City of Annapolis Hazard Mitigation Plan

2018

Gavin Buckley, Mayor

PUBLIC VERSION

This plan document was prepared by:
The City of Annapolis Office of Emergency Management
Smith Planning and Design, LLC

City of Annapolis

Signature Copy

Resolution: R-11-18

160 Duke of Gloucester Street
Annapolis, MD 21401

File Number: R-11-18

Amended 2018 City of Annapolis Natural Hazard Mitigation Plan - For the purpose of adopting as amended the 2018 City of Annapolis Natural Hazard Mitigation Plan, as required by the Federal Emergency Management Agency, to maintain eligibility for disaster funding for large scale emergencies and disasters, as well as mitigation grant funding.

CITY COUNCIL OF THE

City of Annapolis

Resolution 11-18

Introduced by: Mayor Buckley, Alderwoman Tierney, Alderman Paone, Alderwoman Pindell Charles, Alderwoman Finlayson, Alderman Rodriguez, Alderwoman Henson, Alderman Savidge and Alderman Arnett

A RESOLUTION concerning

Amended 2018 City of Annapolis Natural Hazard Mitigation Plan

FOR the purpose of adopting as amended the 2018 City of Annapolis Natural Hazard Mitigation Plan, as required by the Federal Emergency Management Agency, to maintain eligibility for disaster funding for large scale emergencies and disasters, as well as mitigation grant funding.

WHEREAS, this Resolution amends R-2-18 as adopted on January 8, 2018, and incorporates revisions required by the Federal Emergency Management Agency; these revisions include more information on Annapolis participation in the National Flood Insurance Program, a discussion of ongoing mitigation actions, and other technical requirements; FEMA affirmed that it will approve this Plan after it has been adopted by the Annapolis City Council; and

WHEREAS, to support better mitigation planning in order to prepare for and minimize the impacts of disasters in the future, Congress enacted the Disaster Mitigation Act of 2000 (DMA 2000); and

WHEREAS, in 2002, the Federal Emergency Management Agency (FEMA) issued regulations to implement requirements for mitigation planning by states and communities.

FEMA is the lead agency supporting implementation of the DMA 2000 requirements and makes funds available to support efforts to meet these requirements; and

WHEREAS, to be eligible for FEMA funds, state and local entities were required to prepare DMA 2000 Hazard Mitigation Plans for natural hazards; the City of Annapolis met that requirement in 2005; and

WHEREAS, the purpose of the plan is to assess the communities' vulnerabilities to natural hazards and prepare a long-term strategy to address these hazards and prevent future damage and loss of life of Annapolis city residents; and

WHEREAS, the City of Annapolis Natural Hazard Mitigation Plan was updated in 2009 and 2013, which updates were the outcome of participation from state, county and municipal officials, residents, business owners, and other agencies.

NOW, THEREFORE,

BE IT RESOLVED BY THE ANNAPOLIS CITY COUNCIL that the City of Annapolis Amended 2018 Natural Hazard Mitigation Plan, is a part hereof, and incorporated herein, https://drive.google.com/file/d/1aL0YUh2gsBQlKhAOrgl2mAeWwzxT5gy-/view?usp=sharing and is hereby approved.

AND BE IT FURTHER RESOLVED BY THE ANNAPOLIS CITY COUNCIL that this resolution shall take effect from the date of its passage.

EXPLANATION

Underlining indicates matter added to existing law.
[~~Strikethrough~~] indicates matter stricken from existing law.

ADOPTED this 19th day of March. 2018

Aye:8 Mayor Buckley, Alderman Savidge, Alderman Arnett, Alderwoman Tierney, Alderman Paone, Alderwoman Pindell Charles, Alderwoman Finlayson, Alderman Rodriguez

THE ANNAPOLIS CITY COUNCIL _____ Date: 3/28/18
Gavin Buckley, Mayor

ATTEST _____ Date: 3/28/18
Regina C. Watkins-Eldridge, MMC
City Clerk

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SECTION 1- PLANNING AREA & PLAN DEVELOPMENT

Chapter 1

INTRODUCTION

Hazard Mitigation Planning

The City of Annapolis has been engaged in hazard mitigation planning since 2004, when the first Hazard Mitigation Planning Committee was formed. The following hazard mitigation plans have been developed and adopted by the City of Annapolis:

- *2005 Annapolis Hazard Mitigation Plan;*
- *Plan amendments incorporated in both 2006 & 2007; and,*
- *2012 Annapolis Natural Hazard Mitigation Plan Update.*

In order to complete the five (5) year update of the Plan and focus planning efforts, the Disaster Mitigation Act of 2000 planning requirements were reviewed, as well as FEMA and Maryland hazard mitigation planning guidance.

Guiding Principles for Plan Development – 2013 FEMA Local Mitigation Plan Handbook

When developing the mitigation plan, keep the following guiding principles in mind:

- ***Focus on the mitigation strategy***. The mitigation strategy is the plan's primary purpose. All other sections contribute to and inform the mitigation strategy and specific hazard mitigation actions.
- ***Process is as important as the plan itself***. In mitigation planning, as with most other planning efforts, the plan is only as good as the process and people involved in its development. The plan should also serve as the written record, or documentation, of the planning process.
- ***This is your community's plan.*** To have value, the plan must represent the current needs and values of the community and be useful for local stakeholders. Develop the mitigation plan in a way that best serves your community's purpose and people.

