (*WHD Nomination*, 5)
- Majority of existing buildings date to 19th century (*WHD Nomination*, 5)
- Located along the Wicomico River, the town historically relied on fishing and served as a shipping point - Some residents continue to make a living from the river through fishing and crabbing (*WHD Nomination*, 5)
- The community thrived in the 19th century but then went into decline when the river was dredged to Salisbury and the automobile was introduced (*WHD Nomination*, 12)

### HISTORICAL SIGNIFICANCE

- One of the oldest communities in this part of Maryland (*WCC Plan*, 10)
- It is the only surviving village in the county that was authorized by the General Assembly in the 17th century (*WHD Nomination*, 10)
- Home to oldest, publicly owned ferry in the United States (*WCC Plan*, 9-8)

### BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- Source of water and sewage treatment is unknown

## ACCESS TO ROADWAYS AND BRIDGES

- Whitehaven is located off Route 352, which supplements the network of primary routes in the county (*WCC Plan,* 8-4)
- Most come in through Whitehaven Road with ferry traffic bypassing historic village core (Site visit)

## ACCESS TO PUBLIC SERVICES

- Significant amount of health care services can be found in Salisbury, approximately 15 miles from Whitehaven (*WCC Plan*, 9-16)

## ACCESS PRIVATE SERVICES

- No commercial activity with the exception of the hotel (Site visit)
- No apparent governmental services in the town (Site visit)

## POPULATION'S PROFILE

- Mostly vacation homes, few full-time residents (Site visit)
- The county estimates that its overall population will continue to grow, with growth focused on towns and cities, as will the number of housing units (*WCC Plan,* 3-1 - 3-2)
- Approximately 88% of housing units are owner-occupied in the county, compared to 95.5% owner-occupied housing units in Whitehaven (*WCC Plan*, 3-4; US Census)

## INDUSTRY

- Historic hotel only commercial enterprise in town

## RESOURCES


*2016 Wicomico County Comprehensive Plan*. (*WCC Plan*) 15 March 2016. http://www.wicomicocounty.org/DocumentCenter/View/4424.

US Census. 2010 http://www.census.gov/prod/cen2010/cph-1-22.pdf.

*Whitehaven Historic District Nomination*. (*WHD Nomination*) 5 November 1979.

*Wicomico County Floodplain Regulations*. (*WCF Regulations*) 5 May 2015. http://www.wicomicocounty.org/DocumentCenter/Home/View/4220.


### HISTORY OF FLOODING

When river floods, water backs into marsh and floods town (Site visit)

Flooding can come from the river to the south and marsh land to the north (Site visit)

### MITIGATION MEASURES

The county "regulates development in designated flood hazard areas" through its County Floodplain Management Ordinance (*WCC Plan*, 4-6)

Historic structures are subject to the Floodplain Management Ordinance if work is determined a "substantial improvement" (*WCF Regulations*, 25)

### COMMUNITY RATING CLASSIFICATION: N/A

*The hotel, located adjacent to the ferry landing, is a focal point of the community.*

*This house was elevated and now includes substantial brick piers. The setback allows a straight-run stair.*

*A small opening is located in the rusticated block wall, potentially restricting site drainage.*

*A concrete bulkhead has been installed along the river, and new houses along the water are being constructed at a higher elevation.*

## SITE VISIT - 16 MAY 2016

**Attendees:**

Gloria Smith, Wicomico County Historic District Commission

Anne Raines, MHT

Nell Ziehl, MHT

Jennifer Sparenberg, MHT

Dominique M. Hawkins, PDP

Sarah Blitzer, PDP

**Overview:**

Whitehaven is a relatively compact, geographically defined, historic town located on the southern Eastern Shore of Maryland. The majority of the buildings are of wood-framed construction and are located along the street edge on relatively small lots. The primary focus of the site visit was to see first-hand the elevation of three buildings along River Street, namely the historic hotel adjacent to the ferry landing and two residences near Church Street.

**Challenges:**

- The entire town is historically designated and located within the 100-year flood plain
- Flooding can come from the river and the marsh land bordering the town northeast of Whitehaven Road
- With the open access to river's edge, building elevation is one of the few mitigation alternatives
- The buildings are located on narrow lots relatively close to the street, limiting options for mitigation of building elevation through landscaping and creating a design challenge to provide historically appropriate foundations and access to front porches and doors through extended steps and ramps
- The historic district includes at least one repetitive loss structure

**Approach / Observations:**

The flood mitigation approach includes some efforts by individual property owners as well as those benefiting the town as a whole.

- Completed work includes the elevation of two residences and the hotel - although it is unclear whether the elevated height meets current flood plain requirements
- Potential work includes the elevation of an additional house, which has received required approvals, but had not commenced by the time of the site visit

- A bulkhead has been installed along the length of River Street in the town, and the ferry landing area has been reinforced

New construction south of River Road is elevated and more contemporary than the remainder of the historic district

The Wicomico County Historic Preservation Commission provides a rigorous review process for proposed alterations in the historic district.

*A marshy landscape is located across Whitehaven Road from the community.*

**Possible Mitigation Strategies:**

One of the difficulties with elevating individual historic buildings is that they were generally constructed at approximately the same first floor height along a streetscape. As a result, individual building elevations have the potential to appear our of scale relative to their neighbors.

However, given the wood framed construction and relatively compact nature of the Whitehaven Historic District, with property owner concurrence it might be possible to elevate all of the buildings to maintain the relationship between the buildings while maintaining continuity of scale.

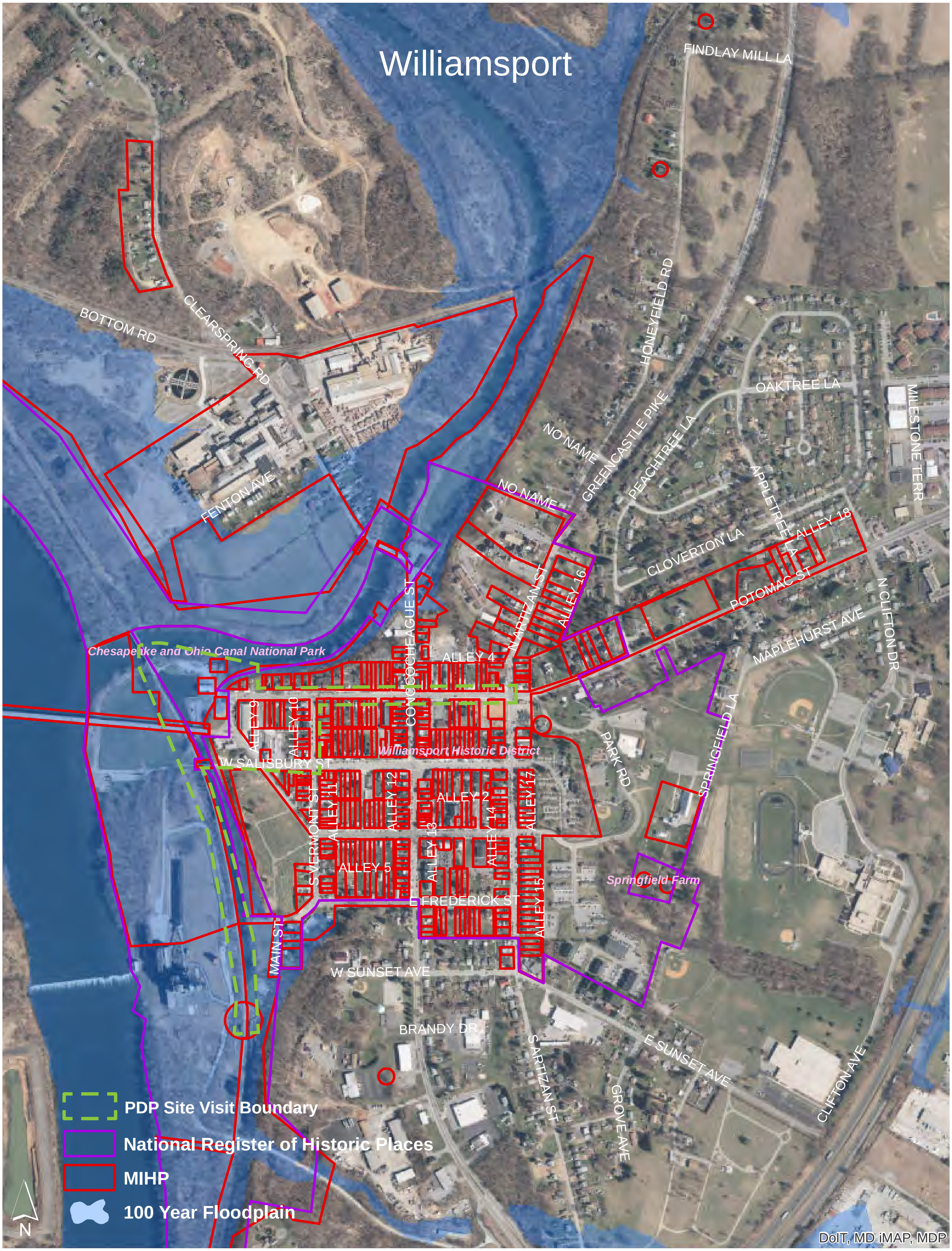
This approach could be taken one step further to include the elevation of all of the streets in the town to maintain the same relative height to grade. This strategy was employed in Galveston, Texas, following a hurricane in 1900 in which the city thoroughfares were raised as much as 17’, followed by the raising of buildings by individual property owners. A similar approach is currently being undertaken in Miami Beach, Florida. This strategy would:

- Maintaining the relative height between the buildings with pedestrians and the street
- Providing guidance to maintain the historic appearance of the building foundation, entrance steps and ramps
- Providing additional protection/fortification against future flooding and erosion

*The first floor of this residence is close to grade, and it has suffered repeated damage from flooding.*

*The elevation of the central residence altered the relationship between the porch and the street and required modification of the entrance stair. Also note the concrete foundation has been tinted a brick color.*

# WILLIAMSPORT


Williamsport
FINDLAY MILL LA
HONEYFIELD RD
BOTTOM RD
CLEARSPRING RD
FENTON AVE
NO NAME
GREENCASTLE PIKE
PEACHTREE LA
OAKTREE LA
MILLSTONE TERR
APPLETREE LA
ALLEY 18
CLOVERTON LA
POTOMAC ST
N CLIFTON DR
MAPLEHURST AVE
ALLEY 16
N ARTIZAN ST
CONOCOCHEAGUE ST
ALLEY 4
Chesapeake and Ohio Canal National Park
ALLEY 9
ALLEY 10
Williamsport Historic District
W SALISBURY ST
PARK RD
SPRINGFIELD LA
ALLEY 2
ALLEY 12
ALLEY 11
ALLEY 13
ALLEY 14
ALLEY 17
S VERMONT ST
ALLEY 5
ALLEY 15
E FREDERICK ST
Springfield Farm
MAIN ST
W SUNSET AVE
BRANDY DR
S ARTIZAN ST
GROVE AVE
E SUNSET AVE
CLIFTON AVE
PDP Site Visit Boundary
National Register of Historic Places
MIHP
100 Year Floodplain
N
DoIT, MD iMAP, MDP

## PROFILE

County: Washington

Population:

- County: 147,430
- Town: 2,137

Flood Risk: Flash flooding, riverine flooding, ice jams, winter storms

Average household income: Unavailable

Owner-occupied housing: 39.3%

## HISTORIC DESIGNATIONS

Williamsport Historic District

* National Register historic district

## LOCAL HISTORIC PRESERVATION REGULATORY CONTROL

Washington County Historic District Commission

# L. WILLIAMSPORT

## HISTORICAL DEVELOPMENT

- Located at the confluence of the Potomac River and the Conococheague Creek, Williamsport's success has relied upon its location as a crossroads for transit: river, highway, and canal (*WHD Nomination*, 4)
- Historically, Williamsport was located at a ferry crossing and at the crossroads of an 18th century highway (*WHD Nomination*, 8)
- Operating between 1828 and 1924, the Chesapeake and Ohio Canal ran through the town (*WHD Nomination*, 8)
- Williamsport was also the final stop along the Cumberland Valley Railroad (*WHD Nomination*, 8)
- With easier access to transit and thus a wider market for selling produce, the region's mostly agricultural economy flourished (*CPC*, 8)
- Williamsport's proximity to transit encouraged other industries to settle in the town in the 19th century, including a "tannery [...], lumber and coal dealing, and brickyards" (*WHD Nomination*, 8)
- During the Civil War, Union troops were stationed in Williamsport to defend the Potomac (*WHD Nomination*, 9)

## HISTORICAL SIGNIFICANCE

- Only functional water aqueduct in North America (Site visit)

## BROAD INFRASTRUCTURE AFFECTING LOCAL AREA

- The county operates two water treatment plants: the Wilson Plant in Williamsport and the Conococheague Wastewater Treatment Plant (*CCPC*, 44 - 45)
- Williamsport is served by the Hagerstown Water Department (*CPC*, 147)

## ACCESS TO ROADWAYS AND BRIDGES

- Williamsport is considered a hub along Maryland's interstate roadways system (*CPC*, 46)

## ACCESS TO PUBLIC SERVICES

- The county operates the Washington County Health System, which includes the Williamsport Family Medical Center (*CPC*, 46)
- County operates 7 high schools, 7 middle schools, and 25 elementary schools (*CPC*, 43)

## POPULATION'S PROFILE

- County predicts that the population will steadily grow (*CPC*, 17)

## INDUSTRY

- Historically, the county sustained itself through agriculture, though the county predicts that farming is in decline (*CPC*, 20)
- Currently, the largest job market is in services (*CPC*, 20)
- Employment in the county is at an all-time low (*CPC*, 57)
- The presence of the National Park Service in Williamsport provides employment opportunities and stimulates tourism as an economic driver (*CPC*, 66)

## RESOURCES


*Comprehensive Plan for the County 2002*. (CPC) http://www.washco-md.net/county_attorney/pdf/comp_plan/Main_pdf_doc.pdf.

Hobbs, Thomas R. *Williamsport Historic District Nomination*. (*WHD Nomination*) May 26 1983.

US Census. 2010 http://www.census.gov/prod/cen2010/cph-1-22.pdf.


### HISTORY OF FLOODING

The *Nomination* highlights Williamsport's multi-faceted relationship with the river, which has historically brought the town success but has also destroyed the town during floods (*WHD Nomination*, 6)

Hurricane Agnes shut down sections of canal (Site visit)

No floods since 1996 (Site visit)

Flooding tends to result from precipitation, snow melt, and ice damming (Site visit)

### MITIGATION MEASURES

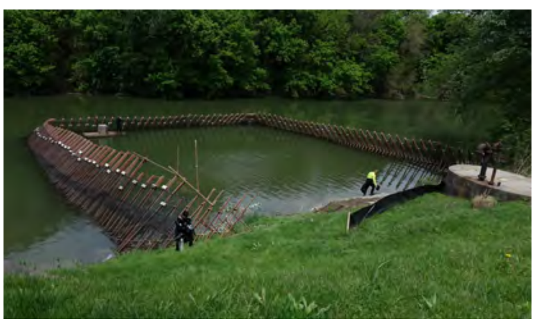
County enacted its Floodplain Management Ordinance in 1992, which does not allow new construction on a floodplain, unless construction is intended for water-related activities. Any additions or alterations to existing structures must meet flood-proofing specifications. With this Ordinance, the County does not plan to expand mitigation measures. (*CPC*, 102)

Flood mapping has recently been revised, modifying boundaries – Some areas shrank, others grew (Site visit)

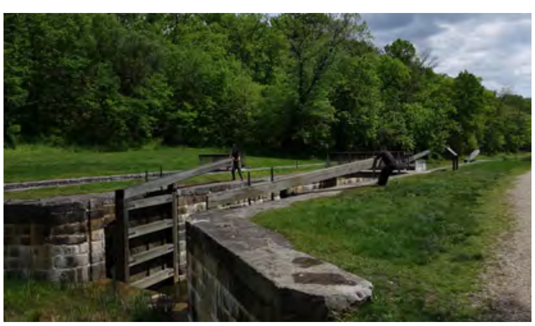
### COMMUNITY RATING CLASSIFICATION: N/A

*A hiking and biking trail is located along the canal, as are remnants of an abandoned railroad bridge.*

*Plans to restore the aqueduct require the rebuilding of the east wall. Also note the debris in the river.*



*To allow water to be available for the aqueduct, a pipe inlet is undergoing repair.*



*Completed work includes the restoration of Lock 44 in front of the lock tender's house.*

## SITE VISIT - 13 MAY 2016

**Attendees:**

Donnie Stotelmayr, Town Clerk/Treasurer, Williamsport

Ben Helwig, National Park Service

Jennifer Sparenberg, MHT

Dominique M. Hawkins, PDP

Sarah Blitzer, PDP

**Overview:**

The historic town of Williamsport is located at the top of a hill overlooking the Chesapeake and Ohio Canal National Park. The primary focus of the site visit was to review ongoing efforts within the National Park to celebrate the historic canal system. The site visit was conducted as a walking tour along the canal from the aqueduct to the restored lock and lock tenders house.

**Challenges:**

- The area along the river and canal is located within the 1% floodplain and is prone to flooding on a regular basis
- Employment opportunities in the area have declined, depressing real estate values and reinvestment
- An abandoned back-up power plant is located between the canal and the river, providing an eyesore to the Park, and there is also an abandoned wastewater treatment plant

**Approach / Observations:**

The town is easily accessed by highways and has the potential to be more of a tourist destination.

With an understanding of the importance of the canal as part of its historical development, the Town of Williamsport, working with the National Park Service, actively sought to promote the canal as an attraction rather than a liability. With that in mind, work in the canal area has been completed and is ongoing to allow interpretation of the canal to the 1920s, when the canal flourished prior to the dominance of the railroad.

- Completed work includes the restoration of Lock 44 and the lock tender's house
- Ongoing work includes the restoration of the canal and rebuilding of the aqueduct
- Related efforts include the centralization of the National Park Service canal offices including the communications center and incident command in Williamsport

The work along the canal is continuing to draw visitors and tourists to the Park and is viewed as a means of "jump-starting" the community. In addition, the Town has developed various programs to encourage year-round tourism rather than focusing on a single-purpose, canal-related visitor experience.

The centralization of the National Park Service's canal-related functions to Williamsport will increase local jobs as well as include local investment in the rehabilitation of the former lumber yard building into offices as well as associated housing and services for relocated employees.

The abandoned power plant is visually intrusive within the historic context of the Park. Retaining the plant on-site allows future replacement with a gas facility without requiring a wavier from the Federal government.

The Town of Williamsport currently has an active Planning and Zoning Board. It is anticipated that Board will help guide anticipated future development.

**Possible Mitigation Strategies:**

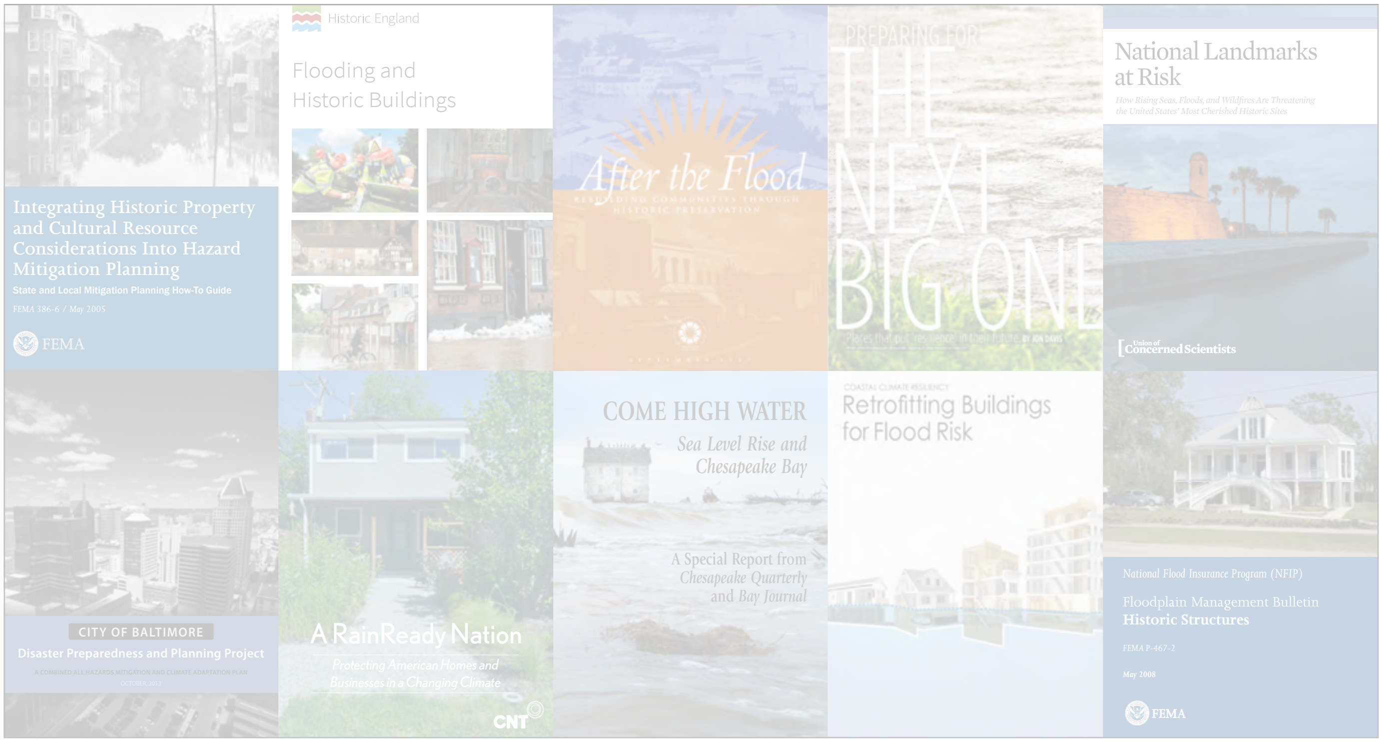
- Maintaining clear openings under bridges and viaduct to allow unimpeded water flow
- Utilizing dry floodproofing on non-residential structures if they will not be elevated (sealants, retrofit flood openings, flood barriers, and gates)

*The NPS currently occupies the Cushwa building, and have located sensitive equipment on the 2nd floor.*

*The white markers on the Cushwa building indicate the heights and dates of past flood events.*

*The abandoned power plant is located between the canal and the river.*

*The center of the town, centered on Conococheague Street, is located above the floodplain.*




B

# ANNOTATED BIBLIOGRAPHY

- **A.** International
- **B.** Federal
- **C.** State of Maryland
- **D.** Non-State-of-Maryland
- **E.** Other Entities

NOTE: The majority of the resources referenced in this section was accessed online between the fall of 2015 and spring of 2016. As a result, countless relevant recent publications, articles, and websites are not included in this Annotated Bibliography, and some of the cited links may no longer be active.

# INTERNATIONAL

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# THE EU FLOODS DIRECTIVE

## EUROPEAN COMMISSION

No Date
http://ec.europa.eu/environment/water/flood_risk/
Date Accessed: 23 December 2015

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.


12/23/2015 Flood risk management - Water - Environment - European Commission

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The EU Floods Directive

Directive 2007/60/EC on the assessment and management of flood risks entered into force on 26 November 2007. This Directive now requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. With this Directive also reinforces the rights of the public to access this information and to have a say in the planning process.

The Directive was proposed by the European Commission on 18/01/2006, and was finally published in the Official Journal on 6 November 2007. Its aim is to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. The Directive requires Member States to first carry out a preliminary assessment by 2011 to identify the river basins and associated coastal areas at risk of flooding. For such zones they would then need to draw up flood risk maps by 2013 and establish flood risk management plans focused on prevention, protection and preparedness by 2015. The Directive applies to inland waters as well as all coastal waters across the whole territory of the EU.

Floods Directive Viewer now in WISE ! Find out which Authorities are responsible for the implementation of the Floods Directive in all EU Member States ! Available WISE hosted by the EEA.

The Directive shall be carried out in coordination with the Water Framework Directive, notably by flood risk management plans and river basin management plans being coordinated, and through coordination of the public participation procedures in the preparation of these plans. All assessments, maps and plans prepared shall be made available to the public.

Member States shall furthermore coordinate their flood risk management practices in shared river basins, including with third counties, and shall in solidarity not undertake measures that would increase the flood risk in neighbouring countries. Member States shall in take into consideration long term developments, including climate change, as well as sustainable land use practices in the flood risk management cycle addressed in this Directive.

Background

Between 1998 and 2009, Europe suffered over 213 major damaging floods, including the catastrophic floods along the Danube and Elbe rivers in summer 2002. Severe floods in 2005 further reinforced the need for concerted action. Between 1998 and 2009, floods in Europe have caused some 1126 deaths, the displacement of about half a million people and at least €52 billion in insured economic losses. (Source: EEA)

Catastrophic floods endanger lives and cause human tragedy as well as heavy economic losses. Floods are natural phenomena but through the right measures we can reduce their likelihood and limit their impacts. In addition to economic and social damage, floods can have severe environmental consequences, for example when installations holding large quantities of toxic chemicals are inundated or wetland areas destroyed. The coming decades are likely to see a higher flood risk in Europe and greater economic damage.

Further reading

Directive 2007/60/EC on the assessment and management of flood risks in all available languages (OJ L288, 6.11.2007, p.27)

Key documents from the negotiations of the Directive are available here.

Read more about the implementation of the Directive !

Read more about the EU Floods Action Programme!

http://ec.europa.eu/environment/water/flood_risk/ 1/2

# EUROPEAN CLIMATE ADAPTATION PLATFORM


## EUROPEAN ENVIRONMENT AGENCY

No Date
Http://climate-adapt.eea.europa.eu/
Date Accessed: 23 December 2015

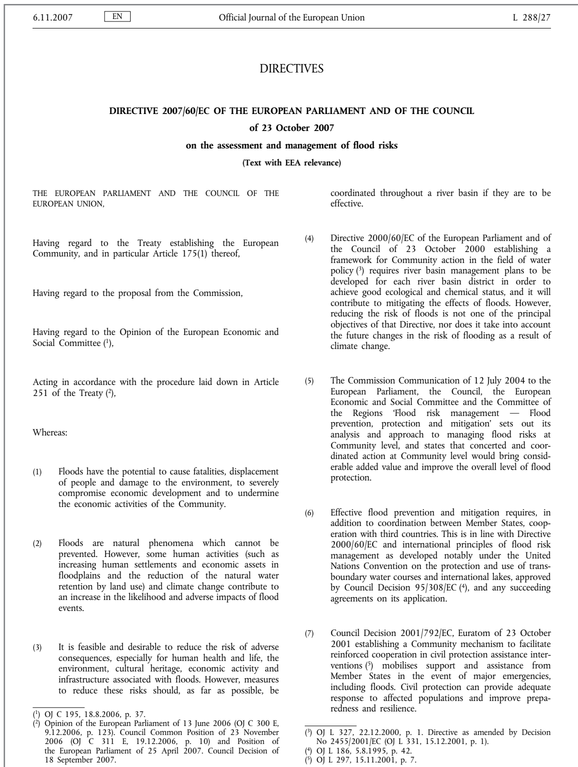
The European Climate Adaptation Platform (CLIMATE-ADAPT) is an electronic platform intended to support Europe in adapting to climate change. It helps users access and share data regarding:

- 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 EN 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,

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

Having regard to the proposal from the Commission,

Having regard to the Opinion of the European Economic and Social Committee (1),

Acting in accordance with the procedure laid down in Article 251 of the Treaty (2),

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.

(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.

(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 coordinated throughout a river basin if they are to be effective.

(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 (3) 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.

(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.

(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 95/308/EC (4), and any succeeding agreements on its application.

(7) Council Decision 2001/792/EC, Euratom of 23 October 2001 establishing a Community mechanism to facilitate reinforced cooperation in civil protection assistance interventions (5) 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.

(1) OJ C 195, 18.8.2006, p. 37.
(2) Opinion of the European Parliament of 13 June 2006 (OJ C 300 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 25 April 2007. Council Decision of 18 September 2007.
(3) 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).
(4) OJ L 186, 5.8.1995, p. 42.
(5) 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 December 2015

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: 15 January 2016

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, unbenownst 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 1971) 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

WMF.ORG

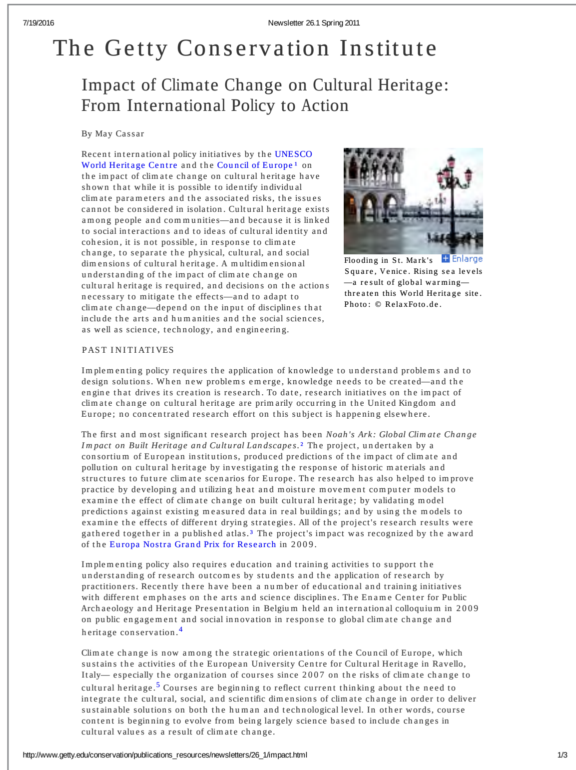
## IMPACT OF CLIMATE CHANGE ON CULTURAL HERITAGE: FROM INTERNATIONAL POLICY TO ACTION

May Cassar

2011
http://www.getty.edu/conservation/publications_resources/newsletters/26_1/impact.html
Date Accessed: 19 July 2016

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.



7/19/2016 Newsletter 26.1 Spring 2011

The Getty Conservation Institute

Impact of Climate Change on Cultural Heritage: From International Policy to Action

By May Cassar

Recent international policy initiatives by the UNESCO World Heritage Centre and the Council of Europe[1] on the impact of climate change on cultural heritage have shown that while it is possible to identify individual climate parameters and the associated risks, the issues cannot be considered in isolation. Cultural heritage exists among people and communities—and because it is linked to social interactions and to ideas of cultural identity and cohesion, it is not possible, in response to climate change, to separate the physical, cultural, and social dimensions of cultural heritage. A multidimensional understanding of the impact of climate change on cultural heritage is required, and decisions on the actions necessary to mitigate the effects—and to adapt to climate change—depend on the input of disciplines that include the arts and humanities and the social sciences, as well as science, technology, and engineering.

Flooding in St. Mark's Square, Venice. Rising sea levels—a result of global warming—threaten this World Heritage site. Photo: © RelaxFoto.de. Enlarge

PAST INITIATIVES

Implementing policy requires the application of knowledge to understand problems and to design solutions. When new problems emerge, knowledge needs to be created—and the engine that drives its creation is research. To date, research initiatives on the impact of climate change on cultural heritage are primarily occurring in the United Kingdom and Europe; no concentrated research effort on this subject is happening elsewhere.

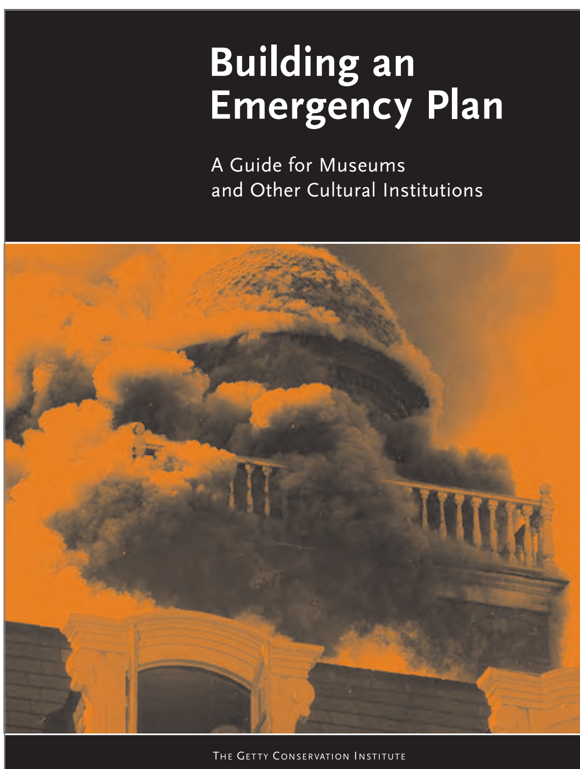
The first and most significant research project has been *Noah's Ark: Global Climate Change Impact on Built Heritage and Cultural Landscapes*.[2] The project, undertaken by a consortium of European institutions, produced predictions of the impact of climate and pollution on cultural heritage by investigating the response of historic materials and structures to future climate scenarios for Europe. The research has also helped to improve practice by developing and utilizing heat and moisture movement computer models to examine the effect of climate change on built cultural heritage; by validating model predictions against existing measured data in real buildings; and by using the models to examine the effects of different drying strategies. All of the project's research results were gathered together in a published atlas.[3] The project's impact was recognized by the award of the Europa Nostra Grand Prix for Research in 2009.

Implementing policy also requires education and training activities to support the understanding of research outcomes by students and the application of research by practitioners. Recently there have been a number of educational and training initiatives with different emphases on the arts and science disciplines. The Ename Center for Public Archaeology and Heritage Presentation in Belgium held an international colloquium in 2009 on public engagement and social innovation in response to global climate change and heritage conservation.[4]

Climate change is now among the strategic orientations of the Council of Europe, which sustains the activities of the European University Centre for Cultural Heritage in Ravello, Italy— especially the organization of courses since 2007 on the risks of climate change to cultural heritage.[5] Courses are beginning to reflect current thinking about the need to integrate the cultural, social, and scientific dimensions of climate change in order to deliver sustainable solutions on both the human and technological level. In other words, course content is beginning to evolve from being largely science based to include changes in cultural values as a result of climate change.

http://www.getty.edu/conservation/publications_resources/newsletters/26_1/impact.html 1/3

## BUILDING AN EMERGENCY PLAN: A GUIDE FOR MUSEUMS AND OTHER CULTURAL INSTITUTIONS




Valerie Dorge and Sharon L. Jones

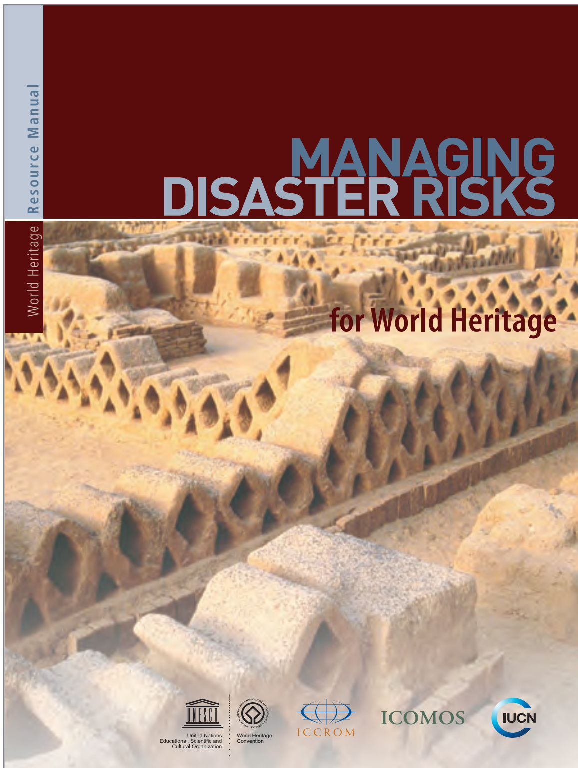
1999
http://hdl.handle.net/10020/gci_pubs/emergency_englis
Date Accessed: 19 January 2016

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
http://whc.unesco.org/document/104522
Date Accessed: 22 December 2015

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.