Disaster Mitigation Act of 2000

The purpose of the Stafford Act, as amended by the Disaster Mitigation Act of 2000, is "to reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters."

Section 322 of the act specifically addresses mitigation planning and requires state and local governments to prepare multi-hazard mitigation plans as a precondition for receiving FEMA mitigation project grants.

Source: Local Mitigation Planning Handbook - 2013

1. Organization of the Plan

The *City of Annapolis Hazard Mitigation Plan* has been organized into three distinct plan sections:

- Section 1- Planning Area & Plan Development Process;
- Section 2- Hazard Profiles, Risk & Vulnerability; and,

- Section 3- Mitigation Strategies, Plan Maintenance & Monitoring.

2. Resources

The City of Annapolis obtained grant funding through the Federal Emergency Management Agency (FEMA) to assist in the update of the *City of Annapolis Hazard Mitigation Plan*. The Office of Emergency Management oversaw the grant process and Deputy Director, Dave Mandell, served as the Project Manager.

In October of 2016, Smith Planning and Design was contracted to update the *City of Annapolis Hazard Mitigation Plan*. Smith Planning and Design assisted in the plan development by:

- Identifying hazards, assessing vulnerabilities, and understanding significant risks;
- Facilitating planning team meetings, public involvement, and decision making activities; and
- Creating an organized and functional plan document, including maps and other graphics.

In addition, Smith Planning and Design assisted in the coordination, facilitation, and execution of the mitigation planning process for the City of Annapolis by utilizing their community planning abilities to:

- Recognize the unique demographic, geographic, technical, and political considerations of the community.
- Demonstrate knowledge and experience with land use and community development.
- Understand all the applicable policies and regulations as they apply to the mitigation plan, including Federal law, FEMA guidance, and state and local ordinances.
- Recognize that community input and public participation are integral to any successful mitigation plan.
- Exhibit familiarity with emergency management and multi-hazard mitigation concepts.
- Provide past performance information and references.

Smith Planning and Design worked with local stakeholders and City staff and shared the same commitment to developing a plan to reduce risks from hazards in their community.

3. Planning Team

As noted previously, the City of Annapolis has been engaged in hazard mitigation planning over the course of many years, and has an established mitigation planning committee, *Weather It Together*, in which to assist in the plan development process. Committee members are comprised from various department, agencies, and organizations.

Weather It Together was launched by the City of Annapolis in response to the threats identified in the *City's Natural Hazard Mitigation Plan* (2012) and the *City Dock Master Plan* (2014) which included the impacts of sea level rise and tidal flooding on the Annapolis Historic District. The long-term concern for the accelerating rate of sea level rise and the devastation realized by Hurricane Sandy created a sense of urgency in Annapolis for the development of a *Cultural Resource Hazard Mitigation Plan*.

The *Cultural Resources Hazard Mitigation Plan*, an appendix to the overall Hazard Mitigation Plan, has been four (4) years in development, engaged over 2,500 local stakeholders, been showcased at 70 workshops, and has resulted in eight (8) major projects proposed for completion over the next five (5) years to mitigate the potential loss associated with natural disasters, sea-level rise, subsidence, and tidal flooding to the City of Annapolis. The *Weather It Together* planning process requires organizing staff and financial resources, identifying affected properties, establishing critical partnerships, assessing risks to vulnerable properties and infrastructure, developing mitigation strategies, implementing protection measures, and monitoring progress towards sustainable adaptation efforts.

Weather It Together

The City of Annapolis recently developed a Natural Hazard Mitigation Plan, which was updated in 2012, to address various types of natural disasters prevalent to the region. However, the long-term concern for the accelerating rate of sea level rise and the devastation realized in the aftermath of Hurricane Sandy has created a sense of urgency in Annapolis for the development of a Cultural Resource Hazard Mitigation Plan (CRHMP). A CRHMP will identify and mitigate potential loss to historic resources associated with natural disasters, primarily threats to sea-level rise, subsidence, and flooding. By assessing the significance of cultural resources within the 100-year floodplain boundary and risk from flooding associated with those resources, planning for their preservation enables the City of Annapolis to better protect the architectural integrity of the Colonial Annapolis Landmark.

4. Plan Development

Following the initial staff meeting, Smith Planning and Design (SP&D) personnel attended the *Weather It Together* meeting held on 13 October 2016. Emergency management staff introduced SP&D and outlined the plan development approach. At that meeting, partners discussed the hazard mitigation plan and the cultural resources hazard mitigation plan, which is an annex to the overall plan. Partners decided that both plans should be completed concurrently and the format of each document would be similar in order to foster plan integration, as appropriate.

The next meeting of the *Weather It Together* partners that included the Hazard Mitigation Plan as part of the agenda occurred on 16 February 2017. The entirety of the meeting was concentrated on the overall hazard mitigation plan. The following items were reviewed and discussed with those in attendance:

- Planning Area & Plan Development Process;
    - Community Profile
    - Hazard Identification
- Hazard Identification & Profiles;
    - Coastal Hazards, Flood, Winter Storm, Tornado, High Wind, Thunderstorm, Drought, Extreme Heat and Earthquake.
- Risk and Vulnerability;
- NFIP & CRS;
- Mitigation Status Report; and,
- Hazard Impact Work Session.