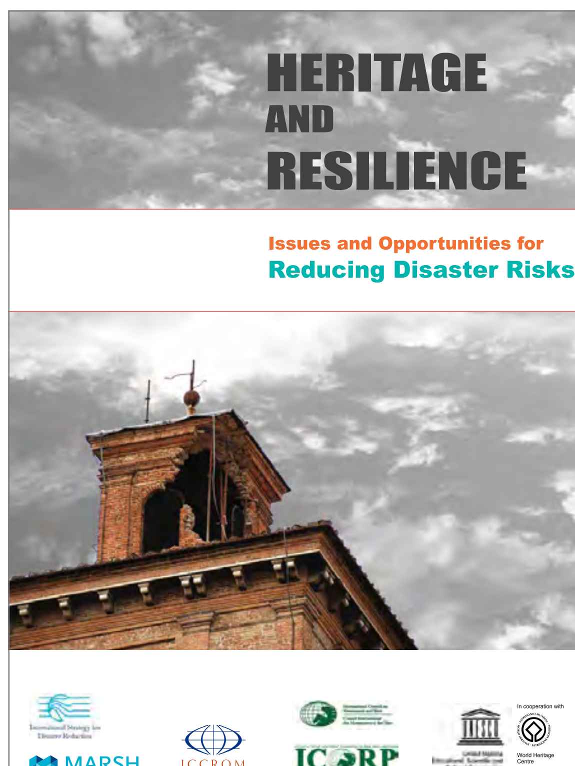
Although prepared for World Heritage sites, the principals of DRM plans can be applied to any cultural institution that is at risk for a disaster. The manual explains:

- 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://icorp.icomos.org/images/documents/Heritage%20and%20Resilience%20Book%20for%20GP2013%20Disaster%20Management.pdf
Date Accessed: 23 December 2015




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

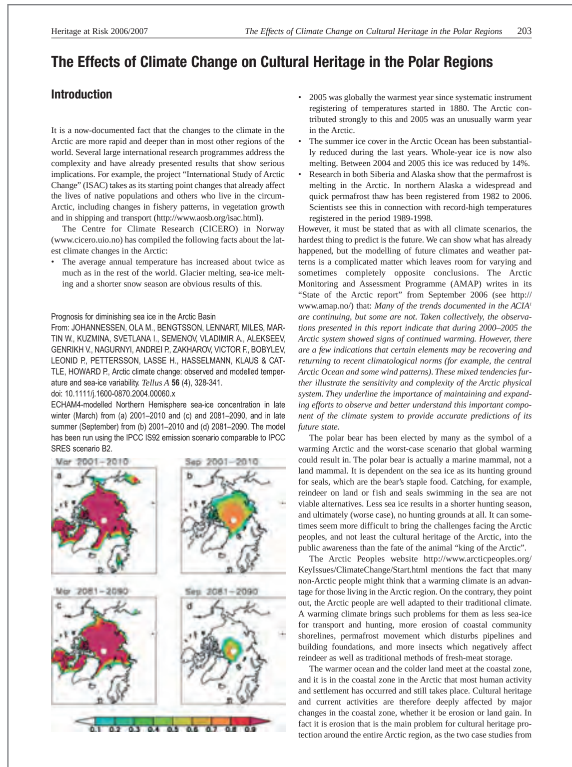
Susan Barr

2008
http://www.icomos.org/risk/world_report/2006-2007/pdf/H@R_2006-2007_53_Special_Focus_Effects_GCC_Polar.pdf
Date Accessed: 18 July 2016

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.


Heritage at Risk 2006/2007 — *The Effects of Climate Change on Cultural Heritage in the Polar Regions* 203

**The Effects of Climate Change on Cultural Heritage in the Polar Regions**

**Introduction**

It is a now-documented fact that the changes to the climate in the Arctic are more rapid and deeper than in most other regions of the world. Several large international research programmes address the complexity and have already presented results that show serious implications. For example, the project "International Study of Arctic Change" (ISAC) takes as its starting point changes that already affect the lives of native populations and others who live in the circum-Arctic, including changes in fishery patterns, in vegetation growth and in shipping and transport (http://www.aosb.org/isac.html).

The Centre for Climate Research (CICERO) in Norway (www.cicero.uio.no) has compiled the following facts about the latest climate changes in the Arctic:

- The average annual temperature has increased about twice as much as in the rest of the world. Glacier melting, sea-ice melting and a shorter snow season are obvious results of this.

Prognosis for diminishing sea ice in the Arctic Basin
From: JOHANNESSEN, OLA M., BENGTSSON, LENNART, MILES, MARTIN W., KUZMINA, SVETLANA I., SEMENOV, VLADIMIR A., ALEKSEEV, GENRIKH V., NAGURNYI, ANDREI P., ZAKHAROV, VICTOR F., BOBYLEV, LEONID P., PETTERSSON, LASSE H., HASSELMANN, KLAUS & CATTLE, HOWARD P., Arctic climate change: observed and modelled temperature and sea-ice variability. *Tellus A* **56** (4), 328-341.
doi: 10.1111/j.1600-0870.2004.00060.x
ECHAM4-modelled Northern Hemisphere sea-ice concentration in late winter (March) from (a) 2001–2010 and (c) and 2081–2090, and in late summer (September) from (b) 2001–2010 and (d) 2081–2090. The model has been run using the IPCC IS92 emission scenario comparable to IPCC SRES scenario B2.



- 2005 was globally the warmest year since systematic instrument registering of temperatures started in 1880. The Arctic contributed strongly to this and 2005 was an unusually warm year in the Arctic.
- The summer ice cover in the Arctic Ocean has been substantially reduced during the last years. Whole-year ice is now also melting. Between 2004 and 2005 this ice was reduced by 14%.
- Research in both Siberia and Alaska show that the permafrost is melting in the Arctic. In northern Alaska a widespread and quick permafrost thaw has been registered from 1982 to 2006. Scientists see this in connection with record-high temperatures registered in the period 1989-1998.

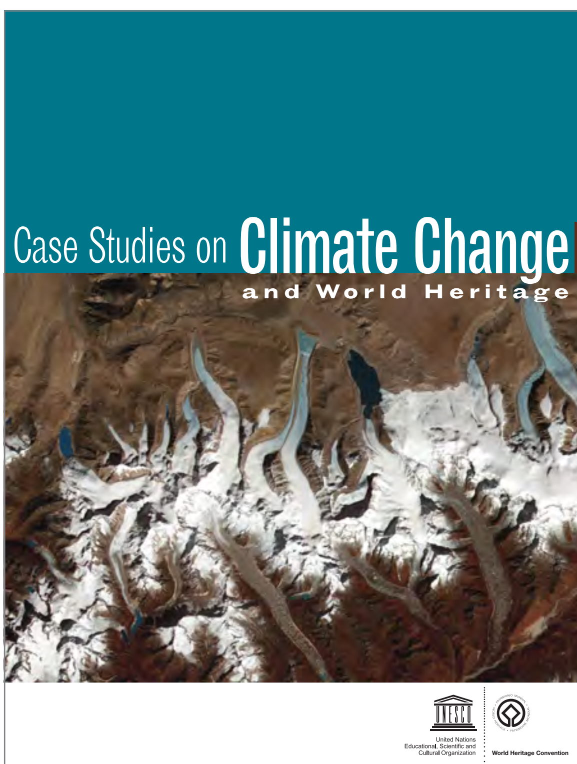
However, it must be stated that as with all climate scenarios, the hardest thing to predict is the future. We can show what has already happened, but the modelling of future climates and weather patterns is a complicated matter which leaves room for varying and sometimes completely opposite conclusions. The Arctic Monitoring and Assessment Programme (AMAP) writes in its "State of the Arctic report" from September 2006 (see http://www.amap.no/) that: *Many of the trends documented in the ACIA[1] are continuing, but some are not. Taken collectively, the observations presented in this report indicate that during 2000–2005 the Arctic system showed signs of continued warming. However, there are a few indications that certain elements may be recovering and returning to recent climatological norms (for example, the central Arctic Ocean and some wind patterns). These mixed tendencies further illustrate the sensitivity and complexity of the Arctic physical system. They underline the importance of maintaining and expanding efforts to observe and better understand this important component of the climate system to provide accurate predictions of its future state.*

The polar bear has been elected by many as the symbol of a warming Arctic and the worst-case scenario that global warming could result in. The polar bear is actually a marine mammal, not a land mammal. It is dependent on the sea ice as its hunting ground for seals, which are the bear's staple food. Catching, for example, reindeer on land or fish and seals swimming in the sea are not viable alternatives. Less sea ice results in a shorter hunting season, and ultimately (worse case), no hunting grounds at all. It can sometimes seem more difficult to bring the challenges facing the Arctic peoples, and not least the cultural heritage of the Arctic, into the public awareness than the fate of the animal "king of the Arctic".

The Arctic Peoples website http://www.arcticpeoples.org/KeyIssues/ClimateChange/Start.html mentions the fact that many non-Arctic people might think that a warming climate is an advantage for those living in the Arctic region. On the contrary, they point out, the Arctic people are well adapted to their traditional climate. A warming climate brings such problems for them as less sea-ice for transport and hunting, more erosion of coastal community shorelines, permafrost movement which disturbs pipelines and building foundations, and more insects which negatively affect reindeer as well as traditional methods of fresh-meat storage.

The warmer ocean and the colder land meet at the coastal zone, and it is in the coastal zone in the Arctic that most human activity and settlement has occurred and still takes place. Cultural heritage and current activities are therefore deeply affected by major changes in the coastal zone, whether it be erosion or land gain. In fact it is erosion that is the main problem for cultural heritage protection around the entire Arctic region, as the two case studies from

## CASE STUDIES ON CLIMATE CHANGE AND WORLD HERITAGE




Augustin Colette

2007
http://whc.unesco.org/en/activities/473/
Date Accessed: 15 January 2016

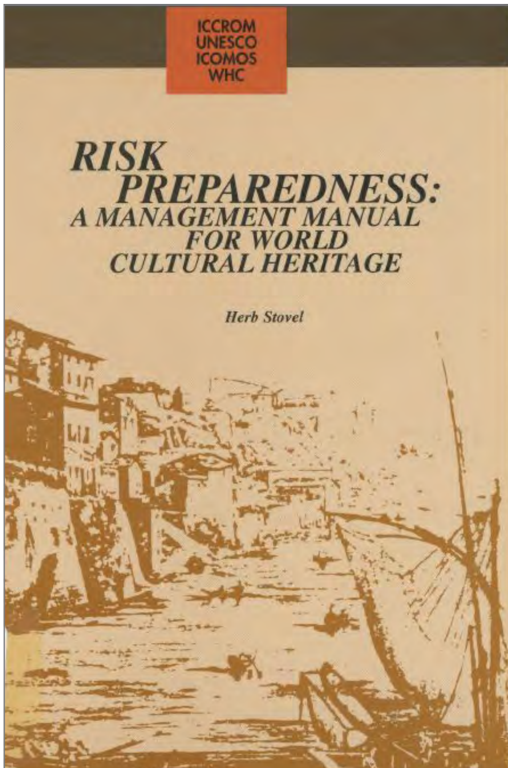
The twenty-six case studies presented here intend to illustrate the effect of climate change on heritage sites. These case studies range from Sagarmatha National Park in Nepal to the Golden Mountains of Altai in the Russian Federation to Timbuktu in Mali. The case studies are organized by category: Glaciers, 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

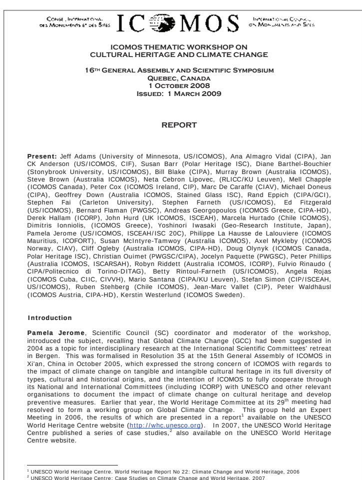
1998
http://www.iccrom.org/ifrcdn/pdf/ICCROM_17_RiskPreparedness_en.pdf
Date Accessed: 22 December 2015

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



Conseil International des Monuments et des Sites ICOMOS International Council on Monuments and Sites

ICOMOS THEMATIC WORKSHOP ON
CULTURAL HERITAGE AND CLIMATE CHANGE

16TH GENERAL ASSEMBLY AND SCIENTIFIC SYMPOSIUM
QUEBEC, CANADA
1 OCTOBER 2008
ISSUED: 1 MARCH 2009

REPORT

**Present:** Jeff Adams (University of Minnesota, US/ICOMOS), Ana Almagro Vidal (CIPA), Jan CK Anderson (US/ICOMOS, CIF), Susan Barr (Polar Heritage ISC), Diane Barthel-Bouchier (Stonybrook University, US/ICOMOS), Bill Blake (CIPA), Murray Brown (Australia ICOMOS), Steve Brown (Australia ICOMOS), Neta Cebron Lipovec, (RLICC/KU Leuven), Mell Chapple (ICOMOS Canada), Peter Cox (ICOMOS Ireland, CIP), Marc De Caraffe (CIAV), Michael Doneus (CIPA), Geoffrey Down (Australia ICOMOS, Stained Glass ISC), Rand Eppich (CIPA/GCI), Stephen Fai (Carleton University), Stephen Farneth (US/ICOMOS), Ed Fitzgerald (US/ICOMOS), Bernard Flaman (PWGSC), Andreas Georgopoulos (ICOMOS Greece, CIPA-HD), Derek Hallam (ICORP), John Hurd (UK ICOMOS, ISCEAH), Marcela Hurtado (Chile ICOMOS), Dimitris Ionniolis, (ICOMOS Greece), Yoshinori Iwasaki (Geo-Research Institute, Japan), Pamela Jerome (US/ICOMOS, ISCEAH/ISC 20C), Philippe La Hausse de Lalouviere (ICOMOS Mauritius, ICOFORT), Susan McIntyre-Tamwoy (Australia ICOMOS), Axel Mykleby (ICOMOS Norway, CIAV), Cliff Ogleby (Australia ICOMOS, CIPA-HD), Doug Olynyk (ICOMOS Canada, Polar Heritage ISC), Christian Ouimet (PWGSC/CIPA), Jocelyn Paquette (PWGSC), Peter Phillips (Australia ICOMOS, ISCARSAH), Robyn Riddett (Australia ICOMOS, ICORP), Fulvio Rinaudo ( CIPA/Politecnico di Torino-DITAG), Betty Rintoul-Farneth (US/ICOMOS), Angela Rojas (ICOMOS Cuba, CIIC, CIVVH), Mario Santana (CIPA/KU Leuven), Stefan Simon (CIP/ISCEAH, US/ICOMOS), Ruben Stehberg (Chile ICOMOS), Jean-Marc Vallet (CIP), Peter Waldhäusl (ICOMOS Austria, CIPA-HD), Kerstin Westerlund (ICOMOS Sweden).

**Introduction**

**Pamela Jerome**, Scientific Council (SC) coordinator and moderator of the workshop, introduced the subject, recalling that Global Climate Change (GCC) had been suggested in 2004 as a topic for interdisciplinary research at the International Scientific Committees' retreat in Bergen. This was formalised in Resolution 35 at the 15th General Assembly of ICOMOS in Xi'an, China in October 2005, which expressed the strong concern of ICOMOS with regards to the impact of climate change on tangible and intangible cultural heritage in its full diversity of types, cultural and historical origins, and the intention of ICOMOS to fully cooperate through its National and International Committees (including ICORP) with UNESCO and other relevant organisations to document the impact of climate change on cultural heritage and develop preventive measures. Earlier that year, the World Heritage Committee at its 29th meeting had resolved to form a working group on Global Climate Change. This group held an Expert Meeting in 2006, the results of which are presented in a report[1] available on the UNESCO World Heritage Centre website (http://whc.unesco.org). In 2007, the UNESCO World Heritage Centre published a series of case studies,[2] also available on the UNESCO World Heritage Centre website.

[1] UNESCO World Heritage Centre. World Heritage Report No 22: Climate Change and World Heritage, 2006
[2] UNESCO World Heritage Centre: Case Studies on Climate Change and World Heritage. 2007

1

PAMELA JEROME - 2009
http://www.icomos.org/climatechange/pdf/ICOMOS_GCC_Cultural_Heritage_Workshop_Quebec_2008_Report_Final_EN.pdf
Date Accessed: 18 July 2016

## SUMMARY OF THE SIGNIFICANCE OF AND THREATS TO THE CULTURAL RESOURCES LOCATED AT THE HISTORIC SETTLEMENT AREA ON HERSCHEL ISLAND TERRITORIAL PARK IN YUKON

212 *Summary of the Significance of and Threats to Cultural Resources* Heritage at Risk 2006/2007

**Summary of the Significance of and Threats to Cultural Resources Located at the Historic Settlement Area on Herschel Island Territorial Park of Yukon**

The Historic Settlement Area on Herschel Island was designated as a National Historic Event of Canada in 1972 and is part of Yukon's first Territorial Park, established in 1987. The events recognized in its national designation were the whaling industry, the establishment of Canadian sovereignty in the western Canadian Arctic, and the meeting of cultures. It is part of an area called Ivvavik/Vuntut/Herschel Island that is on Canada's tentative list for nomination as a World Heritage site. Ivvavik and Vuntut are each Canadian National Parks located in the very northwest corner of Yukon and Canada.

Sir John Franklin met ancestors of today's Inuvialuit when he visited the island in the summer of 1826 and gave it its English name. There is archaeological evidence here of the Thule culture which would mean at least 1,000 years of human use and occupation. Inuvialuit continue to use the island as a seasonal base for traditional hunting and fishing.

In 1890, American whalers, pursuing diminishing stocks of Pacific Bowhead whales, followed them over the north coast of Alaska into the Beaufort Sea of the Arctic Ocean. The fleet established a "settlement" at the deep and sheltered harbour of Pauline Cove on Herschel Island. At first, ships were simply frozen fast in the ice of the cove to provide shelter over winter in order to get the earliest start possible to the next whaling season. The first structure was built on land in 1892. Today, there are a dozen buildings standing that date back as far as 1893.

There are also archaeological remains of prehistoric, semi-subterranean houses and over 100 grave sites nearby.

As reported in the 2004/5 edition of Heritage at Risk (pp 266-7), cultural resources in the historic settlement area are threatened by climate change. The specific effects are rising sea level, coastline erosion, decaying permafrost, and changes to the hydrologic regime. The western Canadian Arctic and Alaska are seeing the greatest increases in yearly average temperature in the world.

Sea level in the Beaufort region has increased by 10 to 20 centimetres in the past century and is conservatively predicted to rise another half a metre in the next century. The Settlement Area is on a low lying spit of land. A rise of this extent will bring water up to the doorsteps of most of the historic buildings and submerge all archaeological sites.

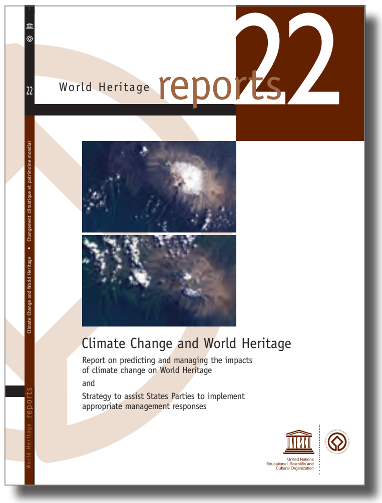
Another effect of warming is the disappearance of sea ice and increasingly violent late summer and fall storms in the Beaufort Sea. These phenomena are directly related to accelerated shoreline erosion due to increased wave action caused by high winds and the fetch provided by the recession of fixed sea ice.

Permafrost and ice lenses are found below ground throughout the island. Solifluction; the downward slumping of the thawed, active layer of soil over the frozen ground beneath has caused coffins to tumble and be pushed out of the ground on the south facing slopes behind the Settlement Area. This deterioration of the permafrost, coupled with a predicted increase in precipitation will inevitably effect the hydrologic regime and surface runoff rates and patterns.

June, 1991 aerial photograph of the Historic Settlement Area with the Northern Whaling and Trading Company (NW&TCo) Store near the shore at centre left and Pauline Cove at right (Credit: Government of Yukon Territory)

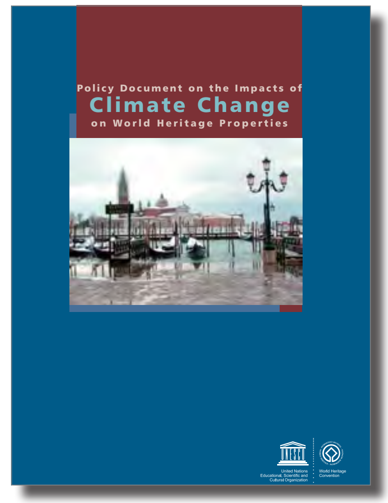
DOUG OLYNYK - 2008
http://www.icomos.org/risk/world_report/2006-2007/pdf/H@R_2006-2007_56_Special_Focus_Herschel_Yukon.pdf
Date Accessed: 19 July 2016

## WORLD HERITAGE REPORTS 22, CLIMATE CHANGE AND WORLD HERITAGE




UNESCO/World Heritage - 2007
http://whc.unesco.org/en/activities/474
Date Accessed: 18 July 2016

## POLICY DOCUMENT AND THE IMPACTS OF CLIMATE CHANGE ON WORLD HERITAGE PROPERTIES




UNESCO - 2008
http://whc.unesco.org/en/CC-policy-document/
Date Accessed: 18 July 2016

## FLOODING AND HISTORIC BUILDINGS


David Pickles, et al

2015
https://content.historicengland.org.uk/images-books/publications/flooding-and-historic-buildings-2ednrev/heag017-flooding-and-historic-buildings.pdf/
Date Accessed: 22 December 2015

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

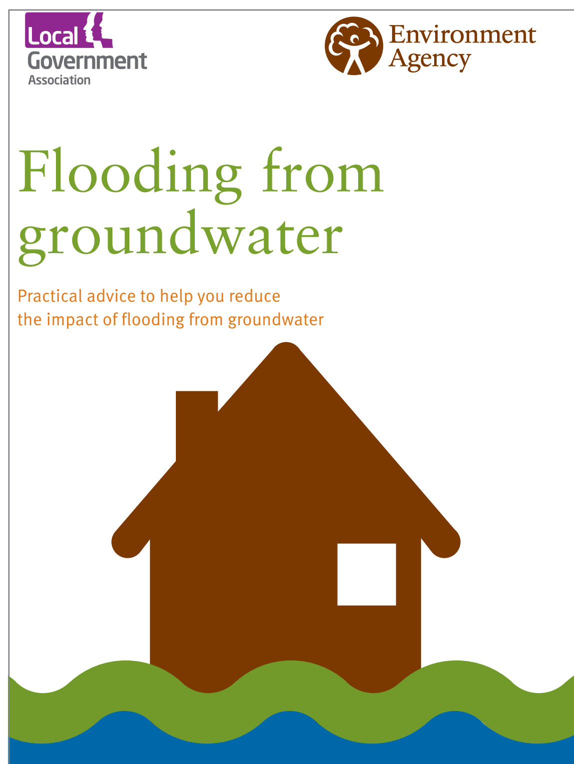
Local Government Association

2011
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297421/flho0911bugi-e-e.pdf
Date Accessed: 22 December 2015

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:

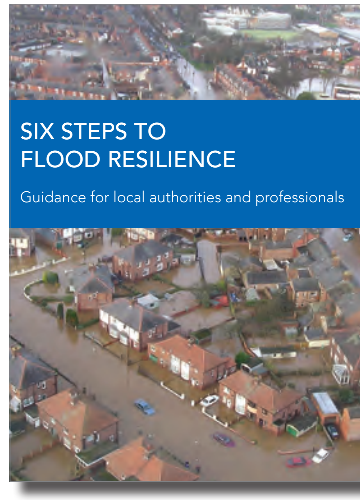
- The potential sources of flooding
- The initiation, duration, and emergent location of flood events
- Potential sources of information regarding groundwater flood risk at a particular property
- Recommended homeowner preparations for flooding
- Alternatives for preventing groundwater from entering 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

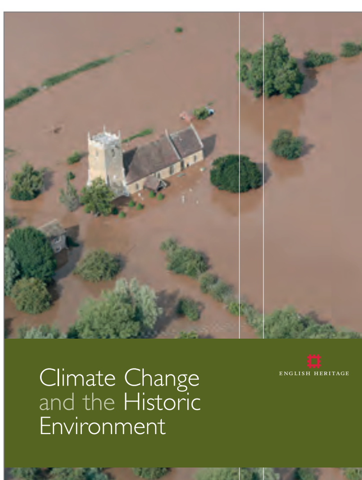

K. Murphy and M. Ings - 2013
http://cadw.gov.wales/docs/cadw/publications/Climate_change_and_the_historic_environment_of_Wales_EN.pdf
Date Accessed: 19 July 2016

## 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: 19 January 2016

## CLIMATE CHANGE AND THE HISTORIC ENVIRONMENT

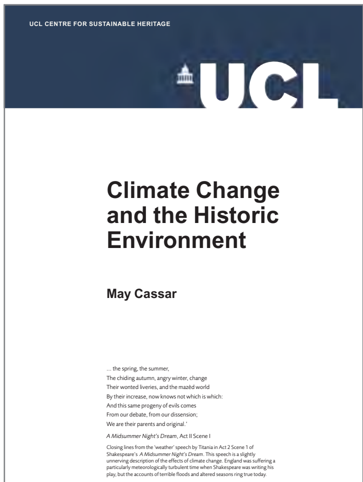



English Heritage (Historic England) - 2011
https://content.historicengland.org.uk/images-books/publications/climate-change-and-the-historic-environment/climate-change.pdf/
Date Accessed: 18 July 2016

## FLOOD DAMAGE TO TRADITIONAL BUILDINGS: INFORMATION FOR HISTORIC BUILDINGS


Historic Scotland - 2014
http://conservation.historic-scotland.gov.uk/inform-flood-damage-to-traditional-buildings.pdf
Date Accessed: 18 July 2016

## CLIMATE CHANGE AND THE HISTORIC ENVIRONMENT




MAY CASSAR - 2005
http://discovery.ucl.ac.uk/2082/1/2082.pdf
Date Accessed: 18 July 2016

## 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: 19 July 2016

## EXPLORING CULTURAL DIMENSIONS OF ADAPTATION TO CLIMATE CHANGE

17

Exploring cultural dimensions of adaptation to climate change

*Thomas Heyd and Nick Brooks*

**Introduction**

The latest report of the IPCC states that 'Warming of the climate system is unequivocal' and that most of the warming over the past half-century is '*very likely* due to the observed increase in anthropogenic [greenhouse gas] concentrations' (IPCC, 2007a, pp. 1, 4). A range of potentially damaging impacts of climate change is anticipated, some of which may be abrupt and irreversible, with potentially severe impacts on human and natural systems (IPCC, 2007b). It is a reasonable proposition that, in light of these conclusions, ethically responsible decision-makers ought to take appropriate action, be it in terms of prevention, mitigation or adaptation (see Jamieson, 2001; Gardiner, 2004).

Though anthropogenic climate change may be new, significant local and regional variations in climate have occurred throughout the historical period, and prehistoric modern humans lived through repeated periods of abrupt and severe climate change that was often global in nature, responding and adapting to environmental change and variation with varying degrees of success and a variety of different outcomes (for example Roberts, 1998; Brooks, 2006).

In this chapter, we propose that culture plays an important role in mediating human responses to environmental change. In particular, we argue that these responses depend heavily on the extent to which societies see themselves as separate from or part of the wider physical or 'natural' environment. A detailed discussion of the social construction of nature is beyond the scope of this chapter (but see Heyd, 2007). For the purposes of this chapter, the term nature is used here to refer to the suite of biogeophysical and biogeochemical systems and processes that serve to regulate the physical environment over a wide range of spatial and temporal scales. These systems are not isolated from human influence, but may be viewed

*Adapting to Climate Change: Thresholds, Values, Governance*, eds. W. Neil Adger, Irene Lorenzoni and Karen L. O'Brien. Published by Cambridge University Press. © Cambridge University Press 2009.

269

THOMAS HEYD AND NICK BROOKS - 2009
http://www.garama.co.uk/wp-content/uploads/2013/06/Heyd-Brooks_cultural.pdf
Date Accessed: 19 July 2016

# B FEDERAL

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## 36 CFR Part 800 – Protection of Historic Properties

Advisory Council on Historic Preservation

2004
http://www.achp.gov/regs-rev04.pdf
Date Accessed: 22 December 2015

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.


1

36 CFR PART 800 – PROTECTION OF HISTORIC PROPERTIES [incorporating amendments effective August 5, 2004]

Subpart A – Purposes and Participants

Sec.
800.1 Purposes.
800.2 Participants in the Section 106 process.

Subpart B – The Section 106 Process

800.3 Initiation of the section 106 process.
800.4 Identification of historic properties.
800.5 Assessment of adverse effects.
800.6 Resolution of adverse effects.
800.7 Failure to resolve adverse effects.
800.8 Coordination with the National Environmental Policy act.
800.9 Council review of Section 106 compliance.
800.10 Special requirements for protecting National Historic Landmarks.
800.11 Documentation standards.
800.12 Emergency situations.
800.13 Post-review discoveries.

Subpart C – Program Alternatives

800.14 Federal agency program alternatives.
800.15 Tribal, State and Local Program Alternatives. (Reserved)
800.16 Definitions.
Appendix A – Criteria for Council involvement in reviewing individual section 106 cases

Authority: 16 U.S.C. 470s.

Subpart A-Purposes and Participants

§ 800.1 Purposes.

(a) *Purposes of the section 106 process.* Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the Council a reasonable opportunity to comment on such undertakings. The procedures in this part define how Federal agencies meet these statutory responsibilities. The section 106 process seeks to accommodate historic preservation concerns with the needs of Federal undertakings through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties, commencing at the early stages of project planning. The goal of consultation is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties.

(b) *Relation to other provisions of the act.* Section 106 is related to other provisions of the act designed to further the national policy of historic preservation. References to those provisions are included in this part to identify circumstances where they may affect actions taken to meet section 106 requirements. Such provisions may have their own implementing regulations or guidelines and are not intended to be implemented by the procedures in this part except insofar as they relate to the section 106 process. Guidelines, policies and procedures issued by other agencies, including the Secretary, have been cited in this part for ease of access and are not incorporated by reference.

(c) *Timing.* The agency official must complete the section 106 process "prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license." This does not prohibit agency official from conducting or authorizing nondestructive project planning activities before completing compliance with section 106, provided that such actions do not restrict the subsequent consideration of alternatives to avoid, minimize or mitigate the undertaking's adverse effects on historic properties. The agency official shall ensure that the section 106 process is initiated early in the undertaking's planning, so that a broad range of alternatives may be considered during the planning process for the undertaking.

§ 800.2 Participants in the Section 106 process.

(a) *Agency official.* It is the statutory obligation of the Federal agency to fulfill the requirements of section 106 and to ensure that an agency official with jurisdiction over an undertaking takes legal and financial responsibility for section 106 compliance in accordance with subpart B of this part. The agency official has approval authority for the undertaking and can commit the Federal agency to take appropriate action for a specific undertaking as a result of section 106 compliance. For the purposes of subpart C of this part, the agency official has the authority to commit the Federal agency to any obligation it may assume in the implementation of a program alternative. The agency official may be a State, local, or tribal government official who has been delegated legal responsibility for compliance with section 106 in accordance with Federal law.

(1) *Professional standards.* Section 112(a)(1)(A) of the act requires each Federal agency responsible for the protection of historic resources, including archeological resources, to ensure that all actions taken by employees or contractors of the agency shall meet professional standards under regulations developed by the Secretary.

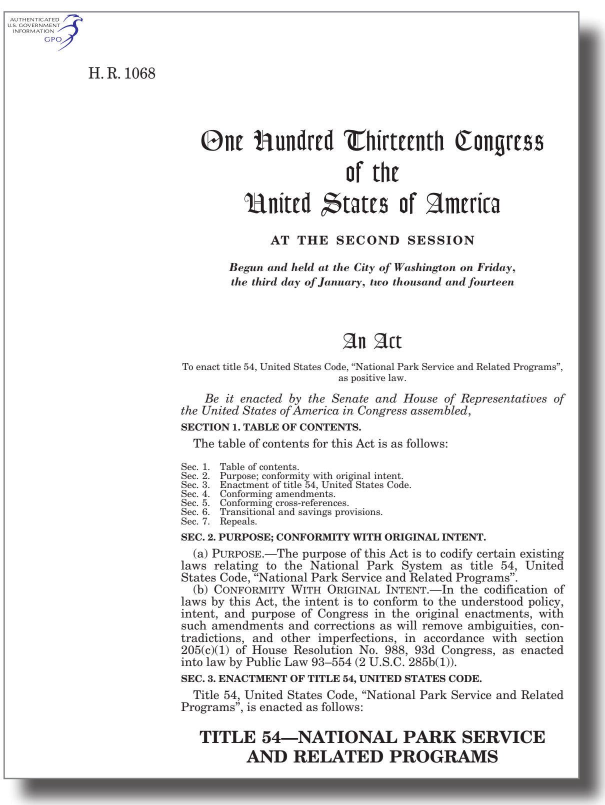
(2) *Lead Federal agency.* If more than one Federal agency is involved in an undertaking, some or all the agencies may designate a lead Federal agency, which shall identify the appropriate official to serve as the agency official who shall act on their behalf, fulfilling their collective responsibilities under section 106. Those Federal agencies that do not designate a lead Federal agency remain individually responsible for their compliance with this part.

(3) *Use of contractors.* Consistent with applicable conflict of interest laws, the agency official may use the services of applicants, consultants, or designees to prepare information, analyses and recommendations under this part. The agency official remains legally responsible for all required findings and determinations. If a document or study is prepared by a non-Federal party, the agency official is responsible for ensuring that its content meets applicable standards and guidelines.

(4) *Consultation.* The agency official shall involve the consulting parties described in paragraph (c) of this section in findings and determinations made during the section 106 process. The agency official should plan consultations appropriate to the scale of the undertaking and the scope of Federal involvement and coordinated with other requirements of other statutes, as applicable, such as the National Environmental Policy Act, the Native American Graves Protection and Repatriation Act, the American Indian Religious Freedom Act, the Archeological Resources Protection Act and agency-specific legislation. The Council encourages the agency official to use to the extent possible existing agency procedures and mechanisms to fulfill the consultation requirements of this part.

(b) *Council.* The Council issues regulations to implement section 106,

## H. R. 1068, Title 54, United States Code, "National Park Service and Related Programs."


Authenticated U.S. Government Information GPO

H. R. 1068

One Hundred Thirteenth Congress of the United States of America

AT THE SECOND SESSION

*Begun and held at the City of Washington on Friday, the third day of January, two thousand and fourteen*

An Act

To enact title 54, United States Code, "National Park Service and Related Programs", as positive law.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,*

**SECTION 1. TABLE OF CONTENTS.**

The table of contents for this Act is as follows:

Sec. 1. Table of contents.
Sec. 2. Purpose; conformity with original intent.
Sec. 3. Enactment of title 54, United States Code.
Sec. 4. Conforming amendments.
Sec. 5. Conforming cross-references.
Sec. 6. Transitional and savings provisions.
Sec. 7. Repeals.

**SEC. 2. PURPOSE; CONFORMITY WITH ORIGINAL INTENT.**

(a) Purpose.—The purpose of this Act is to codify certain existing laws relating to the National Park System as title 54, United States Code, "National Park Service and Related Programs".

(b) Conformity With Original Intent.—In the codification of laws by this Act, the intent is to conform to the understood policy, intent, and purpose of Congress in the original enactments, with such amendments and corrections as will remove ambiguities, contradictions, and other imperfections, in accordance with section 205(c)(1) of House Resolution No. 988, 93d Congress, as enacted into law by Public Law 93–554 (2 U.S.C. 285b(1)).