Source: Smith Planning and Design

The Hazard Impact Work Session entailed dividing the attendees into eight separate groups of 3-5 people per group. Each group was provided a blank hazard impact worksheet. Each group discussed their assigned hazard topic and then recorded impacts from the following perspectives:

- Health & Safety of the Public;
- Health & Safety of First Responders;
- Continuity of Operations;
- Property, Facilities & Infrastructure;
- Environment;

- Economic Conditions; and,
- Public Confidence in the Government.

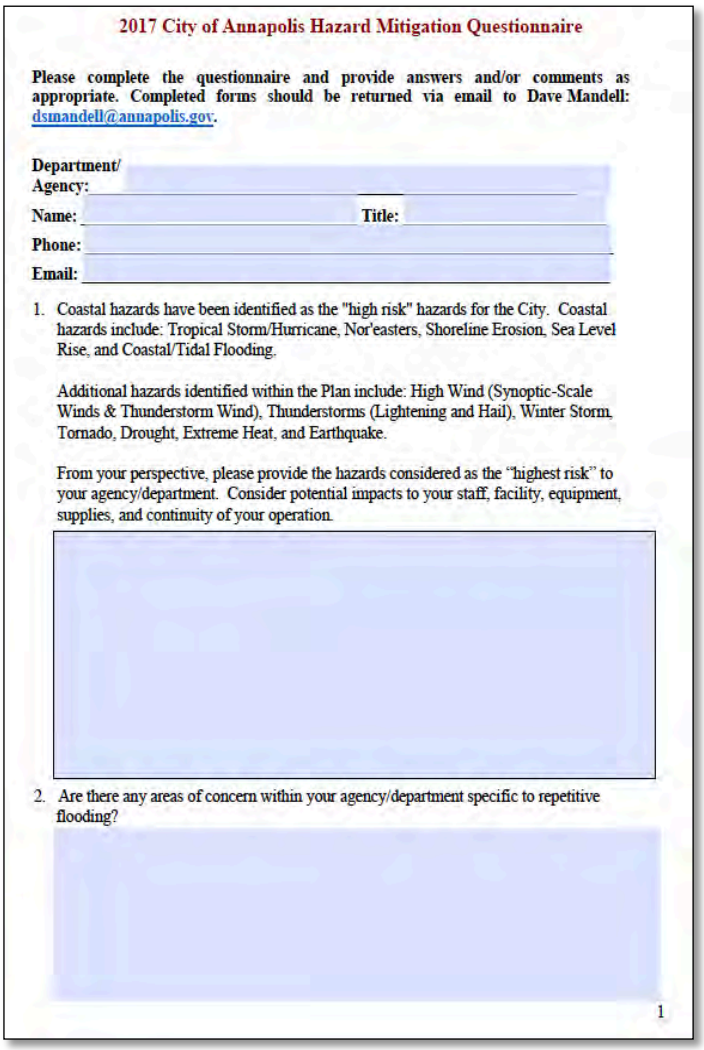
Following the completion of the group work, each group assigned a speaker to report out on the impacts from their assigned hazard. Hazard impact tables were developed as a result and have been included in the beginning section of chapters 3-10.

SP&D, along with staff from the Office of Emergency Management, met with various City Offices and Departments throughout the plan development process including:

- Office of Emergency Management;
- Office of Environmental Policy;
- Planning and Zoning; and,
- Transit.

In an effort to collect information in a timely and efficient manner, a fillable Adobe PDF questionnaire was developed. Information from key stakeholders, as well as City departments and agencies, was sought during the planning process. Stakeholders were asked to assist the Office of Emergency Management in updating the plan document by completing the questionnaire using their best available information and ideas.

Information collected from the Hazard Mitigation Questionnaire was assembled and mitigation projects were developed. Various meetings were held with City offices, departments, and agencies, such as Planning and Zoning, Transportation, and Public Works to further develop projects and provide necessary detailed information.



2017 City of Annapolis Hazard Mitigation Questionnaire

Please complete the questionnaire and provide answers and/or comments as appropriate. Completed forms should be returned via email to Dave Mandell: dsmandell@annapolis.gov.

Department/ Agency: _____

Name: _____ **Title:** _____

Phone: _____

Email: _____

1. Coastal hazards have been identified as the "high risk" hazards for the City. Coastal hazards include: Tropical Storm/Hurricane, Nor'easters, Shoreline Erosion, Sea Level Rise, and Coastal/Tidal Flooding.

   Additional hazards identified within the Plan include: High Wind (Synoptic-Scale Winds & Thunderstorm Wind), Thunderstorms (Lightening and Hail), Winter Storm, Tornado, Drought, Extreme Heat, and Earthquake.

   From your perspective, please provide the hazards considered as the "highest risk" to your agency/department. Consider potential impacts to your staff, facility, equipment, supplies, and continuity of your operation.

2. Are there any areas of concern within your agency/department specific to repetitive flooding?

1

Source: Smith Planning and Design & OEM

Eleven total mitigation projects were identified during the plan development process. These projects are robust and represent stakeholder engagement throughout the planning process. In order to prioritize the projects, a survey was developed and distributed to forty-seven individuals. The survey contained the same five questions for each project and was limited to yes/no answers, along with a comment section for use by respondents. The five questions included:

City of Annapolis 2017 Hazard Mitigation Plan

Mitigation Project Prioritization Survey

Each mitigation project for prioritization includes a brief description. For additional information, please utilize the attached Hazard Mitigation Project Reference document sent via email on September 20, 2017. Thank you for participating in the City's Mitigation Project Prioritization Survey.

Project A: Community Rating System Application

Prepare a Community Rating System application to reduce insurance cost for City residents. For additional information, see Project A on pages 1-3.

Lead Department: Office of Environmental Policy

1. *Do you consider this project cost effective?*
2. *Would there be community acceptance/support for this project?*
3. *Is this project technically feasible?*
4. *Is this project consistent with the City's environmental goals?*
5. *Should this project be a "High" priority project for the City of Annapolis?*

Survey results yielded six "High" priority projects. Project sheets detailing the project, associated goals, responsible entity(s), estimated cost, and potential grant funding sources are included in *Chapter 12: New Mitigation Goals, Objectives, and Projects*.

Finally, input and technical assistance was provided throughout the plan development process for both the Hazard Mitigation Plan and the *Cultural Resources Hazard Mitigation Plan* by State partners including, but not limited to the following:

- Maryland Emergency Management Agency;
- Federal Emergency Management Agency;
- Maryland Department of the Environment;
- Maryland Historical Trust; and,
- Maryland Department of Natural Resources.

5. Outreach Strategy

The City of Annapolis continuously conducts flood mitigation and preparedness public outreach. The *Weather It Together* partnered along with the Federal Emergency Management Agency (FEMA) and the Maryland Department of the Environment (MDE) and offered two outreach sessions in January 2017 to area businesses and residents. The sessions entitled *Flood Insurance, What You Need To Know* were offered during two separate time slots, one morning and one evening, in order to attract the highest number of attendees. Speakers included both FEMA and MDE representatives.

MAYOR PANTELIDES INVITES BUSINESSES AND RESIDENTS TO

FLOOD INSURANCE, WHAT YOU NEED TO KNOW:

HOW DOES THE NATIONAL FLOOD INSURANCE PROGRAM KEEP ANNAPOLIS AFLOAT?

A property owner's insurance policy covers most disasters, but it won't cover flood damage. Private insurers long ago deemed flood loss, which accounts for most disaster losses in the United States, as "too big to insure." So people who live in a high risk flood zone (also known as a Special Flood Hazard Area) and have a federally-backed mortgage must purchase flood insurance through the National Flood Insurance Program (NFIP), which was established in 1968 to make flood insurance more affordable.

The National Flood Insurance Program aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically.

Join our Weather It Together partners from the Federal Emergency Management Agency (FEMA) and the Maryland Department of the Environment (MDE) to learn more about how you can insure your home and business property through the National Flood Insurance Program (NFIP).

SPEAKERS INCLUDE:

Richard Sobota, Senior Insurance Specialist, FEMA Region III

Walter McGuckin, Regional Support Team Lead and Region III Manager

Kevin Wagner, Natural Resources Planner, MDE

PARTNERS:

TUESDAY, JANUARY 24

Co-hosted by

the Ward One Resident Association

This evening gathering for residential property owners in Annapolis will be at the **Annapolis Waterfront Hotel, Harborside Room**, 80 Compromise Street from **6:30 to 8:30 pm**. One-on-One consultations can be scheduled in advance or onsite.

Limited Seating!