**SEC. 3. ENACTMENT OF TITLE 54, UNITED STATES CODE.**

Title 54, United States Code, "National Park Service and Related Programs", is enacted as follows:

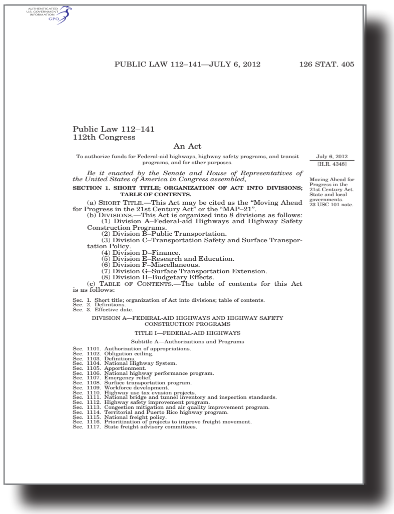
**TITLE 54—NATIONAL PARK SERVICE AND RELATED PROGRAMS**

One Hundred Thirteenth Congress of the United States of America at the Second Session
2003
https://www.gpo.gov/fdsys/pkg/WCPD-2003-03-10/pdf/WCPD-2003-03-10-Pg286.pdf
Date Accessed: 22 December 2015

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


PUBLIC LAW 112–141—JULY 6, 2012 126 STAT. 405

Public Law 112–141
112th Congress

An Act

To authorize funds for Federal-aid highways, highway safety programs, and transit programs, and for other purposes.

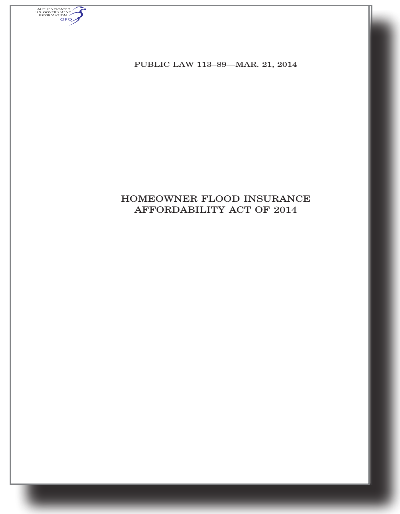
July 6, 2012 [H.R. 4348]

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,*

SECTION 1. SHORT TITLE; ORGANIZATION OF ACT INTO DIVISIONS; TABLE OF CONTENTS.

(a) Short Title.—This Act may be cited as the "Moving Ahead for Progress in the 21st Century Act" or the "MAP–21".
(b) Divisions.—This Act is organized into 8 divisions as follows:
(1) Division A–Federal-aid Highways and Highway Safety Construction Programs.
(2) Division B–Public Transportation.
(3) Division C–Transportation Safety and Surface Transportation Policy.
(4) Division D–Finance.
(5) Division E–Research and Education.
(6) Division F–Miscellaneous.
(7) Division G–Surface Transportation Extension.
(8) Division H–Budgetary Effects.
(c) Table of Contents.—The table of contents for this Act is as follows:

## Homeowner Flood Insurance Affordability Act of 2014


PUBLIC LAW 113–89—MAR. 21, 2014

HOMEOWNER FLOOD INSURANCE AFFORDABILITY ACT OF 2014

US Government Publishing Office - 6 July 2012
https://www.gpo.gov/fdsys/pkg/PLAW-112publ141/pdf/PLAW-112publ141.pdf
Date Accessed: 11 August 2016

US Government Publishing Office - 21 March 2014
https://www.congress.gov/113/plaws/publ89/PLAW-113publ89.pdf
Date Accessed: 22 February 2016

## 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: 22 December 2015

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.


FEMA Fact Sheet

Federal Insurance and Mitigation Administration

Historic Structures and the Biggert-Waters Flood Insurance Reform Act of 2012

*In 2012, the U.S. Congress passed the Biggert Waters Flood Insurance Reform Act of 2012 (BW 12) which calls on the Federal Emergency Management Agency (FEMA) and other agencies to make a number of changes to the way the NFIP is run. Some of these changes have already been put in place, and others will be implemented in the coming months. Key provisions of the legislation will require the NFIP to raise rates to reflect true flood risk, make the program more financially stable, and change how Flood Insurance Rate Map (FIRM) updates impact policyholders. The changes will mean premium rate increases for some – but not all -- policyholders over time.*

*Below are some of the Frequently Asked Questions (FAQs) associated with BW 12 and its impact on historic structures.*

**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, A1-A30, V, VE, V1-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.

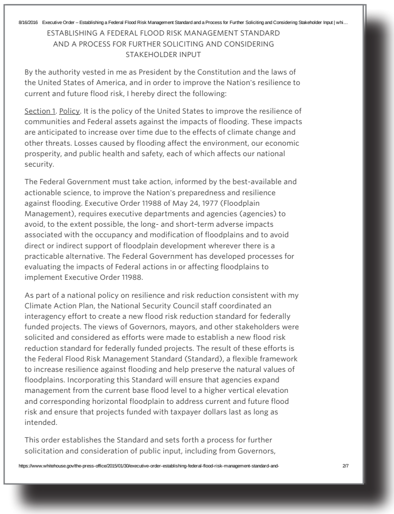
**6. What are the NFIP floodplain management provisions that pertain to historic structures?**

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



8/16/2016 Executive Order – Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input | whi...

ESTABLISHING A FEDERAL FLOOD RISK MANAGEMENT STANDARD AND A PROCESS FOR FURTHER SOLICITING AND CONSIDERING STAKEHOLDER INPUT

By the authority vested in me as President by the Constitution and the laws of the United States of America, and in order to improve the Nation's resilience to current and future flood risk, I hereby direct the following:

Section 1. Policy. It is the policy of the United States to improve the resilience of communities and Federal assets against the impacts of flooding. These impacts are anticipated to increase over time due to the effects of climate change and other threats. Losses caused by flooding affect the environment, our economic prosperity, and public health and safety, each of which affects our national security.

The Federal Government must take action, informed by the best-available and actionable science, to improve the Nation's preparedness and resilience against flooding. Executive Order 11988 of May 24, 1977 (Floodplain Management), requires executive departments and agencies (agencies) to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. The Federal Government has developed processes for evaluating the impacts of Federal actions in or affecting floodplains to implement Executive Order 11988.

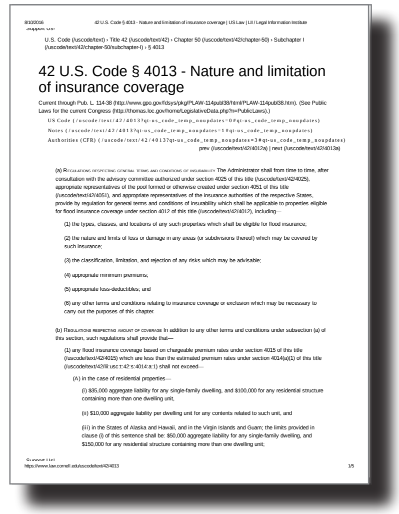
As part of a national policy on resilience and risk reduction consistent with my Climate Action Plan, the National Security Council staff coordinated an interagency effort to create a new flood risk reduction standard for federally funded projects. The views of Governors, mayors, and other stakeholders were solicited and considered as efforts were made to establish a new flood risk reduction standard for federally funded projects. The result of these efforts is the Federal Flood Risk Management Standard (Standard), a flexible framework to increase resilience against flooding and help preserve the natural values of floodplains. Incorporating this Standard will ensure that agencies expand management from the current base flood level to a higher vertical elevation and corresponding horizontal floodplain to address current and future flood risk and ensure that projects funded with taxpayer dollars last as long as intended.

This order establishes the Standard and sets forth a process for further solicitation and consideration of public input, including from Governors,

https://www.whitehouse.gov/the-press-office/2015/01/30/executive-order-establishing-federal-flood-risk-management-standard-and- 2/7

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



8/10/2016 42 U.S. Code § 4013 - Nature and limitation of insurance coverage | US Law | LII / Legal Information Institute

U.S. Code (/uscode/text) › Title 42 (/uscode/text/42) › Chapter 50 (/uscode/text/42/chapter-50) › Subchapter I (/uscode/text/42/chapter-50/subchapter-I) › § 4013

42 U.S. Code § 4013 - Nature and limitation of insurance coverage

Current through Pub. L. 114-38 (http://www.gpo.gov/fdsys/pkg/PLAW-114publ38/html/PLAW-114publ38.htm). (See Public Laws for the current Congress (http://thomas.loc.gov/home/LegislativeData.php?n=PublicLaws).)

US Code (/uscode/text/42/4013?qt-us_code_temp_noupdates=0#qt-us_code_temp_noupdates)
Notes (/uscode/text/42/4013?qt-us_code_temp_noupdates=1#qt-us_code_temp_noupdates)
Authorities (CFR) (/uscode/text/42/4013?qt-us_code_temp_noupdates=3#qt-us_code_temp_noupdates)
prev (/uscode/text/42/4012a) | next (/uscode/text/42/4013a)

(a) Regulations respecting general terms and conditions of insurability The Administrator shall from time to time, after consultation with the advisory committee authorized under section 4025 of this title (/uscode/text/42/4025), appropriate representatives of the pool formed or otherwise created under section 4051 of this title (/uscode/text/42/4051), and appropriate representatives of the insurance authorities of the respective States, provide by regulation for general terms and conditions of insurability which shall be applicable to properties eligible for flood insurance coverage under section 4012 of this title (/uscode/text/42/4012), including—

(1) the types, classes, and locations of any such properties which shall be eligible for flood insurance;

(2) the nature and limits of loss or damage in any areas (or subdivisions thereof) which may be covered by such insurance;

(3) the classification, limitation, and rejection of any risks which may be advisable;

(4) appropriate minimum premiums;

(5) appropriate loss-deductibles; and

(6) any other terms and conditions relating to insurance coverage or exclusion which may be necessary to carry out the purposes of this chapter.

(b) Regulations respecting amount of coverage In addition to any other terms and conditions under subsection (a) of this section, such regulations shall provide that—

(1) any flood insurance coverage based on chargeable premium rates under section 4015 of this title (/uscode/text/42/4015) which are less than the estimated premium rates under section 4014(a)(1) of this title (/uscode/text/42/lii:usc:t:42:s:4014:a:1) shall not exceed—

(A) in the case of residential properties—

(i) $35,000 aggregate liability for any single-family dwelling, and $100,000 for any residential structure containing more than one dwelling unit,

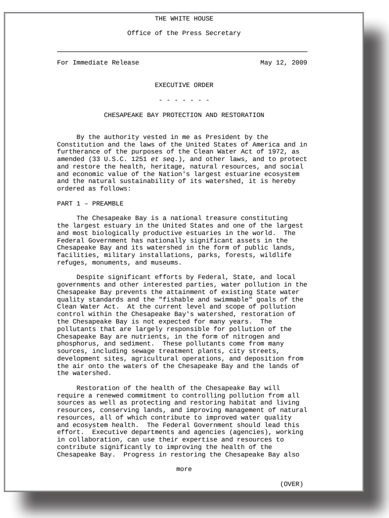
(ii) $10,000 aggregate liability per dwelling unit for any contents related to such unit, and

(iii) in the States of Alaska and Hawaii, and in the Virgin Islands and Guam; the limits provided in clause (i) of this sentence shall be: $50,000 aggregate liability for any single-family dwelling, and $150,000 for any residential structure containing more than one dwelling unit;

https://www.law.cornell.edu/uscode/text/42/4013 1/5

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

Office of the Press Secretary

For Immediate Release May 12, 2009

EXECUTIVE ORDER

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CHESAPEAKE BAY PROTECTION AND RESTORATION

By the authority vested in me as President by the Constitution and the laws of the United States of America and in furtherance of the purposes of the Clean Water Act of 1972, as amended (33 U.S.C. 1251 *et seq.*), and other laws, and to protect and restore the health, heritage, natural resources, and social and economic value of the Nation's largest estuarine ecosystem and the natural sustainability of its watershed, it is hereby ordered as follows:

PART 1 – PREAMBLE

The Chesapeake Bay is a national treasure constituting the largest estuary in the United States and one of the largest and most biologically productive estuaries in the world. The Federal Government has nationally significant assets in the Chesapeake Bay and its watershed in the form of public lands, facilities, military installations, parks, forests, wildlife refuges, monuments, and museums.

Despite significant efforts by Federal, State, and local governments and other interested parties, water pollution in the Chesapeake Bay prevents the attainment of existing State water quality standards and the "fishable and swimmable" goals of the Clean Water Act. At the current level and scope of pollution control within the Chesapeake Bay's watershed, restoration of the Chesapeake Bay is not expected for many years. The pollutants that are largely responsible for pollution of the Chesapeake Bay are nutrients, in the form of nitrogen and phosphorus, and sediment. These pollutants come from many sources, including sewage treatment plants, city streets, development sites, agricultural operations, and deposition from the air onto the waters of the Chesapeake Bay and the lands of the watershed.

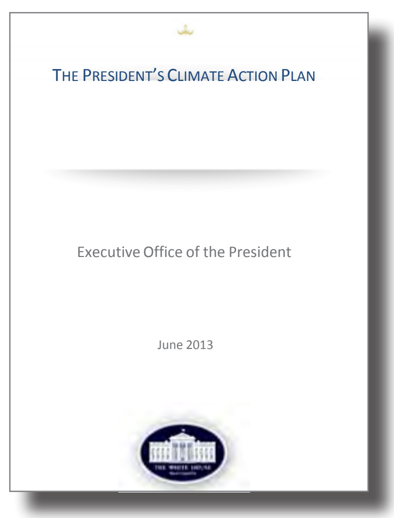
Restoration of the health of the Chesapeake Bay will require a renewed commitment to controlling pollution from all sources as well as protecting and restoring habitat and living resources, conserving lands, and improving management of natural resources, all of which contribute to improved water quality and ecosystem health. The Federal Government should lead this effort. Executive departments and agencies (agencies), working in collaboration, can use their expertise and resources to contribute significantly to improving the health of the Chesapeake Bay. Progress in restoring the Chesapeake Bay also

more

(OVER)

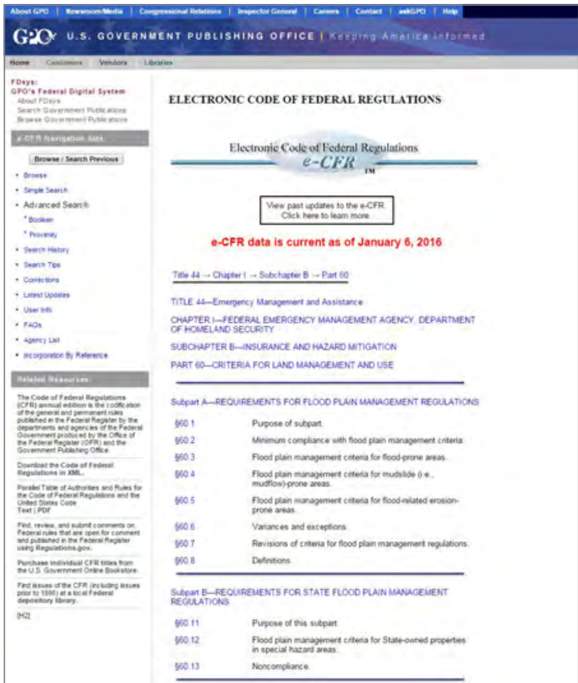
The White House - 12 May 2009
http://executiveorder.chesapeakebay.net/EO/file.axd?file=2009%2f8%2fChesapeake+Executive+Order.pdf
Date Accessed: 26 February 2016

## THE PRESIDENT'S CLIMATE ACTION PLAN




Executive Office of the President - June 2013
https://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf
Date Accessed: 26 February 2016

## 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: 4 January 2016

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:22 December 2015

The order has these main objectives:

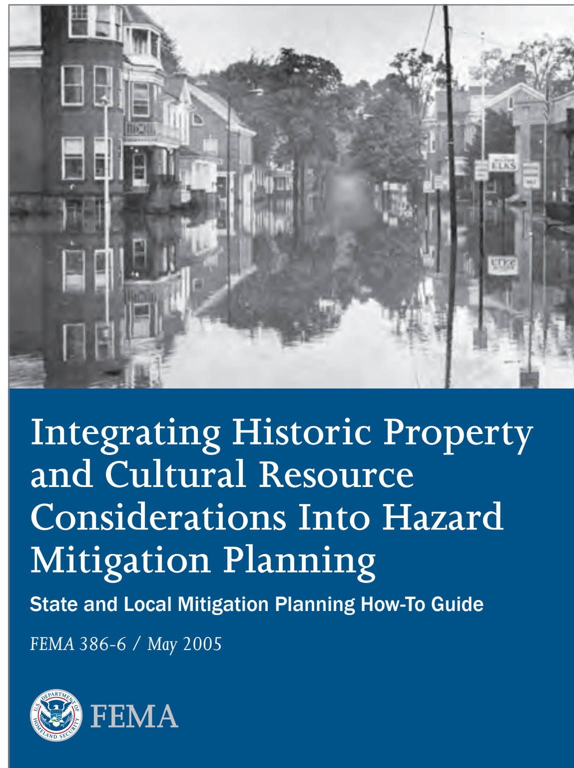
- The Federal government shall provide leadership in preserving America's heritage through active advancement and by promoting partnerships for the preservation and use of historic properties.
- Federal agencies shall seek to build preservation partnerships with State and local governments, Indian tribes, 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

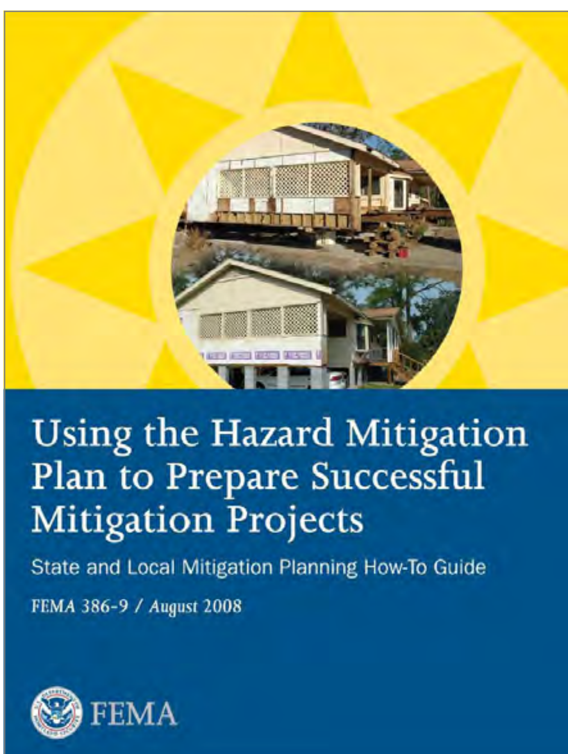
Federal Emergency Management Agency (FEMA)

2006
http://www.fema.gov/media-library/assets/documents/4317
Date Accessed: 23 December 2015

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.




## FEMA 386-9, USING THE HAZARD MITIGATION PLAN TO PREPARE SUCCESSFUL MITIGATION PROJECTS

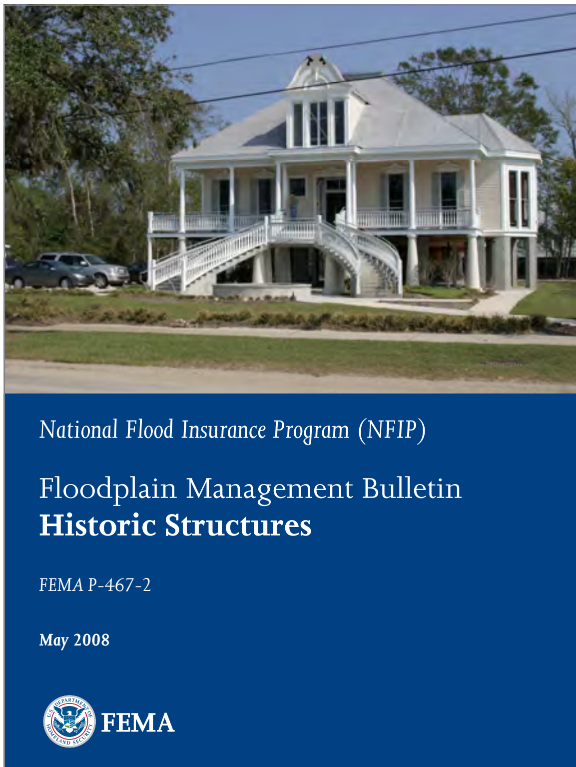



Federal Emergency Management Agency (FEMA)

2008
http://www.fema.gov/media-library-data/20130726-1635-20490-7447/how_to_9_aug08.pdf
Date Accessed: 4 January 2016

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




### Federal Emergency Management Agency (FEMA)

2008
http://www.fema.gov/media-library/assets/documents/13411?id=3282
Date Accessed: 23 December 2015

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:

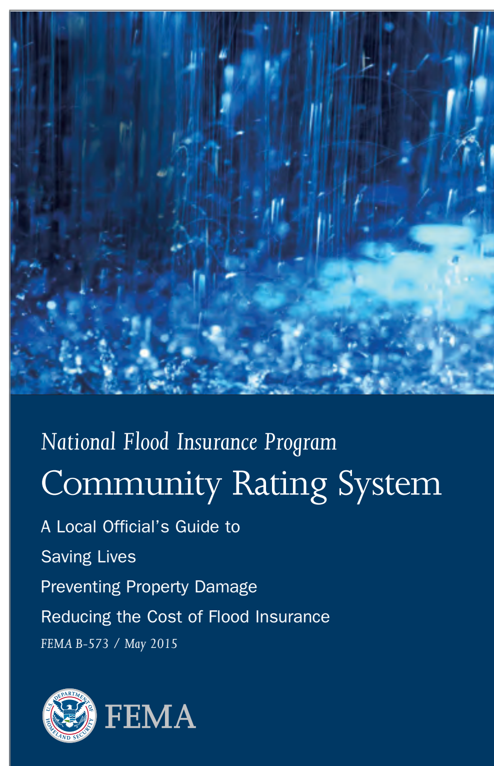
- Elevation
    - Buildings and associated foundations
    - Floor levels inside of buildings
- Flood proofing
    - Dry flood proofing
    - Wet flood proofing
- Relocation

## FEMA Community Rating System

### Federal Emergency Management Agency (FEMA)

22 December 2015
http://www.fema.gov/community-rating-system
Date Accessed: 8 January 2016

This document describes the Community Rating System (CRS) which recognizes and encourages community floodplain management activities that exceed the minimum NFIP standards. Depending upon the level of participation, flood insurance premium rates for policyholders can be reduced up to 45%. Besides the benefit of reduced insurance rates, CRS floodplain management activities enhance public safety, reduce damages to property and public infrastructure, avoid economic disruption and losses, reduce human suffering, and protect the environment. Technical assistance on designing and implementing some activities is available at no charge. Participating in the CRS provides an incentive to maintaining and improving a community's floodplain management program over the years. Implementing some CRS activities can help projects qualify for certain other Federal assistance programs.



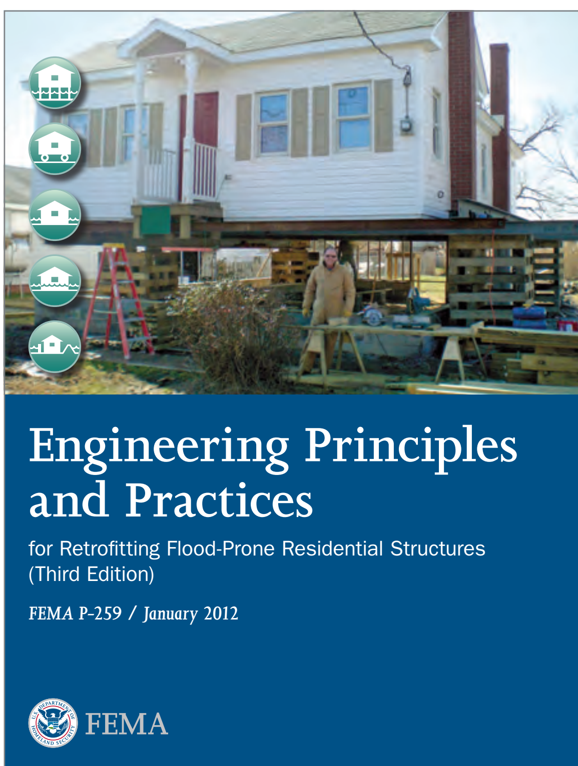
## FEMA P-312, 3rd Edition: Homeowner's Guide to Retrofitting: Six Ways to Protect Your Home from Flooding

Federal Emergency Management Agency (FEMA)

2014
https://www.fema.gov/media-library/assets/documents/480
Date Accessed: 22 December 2015

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

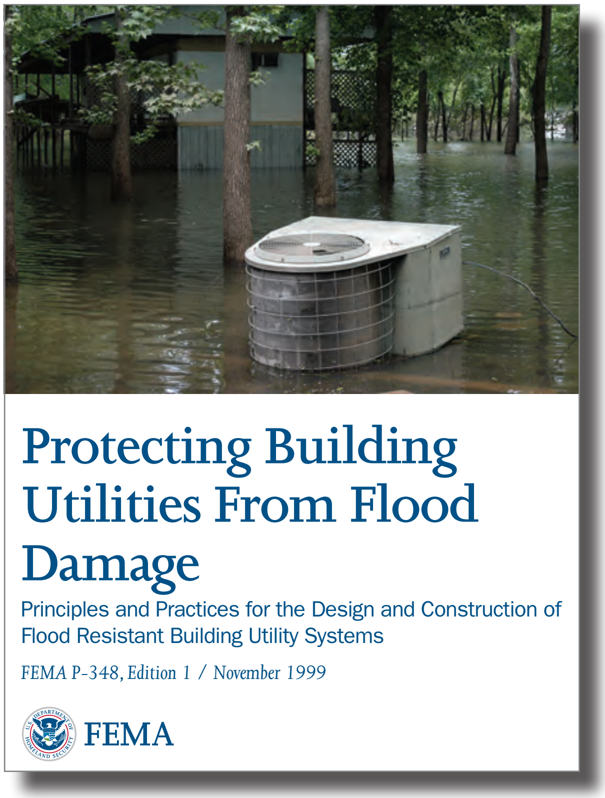



Federal Emergency Management Agency (FEMA)

2012
https://www.fema.gov/media-library/assets/documents/3001
Date Accessed: 4 January 2016

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)

1999
https://www.fema.gov/media-library/assets/documents/3729
Date Accessed: 22 December 2015

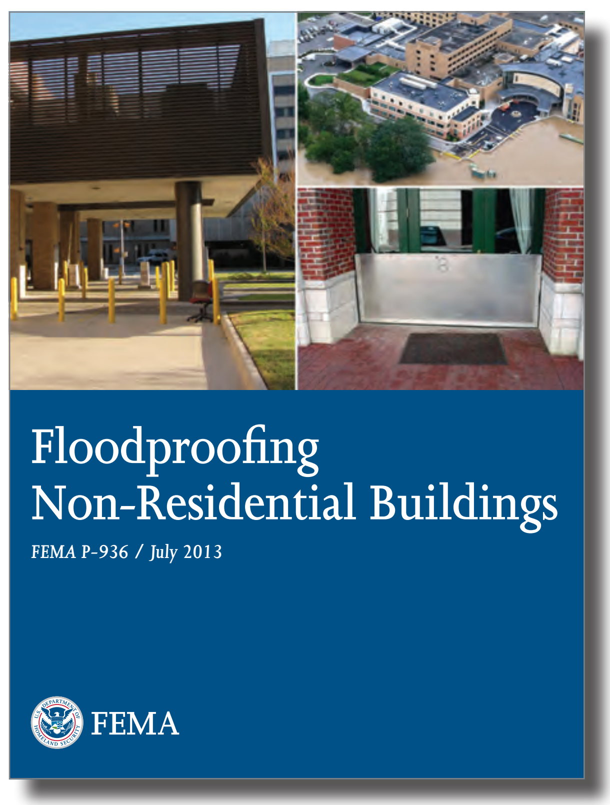
The overall objective of this document is to assist in the design and construction or improvement of building utility systems in new, substantially improved or existing buildings so that the buildings can be re-occupied and fully operational as soon as electricity, sewer, and water are restored to the neighborhood.

## FEMA P-936, Floodproofing Non-Residential Buildings

Federal Emergency Management Agency (FEMA)

2013
http://www.fema.gov/media-library-data/9a50c534fc5895799321dcdd4b6083e7/P-936_8-20-13_508r.pdf
Date Accessed: 23 December 2015

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.

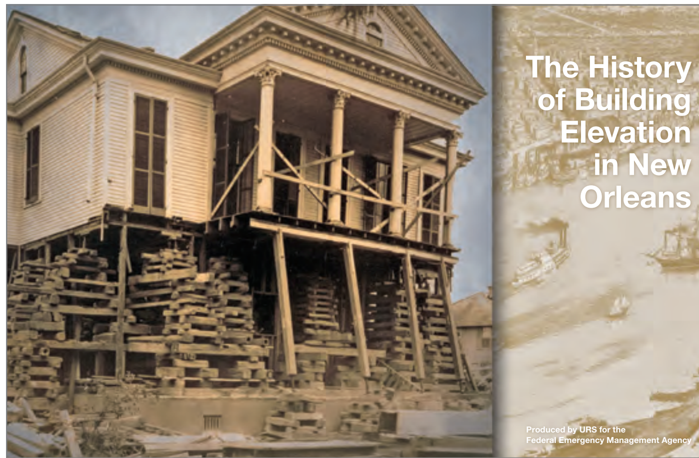


## THE HISTORY OF BUILDING ELEVATION IN NEW ORLEANS

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. Theis 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 Orlean's risk to flooding, despite the intentionof behind puttiing this new infrastructure in place.

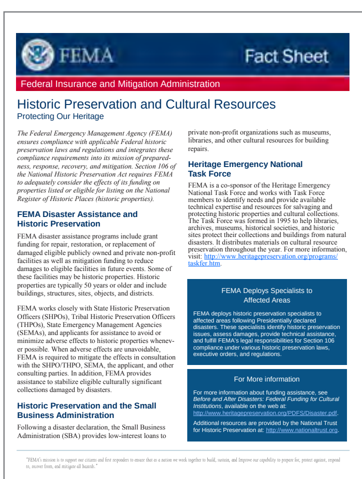
The report wraps up with a chapter on the archaeological concerns associated with elevating a building. It recommends leaving archaeological findings in place and consulting an archaeologist if this cannot be avoided.




Federal Emergency Management Agency (FEMA)

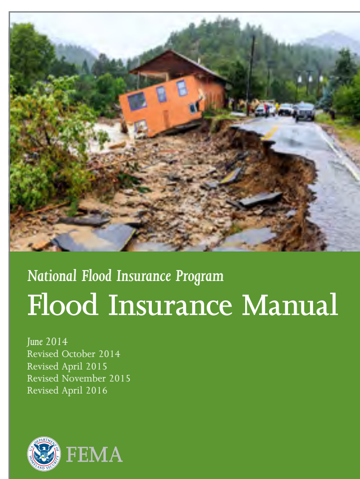
December 2012
http://www.fema.gov/media-library-data/20130726-1919-25045-5921/cno_history_bldg_elev_042313.pdf
Date Accessed: 8 January 2016

## FEMA FACT SHEET: HISTORIC PRESERVATION AND CULTURAL RESOURCES



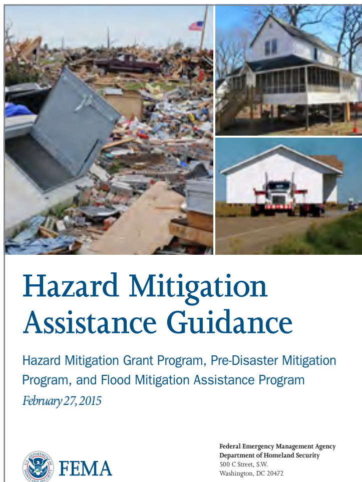

Federal Emergency Management Agency (FEMA) - 14 July 2014
http://www.fema.gov/media-library-data/20130726-1533-20490-9000/historicpreservationcultural_resources_2012.pdf Date Accessed: 5 February 2016

## 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: 9 August 2016

## HAZARD MITIGATION ASSISTANCE GUIDANCE

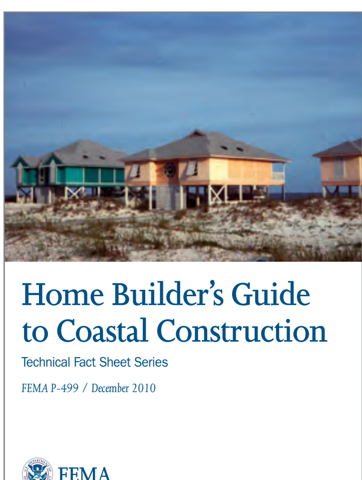



Federal Emergency Management Agency (FEMA) -
27 February 2015
http://www.fema.gov/media-library-data/1424983165449-38f5dfc69c0bd4ea8a161e8bb7b79553/HMA_Guidance_022715_508.pdf
Date Accessed: 21 January 2016

## PRE-DISASTER MITIGATION GRANT PROGRAM

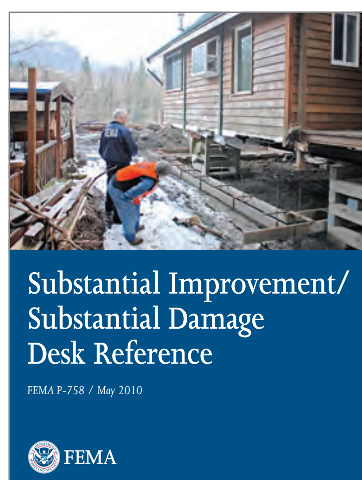

Federal Emergency Management Agency (FEMA) -
30 October 2015
http://www.fema.gov/pre-disaster-mitigation-grant-program
Date Accessed: 4 February 2016

## FEMA P-499 HOME BUILDER'S GUIDE TO COASTAL CONSTRUCTION



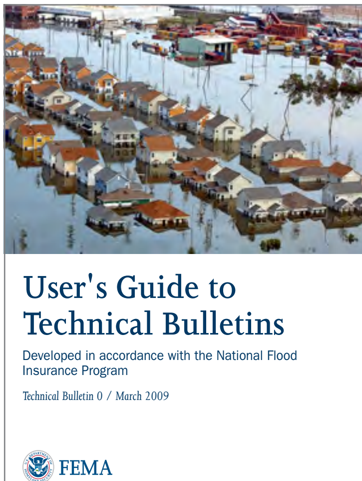

Federal Emergency Management Agency (FEMA) -
December 2010
http://www.fema.gov/media-library-data/20130726-1538-20490-2983/fema499web_2.pdf
Date Accessed: 16 February 2016

## 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: 10 August 2016

## TECHNICAL BULLETIN 0: USER'S GUIDE TO TECHNICAL BULLETINS




Federal Emergency Management Agency (FEMA) -
Date: March 2009
http://www.fema.gov/media-library-data/20130726-1447-20490-2019/fema_tb_0_color_rev1.pdf
Date Accessed: 18 August 2016