Please RSVP to president@wardone.org

WEDNESDAY, JANUARY 25

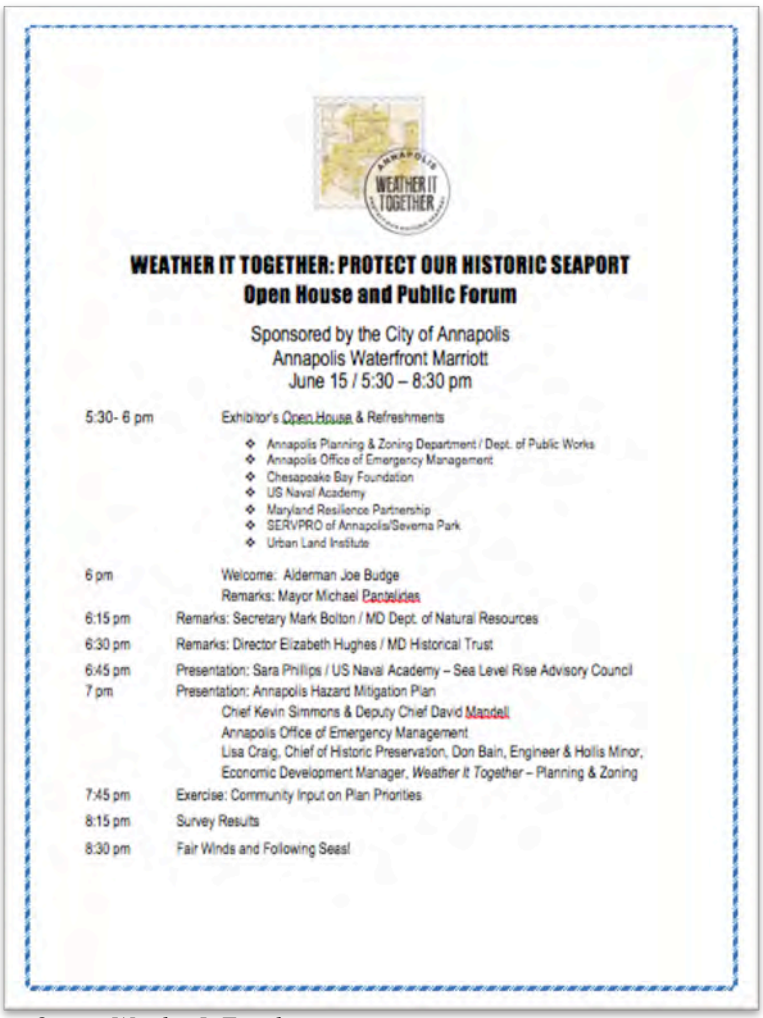
Co-hosted by

This morning workshop for commercial property owners and businesses will be at the **Annapolis City Hall Council Chambers**, 160 Duke of Gloucester St. from **8 to 10 am**. One-on-One consultations can be scheduled in advance or onsite.

Please RSVP to histprec@annapolis.gov

Source: Weather It Together, MDE & FEMA

The *Weather It Together: Protect our Historic Seaport* Public Forum held on 15 June 2017 engaged attendees in identifying priorities for hazard mitigation and adaptation projects important to protecting the architectural heritage, community character and resident / visitor experience in Annapolis. Project updates from Federal, State and Local agency representatives provided the most current information regarding where Annapolis is positioned to respond to and prepare for near term hazards such as tidal flooding, unexpected natural hazards such as hurricanes and the longer-term consequences of sea level rise & subsidence. Public and private sector exhibitors were on hand to provide information for property owners looking for tips on emergency preparedness and response.



WEATHER IT TOGETHER: PROTECT OUR HISTORIC SEAPORT
Open House and Public Forum

Sponsored by the City of Annapolis
Annapolis Waterfront Marriott
June 15 / 5:30 – 8:30 pm

5:30- 6 pm Exhibitor's Open House & Refreshments
- Annapolis Planning & Zoning Department / Dept. of Public Works
- Annapolis Office of Emergency Management
- Chesapeake Bay Foundation
- US Naval Academy
- Maryland Resilience Partnership
- SERVPRO of Annapolis/Severna Park
- Urban Land Institute

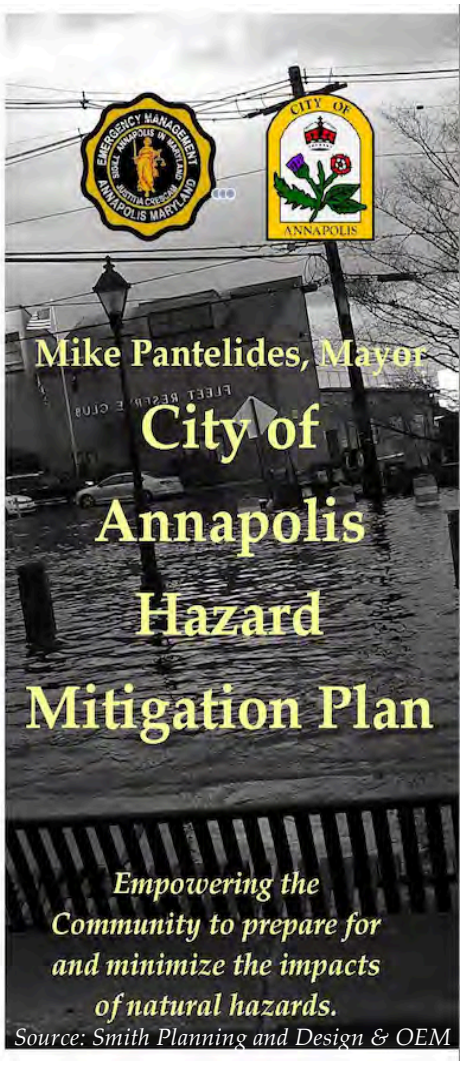
6 pm Welcome: Alderman Joe Budge
Remarks: Mayor Michael Pantelides
6:15 pm Remarks: Secretary Mark Bolton / MD Dept. of Natural Resources
6:30 pm Remarks: Director Elizabeth Hughes / MD Historical Trust
6:45 pm Presentation: Sara Phillips / US Naval Academy – Sea Level Rise Advisory Council
7 pm Presentation: Annapolis Hazard Mitigation Plan
Chief Kevin Simmons & Deputy Chief David Mandell
Annapolis Office of Emergency Management
Lisa Craig, Chief of Historic Preservation, Don Bain, Engineer & Hollis Minor, Economic Development Manager, *Weather It Together* – Planning & Zoning
7:45 pm Exercise: Community Input on Plan Priorities
8:15 pm Survey Results
8:30 pm Fair Winds and Following Seas!

Source: Weather It Together

Emergency Management personnel along with SP&D staff presented updates on the 2017 Hazard Mitigation Plan at the 15 June 2017 Open House and Public Forum.

Source: Smith Planning and Design

In addition, an information brochure was developed and distributed to all participants. The brochure outlined the hazard mitigation planning process and how to obtain additional information.



Source: Smith Planning and Design & OEM

Past events that occurred during the planning cycle included:

- 2016 John Englander, oceanographer, author and president of the International Sea Level Institute delivered a lecture on the global and local impacts of rising sea levels. The event was held at the Francis Scott Key Auditorium at St John's College.
- 2015 Mayor's Safety Initiatives for Businesses- The Annapolis Police Department, Fire Department, and the Office of Emergency Management presented on topics including civil unrest, bomb threats, active shooters, vagrancy, and shoplifting in response to a survey given to business owners of what public safety concerns affect them most, and what emergency responses would be in the event that these concerns come to life.
- 2015 Protecting Houses of Worship- (PDF) Publication
- 2013 Hurricane Recovery- Annapolis 2013 Hurricane Recovery Exercise Video

Finally, the City of Annapolis, with the support of the Newport Restoration Foundation, hosted an international gathering entitled, *Keeping History Above Water,* as part of their ongoing *Weather It Together* initiative. The Conference began on October 29, 2017. Incidentally, October 29th marks the Anniversary of Hurricane Sandy.

> *"Three hundred years of history," Mayor Michael Pantelides says. "So it's probably the most vital resource to the city of Annapolis. It's been a priority in my administration. We're going to find the money. We're going to fix it."*
>
> *Source: Alex DeMetrick, Baltimore WJZ/ CBS Baltimore, entitled: Daily Floods Could Plague Annapolis In 50 Years, Historic Preservation Chief Says.*

PRESS RELEASES

KEEPING HISTORY ABOVE WATER: ANNAPOLIS CONFERENCE PROGRAM ANNOUNCED

June 27, 2017 View more Press Releases

Newport, RI, June 27, 2017 - The Newport Restoration Foundation and the City of Annapolis are pleased to announce that the official program for the second *Keeping History Above Water* conference has been finalized to take place on October 29 - November 1, 2017 in Annapolis, Maryland. The City of Annapolis will be hosting this international gathering of preservation, economic development, and military and scientific experts to advance knowledge as communities around the world prepare for the impact of rising tides, sea level rise, and land subsidence. With the support of Newport Restoration Foundation, who developed and organized the first *Keeping History Above Water* conference in April 2016 in Newport, Rhode Island, the second conference will advance the discussion of climate heritage and sea level rise as the event now travels to other coastal communities that face similar issues.

The Newport Restoration Foundation selected the City of Annapolis as the next conference host because of the city's leadership in the multi-year initiative, Weather It Together: Protecting Our Historic Seaport Community. This initiative includes the development of a cultural resource hazard mitigation plan and implementation strategies to reduce the risk of damage or loss to private and public properties most vulnerable to the effects of rising tides. In 2016, Annapolis was named one of ten cities selected to be part of the National League of Cities Leadership in Community Resilience Program, and was recognized by the Maryland Historical Trust for Excellence in Community Engagement. The City includes a National Historic Landmark District and is home to many historic and cultural assets.

Keeping History Above Water: Annapolis will be held at the Annapolis Waterfront Hotel. The full conference program is now available online for viewing at www.historyabovewater.org and includes local tours, educational workshops, seven unique panel sessions, 16 poster sessions, and keynotes by Dr. David Guggenheim, Dr. William Sweet, and many others. The 2017 conference is supported by national and local sponsors such as the Virginia Department of Historic Resources, Maryland Historical Trust, National Trust for Historic Preservation, SERVPRO, Annapolis/Severna Park, Urban Land Institute, and the National League of Cities.

The conference program will kick off with tours of the United States Naval Academy, City Dock, Smithsonian Environmental Science Center, and Spa Creek (by boat), followed by a public address and book signing at St. John's College on Sunday, October 29, 2017. Phil Dyke, the Coast and Marine Advisor for the National Trust, UK, will address the topic of "When Cultural Landscapes and Natural Resources Collide." Jeff Goodell, investigative journalist, contributing editor to *Rolling Stone Magazine*, and author of "The Water Will Come: Rising Seas, Sinking Cities and the Remaking of the Civilized World," will be available to sign books following his talk.

6. Regional Coordination

City staff discussed the development of the hazard mitigation plan, specifically data analysis results and mitigation strategies with various jurisdictions within the region, including but not limited to the following:

- **Baltimore Urban Area Security Initiative**, Emergency Management Committee Meeting, 25 July 2017.
- **Anne Arundel County** Local Emergency Planning Committee (LEPC) Meeting, 11 July 2017.