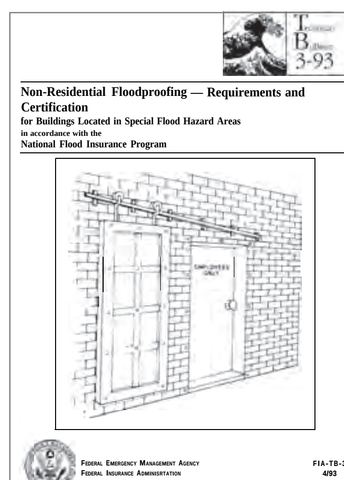
## TECHNICAL BULLETIN 1: OPENINGS IN FOUNDATION WALLS AND WALLS OF ENCLOSURES


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: 22 February 2016

## TECHNICAL BULLETIN 2: FLOOD DAMAGE-RESISTANT MATERIALS REQUIREMENTS

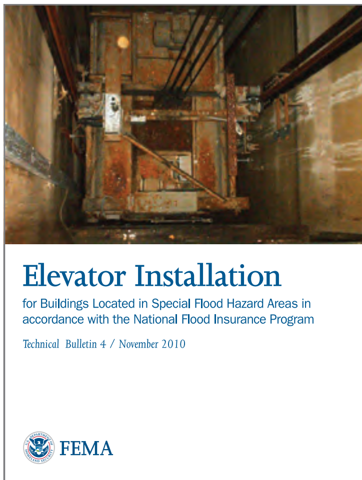

Federal Emergency Management Agency (FEMA) -
August 2008
http://www.fema.gov/media-library-data/20130726-1502-20490-4764/fema_tb_2_rev1.pdf
Date Accessed: 22 February 2016

## 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: 16 August 2016

## TECHNICAL BULLETIN 4: ELEVATOR INSTALLATION

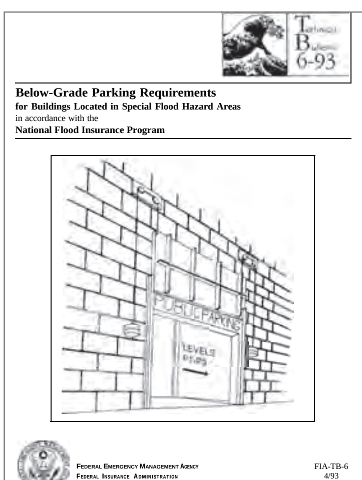



Federal Emergency Management Agency (FEMA) -November 2010
http://www.fema.gov/media-library-data/20130726-1511-20490-5041/fema_tb_4_rev.pdf
Date Accessed: 16 August 2016

## 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: 16 August 2016

## 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: 16 August 2016

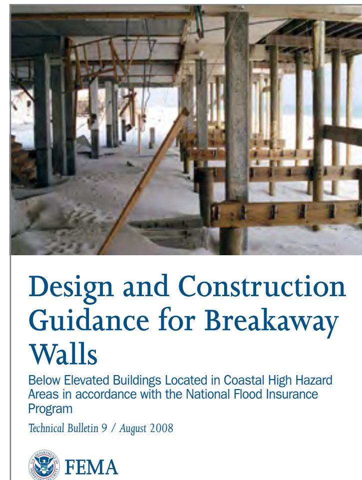
## TECHNICAL BULLETIN 7: WET FLOODPROOFING REQUIREMENTS


Federal Emergency Management Agency (FEMA) - 1993
http://www.fema.gov/media-library-data/20130726-1511-20490-8042/tb_7_complete_scan.pdf
Date Accessed: 22 February 2016

## TECHNICAL BULLETIN 8: CORROSION PROTECTION FOR METAL CONNECTORS IN COASTAL AREAS

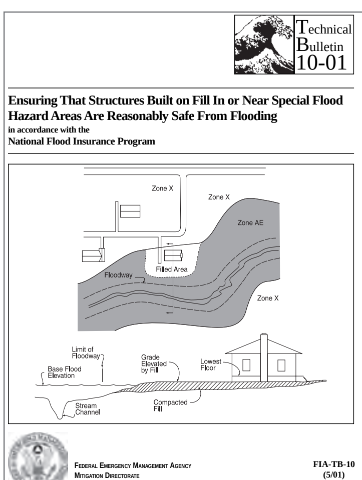

Federal Emergency Management Agency (FEMA) - 1996
http://www.fema.gov/media-library-data/1396889463119-906ae05bc13c3677cf4330b5dc96897e/tb-8_rev.pdf
Date Accessed: 22 February 2016

## TECHNICAL BULLETIN 9: DESIGN AND CONSTRUCTION GUIDANCE FOR BREAKAWAY WALLS



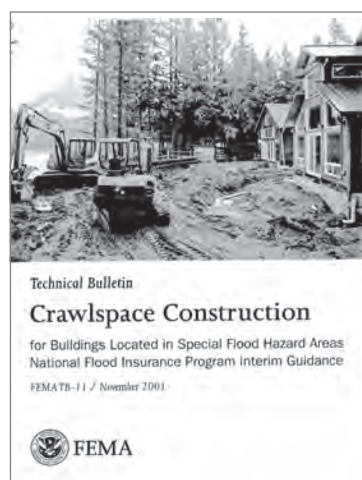

Federal Emergency Management Agency (FEMA) - August 2008
http://www.fema.gov/media-library-data/20130726-1511-20490-8359/fema_tb_9.pdf
Date Accessed: 16 August 2016

## TECHNICAL BULLETIN 10: ENSURING THAT STRUCTURES BUILT ON FILL IN OR NEAR SPECIAL FLOOD HAZARD AREAS ARE REASONABLY SAFE FROM FLOODING



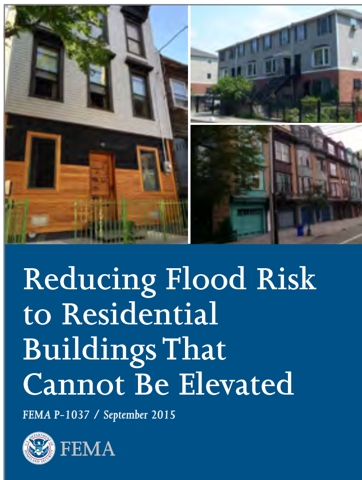

Federal Emergency Management Agency (FEMA) - May 2001
http://www.fema.gov/media-library-data/20130726-1511-20490-3169/tb1001.pdf
Date Accessed: 16 August 2016

## TECHNICAL BULLETIN 11: CRAWLSPACE CONSTRUCTION



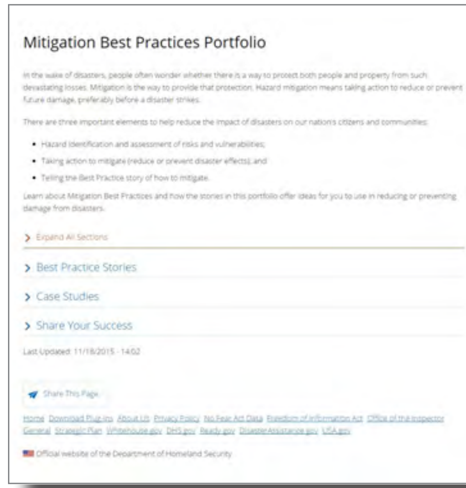

Federal Emergency Management Agency (FEMA) - November 2001
http://www.fema.gov/media-library-data/20130726-1511-20490-0716/tb_11_rev.pdf
Date Accessed: 9 August 2016

## REDUCING FLOOD RISK TO RESIDENTIAL BUILDINGS THAT CANNOT BE ELEVATED



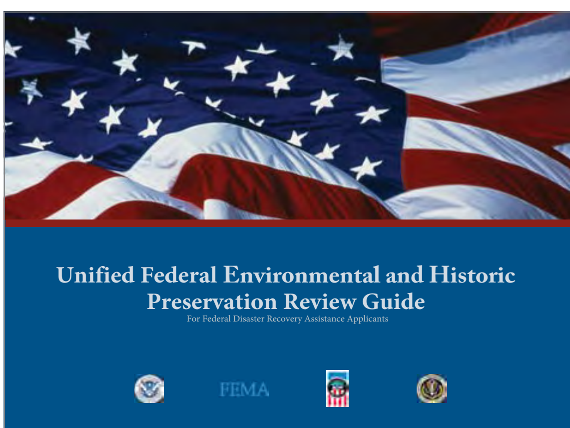

Federal Emergency Management Agency (FEMA) - September 2015
http://www.fema.gov/media-library-data/1443014398612-a4dfc0f86711bc72434b82c4b100a677/revFEMA_HMA_Grants_4pg_2015_508.pdf Date Accessed: 29 January 2016

## MITIGATION BEST PRACTICES PORTFOLIO



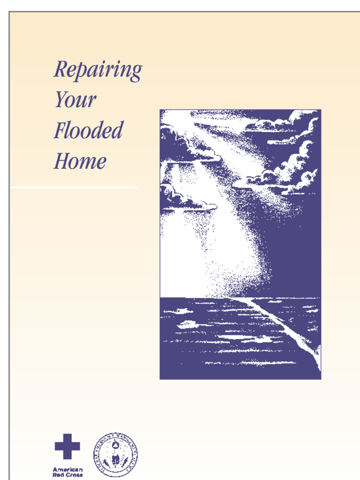

Federal Emergency Management Agency (FEMA) -18 November 2015
https://www.fema.gov/mitigation-best-practices-portfolio#
Date Accessed: 4 January 2016

## UNIFIED FEDERAL ENVIRONMENTAL AND HISTORIC PRESERVATION REVIEW GUIDE



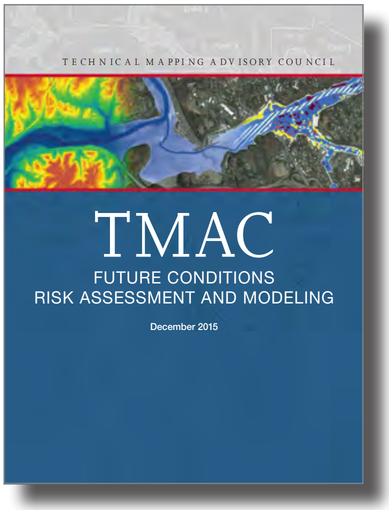

FEMA and the Advisory Council on Historic Preservation - No Date
http://www.fema.gov/media-library-data/1440713845421-9bdb5c0c8fe19ab86d97059ccb26e3b4/UFR_Applicant_Guide_Final_508.pdf Date Accessed: 26 January 2016

## REPAIRING YOUR FLOODED HOME



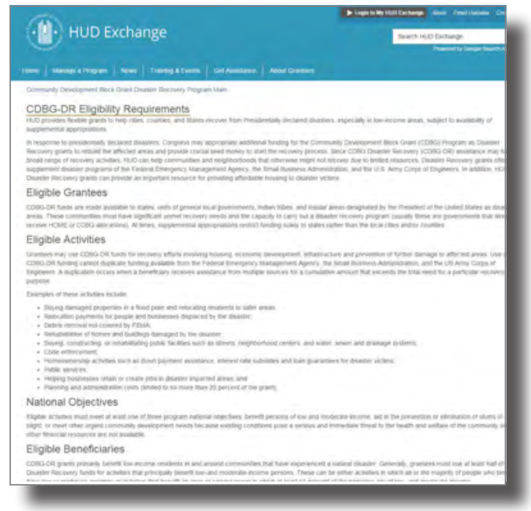

Federal Emergency Management Agency and the Red Cross - No Date
http://www2.redcross.org/static/file_cont333_lang0_150.pdf
Date Accessed: 19 January 2016

## TMAC FUTURE CONDITIONS RISK ASSESSMENT AND MODELING



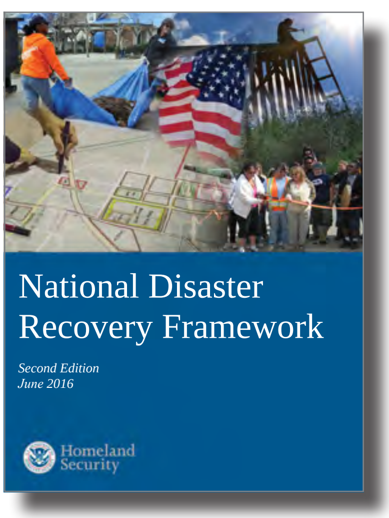

Technical Mapping Advisory Council - December 2015
http://www.fema.gov/media-library-data/1454954261186-c348aa9b1768298c9eb66f84366f836e/TMAC_2015_Future_Conditions_Risk_Assessment_and_Modeling_Report.pdf
Date Accessed: 11 August 2016

## COMMUNITY DEVELOPMENT BLOCK GRANT DISASTER RECOVERY PROGRAM



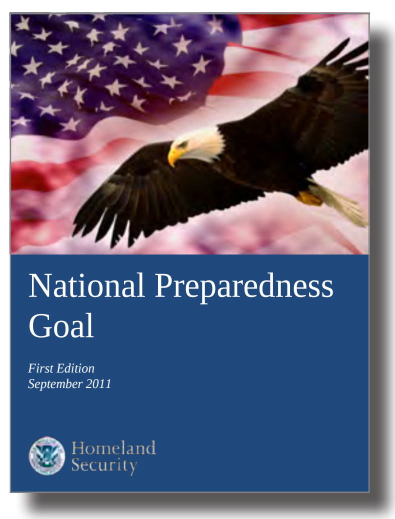

Department of Housing and Urban Development - 2014
https://www.hudexchange.info/programs/cdbg-dr/cdbg-dr-eligibility-requirements/
Date Accessed: 4 February 2016

## NATIONAL DISASTER RECOVERY FRAMEWORK



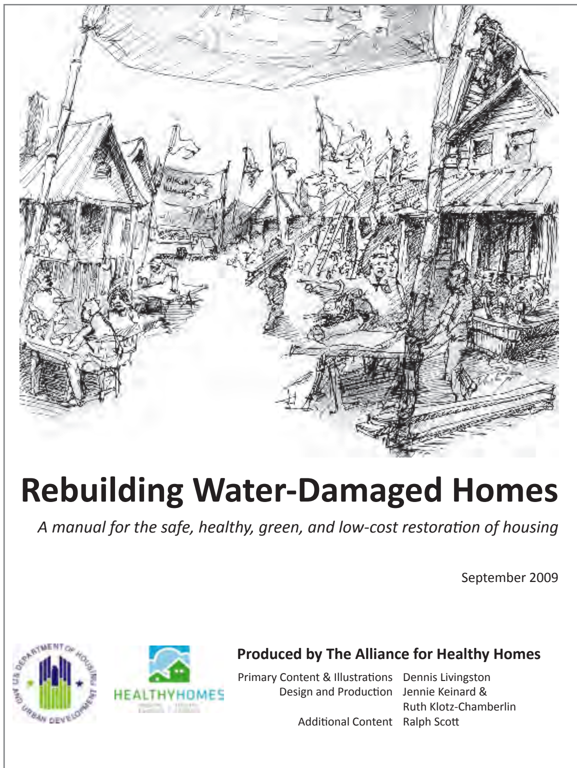

Department of Homeland Security - June 2016
http://www.fema.gov/media-library-data/1466014998123-4bec8550930f774269e0c5968b120ba2/National_Disaster_Recovery_Framework2nd.pdf
Date Accessed: 10 August 2016

## NATIONAL PREPAREDNESS GOAL




Department of Homeland Security - September 2011
http://www.fema.gov/pdf/prepared/npg.pdf
Date Accessed: 10 August 2016

## REBUILDING WATER-DAMAGED HOMES




Dennis Livingston

2009
https://ag.purdue.edu/extension/eden/Mold/AFHH-manual.pdf
Date Accessed: 22 December 2015

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.

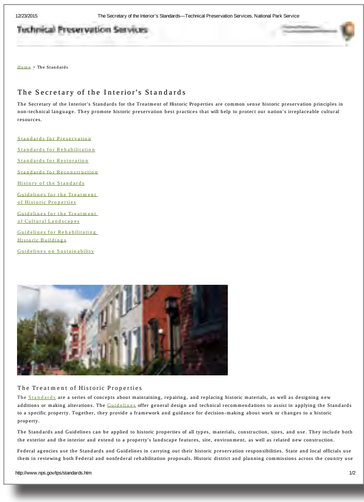
## HURRICANE SANDY REBUILDING TASK FORCE, REBUILD BY DESIGN


U.S. Department of Housing and Urban Development - No Date
http://portal.hud.gov/hudportal/HUD?src=/sandyrebuilding/rebuildbydesign
Date Accessed: 23 December 2015

## HURRICANE SANDY REBUILDING STRATEGY

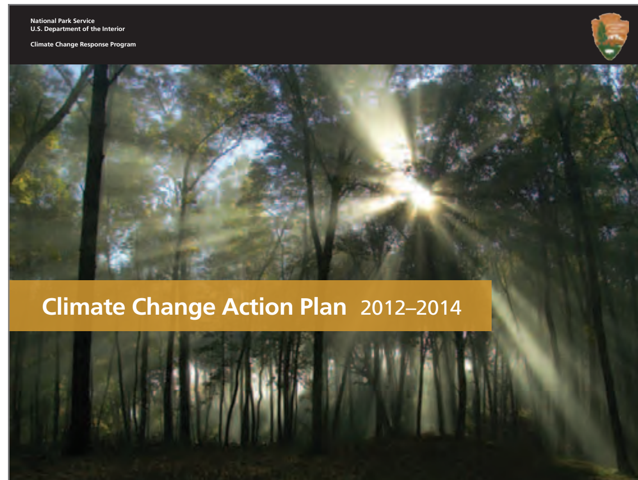

Hurricane Sandy Rebuilding Task Force - August 2013
http://portal.hud.gov/hudportal/documents/huddoc?id=HSRebuildingStrategy.pdf
Date Accessed: 1 February 2016

## THE SECRETARY OF THE INTERIOR'S STANDARDS FOR THE TREATMENT OF HISTORIC PROPERTIES



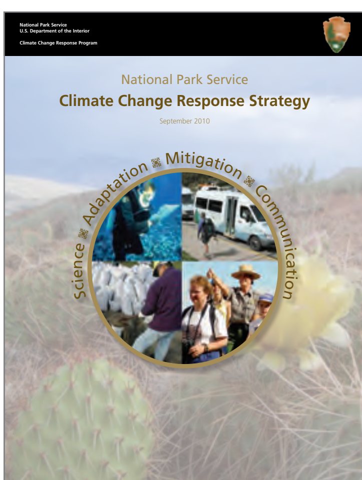

National Park Service - 2017
http://www.nps.gov/tps/standards.htm
Date Accessed:  January 2018

## CLIMATE ACTION PLAN 2012-2014



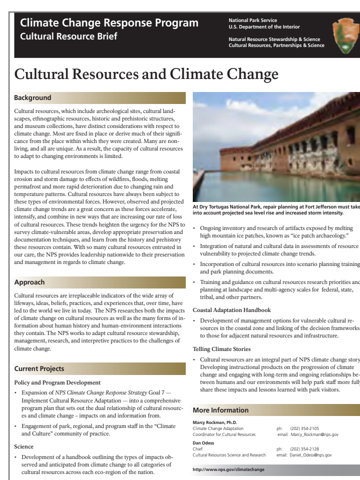

November 2012
http://www.nature.nps.gov/climatechange/docs/NPS_CCActionPlan.pdf
Date Accessed: 26 February 2016

## CLIMATE CHANGE RESPONSE STRATEGY: SCIENCE, ADAPTATION, MITIGATION, COMMUNICATION



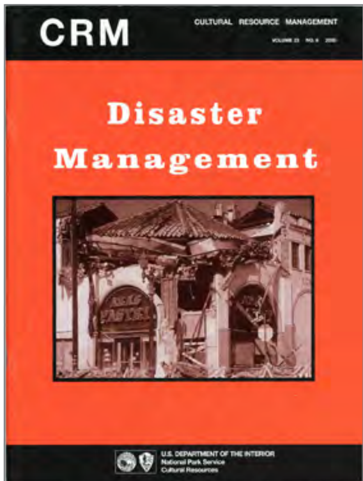

National Park Service - September 2010
https://www.nps.gov/orgs/ccrp/upload/NPS_CCRS.pdf
Date Accessed: 18 July 2016

## CULTURAL RESOURCES AND CLIMATE CHANGE, CULTURAL RESOURCE BRIEF




National Park Service
https://www.nps.gov/subjects/climatechange/upload/CulturalResourceBriefMar2013.pdf
Date Accessed: 18 July 2016

## Disaster Management for Cultural Properties



CRM
CULTURAL RESOURCE MANAGEMENT
Disaster Management
U.S. DEPARTMENT OF THE INTERIOR
National Park Service
Cultural Resources

David W. Look and Dirk H.R. Spennemann - 2000
http://www.nps.gov/history/CRMJournal/CRM/v23n6.pdf
Date Accessed: 4 January 2016

## Disaster Preparedness, Planning, and Mitigation

David W. Look and Dirk H.R. Spennemann
Disaster Preparedness, Planning, and Mitigation

David W. Look and Dirk H.R. Spennemann - 2001
http://www.nps.gov/history/crmjournal/CRM/v24n8.pdf
Date Accessed: 19 January 2016

## Earth, Wind, Fire, and Water - Historic Preservation Disaster Planning in Miami-Dade County, Florida

Christopher R. Eck
Earth, Wind, Fire, and Water
Historic Preservation Disaster Planning in Miami-Dade County, Florida

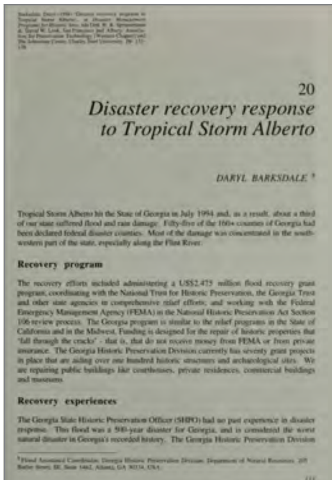
Christopher R. Eck - 2000
http://www.nps.gov/history/CRMJournal/CRM/v23n6.pdf
Date Accessed: 4 January 2016

## "Lord Willing n' the Creek Don't Rise" - Flood Sustainability at Harpers Ferry National Historical Park

Bruce J. Noble, Jr.
"Lord Willing n' the Creek Don't Rise"
Flood Sustainability at Harpers Ferry National Historical Park

Bruce J. Noble, Jr. - 2001
http://www.nps.gov/history/crmjournal/CRM/v24n8.pdf
Date Accessed: 4 January 2015

## FLOOD CASE STUDY: STILLWATER, NEVADA



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*Disaster recovery response to Tropical Storm Alberto*

DARYL BARKSDALE [1]

Tropical Storm Alberto hit the State of Georgia in July 1994 and, as a result, about a third of our state suffered flood and rain damage. Fifty-five of the 160+ counties of Georgia had been declared federal disaster counties. Most of the damage was concentrated in the south-western part of the state, especially along the Flint River.

**Recovery program**

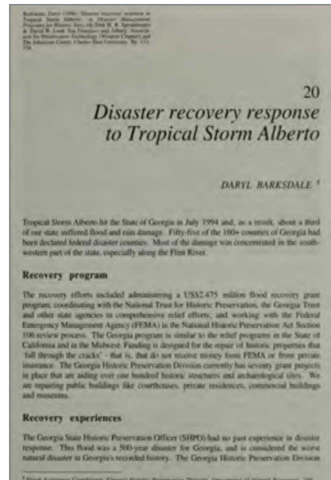
The recovery efforts included administering a US$2.475 million flood recovery grant program; coordinating with the National Trust for Historic Preservation, the Georgia Trust and other state agencies in comprehensive relief efforts; and working with the Federal Emergency Management Agency (FEMA) in the National Historic Preservation Act Section 106 review process. The Georgia program is similar to the relief programs in the State of California and in the Midwest. Funding is designed for the repair of historic properties that "fall through the cracks" - that is, that do not receive money from FEMA or from private insurance. The Georgia Historic Preservation Division currently has seventy grant projects in place that are aiding over one hundred historic structures and archaeological sites. We are repairing public buildings like courthouses, private residences, commercial buildings and museums.

**Recovery experiences**

The Georgia State Historic Preservation Officer (SHPO) had no past experience in disaster response. This flood was a 500-year disaster for Georgia, and is considered the worst natural disaster in Georgia's recorded history. The Georgia Historic Preservation Division

Alice M. Baldrica - 1998
https://archive.org/stream/disastermanageme00spen#page/132/mode/1up
Date Accessed: 5 February 2016

## DISASTER RECOVERY RESPONSE TO TROPICAL STORM ALBERTO



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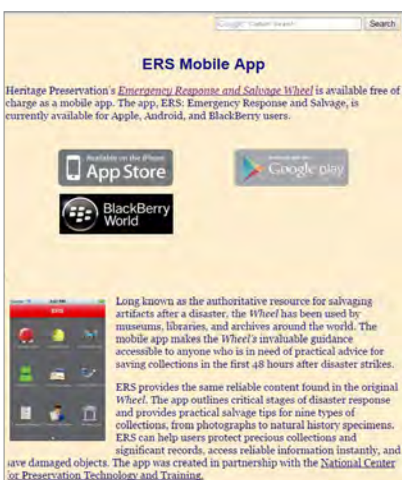
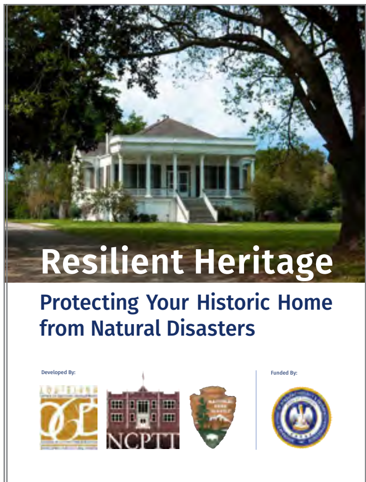
Daryl Barksdale - 1998
https://archive.org/stream/disastermanageme00spen#page/132/mode/1up
Date Accessed: 5 February 2016

## 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

## 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: 19 January 2016

## PREPARING TO PRESERVE; EMERGENCY PLANNING: MODEL CHECKLIST FOR HISTORIC PRESERVATION

Preparing to Preserve
Emergency Planning: Model Checklist for Historic Preservation

*Historic preservation can be a powerful catalyst for recovery and revitalization in the wake of natural and man-made disasters. It restores the fabric of a community, especially the familiar landmarks of one's neighborhood – churches, schools, stores, front porches, parks – which provide a tremendous source of comfort and hope for survivors. It also supports the quick return of life, commerce, and a sense of normalcy to the community.*

*This list of elements should be part of your community's approach to emergency management planning. Advocate for their inclusion to ensure that the built environment is not further degraded through inadvertent response actions, demolition, or neglect.*

***DEFINITIONS***

***Emergency Manager:*** Government official responsible for developing and implementing an emergency response plan.

***Emergency Operations Center:*** A central location staffed by representatives of various agencies including fire, rescue, public works and others that, in the event of an emergency, work together to coordinate the government response.

***Hazard Mitigation:*** Action taken to reduce or eliminate risks to human life or property from natural and human-caused disasters.

***Response:*** Immediate actions taken to save lives, public property and the environment, and meet basic human needs.

***Recovery:*** Once conditions have stabilized, the actions taken to provide long-term aid to affected persons, clear debris, begin repair and rebuilding.

***Damage Assessment Teams:*** Groups of individuals who go into the field to survey conditions to determine the scope and nature of the impact on the natural and built environment.

✓ The preservation community is in regular contact with the ***Emergency Operations Manager*** and a preservation representative is assigned to the ***Emergency Operations Center***.

✓ Preservationists are recruited and trained to participate in ***risk assessment, mitigation, response*** and ***recovery***, and to serve on ***damage assessment teams***.

✓ Local officials have been given a comprehensive survey of their community's historic resources.

✓ Building condition assessment forms consider the historic integrity of buildings districts.

✓ Historic District Commissions and other regulatory review bodies have developed post-disaster procedures for design review and permitting in historic districts.

✓ Sites selected for response personnel staging areas, temporary housing, and debris removal and storage do not impact historic or archeological sites.

✓ Salvage protocols for the debris removal process address the need to preserve historic features and materials.

✓ Demolition permit criteria and procedures include evaluation by historic preservation experts.

✓ A preservation professional is trained and available to participate in deliberations regarding post-disaster recovery activities and priorities.

This material from Heritage Preservation was developed with a grant from the Department of the Interior, National Park Service.
Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the Department of the Interior.

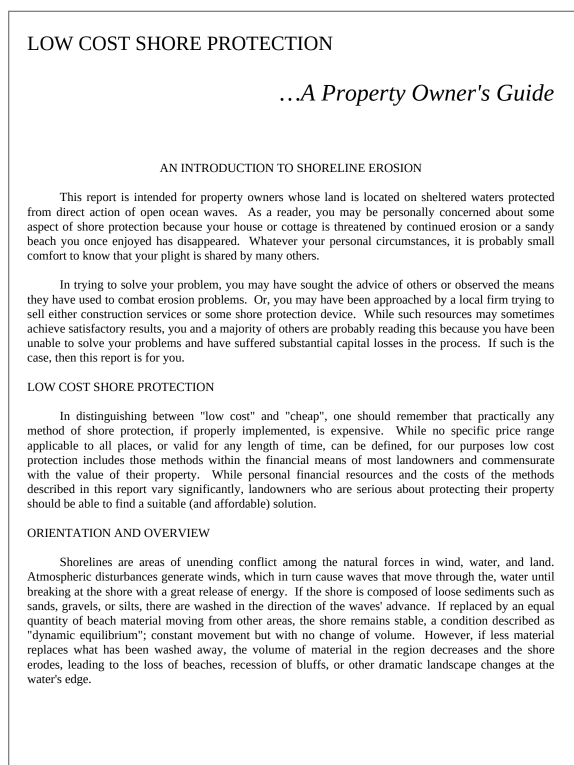
Heritage Preservation - No Date
http://www.heritagepreservation.org/PROGRAMS/PtoP_EPChecklist.pdf
Date Accessed: 16 February 2016

## LOW COST SHORE PROTECTION ... A PROPERTY OWNER'S GUIDE

U.S. Army Corps of Engineers

http://dnr2.maryland.gov/ccs/Publication/sect54owners_sm.pdf
Date Accessed: 21 July 2016

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.



LOW COST SHORE PROTECTION

*…A Property Owner's Guide*

AN INTRODUCTION TO SHORELINE EROSION

This report is intended for property owners whose land is located on sheltered waters protected from direct action of open ocean waves. As a reader, you may be personally concerned about some aspect of shore protection because your house or cottage is threatened by continued erosion or a sandy beach you once enjoyed has disappeared. Whatever your personal circumstances, it is probably small comfort to know that your plight is shared by many others.

In trying to solve your problem, you may have sought the advice of others or observed the means they have used to combat erosion problems. Or, you may have been approached by a local firm trying to sell either construction services or some shore protection device. While such resources may sometimes achieve satisfactory results, you and a majority of others are probably reading this because you have been unable to solve your problems and have suffered substantial capital losses in the process. If such is the case, then this report is for you.

LOW COST SHORE PROTECTION

In distinguishing between "low cost" and "cheap", one should remember that practically any method of shore protection, if properly implemented, is expensive. While no specific price range applicable to all places, or valid for any length of time, can be defined, for our purposes low cost protection includes those methods within the financial means of most landowners and commensurate with the value of their property. While personal financial resources and the costs of the methods described in this report vary significantly, landowners who are serious about protecting their property should be able to find a suitable (and affordable) solution.

ORIENTATION AND OVERVIEW

Shorelines are areas of unending conflict among the natural forces in wind, water, and land. Atmospheric disturbances generate winds, which in turn cause waves that move through the, water until breaking at the shore with a great release of energy. If the shore is composed of loose sediments such as sands, gravels, or silts, there are washed in the direction of the waves' advance. If replaced by an equal quantity of beach material moving from other areas, the shore remains stable, a condition described as "dynamic equilibrium"; constant movement but with no change of volume. However, if less material replaces what has been washed away, the volume of material in the region decreases and the shore erodes, leading to the loss of beaches, recession of bluffs, or other dramatic landscape changes at the water's edge.

## NONSTRUCTURAL MITIGATION ASSESSMENT FOR THE CITY OF ANNAPOLIS HISTORIC DISTRICT

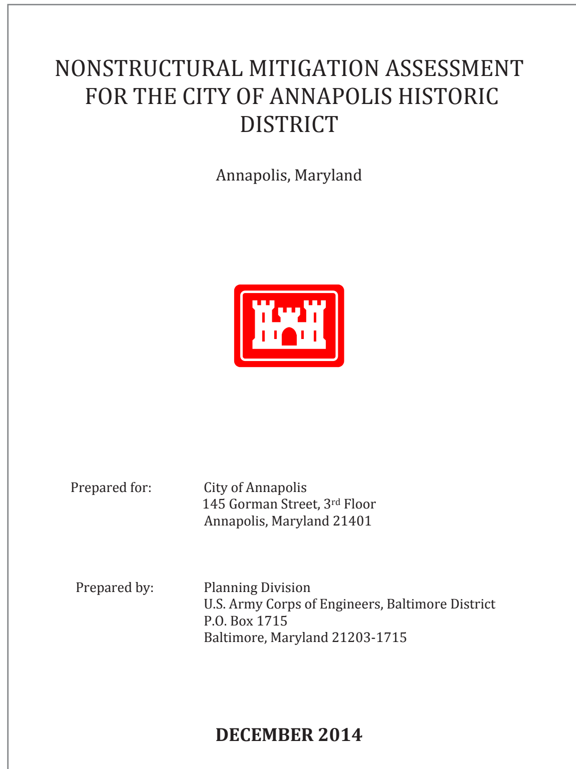
Stephen D. O'Leary, AIA, CFM

December 2014
http://www.annapolis.gov/docs/default-source/planning-and-zoning-documents/us-army-corps-of-engineers---nonstructural-mitigation.pdf?sfvrsn=0
Date Accessed: 22 December 2015

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

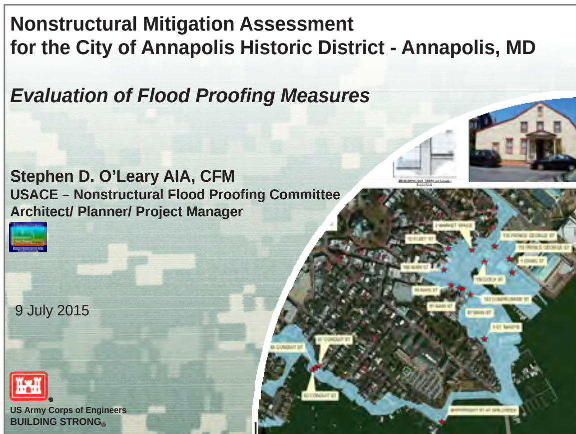

Nonstructural / Flood Proofing measures are permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding. Nonstructural/ Flood Proofing measures differ from Structural measures in that they focus on reducing the consequences of 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

U.S. Army Corps of Engineers

No Date
http://www.kafm.org/downloads/Floodproofing.pdf
Date Accessed: 23 December 2015

## NONSTRUCTURAL MITIGATION ASSESSMENT FOR THE CITY OF ANNAPOLIS HISTORIC DISTRICT

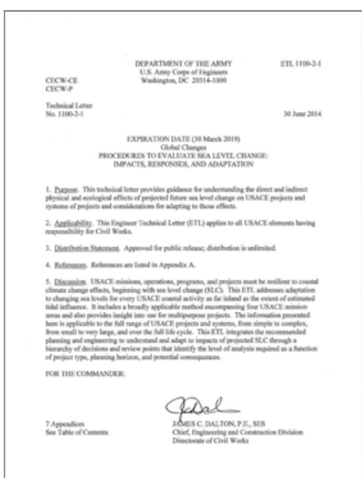



Planning Division, U.S. Army Corps of Engineers - 9 July 2015
https://www.annapolis.gov/DocumentCenter/View/2182/US-Army-Corps-of-Engineers---Nonstructural-Mitigation-PDF
Date Accessed: 22 December 2015

## 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: 22 December 2015

## GLOBAL CHANGES, PROCEDURES TO EVALUATE SEA LEVEL CHANGE: IMPACTS, RESPONSES, AND ADAPTION



DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000

ETL 1100-2-1

CECW-CE
CECW-P

Technical Letter
No. 1100-2-1

30 June 2014

EXPIRATION DATE (30 March 2019)
Global Changes
PROCEDURES TO EVALUATE SEA LEVEL CHANGE:
IMPACTS, RESPONSES, AND ADAPTATION

1. Purpose. This technical letter provides guidance for understanding the direct and indirect physical and ecological effects of projected future sea level change on USACE projects and systems of projects and considerations for adapting to those effects.