COMMUNITY PROFILE

1. Location

Annapolis is the county seat of Anne Arundel County and the state capital of Maryland. The City of Annapolis is located in Anne Arundel County, Maryland on a peninsula between two tributaries of the Chesapeake Bay, the Severn and South Rivers. Historically, the City of Annapolis functioned as a port City, state capital, and freestanding center for a predominantly agricultural region. In recent decades, the City of Annapolis has been increasingly affected by its location within the commuter sheds of the metropolitan areas of Baltimore to the north and Washington, DC to the west.

Because of this location, increasing numbers of residents choose to live in the City of Annapolis or the adjacent Anne Arundel County and commute to jobs in the Baltimore or Washington region. Completion of a series of highway improvements in recent years, including widening of U.S. Route 50/301 and construction of Interstate 97 and Aris T. Allen Boulevard (Route 665) have reduced travel times to these metropolitan areas and helped spur development in Anne Arundel County. With the exception of relatively recently annexed areas along Forest Drive, the City of Annapolis has experienced less development than Anne Arundel County because of the lack of vacant land.

Source: 2012 City of Annapolis Natural Hazard Mitigation Plan

Annapolis is a relatively compact city with 7.2 square miles of land area along with 17 miles of waterfront on the Chesapeake Bay and its tributaries. The geographic context of the City of Annapolis can best be characterized as a cul-de-sac, due to the City of Annapolis' location on a peninsula surrounded on three sides by water. Rowe Boulevard and other local arterials provide access to the regional highway system to the northwest of the City of Annapolis, which converges at Parole.

2. Population Demographics

The City of Annapolis' population was estimated at 38,394 in 2010, an increase of approximately 7.1% from the 2000 population of 35,838. Since much of the City of Annapolis is developed, the population of the City of Annapolis is projected to continue growing at a modest pace for the foreseeable future. In addition, the City of Annapolis derives significant economic benefit from a healthy tourism industry, the state capital, and the presence of two colleges within the City limits. On certain days during any year, the City of Annapolis' population may swell by an additional 10,000 to 50,000 people.

The City of Annapolis demographics indicate that the City of Annapolis is widely diverse in many aspects. Based on 2010 demographic profile data, the City of Annapolis population has a median age of 36.0 years old. The population is approximately 60% Caucasian and 37% identified themselves as minorities. The largest minority groups include African Americans at 26% and Latinos at 16.8%. Data indicates that 17.4 % speak a language other than English in their home, pct. 5+, 2006-2010.

3. Housing Demographics

The 2010 U.S. Census determined that there are 17,845 housing units in the City of Annapolis. Approximately 89% of the housing units were occupied at the time of the Census. In the City of Annapolis, the vacancy rate of homeowner units is 3.8%, and the vacancy rate for rental units is 7.3%. Fifty-four and one half percent (54.5%) of the housing stock is owner occupied and 45.5% is rental occupied. One of the unique features of the City of Annapolis that will play an important role in the education of the public on loss prevention is the location of a substantial number of public housing units within the City of Annapolis. Further, to support the tourism and secondary learning industries described above, the City of Annapolis has several pockets of large hotel space and student dormitories. Both of these housing features will also need to be addressed in mitigation plans.

4. Economic Demographics

Key economic data for the City of Annapolis (Per U.S. Census Bureau's 2009-2013 American Communities Survey) is as follows:

- Median Income of Households: $72,462
- Median Personal Income: $43,389
- % City population below poverty level: 11.2%

According to the U.S. Census Bureau's 2009-2013 American Communities Survey, the median value of owner-occupied housing units is $377,200. The City of Annapolis is also a vibrant business community with county, state, and federal government offices. Approximately 18,500 people work in the City of Annapolis – excluding those who work in education or public administration.

Much of the economy of Annapolis is based around maritime activities, government, and tourism. It is also home to the United States Naval Academy. As a result, many residents are employed in industries such as sailing, shipping, fishing, government services, and service jobs at hotels, restaurants, and retail shops according to the U.S.

Census, 2015; City of Annapolis.

5. Annapolis Government

Annapolis is governed by a City Council composed of a Mayor and eight Aldermen. The Mayor is elected at large for a four-year term and serves full time as the chief executive officer of the City. The eight Aldermen are elected for four-year terms to represent eight different geographic areas of the City known as Wards; Aldermen are not restricted as to the number of terms they may serve.

6. Climate

The City of Annapolis has a moderate climate. The average summer temperature (±) is 71.9°, while the average winter temperature is (±) 46.2°. Average annual precipitation is 40.8 inches, and average annual snowfall is 20.5 inches.

7. Architecture

The appearance of the City is dominated by the handsome buildings of the Naval Academy and the historic State House of Maryland. In addition, there are a number of contemporary State and County office buildings, which have been designed in keeping with the prevailing Georgian architecture of the community. Because of the number of residential structures of significant historic and architectural value for which Annapolis is famous, private and public groups have joined together to retain or to recapture the historic atmosphere of the community in keeping with modern urban requirements. An application to the Department of Interior to enlarge the then existing Historic District as designated on the National Register of Historic Places was approved in 1984.