2. Applicability. This Engineer Technical Letter (ETL) applies to all USACE elements having responsibility for Civil Works.

3. Distribution Statement. Approved for public release; distribution is unlimited.

4. References. References are listed in Appendix A.

5. Discussion. USACE missions, operations, programs, and projects must be resilient to coastal climate change effects, beginning with sea level change (SLC). This ETL addresses adaptation to changing sea levels for every USACE coastal activity as far inland as the extent of estimated tidal influence. It includes a broadly applicable method encompassing four USACE mission areas and also provides insight into use for multipurpose projects. The information presented here is applicable to the full range of USACE projects and systems, from simple to complex, from small to very large, and over the full life cycle. This ETL integrates the recommended planning and engineering to understand and adapt to impacts of projected SLC through a hierarchy of decisions and review points that identify the level of analysis required as a function of project type, planning horizon, and potential consequences.

FOR THE COMMANDER:

7 Appendices
See Table of Contents

JAMES C. DALTON, P.E., SES
Chief, Engineering and Construction Division
Directorate of Civil Works

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 December 2015

C

# STATE OF MARYLAND

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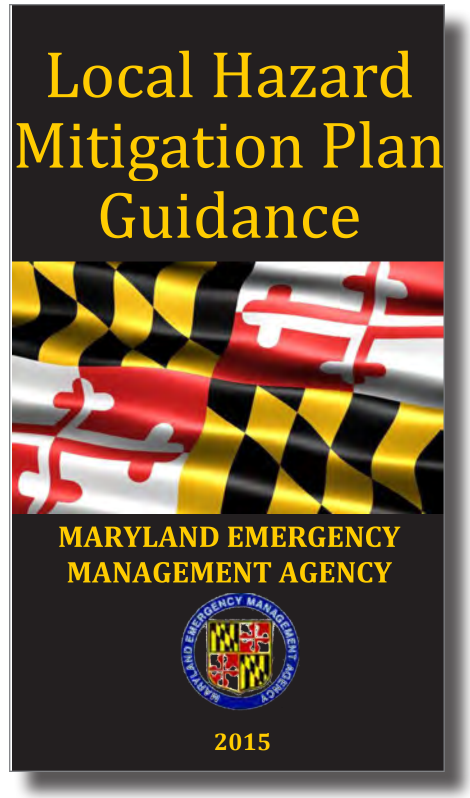
## LOCAL HAZARD MITIGATION PLAN GUIDANCE

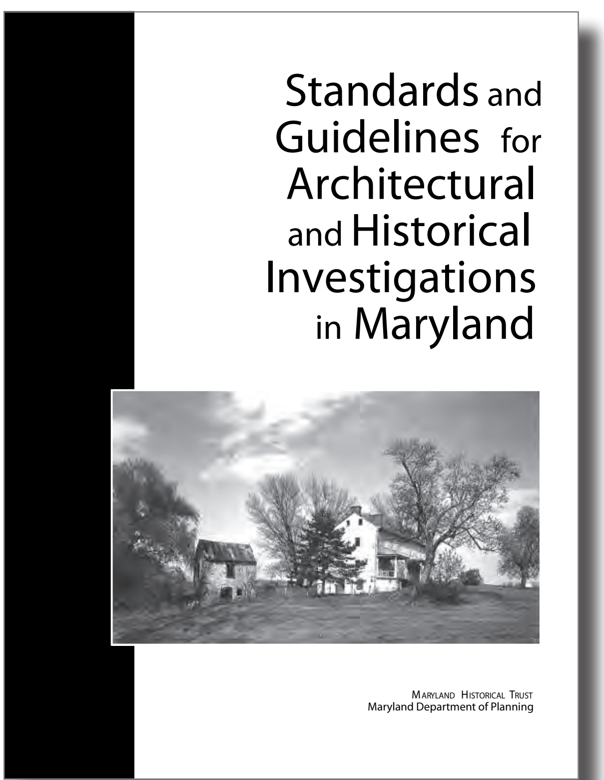
Maryland Emergency Management Agency

2015
http://mema.maryland.gov/community/Pages/Mitigation.aspx
22 December 2015

This document provides planning guidance for local governments to prepare an updated hazard mitigation plan. This guidance introduces Maryland-specific recommendations for hazard mitigation planning and introduces ideas for both plan integration and resiliency to facilitate cooperation between the State and local governments. The document focuses on these areas: hazards, critical facilities, FEMA-flood, capability assessment, resilience, plan integration, safe plan audit, federal declarations, MDE – Flood, and recommendations and suggests additional resources.




## STANDARDS AND GUIDELINES FOR ARCHITECTURAL AND HISTORICAL INVESTIGATIONS IN MARYLAND



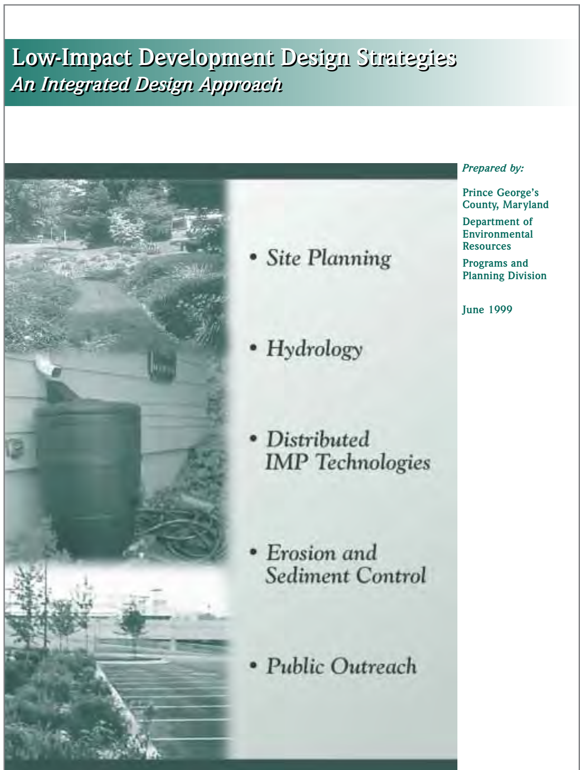

Maryland Department of Planning and Maryland Historical Trust
2000
http://mht.maryland.gov/documents/PDF/research/Survey_standards_architecture_web.pdf
Date Accessed: 22 December 2015

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
http://www.lowimpactdevelopment.org/pubs/LID_National_Manual.pdf
Date Accessed: 5 January 2016

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:

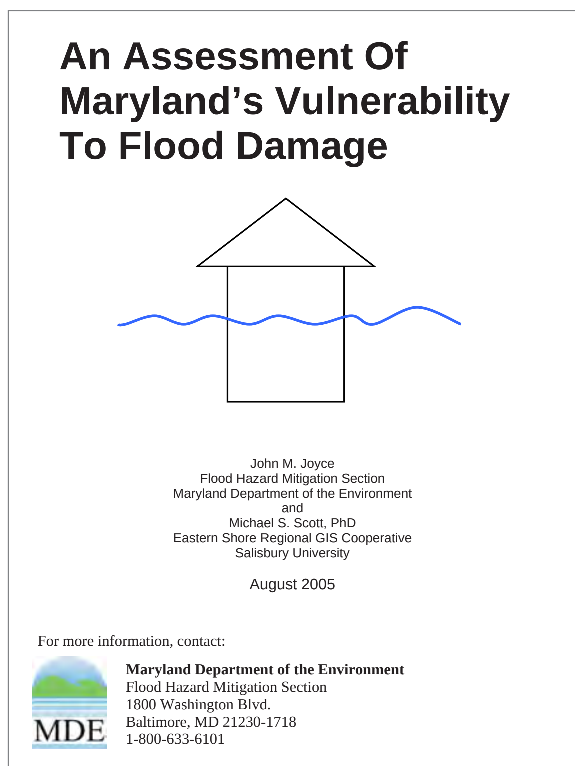
- The maintenance of natural drainage courses, resources, and ecosystems
- Dispersing storm water throughout the landscape and controlling storage and runoff to match pre-development conditions
- Minimizing or reducing impervious surface coverage, as well as dependence on storm water drains, structures, 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
http://www.prattlibrary.org/uploadedFiles/www/locations/central/business_science_and_technology/subject_guides/An%20Assessment%20of%20Marylands%20Vulnerability%20to%20Flooding-1%20(1).pdf
Date Accessed: 23 February 2016




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.

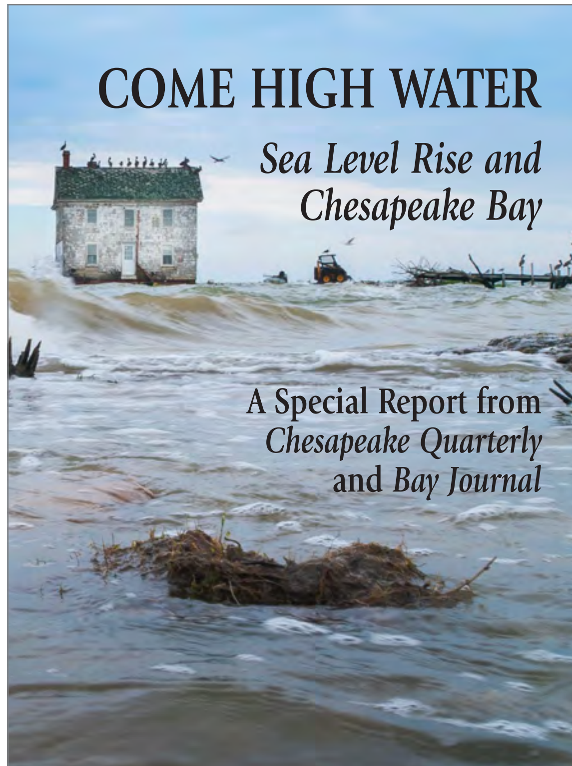
## COME HIGH WATER; SEA LEVEL RISE AND CHESAPEAKE BAY. A SPECIAL REPORT FROM *CHESAPEAKE QUARTERLY* AND *BAY JOURNAL*

Various

June 2015
http://www.mdsg.umd.edu/sites/default/files/files/Come%20High%20Water-Report-2015.pdf
Date Accessed: 5 January 2016

*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.



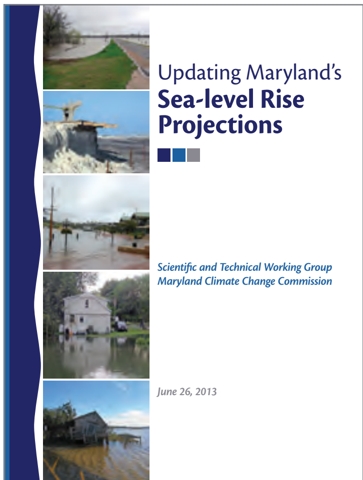

## THE SECRETARY OF THE INTERIOR'S STANDARDS FOR REHABILITATION


Maryland Department of Planning and Maryland Historical Trust
No Date
http://mht.maryland.gov/documents/PDF/Standards_36CFR67.pdf
Date Accessed: 22 December 2015

The State of Maryland follows *The Secretary of the Interior's Standards for Rehabilitation* and requires that all projects qualifying for state or federal tax credits or Maryland Historical Trust (MHT) grants or loans 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.

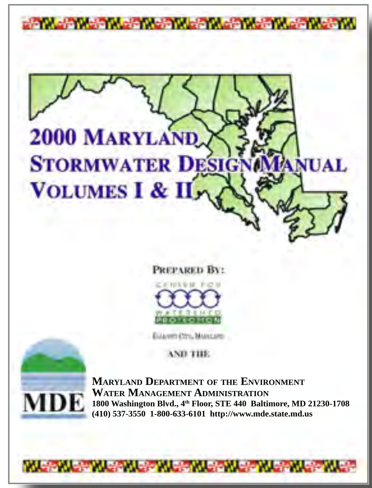
The Maryland Historical Trust's website - https://mht.maryland.gov/ - provides additional info on eligibility for tax credits, grants, and loans. It stresses adhering to the *Standards* to qualify for MHT programs.

## UPDATING MARYLAND'S SEA-LEVEL RISE PROJECTIONS. SPECIAL REPORT OF THE SCIENTIFIC AND TECHNICAL WORKING GROUP TO THE MARYLAND CLIMATE CHANGE COMMISSION



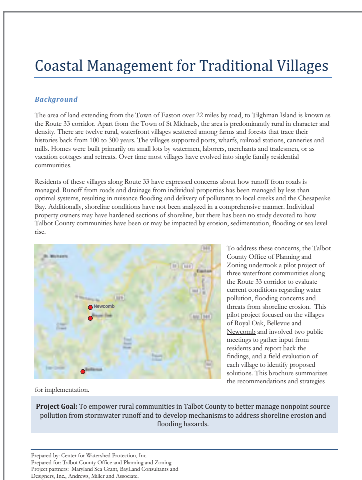

D. F. BOSCH, ET AL - 2013
http://climatechange.maryland.gov/wp-content/uploads/sites/16/2014/12/ian_report_4131.pdf
Date Accessed: 26 February 2016

## 2000 MARYLAND STORMWATER DESIGN MANUAL VOLUMES I & II




CENTER FOR WATERSHED PROTECTION, INC. - No Date
http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/MarylandStormwaterDesignManual/Pages/Programs/WaterPrograms/SedimentandStormwater/stormwater_design/index.aspx
Date Accessed: 10 August 2016

## COASTAL MANAGEMENT FOR TRADITIONAL VILLAGES

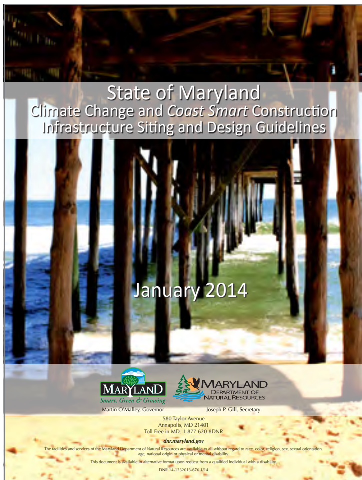



CENTER FOR WATERSHED PROTECTION, INC. - 21 July 2016
http://dnr2.maryland.gov/ccs/Publication/Talbot_CMTV.pdf
Date Accessed: 21 July 2016

## 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: 26 February 2016

## 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

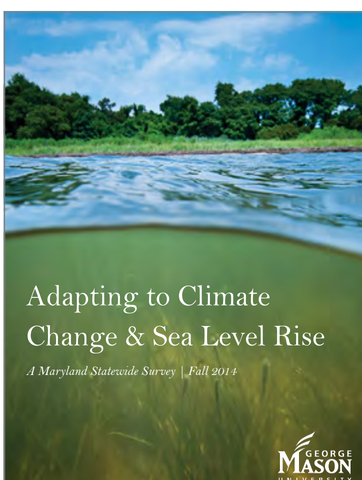



Zoë P. Johnson - January 2014
http://climatechange.maryland.gov/wp-content/uploads/sites/16/2014/12/climate_change_and_coast_smart_final_report1.pdf
Date Accessed: 26 February 2016

## On a Collision Course with Sea Level Rise: Helping Maryland Communities Become Coast-Smart

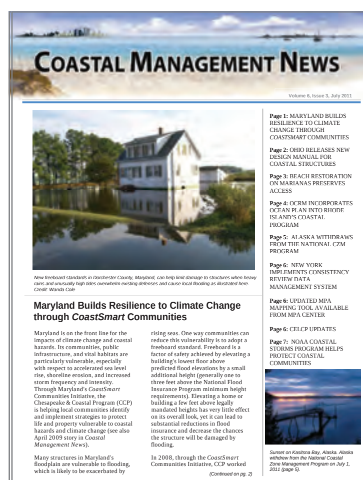

Gwen Shaughnessy - April 2010
http://dnr2.maryland.gov/ccs/Publication/articles_ccslrapr2010.pdf
Date Accessed: 21 July 2016

## 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: 26 February 2016

## Maryland Builds Resilience to Climate Change through CoastSmart Communities




July 2011
http://dnr2.maryland.gov/ccs/Publication/czmnewsjul11.pdf
Date Accessed: 20 July 2016

## MERGING BLUE AND GREEN INFRASTRUCTURE IN MARYLAND

Merging Blue and Green Infrastructure in Maryland

Maryland coastal resource managers have expanded an existing statewide "green infrastructure" program to incorporate what they are calling "blue infrastructure," or aquatic priorities in the nearshore coastal zone, such as submerged aquatic vegetation, oyster bars, tidal wetlands, fish spawning and nursery areas, and shoreline buffers.

This information is not only helping state managers target lands for protection and restoration, it is also being shared with local managers through the state's Coastal Atlas.

"We are helping to ensure the protection of Maryland's critical ocean and estuarine resources, and the coastal economies that depend on them," says Catherine McCall, natural resource planner for the Maryland Chesapeake and Coastal Program. "The Coastal Atlas has been developed to provide direct access to available data needed for coastal and ocean planning efforts."

The new data will be used for everything from finding the best location for renewable energy projects, to locating sand resources needed for beach replenishment, to helping local communities identify areas vulnerable to sea level rise and erosion.

"The Coastal Atlas will assist users in identifying potential conflicts so that they can then be avoided early in the planning process," McCall says.

Adding Blue to Green

While green infrastructure can be used to refer to anything from a street-side rain garden to a statewide land conservation network, the term is commonly defined as an interconnected network of protected land and water that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to a community's health and quality of life.

Benefits of a holistically conceived green infrastructure program include improving stormwater and wastewater management, helping to mitigate impacts from natural hazards and adapt to climate change, and providing other ecological and recreational services.

"We have a very good handle on our green infrastructure program network in Maryland and are targeting land acquisition, but what has been missing is the nearshore information and what is happening in the water," McCall says.

Assessment

To get this information, McCall and a staff geographic information system (GIS) analyst worked to assess the state's blue infrastructure and used marine spatial planning tools to evaluate compatible coastal uses.

*"We are helping to ensure the protection of Maryland's critical ocean and estuarine resources, and the coastal economies that depend on them."*

*Catherine McCall, Maryland Chesapeake and Coastal Program*

To do the analysis, they divided the shoreline into unique 1-kilometer segments that were easily reviewable. Working with resource managers from across the state, they looked at everything from oyster, clam, and mussel habitats, submerged aquatic vegetation beds, access structures, and fish spawning and nursery areas. They came up with a five-tier rating system that coded resources from low to high ecological integrity.

The completed Blue Infrastructure Near-shore Assessment identifies the priority coastal habitat, critical aquatic resources, and associated human uses in the tidal waters and nearshore area of Maryland's Chesapeake and coastal bays, tidal waters, and ocean.

Linking the blue infrastructure with the green infrastructure has "created a framework to identify coastal habitats and areas where conservation and restoration activities can be targeted to maintain and improve coastal resources," McCall says.

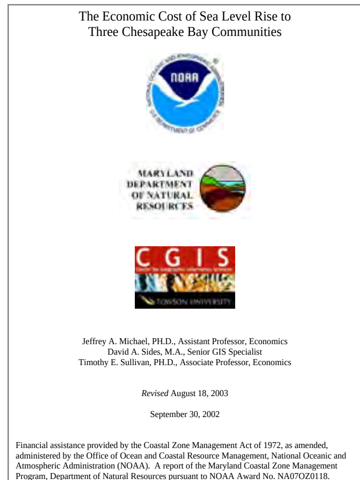
Continued on Page 9

PHOTO COURTESY OF MARYLAND CHESAPEAKE AND COASTAL PROGRAM

Coastal Services | 7

Sept/Oct 2010
http://dnr2.maryland.gov/ccs/Publication/articles_mbgi09102010.pdf
Date Accessed: 20 July 2016

## THE ECONOMIC COST OF SEA LEVEL RISE TO THREE CHESAPEAKE BAY COMMUNITIES



The Economic Cost of Sea Level Rise to
Three Chesapeake Bay Communities

NOAA

MARYLAND DEPARTMENT OF NATURAL RESOURCES

CGIS

TOWSON UNIVERSITY

Jeffrey A. Michael, PH.D., Assistant Professor, Economics
David A. Sides, M.A., Senior GIS Specialist
Timothy E. Sullivan, PH.D., Associate Professor, Economics

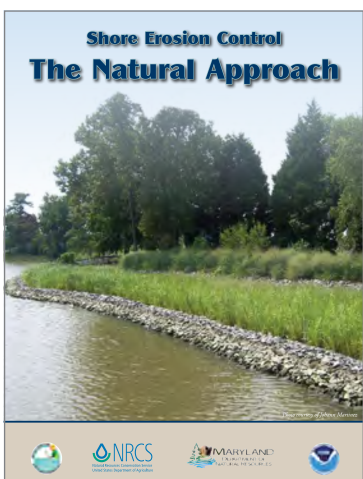
*Revised* August 18, 2003

September 30, 2002

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended, administered by the Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration (NOAA). A report of the Maryland Coastal Zone Management Program, Department of Natural Resources pursuant to NOAA Award No. NA07OZ0118.

MICHAEL A. JEFFREY, DAVID A. SIDES AND TIMOTHY E. SULLIVAN - July 2004
http://dnr2.maryland.gov/ccs/Publication/2003ec_SeaLevelRise.pdf
Date Accessed: 21 July 2016

## SHORE EROSION CONTROL THE NATURAL APPROACH

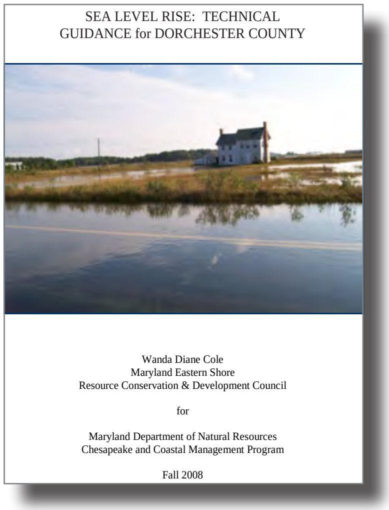



2007
http://dnr2.maryland.gov/ccs/Publication/SE_Natural_Approach_2007.pdf
Date Accessed: 21 July 2016

## PRESERVEMARYLAND: MARYLAND PRESERVATION PLAN 2014


2014
https://mht.maryland.gov/documents/PDF/PreserveMaryland_plan2014.pdf
Date Accessed: 26 February 2016

## SEA LEVEL RISE: TECHNICAL GUIDANCE FOR DORCHESTER COUNTY


SEA LEVEL RISE: TECHNICAL
GUIDANCE for DORCHESTER COUNTY

Wanda Diane Cole
Maryland Eastern Shore
Resource Conservation & Development Council

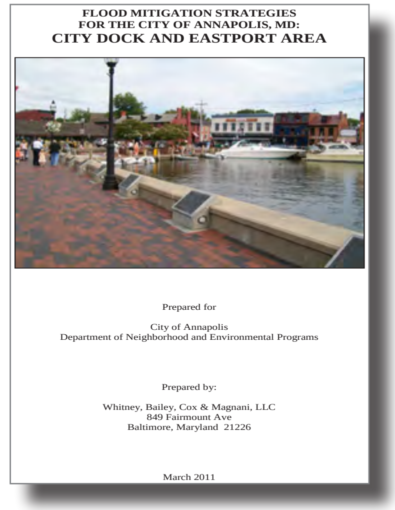
for

Maryland Department of Natural Resources
Chesapeake and Coastal Management Program

Fall 2008

Wanda Diane Cole
http://dnr2.maryland.gov/ccs/Publication/SeaLevel_Dorchester.pdf
Date Accessed: 21 July 2016

## FLOOD MITIGATION STRATEGIES FOR THE CITY OF ANNAPOLIS, MD: CITY DOCK AND EASTPORT AREA


FLOOD MITIGATION STRATEGIES
FOR THE CITY OF ANNAPOLIS, MD:
CITY DOCK AND EASTPORT AREA

Prepared for

City of Annapolis
Department of Neighborhood and Environmental Programs

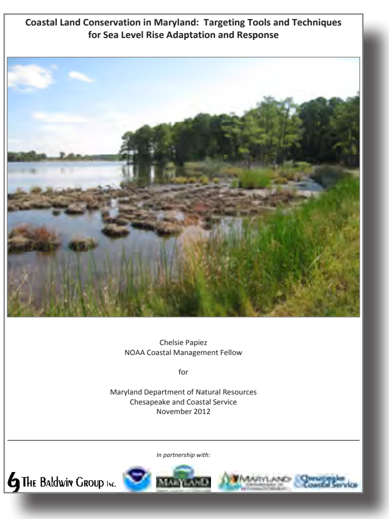
Prepared by:

Whitney, Bailey, Cox & Magnani, LLC
849 Fairmount Ave
Baltimore, Maryland 21226

March 2011

Whitney, Bailey, Cox & Magnani, LLC - March 2011
http://www.annapolis.gov/docs/default-source/dnep-documents-pdfs/03-01-2011-sea-level-study.pdf?sfvrsn=6
Date Accessed: 26 February 2016

## COASTAL LAND CONSERVATION IN MARYLAND: TARGETING TOOLS AND TECHNIQUES FOR SEA LEVEL RISE ADAPTATION AND RESPONSE


Coastal Land Conservation in Maryland: Targeting Tools and Techniques
for Sea Level Rise Adaptation and Response

Chelsie Papiez
NOAA Coastal Management Fellow

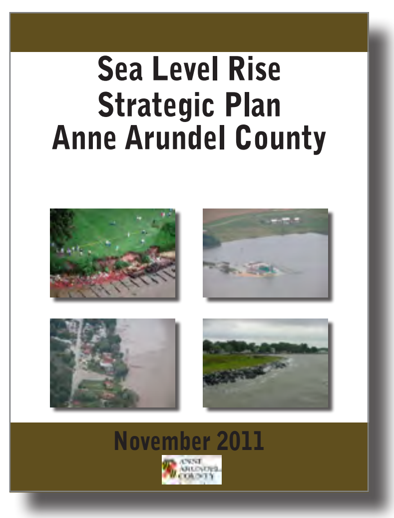
for

Maryland Department of Natural Resources
Chesapeake and Coastal Service
November 2012

In partnership with:

Chelsie Papiez - November 2012
http://dnr2.maryland.gov/ccs/Publication/coastalland_conserv_md.pdf
Date Accessed: 21 July 2016

## SEA LEVEL RISE STRATEGIC PLAN ANNE ARUNDEL COUNTY


Sea Level Rise
Strategic Plan
Anne Arundel County

November 2011

Anne Arundel County Office of Planning and Zoning - November 2011
http://dnr2.maryland.gov/ccs/Publication/AASLRStrategicPlan_final.pdf
Date Accessed: 21 July 2016

## WINDS OF CHANGE; OFFSHORE WIND AND OCEAN PLANNING


WINDS OF CHANGE
Offshore wind and ocean planning

How turbines work

Chris Cortina, et. al. - Fall 2010
http://dnr2.maryland.gov/ccs/Publication/articles_wcfall2010.pdf
Date Accessed: 20 July 2016

## LOCAL RECOVERY PLANNING TOOLKIT OVERVIEW


Maryland.gov
EMERGENCY MANAGEMENT AGENCY
Local Recovery Planning Toolkit Overview

Maryland Emergency Management Agency - No Date
http://mema.maryland.gov/Pages/Local-Recovery-Planning-Toolkit.aspx
Date Accessed: 10 August 2016

# D

# NON-STATE-OF-MARYLAND, GOVERNMENTAL ENTITIES

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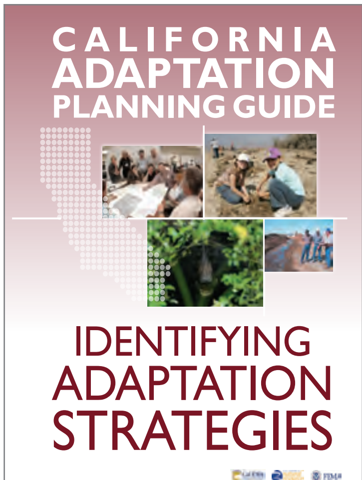
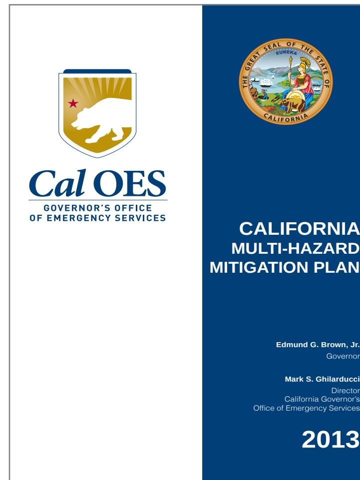
## CALIFORNIA ADAPTATION PLANNING GUIDE



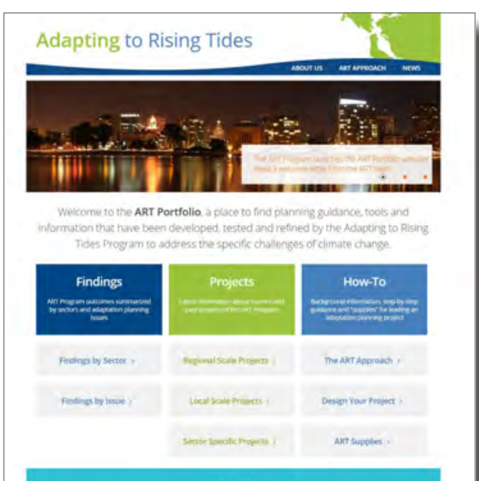

CALIFORNIA EMERGENCY MANAGEMENT AGENCY - July 2012
http://resources.ca.gov/climate/safeguarding/adaptation_policy_guide/
Date Accessed: 3 February 2016

## 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: 26 February 2016

## CALIFORNIA COUNTY HAZARD MITIGATION PROGRAMS

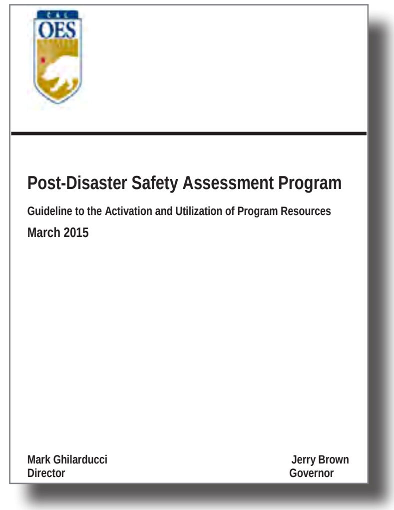

Various Dates
http://www.caloes.ca.gov/cal-oes-divisions/hazard-mitigation/hazard-mitigation-planning/local-hazard-mitigation-program
Date Accessed: 23 February 2016

## NATURAL FLOOD PROTECTION


Natural Flood Protection

SANTA CLARA VALLEY WATER DISTRICT - 2015
http://www.valleywater.org/services/naturalfloodprotection.aspx
Date Accessed: 23 December 2015

## POST-DISASTER SAFETY ASSESSMENT PROGRAM


OES

Post-Disaster Safety Assessment Program

Guideline to the Activation and Utilization of Program Resources

March 2015

Mark Ghilarducci
Director

Jerry Brown
Governor

GOVERNOR'S OFFICE OF EMERGENCY SERVICES - March 2015
http://www.caloes.ca.gov/RecoverySite/Documents/SAP%20Guidelines.pdf
Date Accessed: 3 February 2016

## 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
http://www.1000friendsofflorida.org/building-better-communities/disaster-planning/
Date Accessed: 5 January 2016

## DISASTER PLANNING FOR FLORIDA'S HISTORIC RESOURCES - INCLUDING CASE STUDIES


1000 Friends of Florida
August 2008
http://www.1000friendsofflorida.org/building-better-communities/disaster-planning/
Date Accessed: 5 January 2016

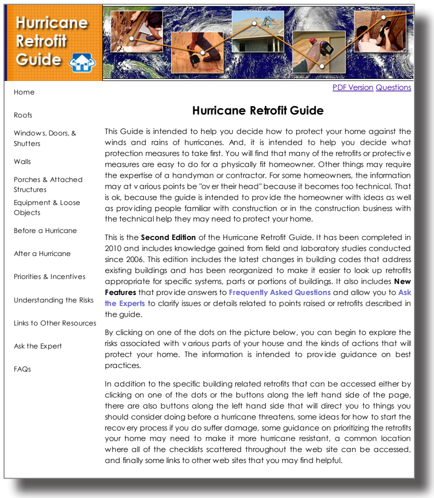
The purpose of this report is to provide guidance on integrating emergency management and historic preservation. The report first provides background information on emergency management and historic preservation individually, then describes how these fields interact. This typically happens only after 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



Hurricane Retrofit Guide

PDF Version Questions

Home

Roofs

Windows, Doors, & Shutters

Walls

Porches & Attached Structures

Equipment & Loose Objects

Before a Hurricane

After a Hurricane

Priorities & Incentives

Understanding the Risks

Links to Other Resources

Ask the Expert

FAQs

**Hurricane Retrofit Guide**

This Guide is intended to help you decide how to protect your home against the winds and rains of hurricanes. And, it is intended to help you decide what protection measures to take first. You will find that many of the retrofits or protective measures are easy to do for a physically fit homeowner. Other things may require the expertise of a handyman or contractor. For some homeowners, the information may at various points be "over their head" because it becomes too technical. That is ok, because the guide is intended to provide the homeowner with ideas as well as providing people familiar with construction or in the construction business with the technical help they may need to protect your home.

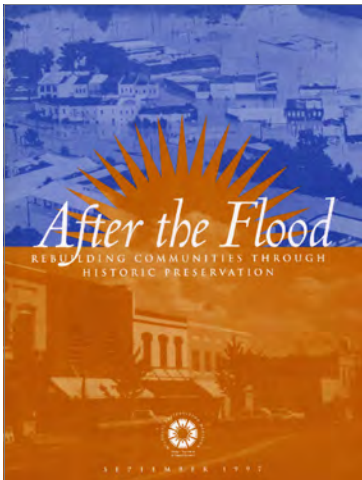
This is the **Second Edition** of the Hurricane Retrofit Guide. It has been completed in 2010 and includes knowledge gained from field and laboratory studies conducted since 2006. This edition includes the latest changes in building codes that address existing buildings and has been reorganized to make it easier to look up retrofits appropriate for specific systems, parts or portions of buildings. It also includes **New Features** that provide answers to **Frequently Asked Questions** and allow you to **Ask the Experts** to clarify issues or details related to points raised or retrofits described in the guide.

By clicking on one of the dots on the picture below, you can begin to explore the risks associated with various parts of your house and the kinds of actions that will protect your home. The information is intended to provide guidance on best practices.

In addition to the specific building related retrofits that can be accessed either by clicking on one of the dots or the buttons along the left hand side of the page, there are also buttons along the left hand side that will direct you to things you should consider doing before a hurricane threatens, some ideas for how to start the recovery process if you do suffer damage, some guidance on prioritizing the retrofits your home may need to make it more hurricane resistant, a common location where all of the checklists scattered throughout the web site can be accessed, and finally some links to other web sites that you may find helpful.

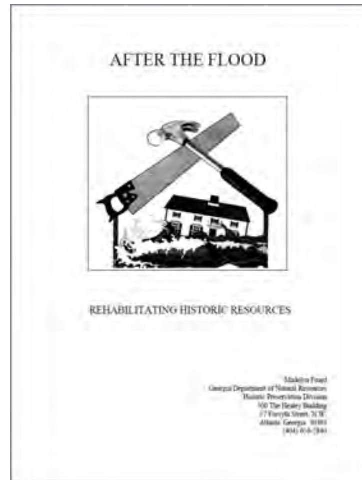
DIVISION OF EMERGENCY MANAGEMENT - No Date
http://www.floridadisaster.org/hrg/index.asp
Date Accessed: 14 January 2016

## AFTER THE FLOOD - REBUILDING COMMUNITIES THROUGH HISTORIC PRESERVATION



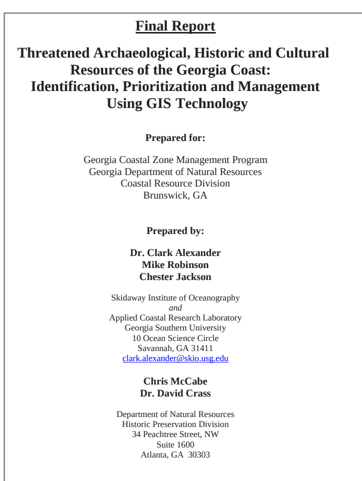

September 1997
http://www.georgiashpo.org/sites/uploads/hpd/pdf/flood_
rebuilding_communities.pdf
Date Accesse: 20 January 2016

## AFTER THE FLOOD - REHABILITATING HISTORIC RESOURCES




1996
http://www.georgiashpo.org/sites/uploads/hpd/pdf/1996_
after_the_flood_complete_rev.pdf
Date Accessed: 20 January 2016

## THREATENED ARCHAEOLOGICAL, HISTORIC AND CULTURAL RESOURCES OF THE GEORGIA COAST - IDENTIFICATION, PRIORITIZATION AND MANAGEMENT USING GIS TECHNOLOGY



Final Report

Threatened Archaeological, Historic and Cultural Resources of the Georgia Coast: Identification, Prioritization and Management Using GIS Technology

Prepared for:

Georgia Coastal Zone Management Program
Georgia Department of Natural Resources
Coastal Resource Division
Brunswick, GA

Prepared by:

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Mike Robinson
Chester Jackson

Skidaway Institute of Oceanography
*and*
Applied Coastal Research Laboratory
Georgia Southern University
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clark.alexander@skio.usg.edu

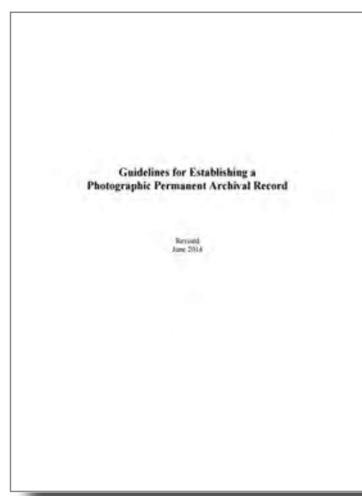
Chris McCabe
Dr. David Crass

Department of Natural Resources
Historic Preservation Division
34 Peachtree Street, NW
Suite 1600
Atlanta, GA 30303

12 February 2008

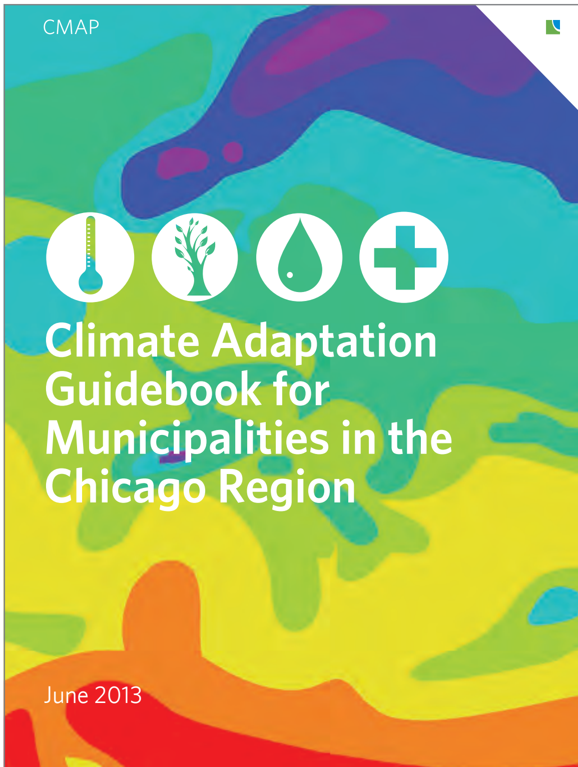
DR. CLARK ALEXANDER, MIKE ROBINSON AND CHESTER JACKSON - 12 February 2008
https://docs.google.com/file/
d/0B3jQMqaDd3SpMXc4clVMbDFKekU/edit?pref=2&pli=1
Date Accessed: 6 January 2016

## GUIDELINES FOR ESTABLISHING A PHOTOGRAPHIC PERMANENT ARCHIVAL RECORD




June 2014
http://georgiashpo.org/sites/uploads/hpd/pdf/PAR%202014.pdf
Date Accessed: 5 February 2016

## 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: 22 January 2016

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

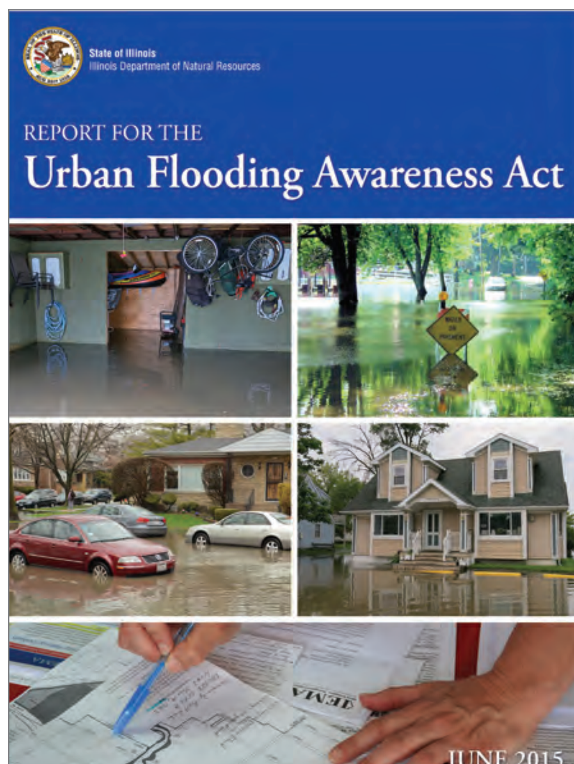
June 2015
http://www.dnr.illinois.gov/WaterResources/Documents/Final_UFAA_Report.pdf
Date Accessed: 26 January 2016

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

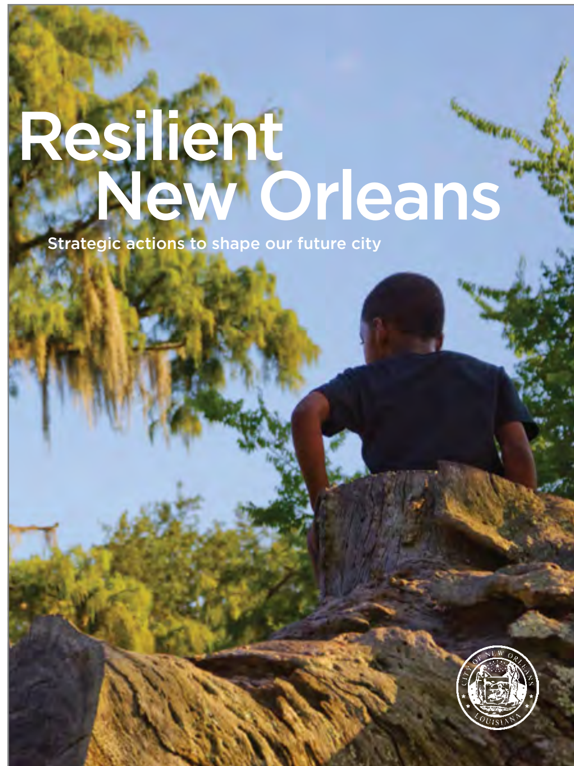
These recommendations focus almost entirely on stormwater management and related infrastructure. Though not targeted for historic structures, the report's recommendations could reduce the frequency of flooding in historic areas.



## RESILIENT NEW ORLEANS

Jeff Hebert, et al

August 2015
http://resilientnola.org/wp-content/uploads/2015/08/Resilient_New_Orleans_Strategy.pdf
Date Accessed: 15 January 2016




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

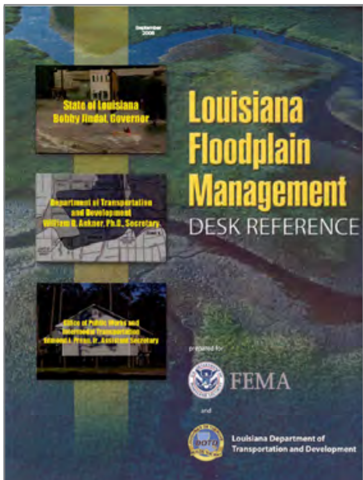

URS - 2014
http://www.crt.state.la.us/Assets/OCD/hp/uniquely-louisiana-education/Disaster-Recovery/Final%20Elevation%20Design%20Booklet%2012-07-15%20v2.pdf
Date Accessed: 4 March 2016

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: 16 August 2016

## MASSACHUSETTS CLIMATE CHANGE ADAPTATION REPORT

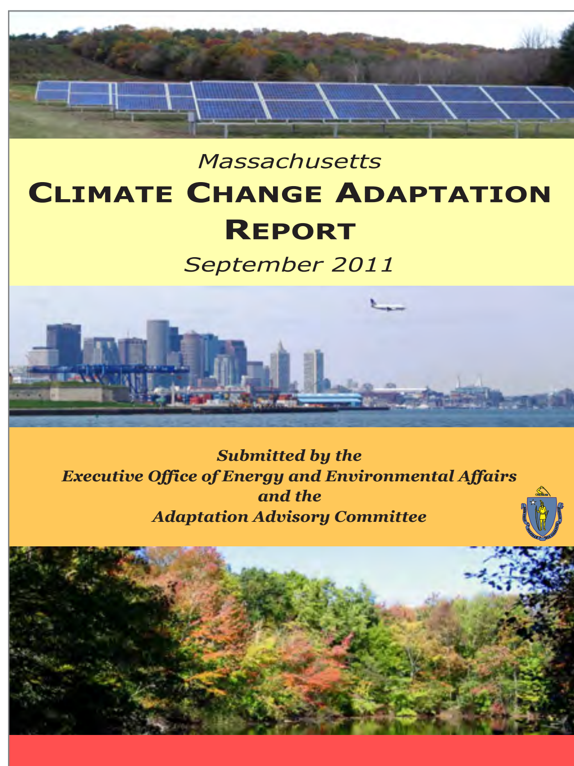
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS AND THE ADAPTATION ADVISORY COMMITTEE
September 2011
http://www.mass.gov/eea/docs/eea/energy/cca/eea-climate-adaptation-report.pdf
Date Accessed: 22 January 2016

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.



## BUILDING RESILIENCE IN BOSTON

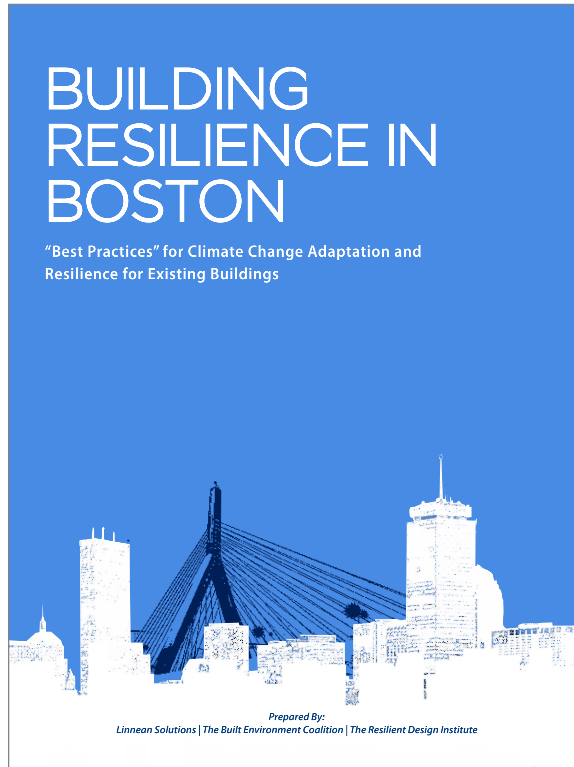
Jim Newman, et al

July 2013
http://www.cityofboston.gov/images_documents/Building_Resilience_in_Boston_FINAL_tcm3-40185.pdf
Date Accessed: 22 January 2016

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: 22 January 2016

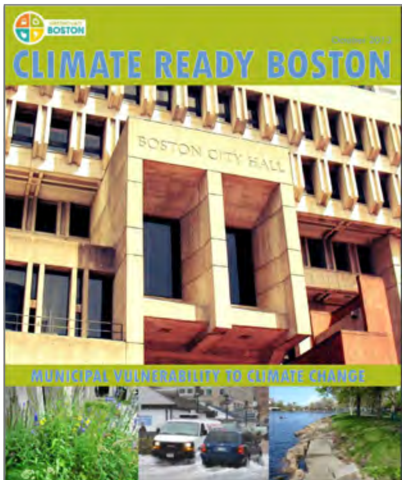
This is a report for property owners, policy-makers, and planners. In addition to outlining how climate change-related coastal flooding will impact Boston, the report provides an assessment of Boston’s vulnerability to flooding and an overview of the city’s 2012 preparedness plan.

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.

## CLIMATE READY BOSTON

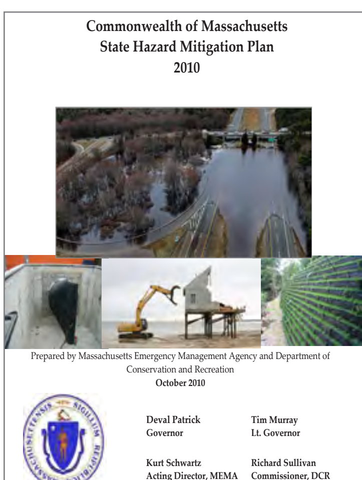



CLIMATE PREPAREDNESS TASK FORCE - October 2013
http://issuu.com/ees_boston/docs/final_report_29oct13
Date Accessed: 22 January 2016

## GREENOVATE BOSTON 2014 CLIMATE ACTION PLAN UPDATE


2014
http://www.cityofboston.gov/eeos/pdfs/Greenovate%20Boston%202014%20CAP%20Update_Full.pdf
Date Accessed: 8 February 2016

## COMMONWEALTH OF MASSACHUSETTS STATE HAZARD MITIGATION PLAN

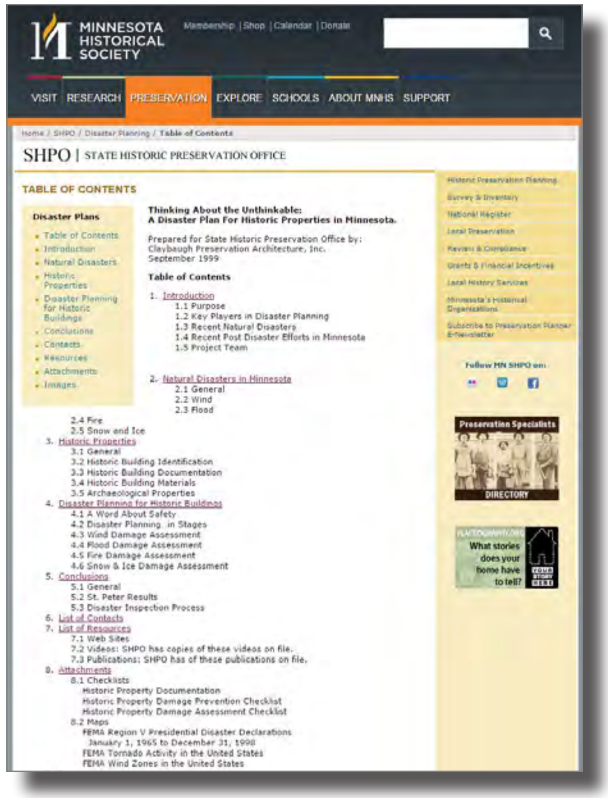



October 2010
http://northeastoceancouncil.org/wp-content/uploads/2012/10/MA-Hazard-Mitigation-Plan-2010.pdf
Date Accessed: 8 February 2016

## 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: 6 January 2016



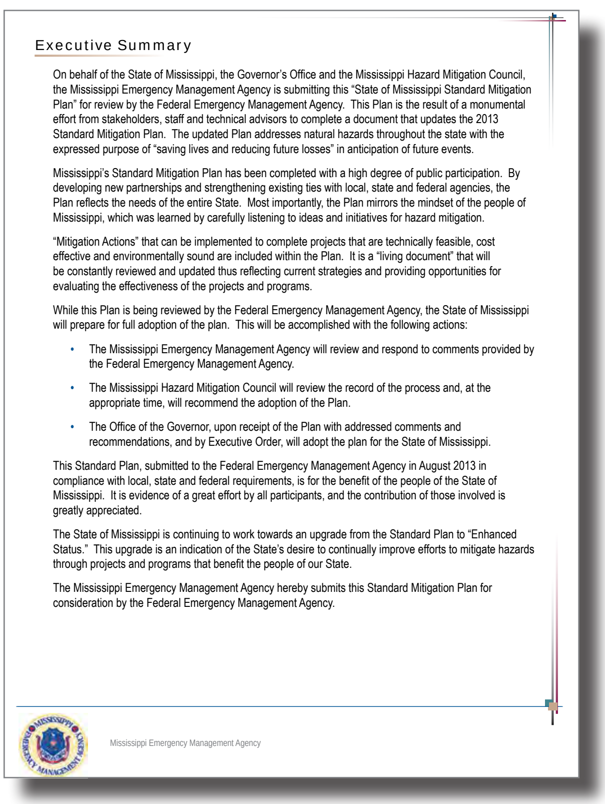

This guide, published by the Minnesota Historical Society, is geared toward owners of historic properties, local governments, and disaster management professionals. Its purpose is to provide information on preparing historic structures for disasters and implementing recovery measures after such an event.

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



Executive Summary

On behalf of the State of Mississippi, the Governor's Office and the Mississippi Hazard Mitigation Council, the Mississippi Emergency Management Agency is submitting this "State of Mississippi Standard Mitigation Plan" for review by the Federal Emergency Management Agency. This Plan is the result of a monumental effort from stakeholders, staff and technical advisors to complete a document that updates the 2013 Standard Mitigation Plan. The updated Plan addresses natural hazards throughout the state with the expressed purpose of "saving lives and reducing future losses" in anticipation of future events.

Mississippi's Standard Mitigation Plan has been completed with a high degree of public participation. By developing new partnerships and strengthening existing ties with local, state and federal agencies, the Plan reflects the needs of the entire State. Most importantly, the Plan mirrors the mindset of the people of Mississippi, which was learned by carefully listening to ideas and initiatives for hazard mitigation.

"Mitigation Actions" that can be implemented to complete projects that are technically feasible, cost effective and environmentally sound are included within the Plan. It is a "living document" that will be constantly reviewed and updated thus reflecting current strategies and providing opportunities for evaluating the effectiveness of the projects and programs.

While this Plan is being reviewed by the Federal Emergency Management Agency, the State of Mississippi will prepare for full adoption of the plan. This will be accomplished with the following actions:

- The Mississippi Emergency Management Agency will review and respond to comments provided by the Federal Emergency Management Agency.
- The Mississippi Hazard Mitigation Council will review the record of the process and, at the appropriate time, will recommend the adoption of the Plan.
- The Office of the Governor, upon receipt of the Plan with addressed comments and recommendations, and by Executive Order, will adopt the plan for the State of Mississippi.

This Standard Plan, submitted to the Federal Emergency Management Agency in August 2013 in compliance with local, state and federal requirements, is for the benefit of the people of the State of Mississippi. It is evidence of a great effort by all participants, and the contribution of those involved is greatly appreciated.

The State of Mississippi is continuing to work towards an upgrade from the Standard Plan to "Enhanced Status." This upgrade is an indication of the State's desire to continually improve efforts to mitigate hazards through projects and programs that benefit the people of our State.

The Mississippi Emergency Management Agency hereby submits this Standard Mitigation Plan for consideration by the Federal Emergency Management Agency.

Mississippi Emergency Management Agency

Mississippi Emergency Management Agency

August 2013
http://www.msema.org/wp-content/uploads/2012/06/State-Hazard-Mitigation-Plan-2013.pdf
Date Accessed: 20 January 2016

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.

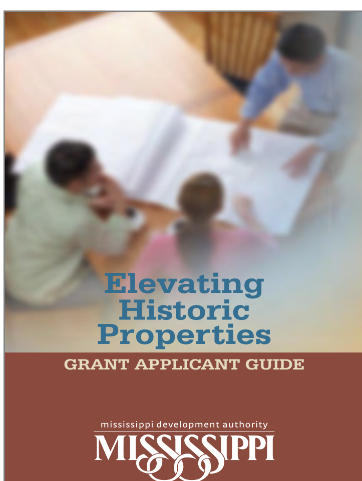
## ELEVATION DESIGN GUIDELINES: FOR HISTORIC HOMES IN THE MISSISSIPPI GULF COAST REGION


In the aftermath of Hurricane Sandy, 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: 22 December 2015

## ELEVATING HISTORIC PROPERTIES GRANT APPLICATION GUIDE

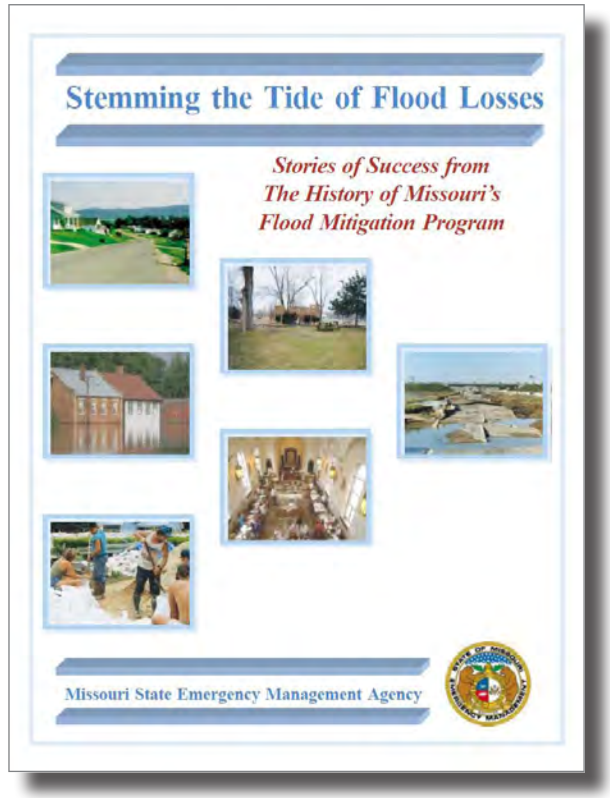



URS - No Date
http://www.msdisasterrecovery.com/documents/historic_prop_grant_app.pdf
Date Accessed: 4 March 2016

## STEMMING THE TIDE OF FLOOD LOSSES - STORIES OF SUCCESS FROM THE HISTORY OF MISSOURI'S FLOOD MITIGATION PROGRAM

MISSOURI STATE MANAGEMENT AGENCY

No Date
http://sema.dps.mo.gov/docs/publications/stemming.pdf
Date Accessed: 21 January 2016




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 it's 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.

## SUSTAINED SURVIVAL

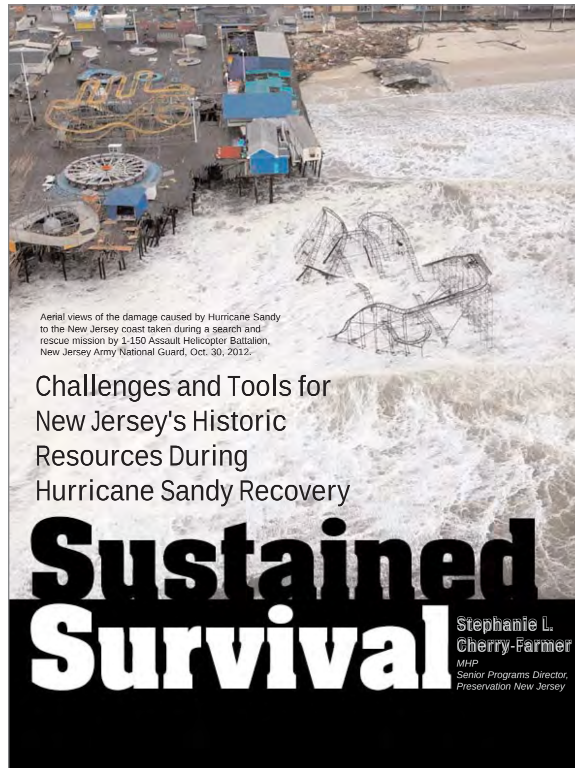
STEPHANIE L. CHERRY-FARMER

March 2013
http://gardenstatelegacy.com/files/Sustained_Survival_Cherry-Farmer_GSL19.pdf
Date Accessed: 15 March 2016

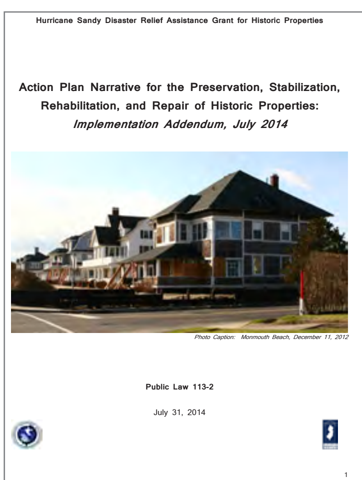
As of the date of Cherry-Farmer's article, the response to the impact of Hurricane Sandy was in a state of flux and the preservation community in NJ could not yet predict how the response would impact historic resources. The full effect of Sandy on these resources was also not yet fully understood and 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.




## ACTION PLAN NARRATIVE FOR THE PRESERVATION, STABILIZATION, REHABILITATION, AND REPAIR OF HISTORIC PROPERTIES: IMPLEMENTATION ADDENDUM


Hurricane Sandy Disaster Relief Assistance Grant for Historic Properties

Action Plan Narrative for the Preservation, Stabilization, Rehabilitation, and Repair of Historic Properties:
*Implementation Addendum, July 2014*

*Photo Caption: Monmouth Beach, December 11, 2012*

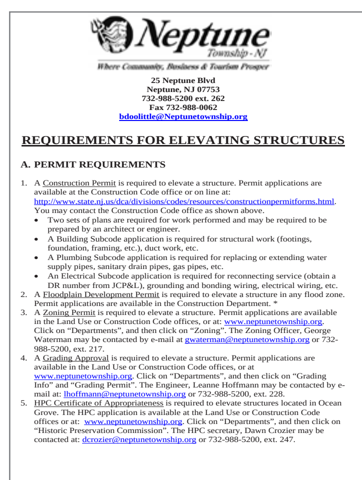
Public Law 113-2

July 31, 2014

1

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: 22 February 2016

## REQUIREMENTS FOR ELEVATING STRUCTURES


Neptune Township - NJ
Where Community, Business & Tourism Prosper

**25 Neptune Blvd**
**Neptune, NJ 07753**
**732-988-5200 ext. 262**
**Fax 732-988-0062**
**bdoolittle@Neptunetownship.org**

**REQUIREMENTS FOR ELEVATING STRUCTURES**

**A. PERMIT REQUIREMENTS**

1. A Construction Permit is required to elevate a structure. Permit applications are available at the Construction Code office or on line at: http://www.state.nj.us/dca/divisions/codes/resources/constructionpermitforms.html. You may contact the Construction Code office as shown above.
   - Two sets of plans are required for work performed and may be required to be prepared by an architect or engineer.
   - A Building Subcode application is required for structural work (footings, foundation, framing, etc.), duct work, etc.
   - A Plumbing Subcode application is required for replacing or extending water supply pipes, sanitary drain pipes, gas pipes, etc.
   - An Electrical Subcode application is required for reconnecting service (obtain a DR number from JCP&L), grounding and bonding wiring, electrical wiring, etc.
2. A Floodplain Development Permit is required to elevate a structure in any flood zone. Permit applications are available in the Construction Department. *
3. A Zoning Permit is required to elevate a structure. Permit applications are available in the Land Use or Construction Code offices, or at: www.neptunetownship.org. Click on "Departments", and then click on "Zoning". The Zoning Officer, George Waterman may be contacted by e-mail at gwaterman@neptunetownship.org or 732-988-5200, ext. 217.
4. A Grading Approval is required to elevate a structure. Permit applications are available in the Land Use or Construction Code offices, or at www.neptunetownship.org. Click on "Departments", and then click on "Grading Info" and "Grading Permit". The Engineer, Leanne Hoffmann may be contacted by e-mail at: lhoffmann@neptunetownship.org or 732-988-5200, ext. 228.
5. HPC Certificate of Appropriateness is required to elevate structures located in Ocean Grove. The HPC application is available at the Land Use or Construction Code offices or at: www.neptunetownship.org. Click on "Departments", and then click on "Historic Preservation Commission". The HPC secretary, Dawn Crozier may be contacted at: dcrozier@neptunetownship.org or 732-988-5200, ext. 247.

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NEPTUNE, NJ TOWNSHIP - No Date
http://www.neptunetownship.org/sites/default/files/documents/Construction/ELEVATING%20STRUCTURES%20-%20Requirements.pdf
Date Accessed: 22 February 2016

## RETROFITTING BUILDINGS FOR FLOOD RISK


Carl Weisbrod

October 2014
http://www.nyc.gov/html/dcp/pdf/retrofitting/retrofitting_complete.pdf
Date Accessed: 14 January 2016

*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: 20 January 2016

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: 1 February 2016

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: 15 January 2016

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:

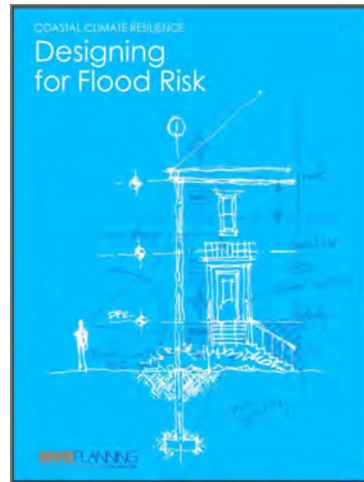
- Upgrading public and private city buildings
- Adopting policies to support building upgrades
- Working to reform FEMA's National Flood Insurance Program (NFIP)

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

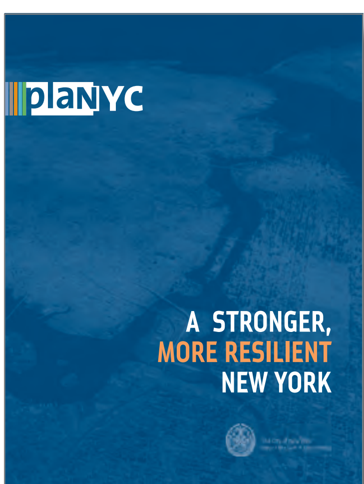

June 2013
http://issuu.com/urbangreen/docs/brtf_executive_summary
Date Accessed: 5 February 2016

## Designing for Flood Risk



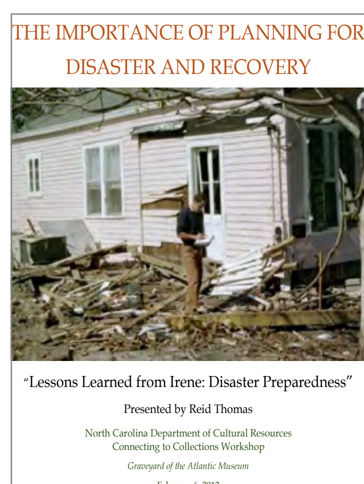

Department of City Planning City of New York - June 2013
http://www1.nyc.gov/assets/planning/download/pdf/plans-studies/sustainable-communities/climate-resilience/designing_flood_risk.pdf Date Accessed: 3 February 2016

## A Stronger, More Resilient New York



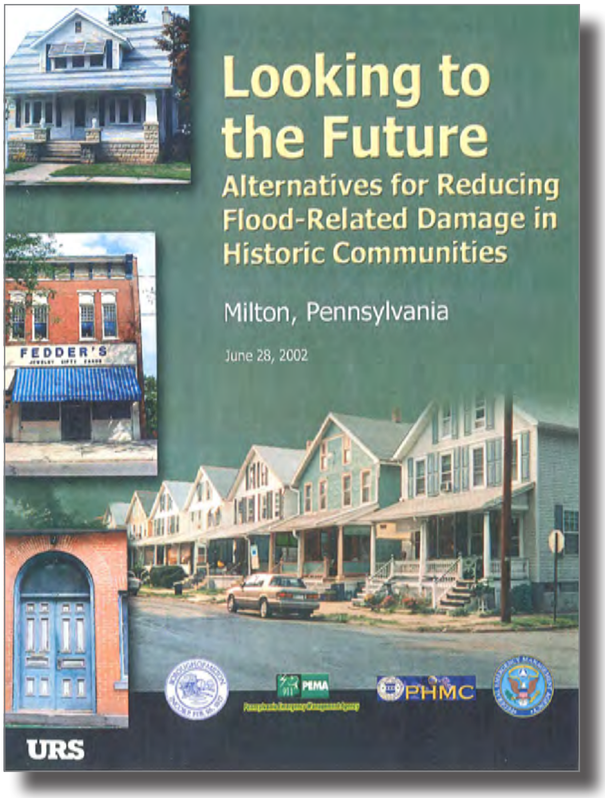

PLANYC - June 2013
http://s-media.nyc.gov/agencies/sirr/SIRR_singles_Lo_res.pdf
Date Accessed: 3 February 2016

## The Importance of Planning for Disaster Recovery




Reid Thomas - 6 February 2012
http://www.hpo.ncdcr.gov/DisasterPlanning&Recovery.pdf
Date Accessed: 16 February 2012

## LOOKING TO THE FUTURE: ALTERNATIVES FOR REDUCING FLOOD-RELATED DAMAGE IN HISTORIC COMMUNITIES




URS

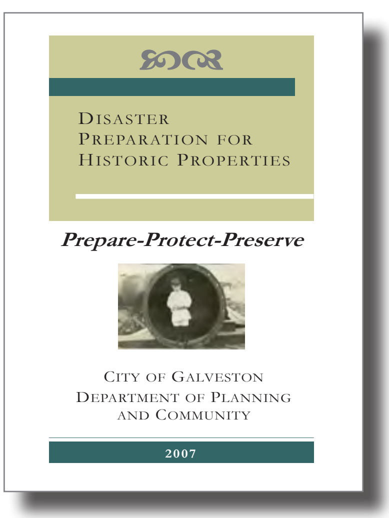
28 June 2002
https://www.portal.state.pa.us/portal/server.pt/document/1425057/looking_to_the_future
Date Accessed: 6 January 2016

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:

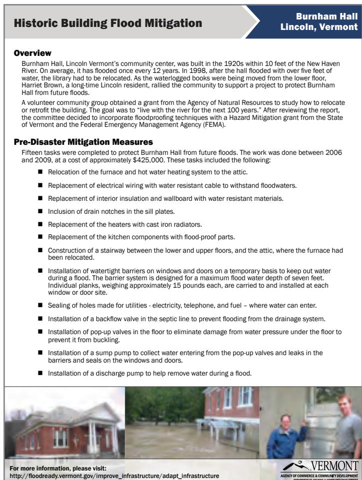
- Acquisition and demolition
- Relocation
- Elevation
- Floodproofing
- Structural flood diversion improvements and stream channel modifications

## DISASTER PREPARATION FOR HISTORIC PROPERTIES




2007
http://www.cityofgalveston.org/DocumentCenter/View/104
Date Accessed: 16 February 2016

## HISTORIC BUILDING FLOOD MITIGATION IN VERMONT


Historic Building Flood Mitigation

Burnham Hall
Lincoln, Vermont

**Overview**

Burnham Hall, Lincoln Vermont's community center, was built in the 1920s within 10 feet of the New Haven River. On average, it has flooded once every 12 years. In 1998, after the hall flooded with over five feet of water, the library had to be relocated. As the waterlogged books were being moved from the lower floor, Harriet Brown, a long-time Lincoln resident, rallied the community to support a project to protect Burnham Hall from future floods.

A volunteer community group obtained a grant from the Agency of Natural Resources to study how to relocate or retrofit the building. The goal was to "live with the river for the next 100 years." After reviewing the report, the committee decided to incorporate floodproofing techniques with a Hazard Mitigation grant from the State of Vermont and the Federal Emergency Management Agency (FEMA).

**Pre-Disaster Mitigation Measures**

Fifteen tasks were completed to protect Burnham Hall from future floods. The work was done between 2006 and 2009, at a cost of approximately $425,000. These tasks included the following:

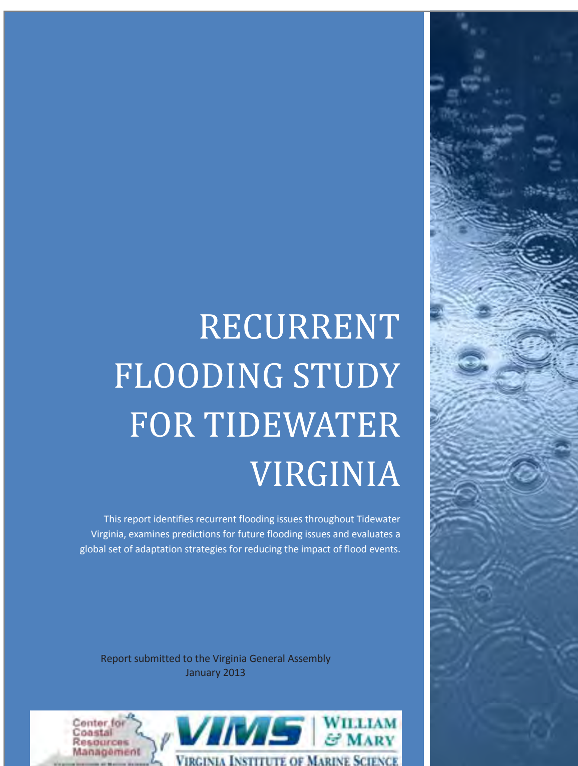
- Relocation of the furnace and hot water heating system to the attic.
- Replacement of electrical wiring with water resistant cable to withstand floodwaters.
- Replacement of interior insulation and wallboard with water resistant materials.
- Inclusion of drain notches in the sill plates.
- Replacement of the heaters with cast iron radiators.
- Replacement of the kitchen components with flood-proof parts.
- Construction of a stairway between the lower and upper floors, and the attic, where the furnace had been relocated.
- Installation of watertight barriers on windows and doors on a temporary basis to keep out water during a flood. The barrier system is designed for a maximum flood water depth of seven feet. Individual planks, weighing approximately 15 pounds each, are carried to and installed at each window or door site.
- Sealing of holes made for utilities - electricity, telephone, and fuel – where water can enter.
- Installation of a backflow valve in the septic line to prevent flooding from the drainage system.
- Installation of pop-up valves in the floor to eliminate damage from water pressure under the floor to prevent it from buckling.
- Installation of a sump pump to collect water entering from the pop-up valves and leaks in the barriers and seals on the windows and doors.
- Installation of a discharge pump to help remove water during a flood.

For more information, please visit:
http://floodready.vermont.gov/improve_infrastructure/adapt_infrastructure

VERMONT
AGENCY OF COMMERCE & COMMUNITY DEVELOPMENT
DEPARTMENT OF HOUSING & COMMUNITY DEVELOPMENT

No Date
http://accd.vermont.gov/sites/accd/files/Flood_Mitigation_Case_Studies_Final.pdf
Date Accessed: 11 August 2016

## RECURRENT FLOODING STUDY FOR TIDEWATER VIRGINIA




Virginia Institute for Marine Science

January 2013
http://tinyurl.com/q22p77s
Date Accessed: 5 January 2016

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
http://nfkresilientcity.org/wp-content/uploads/2015/10/Norfolk_Resilient_Strategy_October_2015.pdf
Date Accessed: 15 January 2016

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.

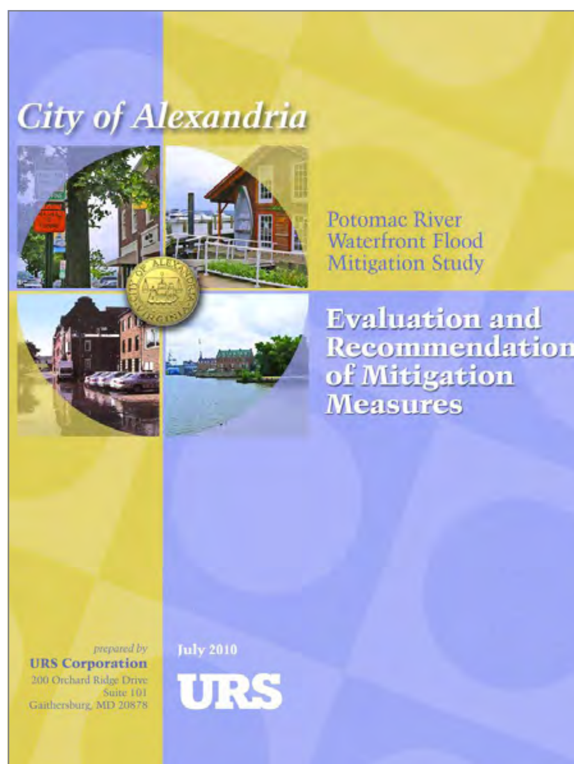
## POTOMAC RIVER WATERFRONT FLOOD MITIGATION STUDY: EVALUATION AND RECOMMENDATION OF MITIGATION MEASURES

URS

July 2010
https://www.alexandriava.gov/uploadedFiles/tes/info/Final_Potomac_Mitigation_Studyx.pdf
Date Accessed: 20 July 2016

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
http://emergencymanagement.wi.gov/mitigation/stories/hm-darlington_success.pdf
Date Accessed: 23 December 2015

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/Leonard1 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 or 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* 9

Rod Scott - August 2015
http://www.floods.org/ace-files/documentlibrary/News_Views/News_Views_Aug2015.pdf
Date Accessed: 26 January 2016

# OTHER ENTITIES

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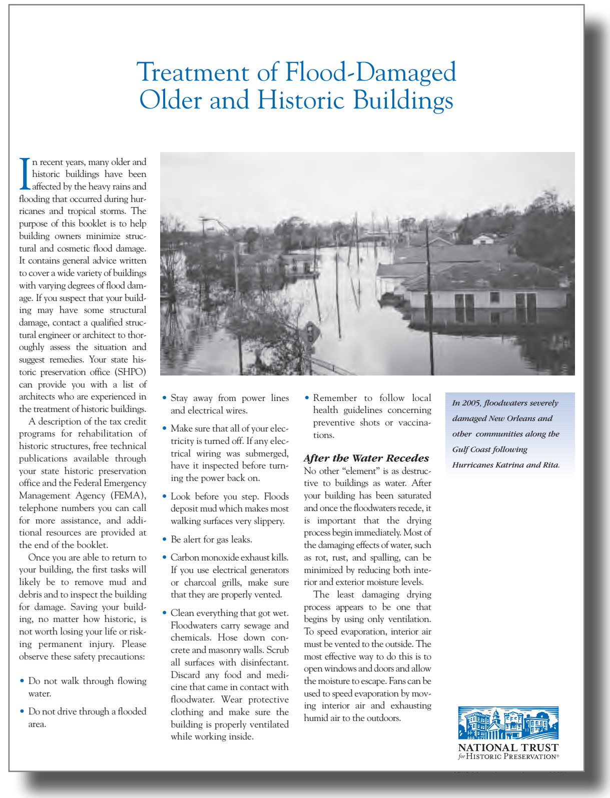
## TREATMENT OF FLOOD-DAMAGED OLDER AND HISTORIC BUILDINGS



# 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. It contains general advice written to cover a wide variety of buildings with varying degrees of 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 electricity 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, interior 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 Hurricanes Katrina and Rita.*

NATIONAL TRUST for HISTORIC PRESERVATION®

Richard Wagner and Claudette Hanks Reichel

No Date
http://www.historycolorado.org/sites/default/files/files/OAHP/NTHP_Flood_Damage.pdf
Date Accessed: 22 December 2015

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.

## CLIMATE CHANGE IN NEWPORT

Preservation Leadership Forum Blog
Insights and Information for Preservation Professionals

HOME ADVOCACY LEGAL SUSTAINABILITY WHY DO OLD PLACES DC 2015 ABOUT

# 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, titled, "High Water and High Stakes: Cultural Resources and Climate Change," contributors examined what changing weather patterns mean 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 this historic Rhode Island community.*

Like so many coastal cities, Newport, Rhode Island's vitality is drawn from the sea. Through the centuries, Newport has been a powerful colonial entrepot, Gilded Age resort, base for the Navy, and currently, a vibrant tourist destination—each chapter formed by a distinct relationship to the water. Proximity to the ocean has always been one of Newport's greatest assets; now it poses an imminent new threat.

*4 Poplar, one of Newport Restoration Foundation's historic homes. | Credit: Newport Restoration Foundation*

Newport's 376-year history is strikingly visible in neighborhoods populated by 18th- and 19th-century homes, 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 new weather realities imposed by climate change. The Newport Restoration Foundation (NRF), of which I am the director, has saved and currently owns nearly 80 18th-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 directly hit Rhode Island. One of the worst 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 sound a warning for what increased tropical activity will bring in 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: 20 January 2016

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

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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.[1]

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."[1]

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."[2]

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.[1] 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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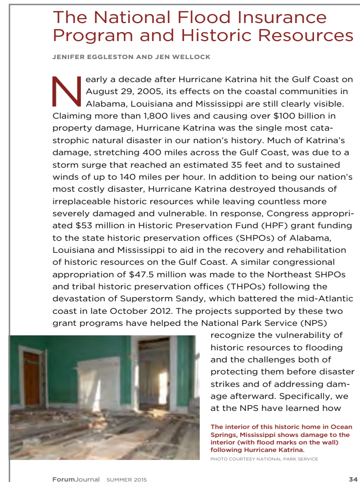
Patty Ferguson-Bohnee - Summer 2015
*Forum Journal*

## 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 (with flood marks on the wall) following Hurricane Katrina.

PHOTO COURTESY NATIONAL PARK SERVICE

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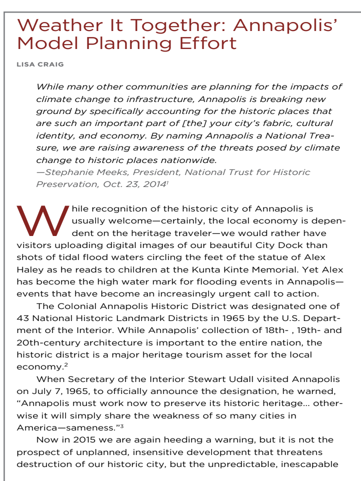
Jenifer Eggleston and Jen Wellock - Summer 2015
*Forum Journal*

## 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, 2014*[1]

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

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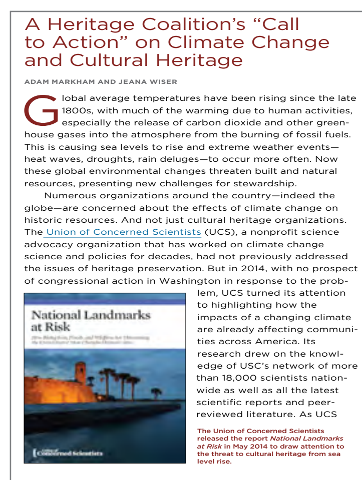
Lisa Craig - Summer 2015
*Forum Journal*

## 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

National Landmarks at Risk

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.

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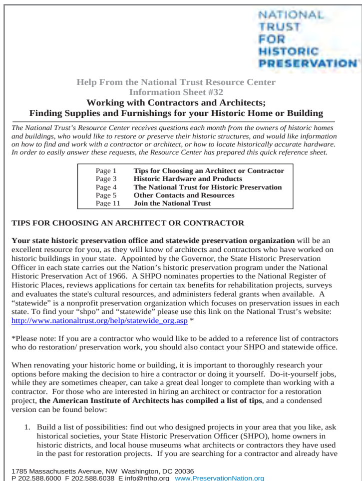
Adam Markham and Jeana Wiser - Summer 2015
*Forum Journal*

## INFORMATION SHEET #32: WORKING WITH CONTRACTORS AND ARCHITECTS - FINDING SUPPLIES AND FURNISHINGS FOR YOUR HISTORIC HOME OR BUILDING


NATIONAL TRUST FOR HISTORIC PRESERVATION

Help From the National Trust Resource Center
Information Sheet #32
**Working with Contractors and Architects;**
**Finding Supplies and Furnishings for your Historic Home or Building**

*The National Trust's Resource Center receives questions each month from the owners of historic homes and buildings, who would like to restore or preserve their historic structures, and would like information on how to find and work with a contractor or architect, or how to locate historically accurate hardware. In order to easily answer these requests, the Resource Center has prepared this quick reference sheet.*



TIPS FOR CHOOSING AN ARCHITECT OR CONTRACTOR

**Your state historic preservation office and statewide preservation organization** will be an excellent resource for you, as they will know of architects and contractors who have worked on historic buildings in your state. Appointed by the Governor, the State Historic Preservation Officer in each state carries out the Nation's historic preservation program under the National Historic Preservation Act of 1966. A SHPO nominates properties to the National Register of Historic Places, reviews applications for certain tax benefits for rehabilitation projects, surveys and evaluates the state's cultural resources, and administers federal grants when available. A "statewide" is a nonprofit preservation organization which focuses on preservation issues in each state. To find your "shpo" and "statewide" please use this link on the National Trust's website: http://www.nationaltrust.org/help/statewide_org.asp *

*Please note: If you are a contractor who would like to be added to a reference list of contractors who do restoration/ preservation work, you should also contact your SHPO and statewide office.

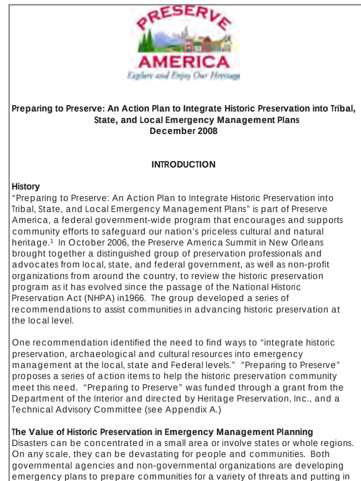
When renovating your historic home or building, it is important to thoroughly research your options before making the decision to hire a contractor or doing it yourself. Do-it-yourself jobs, while they are sometimes cheaper, can take a great deal longer to complete than working with a contractor. For those who are interested in hiring an architect or contractor for a restoration project, **the American Institute of Architects has compiled a list of tips**, and a condensed version can be found below:

1. Build a list of possibilities: find out who designed projects in your area that you like, ask historical societies, your State Historic Preservation Officer (SHPO), home owners in historic districts, and local house museums what architects or contractors they have used in the past for restoration projects. If you are searching for a contractor and already have

1785 Massachusetts Avenue, NW Washington, DC 20036
P 202.588.6000 F 202.588.6038 E info@nthp.org www.PreservationNation.org

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


PRESERVE AMERICA
Explore and Enjoy Our Heritage

**Preparing to Preserve: An Action Plan to Integrate Historic Preservation into Tribal, State, and Local Emergency Management Plans**
**December 2008**

**INTRODUCTION**

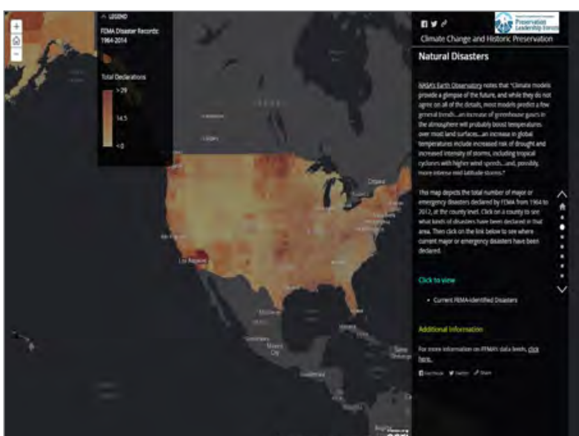
**History**
"Preparing to Preserve: An Action Plan to Integrate Historic Preservation into Tribal, State, and Local Emergency Management Plans" is part of Preserve America, a federal government-wide program that encourages and supports community efforts to safeguard our nation's priceless cultural and natural heritage.[1] In October 2006, the Preserve America Summit in New Orleans brought together a distinguished group of preservation professionals and advocates from local, state, and federal government, as well as non-profit organizations from around the country, to review the historic preservation program as it has evolved since the passage of the National Historic Preservation Act (NHPA) in1966. The group developed a series of recommendations to assist communities in advancing historic preservation at the local level.

One recommendation identified the need to find ways to "integrate historic preservation, archaeological and cultural resources into emergency management at the local, state and Federal levels." "Preparing to Preserve" proposes a series of action items to help the historic preservation community meet this need. "Preparing to Preserve" was funded through a grant from the Department of the Interior and directed by Heritage Preservation, Inc., and a Technical Advisory Committee (see Appendix A.)

**The Value of Historic Preservation in Emergency Management Planning**
Disasters can be concentrated in a small area or involve states or whole regions. On any scale, they can be devastating for people and communities. Both governmental agencies and non-governmental organizations are developing emergency plans to prepare communities for a variety of threats and putting in

December 2008
https://www.doi.gov/sites/doi.gov/files/migrated/pmb/oepc/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 WHOLE BUILDING DESIGN GUIDE a program of the National Institute of Building Sciences

(/design/) (/project/) (/om/) (/references/) (/tools/) (/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(/wbdg_approach.php). (See also Sustainable(sustainable.php) and Sustainable Historic Preservation(/resources/sustainable_hp.php?r=historic_pres).)

Realizing the need to protect America's cultural resources, Congress established the National Historic Preservation Act (NHPA)(http://www.nps.gov/history/local-law/nhpa1966.htm) in 1966, which mandates 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/nr/), 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 archaeological 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 Archaeological Resources Protection Act(http://www.nps.gov/archeology/tools/Laws/arpa.htm) established the public mandate to protect these resources.

U.S. Courthouse at Union Station, Tacoma, WA. Designed by the architectural firm of Reed and Stem and constructed in 1911 and renovated in 1987. Tall ceilings, generous daylight, and grand ceremonial spaces give historic buildings enduring investment value and make them attractive for a variety of uses. (Photo courtesy of the U.S. General Services Administration)

Some practical and/or intangible benefits of historic preservation include:

- Retention of history and authenticity
  - Commemorates the past
  - Aesthetics(aesthetics.php): texture, craftsmanship, style
  - Pedestrian/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/sustainable_hp.php?r=historic_pres) (refer also to WBDG Sustainable Branch(sustainable.php))
  - Less construction and demolition debris
  - Less hazardous material debris
  - Less need for new materials
- Existing usable space—quicker occupancy
- Rehabilitation often costs less than new construction
- Reuse of infrastructure
- Energy savings(minimize_consumption.php)
  - No energy used for demolition
  - No energy used for new construction
  - Reuse of embodied energy in building materials and assemblies

Rehabilitated historic hotel, Cape May, NJ. Photo courtesy of the National Park Service

Following passage of the NHPA, the Secretary of the Interior established Standards for the Treatment of Historic Properties(http://www.nps.gov/tps/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 Educate. Successful preservation design requires early and frequent consultation with a variety of organizations and close collaboration among technical specialists, architects, owner/occupants, and preservation professionals.

Work on historic properties requires specialized skills. The Secretary of the Interior has identified professional qualification standards(http://www.nps.gov/history/local-law/arch_stnds_9.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/tps/standards/four-treatments/treatment-preservation.htm) focuses on the maintenance stabilization, and repair of existing historic materials and retention of a property's form as it has evolved over time.

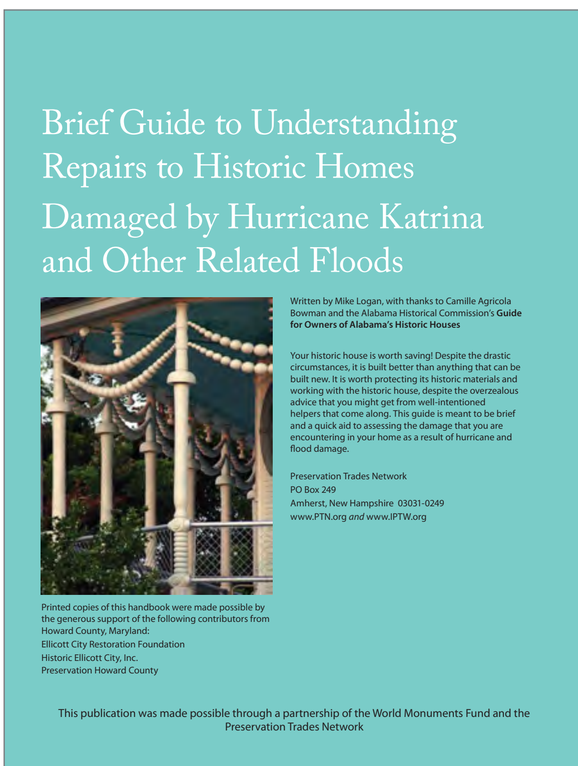
Rehabilitation(http://www.nps.gov/tps/standards/four-treatments/treatment-rehabilitation.htm) acknowledges the need to alter or add to a historic property to meet continuing or changing uses while retaining the property's historic character.

Restoration(http://www.nps.gov/tps/standards/four-treatments/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/tps/standards/four-treatments/treatment-reconstruction.htm) re-creates vanished or non-surviving portions of a property for interpretive purposes.

https://www.wbdg.org/design/historic_pres.php 1/7

## 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

Printed copies of this handbook were made possible by the generous support of the following contributors from Howard County, Maryland:
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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: 16 February 2016

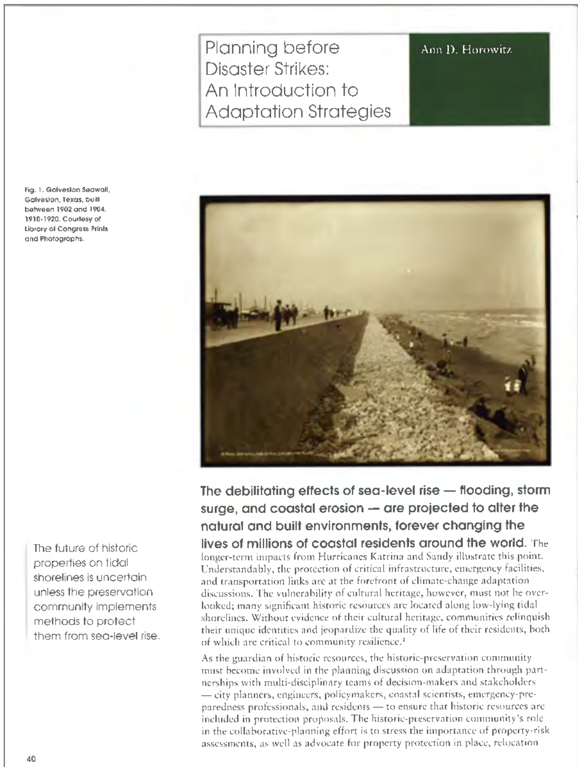
Intended for Gulf Coast homeowners affected by flooding, this guide is meant to serve an introduction to methods for repairing historic homes. It begins with a brief overview of the advantages of repairing and restoring over demolition, highlighting the superior quality and durability of historic buildings 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


Planning before Disaster Strikes: An Introduction to Adaptation Strategies

Ann D. Horowitz

Fig. 1. Galveston Seawall, Galveston, 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.[1]

The future of historic properties on tidal shorelines is uncertain unless the preservation community implements methods to protect them from sea-level rise.

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

40

Ann D. Horowitz

2016
*APT Bulletin*, Vol. XLVII No. 1

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


Sea-Level Rise Vulnerability Assessment of Coastal Resources in New Hampshire

**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.**

Preventative risk-evaluation measures can help to protect buildings from mean sea-level rise.

25

Benjamin Curran, Michael Routhier and Gopal Mulukutla - 2016
*APT Bulletin*, Vol. XLVII No. 1

## PERMAFROST THAW AND ABORIGINAL CULTURAL LANDSCAPES IN THE GWICH'IN REGION, CANADA


Permafrost Thaw and Aboriginal Cultural Landscapes in the Gwich'in Region, Canada

GIS-based heritage risk assessment can help protect fragile cultural resources in the Yukon and Northwest Territories

**In Canada's Northwest Territories, where continuous or discontinuous permafrost underlies close to 80 percent of the landscape and air temperatures are increasing at a rate significantly greater than the global average,** cultural resource managers are faced with the enormous challenge of predicting and managing the impacts of climate change on cultural sites and landscapes.[1]

15

Thomas D. Andrew, et. al. - 2016
*APT Bulletin*, Vol. XLVII No. 1

## CLIMATE CHANGE AND NON-MECHANICALLY VENTILATED INTERIORS


Climate Change and Non-mechanically Ventilated Historic Interiors

Peter Brimblecombe and Caroline Brimblecombe - 2016
*APT Bulletin*, Vol. XLVII No. 1

## WATER MANAGEMENT FOR TRADITIONAL BUILDINGS: ADAPTATION FOR A CHANGING CLIMATE


Water Management for Traditional Buildings: Adaptation for a Changing Climate

Roger Curtis - 2016
*APT Bulletin*, Vol. XLVII No. 1

## CLIMATE CHANGE AND LANDSCAPE PRESERVATION: A TWENTIETH-CENTURY CONUNDRUM


Climate Change and Landscape Preservation: A Twenty-First-Century Conundrum

Robert Melnick - 2009
http://www.apti.org/clientuploads/pdf/Melnick-40-3-4.pdf

## REFINING CLIMATE CHANGE THREATS TO HERITAGE


Peter Brimblecombe

Refining climate change threats to heritage

Peter Brimblecombe - 2014
http://www.tandfonline.com/doi/pdf/10.1080/19455224.2014.916226
Date Accessed: 19 July 2016

## 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: 22 December 2015

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

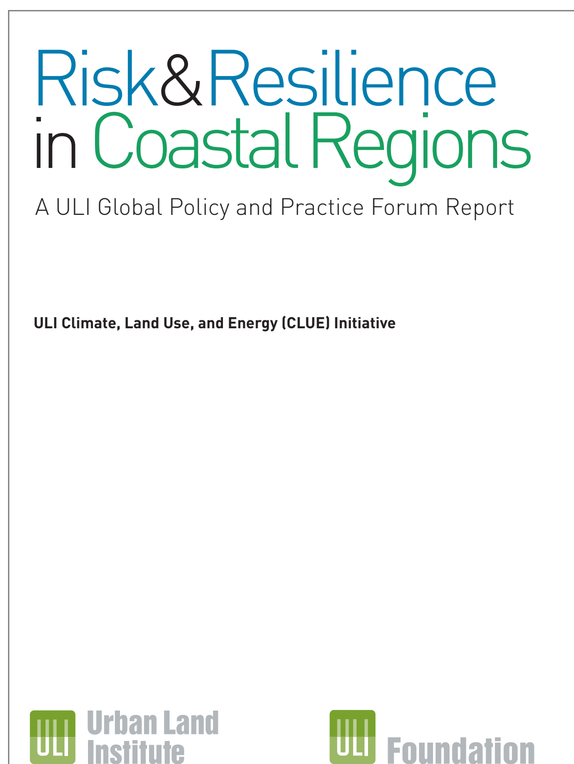
2013
http://uli.org/wp-content/uploads/ULI-Documents/CoastalRegions.pdf
Date Accessed: 22 December 2015

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:

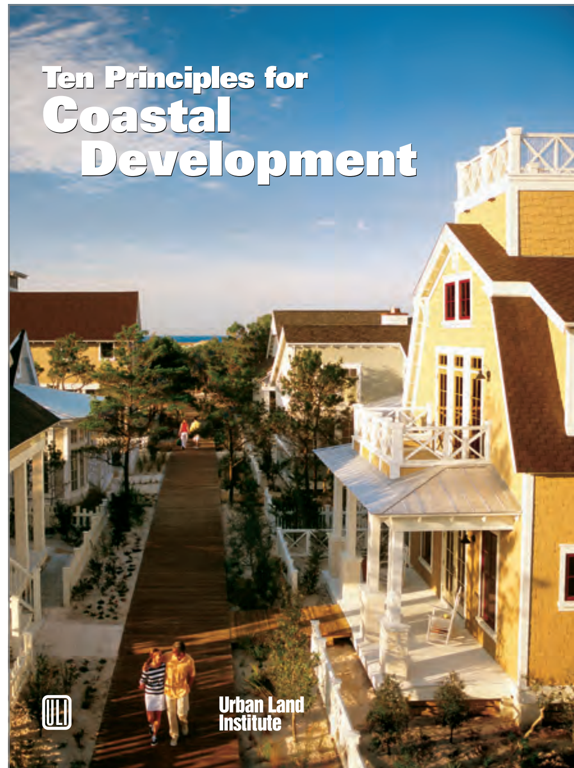
- Dimensions of community decision-making
- Assessing risk across regions and markets
- On site: Mitigating risk in the project



## 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: 22 December 2015




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.

## 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: 16 February 2016

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 have 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.

## 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: 1 February 2016

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: 5 January 2016

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

# A HIGHER TIDE

Planning for sea-level rise

BY MADELINE BODIN

**THE BLUE TAPE IS EVERYWHERE** in coastal South Carolina. It's on the brass door handle of the Palmetto Hammock and Resort Shoppe in Charleston, and it's on the window of the Lowcountry Bistro next door. In fact, blue tape is plastered on the exteriors of businesses all the way from Charleston to North Myrtle Beach.

Discussions about sea-level rise, like other aspects of climate change, are difficult. Frank Knapp, president and CEO of the South Carolina Small Business Chamber of Commerce, wanted to make sea-level rise real for people. The blue tape distributed by the chamber's South Carolina Businesses Acting on Rising Seas project marks the worst-case scenario: the high-tide mark in 2100 under the highest sea-level rise predictions, a six foot rise above the current high tide.

In Charleston's low-lying Market District, the tape marks a spot nearly five feet above street level. And with one step up to reach the door, that means high tide may one day reach door-handle height at the hammock shop.

Knapp found that even in a "red state" like South Carolina, about half the small business owners that his team contacted were concerned about the effect of sea-level rise.

**'Rise' defined**

"Sea-level rise" is shorthand for the increase in the global mean sea level, which has been measured by tide gauges for over 150 years, and more recently by satellites. According to the National Oceanographic and Atmospheric Administration, these measurements show that the global mean sea level has risen about eight inches since 1900. Sea level is expected to continue rising—and at an accelerated pace.

There are two main causes of sea-level rise: ocean water expanding as it warms, and land-based ice melting. Land-based ice includes glaciers, ice sheets, and the polar ice caps. In some places, sinking land adds to the impact of sea-level rise. Typically, land sinks because of the movements of the Earth's crust or groundwater removal.

While sea-level rise is global, its impacts are local. A town perched on a rocky cliff high above the ocean may not suffer as much from sea-level rise as a town on a flat coastal plain. Similarly, the dips and folds of a landscape can direct rising tides toward some neighborhoods while sparing others. Storm surges, extreme precipitation, exceptionally high tides (known as spring, neap, and king tides) all play a role in previewing the impacts of sea-level rise now, and will add to those impacts in the future.

Sea-level rise is a problem of coastal communities, but planning for it offers lessons for all communities concerned about the increase in extreme weather events that accompany climate change.

**Facing the inevitable**

The prevalence of coastal flooding means that sea-level rise is a concern in many states. In Florida, with its frequent hurricanes, coastal flooding is a constant worry. The Mid-Atlantic states are aware, too: They were shaken by Hurricane Sandy. And on the Pacific Coast, where earthquakes are the top natural disaster, coastal flooding is often associated with quake-driven tsunamis.

Susan E. Love, AICP, a planner with the Delaware Coastal Programs, points professional and volunteer planners to the many resources Delaware has developed for preparing for sea-level rise. The state offers a grant for sea-level rise assessment that can be used in several ways, including as part of a comprehensive development plan or as a stand alone assessment. It also provides sea-level rise maps and maps that combine sea-level rise with storm surges.

Because Delaware has just 57 municipalities, Love's team can assist towns individually. The municipalities have responded. Love says 40 towns have passed ordinances that exceed Federal Emergency Management Agency standards. "That's a big win for resiliency in the state," she says.

Her message is that resources are available no matter where you practice. If your state doesn't offer sea-level rise resources from its planning department, and even if it lacks a climate change or sea-level rise program, your state's coastal management program and the federally funded Sea Grant programs typically have information about preparing for sea-level rise, she says.

Nationally, there is Digital Coast, which NOAA created in partnership with the American Planning Association and other groups. The program offers training, access to maps of coastal inundation scenarios, and the data to create maps specific to your area.

The Georgetown Climate Center offers a *Sea-Level Rise and Coastal Land Use Adaptation Toolkit*. This 100-page PDF booklet was created in 2011; an updated, online version will be available soon. It explains how 18 different tools, from zoning overlays to building codes to rolling conservation easements, can be used to prepare for sea-level rise. It also provides model documents.

The National Estuarine Research Reserve System, a partnership between NOAA and coastal states, provides training specific to coastal land-use planning. Nicole Faghin, coastal management specialist with Washington Sea Grant, reports that many of these sessions provide credit toward AICP certification maintenance. "These are huge resources that people should be tapping into," she says.

**It's political**

"One reason we took the approach we did with the sea-level rise toolkit is that there isn't one size that fits all," says Jessica Grannis, adaptation program manager at the Georgetown Climate Center. Big cities and small towns each have their own challenges and opportunities. "We designed the *Sea Level Rise and Coastal Land Use Adaptation Toolkit* as a choose-your-own-adventure, useful for a variety of landscapes."

A rural town on the North Carolina coast might do best by guiding development through buffers and setbacks and protecting existing development by offering permits to create living shorelines. But in New York City, where high-rise buildings have already been built within feet of churning waves, better permitting of seawalls, bulkheads, and tide gates may be the most effective ways to prepare for sea-level rise. The climate center's toolkit offers tips and model language for each of these diverse tools.

The political landscape is as much a part of the process as the

44 **Planning** August/September 2015

## LIVING WITH THE SAINT VRAIN


Community Planning Assistance Teams

October 31, 2014
https://www.planning.org/communityassistance/teams/lyons/pdf/finallyonsreport.pdf
Date Accessed: 8 January 2016

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

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

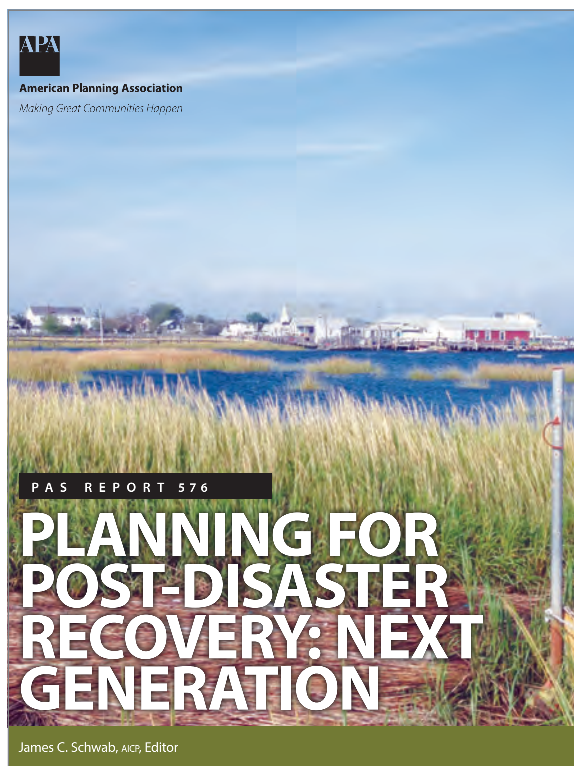
December 2014
https://www.planning.org/pas/reports/pdf/PAS_576.pdf
Date Accessed: 5 January 2016

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:

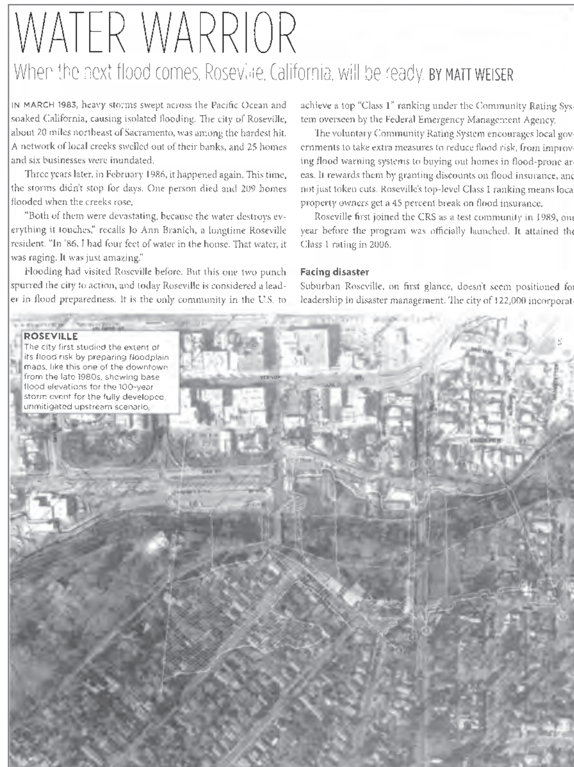
- Anticipating Disruption
- Disaster Recovery Planning: Expectations versus Reality
- The Federal Framework for Disaster Recovery
- Long-Term Recovery Planning: Goals and Policies



## WATER WARRIOR

Matt Weiser

*Planning*
August-September 2015, 32-35
Date Accessed: 5 January 2016



# WATER WARRIOR

When the next flood comes, Roseville, California, will be ready. BY MATT WEISER

IN MARCH 1983, heavy storms swept across the Pacific Ocean and soaked California, causing isolated flooding. The city of Roseville, about 20 miles northeast of Sacramento, was among the hardest hit. A network of local creeks swelled out of their banks, and 25 homes and six businesses were inundated.

Three years later, in February 1986, it happened again. This time, the storms didn't stop for days. One person died and 209 homes flooded when the creeks rose.

"Both of them were devastating, because the water destroys everything it touches," recalls Jo Ann Branich, a longtime Roseville resident. "In '86, I had four feet of water in the house. That water, it was raging. It was just amazing."

Flooding had visited Roseville before. But this one two punch spurred the city to action, and today Roseville is considered a leader in flood preparedness. It is the only community in the U.S. to achieve a top "Class 1" ranking under the Community Rating System overseen by the Federal Emergency Management Agency.

The voluntary Community Rating System encourages local governments to take extra measures to reduce flood risk, from improving flood warning systems to buying out homes in flood-prone areas. It rewards them by granting discounts on flood insurance, and not just token cuts. Roseville's top-level Class 1 ranking means local property owners get a 45 percent break on flood insurance.

Roseville first joined the CRS as a test community in 1989, one year before the program was officially launched. It attained the Class 1 rating in 2006.

**Facing disaster**

Suburban Roseville, on first glance, doesn't seem positioned for leadership in disaster management. The city of 122,000 incorporat-

**ROSEVILLE**
The city first studied the extent of its flood risk by preparing floodplain maps, like this one of the downtown from the late 1980s, showing base flood elevations for the 100-year storm event for the fully developed, unmitigated upstream scenario.

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



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Planning January 2012
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Web-Only Sidebar: A new entry in APA's Delta Urbanism Series

Climate Adaptation and Sea-Level Rise in the San Francisco Bay Area

By Laura Tam

We have known about the perils of climate change for more than two decades. But global efforts to slow it down by reducing greenhouse gas emissions have largely failed. Even where major efforts are moving forward, such as California's Global Warming Solutions Act (AB 32), planned reductions will not even begin for 10 years, and they only represent a fraction of world emissions. In the meantime, the concentration of atmospheric greenhouse gases has continued to rise at an increasing rate.

Even if we are somehow able to stop producing greenhouse gases tomorrow, the high concentration of carbon dioxide already in the atmosphere from historic emissions — since we began burning fossil fuels for energy in the 19th century — will cause the climate to continue to change (see Figure 1).

As a result we must not only intensify our efforts to reduce climate change both now and in the future, but we also must prepare for and adapt to its inevitable effects. These two planning efforts are referred to, respectively, as climate change mitigation and climate change adaptation.

Mitigation and adaptation are related. Without any mitigation, climate change impacts — higher temperatures, higher sea levels, changes in water availability — will be worse. Meanwhile, adaptation will be more difficult and more expensive, and more people are likely to suffer. Some policies or planning actions can support both goals. For example, restoring tidal wetlands both sequesters carbon (mitigation) and builds a buffer against sea-level rise (adaptation). Some actions, however, can pit these goals against each other. Desalination of seawater, for example, is an adaptation strategy for drought that is energy intensive, usually producing significant levels of greenhouse gas emissions. In selecting mitigation and adaptation strategies, it is important to consider trade-offs and try to achieve both ends if possible.

Figure 1: How long will it take our climate to stabilize?





Laura Tam

January 2012
https://www.planning.org/planning/2012/jan/waterwarriorsside2.htm
Date Accessed: 8 January 2016

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: 8 January 2016

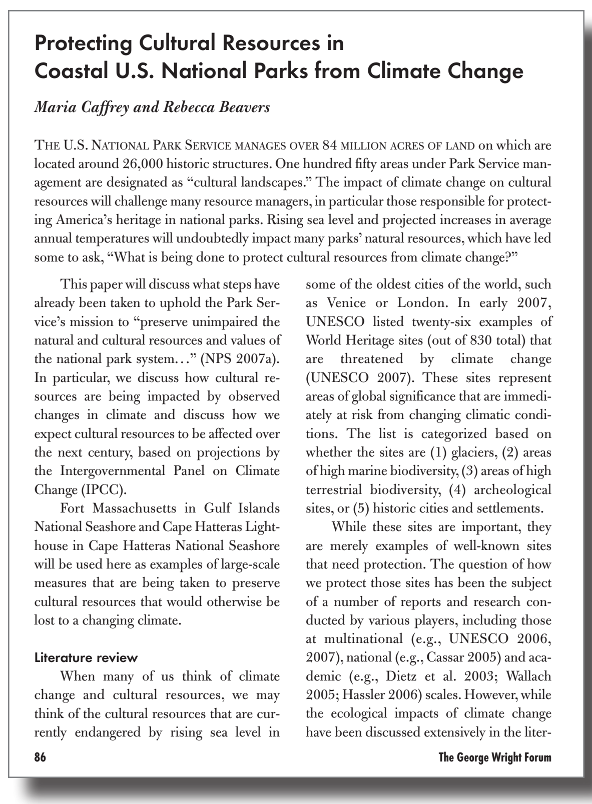
## PROTECTING CULTURAL RESOURCES IN COASTAL U.S. NATIONAL PARKS FROM CLIMATE CHANGE

Maria Caffrey and Rebecca Beavers

2008
http://www.georgewright.org/252caffrey.pdf
Date Accessed: 4 January 2016

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-

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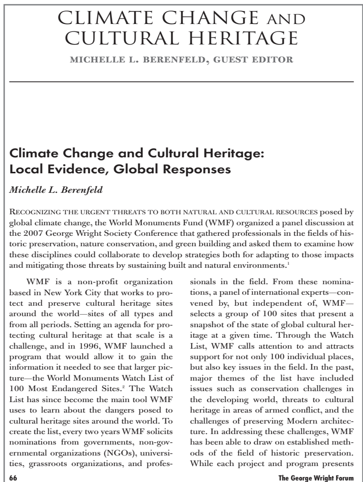
## CLIMATE CHANGE AND CULTURAL HERITAGE: LOCAL EVIDENCE, GLOBAL RESPONSES



CLIMATE CHANGE AND CULTURAL HERITAGE

MICHELLE L. BERENFELD, GUEST EDITOR

**Climate Change and Cultural Heritage: Local Evidence, Global Responses**

*Michelle L. Berenfeld*

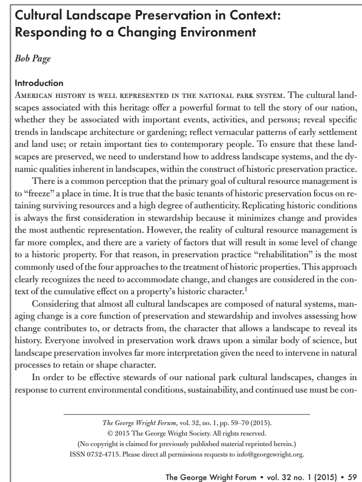
Recognizing the urgent threats to both natural and cultural resources posed by global climate change, the World Monuments Fund (WMF) organized a panel discussion at the 2007 George Wright Society Conference that gathered professionals in the fields of historic preservation, nature conservation, and green building and asked them to examine how these disciplines could collaborate to develop strategies both for adapting to those impacts and mitigating those threats by sustaining built and natural environments.[1]

WMF is a non-profit organization based in New York City that works to protect and preserve cultural heritage sites around the world—sites of all types and from all periods. Setting an agenda for protecting cultural heritage at that scale is a challenge, and in 1996, WMF launched a program that would allow it to gain the information it needed to see that larger picture—the World Monuments Watch List of 100 Most Endangered Sites.[2] The Watch List has since become the main tool WMF uses to learn about the dangers posed to cultural heritage sites around the world. To create the list, every two years WMF solicits nominations from governments, non-governmental organizations (NGOs), universities, grassroots organizations, and professionals in the field. From these nominations, a panel of international experts—convened by, but independent of, WMF—selects a group of 100 sites that present a snapshot of the state of global cultural heritage at a given time. Through the Watch List, WMF calls attention to and attracts support for not only 100 individual places, but also key issues in the field. In the past, major themes of the list have included issues such as conservation challenges in the developing world, threats to cultural heritage in areas of armed conflict, and the challenges of preserving Modern architecture. In addressing these challenges, WMF has been able to draw on established methods of the field of historic preservation. While each project and program presents

66 The George Wright Forum

Michelle L. Berenfeld - 2008
http://www.georgewright.org/252berenfeld.pdf
Date Accessed: 18 July 2016

## CULTURAL LANDSCAPE PRESERVATION IN CONTEXT: RESPONDING TO A CHANGING ENVIRONMENT



**Cultural Landscape Preservation in Context: Responding to a Changing Environment**

*Bob Page*

**Introduction**

American history is well represented in the national park system. The cultural landscapes associated with this heritage offer a powerful format to tell the story of our nation, whether they be associated with important events, activities, and persons; reveal specific trends in landscape architecture or gardening; reflect vernacular patterns of early settlement and land use; or retain important ties to contemporary people. To ensure that these landscapes are preserved, we need to understand how to address landscape systems, and the dynamic qualities inherent in landscapes, within the construct of historic preservation practice.

There is a common perception that the primary goal of cultural resource management is to "freeze" a place in time. It is true that the basic tenants of historic preservation focus on retaining surviving resources and a high degree of authenticity. Replicating historic conditions is always the first consideration in stewardship because it minimizes change and provides the most authentic representation. However, the reality of cultural resource management is far more complex, and there are a variety of factors that will result in some level of change to a historic property. For that reason, in preservation practice "rehabilitation" is the most commonly used of the four approaches to the treatment of historic properties. This approach clearly recognizes the need to accommodate change, and changes are considered in the context of the cumulative effect on a property's historic character.[1]

Considering that almost all cultural landscapes are composed of natural systems, managing change is a core function of preservation and stewardship and involves assessing how change contributes to, or detracts from, the character that allows a landscape to reveal its history. Everyone involved in preservation work draws upon a similar body of science, but landscape preservation involves far more interpretation given the need to intervene in natural processes to retain or shape character.

In order to be effective stewards of our national park cultural landscapes, changes in response to current environmental conditions, sustainability, and continued use must be con-

*The George Wright Forum*, vol. 32, no. 1, pp. 59–70 (2015).
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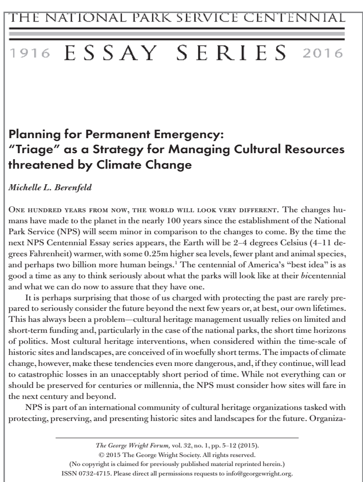
The George Wright Forum • vol. 32 no. 1 (2015) • 59

Bob Page - 2016
http://www.georgewright.org/321page.pdf
Date Accessed: 19 July 2016

## PLANNING FOR PERMANENT EMERGENCY: "TRIAGE" AS A STRATEGY FOR MANAGING CULTURAL RESOURCES THREATENED BY CLIMATE CHANGE



THE NATIONAL PARK SERVICE CENTENNIAL

1916 ESSAY SERIES 2016

**Planning for Permanent Emergency: "Triage" as a Strategy for Managing Cultural Resources threatened by Climate Change**

*Michelle L. Berenfeld*

One hundred years from now, the world will look very different. The changes humans have made to the planet in the nearly 100 years since the establishment of the National Park Service (NPS) will seem minor in comparison to the changes to come. By the time the next NPS Centennial Essay series appears, the Earth will be 2–4 degrees Celsius (4–11 degrees Fahrenheit) warmer, with some 0.25m higher sea levels, fewer plant and animal species, and perhaps two billion more human beings.[1] The centennial of America's "best idea" is as good a time as any to think seriously about what the parks will look like at their *bi*centennial and what we can do now to assure that they have one.

It is perhaps surprising that those of us charged with protecting the past are rarely prepared to seriously consider the future beyond the next few years or, at best, our own lifetimes. This has always been a problem—cultural heritage management usually relies on limited and short-term funding and, particularly in the case of the national parks, the short time horizons of politics. Most cultural heritage interventions, when considered within the time-scale of historic sites and landscapes, are conceived of in woefully short terms. The impacts of climate change, however, make these tendencies even more dangerous, and, if they continue, will lead to catastrophic losses in an unacceptably short period of time. While not everything can or should be preserved for centuries or millennia, the NPS must consider how sites will fare in the next century and beyond.

NPS is part of an international community of cultural heritage organizations tasked with protecting, preserving, and presenting historic sites and landscapes for the future. Organiza-

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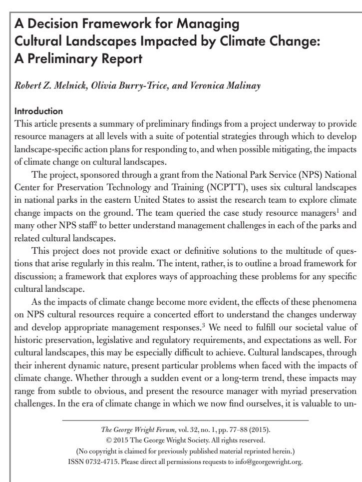
The George Wright Forum • vol. 32 no. 1 (2015) • 5

Michelle L. Berenfeld - 2015
http://www.georgewright.org/321berenfeld.pdf
Date Accessed: 19 July 2016

## A DECISION FRAMEWORK FOR MANAGING CULTURAL LANDSCAPES IMPACTED BY CLIMATE CHANGE: A PRELIMINARY REPORT



**A Decision Framework for Managing Cultural Landscapes Impacted by Climate Change: A Preliminary Report**

*Robert Z. Melnick, Olivia Burry-Trice, and Veronica Malinay*

**Introduction**

This article presents a summary of preliminary findings from a project underway to provide resource managers at all levels with a suite of potential strategies through which to develop landscape-specific action plans for responding to, and when possible mitigating, the impacts of climate change on cultural landscapes.

The project, sponsored through a grant from the National Park Service (NPS) National Center for Preservation Technology and Training (NCPTT), uses six cultural landscapes in national parks in the eastern United States to assist the research team to explore climate change impacts on the ground. The team queried the case study resource managers[1] and many other NPS staff[2] to better understand management challenges in each of the parks and related cultural landscapes.

This project does not provide exact or definitive solutions to the multitude of questions that arise regularly in this realm. The intent, rather, is to outline a broad framework for discussion; a framework that explores ways of approaching these problems for any specific cultural landscape.

As the impacts of climate change become more evident, the effects of these phenomena on NPS cultural resources require a concerted effort to understand the changes underway and develop appropriate management responses.[3] We need to fulfill our societal value of historic preservation, legislative and regulatory requirements, and expectations as well. For cultural landscapes, this may be especially difficult to achieve. Cultural landscapes, through their inherent dynamic nature, present particular problems when faced with the impacts of climate change. Whether through a sudden event or a long-term trend, these impacts may range from subtle to obvious, and present the resource manager with myriad preservation challenges. In the era of climate change in which we now find ourselves, it is valuable to un-

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The George Wright Forum • vol. 32 no. 1 (2015) • 77

Robert Z. Melnick, Olivia Burry-Trice and Veronica Malinay - 2015
http://www.georgewright.org/321melnick.pdf
Date Accessed: 19 July 2016

## 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: 22 January 2016

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: 22 January 2016

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:

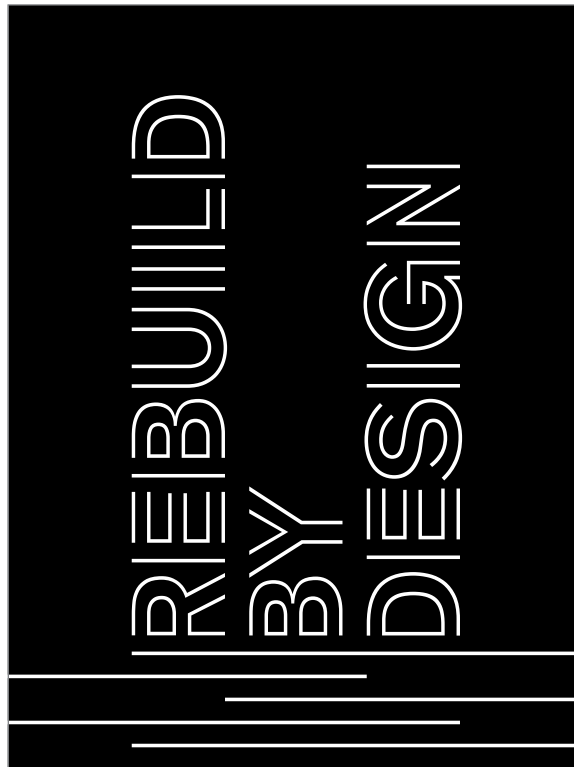
- Flooding in the county is chronic, as are the associated costs
- Those impacted by flooding suffer social and economic consequences
- There has been no clear relationship between claims and floodplain
- All income groups are affected
- Flood insurance does not cover a homeowner's needs

Respondents to the survey could not report that any mitigation efforts were effective during the following flood event.

## REBUILD BY DESIGN

John Gendall, Consultant Editor

2015
http://www.rebuildbydesign.org/book/
Date Accessed: 23 December 2015

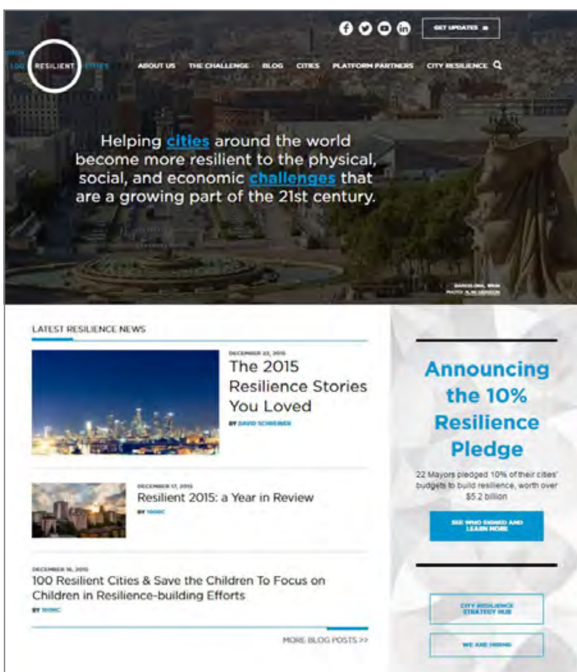



Rebuild by Design was an undertaking, spearheaded by HUD Secretary Shaun Donovan, to rethink the response to Hurricane Sandy and to develop tools for resiliency that can be implemented in areas affected by the storm. This eponymous book documents the research and final proposals of the ten teams that 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: 4 January 2016

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 Rockfeller 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.

## BUILDING RESILIENT REGIONS


The University of California Berkeley

2013
http://brr.berkeley.edu/
Date Accessed: 8 January 2016

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

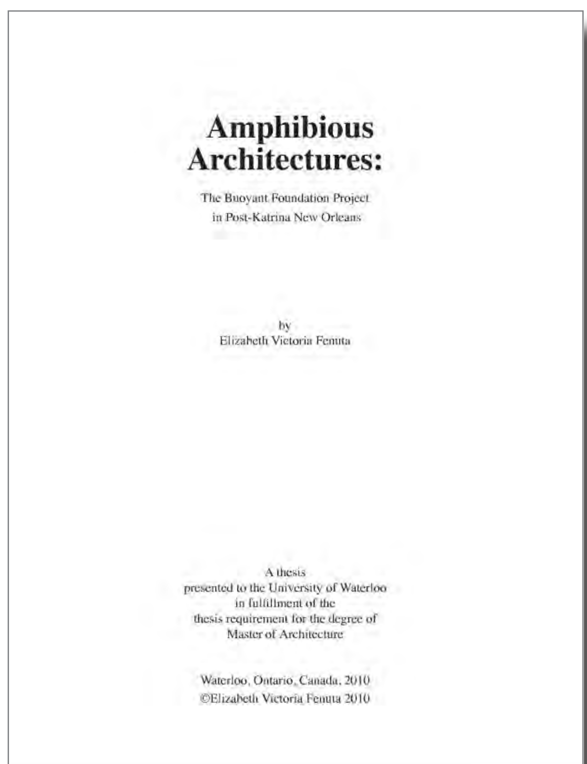
Elizabeth Victoria Fenuta

2010
http://issuu.com/lizfenuta/docs/amphibious_architectures_thesisDate Accessed: 14 January 2016

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 sustainablity 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



Amphibious Architectures:

The Buoyant Foundation Project
in Post-Katrina New Orleans

by
Elizabeth Victoria Fenuta

A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Master of Architecture

Waterloo, Ontario, Canada, 2010
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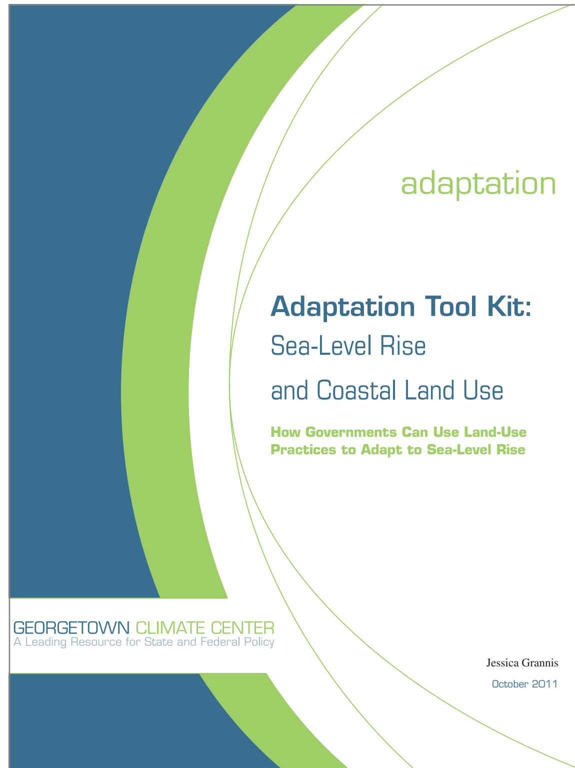
## ADAPTATION TOOLKIT: SEA-LEVEL RISE AND COASTAL LAND USE




VIRGINIA INSTITUTE FOR MARINE SCIENCE

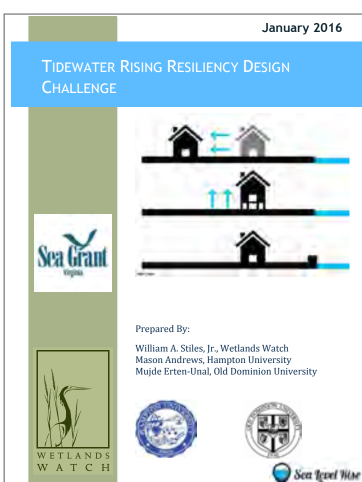
January 2013
http://tinyurl.com/q22p77s
Date Accessed: 5 January 2016

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:

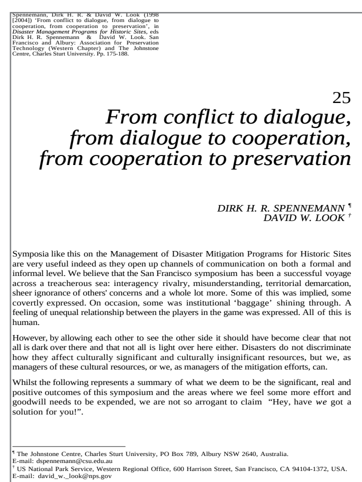
- Planning Tools
- Regulatory Tools
- Spending Tools
- Tax and Market-Based Tools

## TIDEWATER RISING RESILIENCY DESIGN CHALLENGE




WILLIAM A. STILES, MASON ANDREWS AND MUJDE ERTEN-UNAL - January 2016
http://wetlandswatch.org/Portals/3/WW%20documents/Publications/report-chesterfield-heights.pdf
Date Accessed: 19 July 2016

## FROM CONFLICT TO DIALOGUE, FROM DIALOGUE TO COOPERATION, FROM COOPERATION TO PRESERVATION


Spennemann, Dirk H. R. & David W. Look (1998 [2004]) 'From conflict to dialogue, from dialogue to cooperation, from cooperation to preservation', in *Disaster Management Programs for Historic Sites*, eds Dirk H. R. Spennemann & David W. Look. San Francisco and Albury: Association for Preservation Technology (Western Chapter) and The Johnstone Centre, Charles Sturt University. Pp. 175-188.

25

*From conflict to dialogue, from dialogue to cooperation, from cooperation to preservation*

*DIRK H. R. SPENNEMANN* ¶
*DAVID W. LOOK* †

Symposia like this on the Management of Disaster Mitigation Programs for Historic Sites are very useful indeed as they open up channels of communication on both a formal and informal level. We believe that the San Francisco symposium has been a successful voyage across a treacherous sea: interagency rivalry, misunderstanding, territorial demarcation, sheer ignorance of others' concerns and a whole lot more. Some of this was implied, some covertly expressed. On occasion, some was institutional 'baggage' shining through. A feeling of unequal relationship between the players in the game was expressed. All of this is human.

However, by allowing each other to see the other side it should have become clear that not all is dark over there and that not all is light over here either. Disasters do not discriminate how they affect culturally significant and culturally insignificant resources, but we, as managers of these cultural resources, or we, as managers of the mitigation efforts, can.

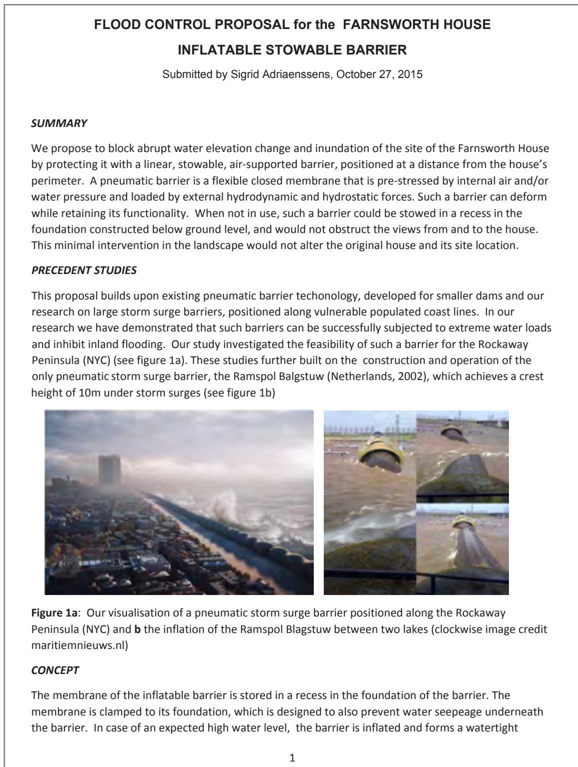
Whilst the following represents a summary of what we deem to be the significant, real and positive outcomes of this symposium and the areas where we feel some more effort and goodwill needs to be expended, we are not so arrogant to claim "Hey, have *we* got a solution for you!".

¶ The Johnstone Centre, Charles Sturt University, PO Box 789, Albury NSW 2640, Australia. E-mail: dspennemann@csu.edu.au
† US National Park Service, Western Regional Office, 600 Harrison Street, San Francisco, CA 94104-1372, USA. E-mail: david_w._look@nps.gov

*175*

DIRK H.R. SPENNEMANN AND DAVID W. LOOKS - 1998
http://csusap.csu.edu.au/~dspennem/PDF-Articles/SFO-25-Final.pdf
Date Accessed: 8 February 2016

# 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 techonology, 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 Ramspol Balgstuw (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 Ramspol Blagstuw 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

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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, Adriaessens 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.

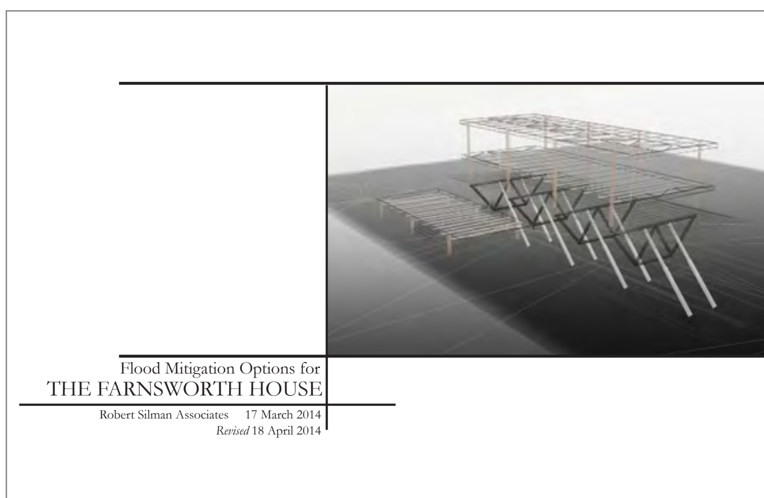
# FLOOD MITIGATION OPTIONS FOR THE FARNSWORTH HOUSE

*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.



Flood Mitigation Options for

THE FARNSWORTH HOUSE

Robert Silman Associates 17 March 2014

*Revised* 18 April 2014

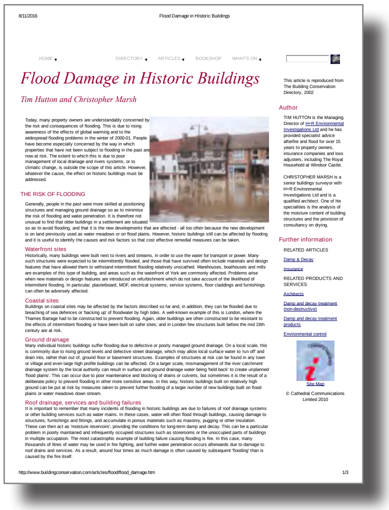
Robert Silman Associates

2014

http://farnsworthproject.org/wp-content/uploads/RSA_Farnsworth_Report.pdf

Date Accessed: 14 January 2016

## FLOOD DAMAGE IN HISTORIC BUILDINGS



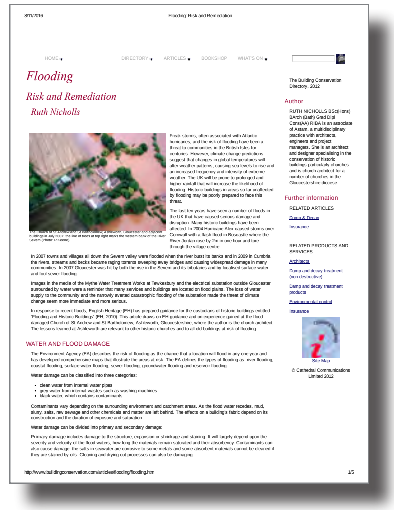
8/11/2016 Flood Damage in Historic Buildings

*Flood Damage in Historic Buildings*

*Tim Hutton and Christopher Marsh*

TIM HUTTON & CHRISTOPHER MARSH - No Date
http://www.buildingconservation.com/articles/flood/flood_damage.htm
Date Accessed: 11 August 2016

## FLOODING RISK AND REMEDIATION



8/11/2016 Flooding: Risk and Remediation

*Flooding*

*Risk and Remediation*

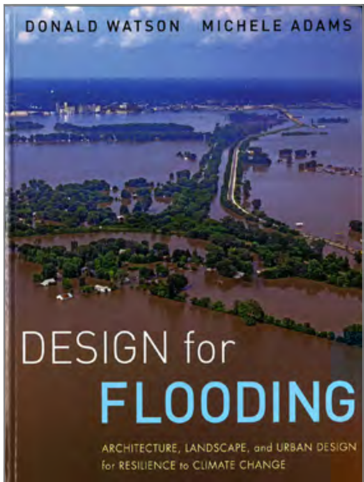
*Ruth Nicholls*

RUTH NICHOLLS - No Date
http://www.buildingconservation.com/articles/flooding/flooding.htm
Date Accessed: 11 August 2016

## EMERGENCY RESPONSE AND SALVAGE WHEEL


https://www.heritagepreservation.org/catalog/Wheel1.htm

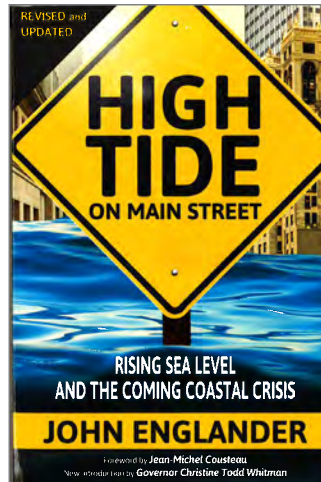
## DESIGN FOR FLOODING




Donald Watson and Michele Adams - 2011

John Wiley & Sons

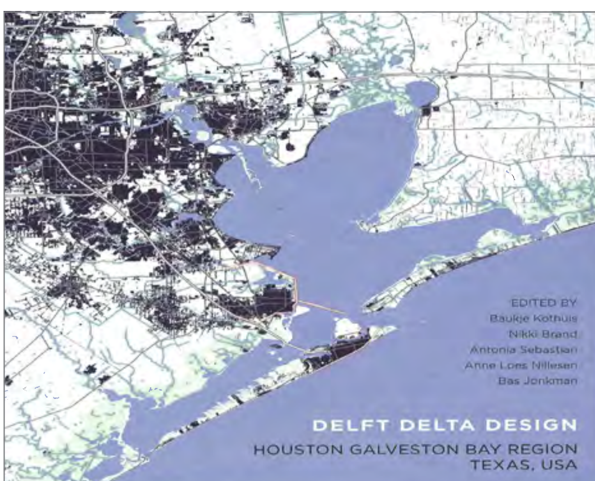
## HIGH TIDE ON MAIN STREET




John Englander - 2013

The Science Bookshelf

## DEFLT DELTA DESIGN: HOUSTON GALVESTON BAY REGION, TEXAS, USA




Baukje Kothuis, Nikke Brand, Antonia Sebastian, Anne Loes Nillesen and Bas Jonkman - 2015

Delft University Publishers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