8. Present and Future Land Use

The most recent Annapolis Comprehensive Plan (2009) was adopted by City Council in October 2009. The information and mapping exhibits below has been obtained from the *2009 City of Annapolis Comprehensive Plan.* According to the Comprehensive Plan, due to the City's geographic location on the Annapolis Neck Peninsula, there is little to no room for physical expansion. Existing development outside of Annapolis, combined with the expansion of Parole on the western edge, leave Annapolis with few options for growth outside of present boundaries. The City's growth does not depend on outward expansion of its borders, but rather the promotion of mixed use development, redevelopment, and in-fill development. All of which are opportunities to encourage hazard mitigation in all new construction and substantial improvement projects through the permit process, including but not limited to, the mitigation of both the flood hazard and sea-level rise.

Included within the Comprehensive Plan: *Chapter 3-Land Use and Economic Development* is the following text:

Principle 3: Today's land use planning and development must recognize the need to locate investments where they will be secure from hazards, such as flooding, in the future.

Objectives:

1. *A City land use pattern that is cognizant of potential flooding hazards due to sea level rise.*
2. *The way for the City to respond to the potential impact of sea level rise on downtown Annapolis involves proactive study and planning to promote consensus and guide both public and private decision-making long-tem.*

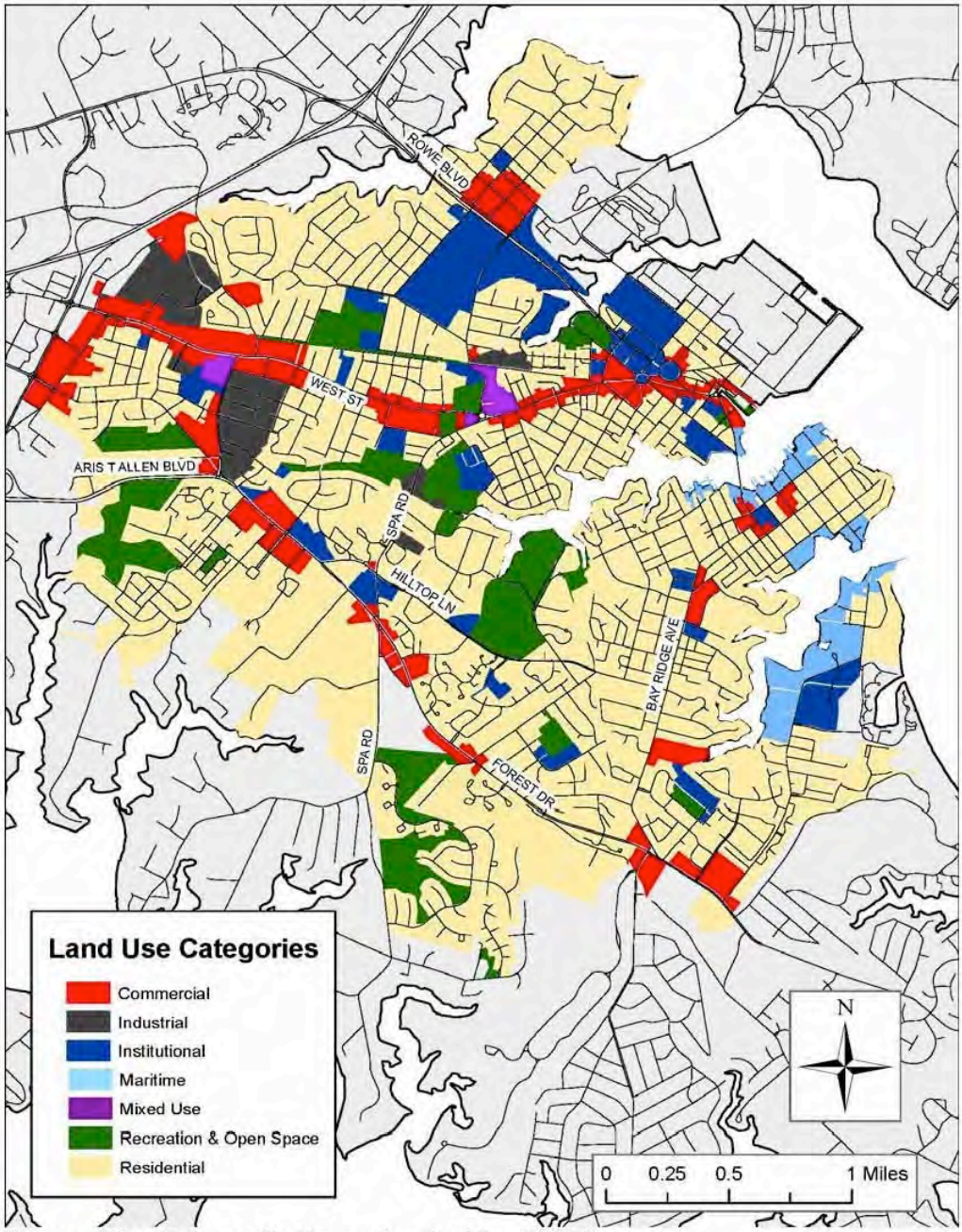
In addition, the Comprehensive Plan: *Chapter 3-Land Use and Economic Development* is the following text:

Principle 10: Evaluate the risk from sea level rise in decisions involving land use along the waterfront.

The parts of the established downtown, which are prone to severe flooding and may be expected to be impacted by sea level rise should be the subject of a study to determine the costs and benefits of public decision-making in mitigating property damage.

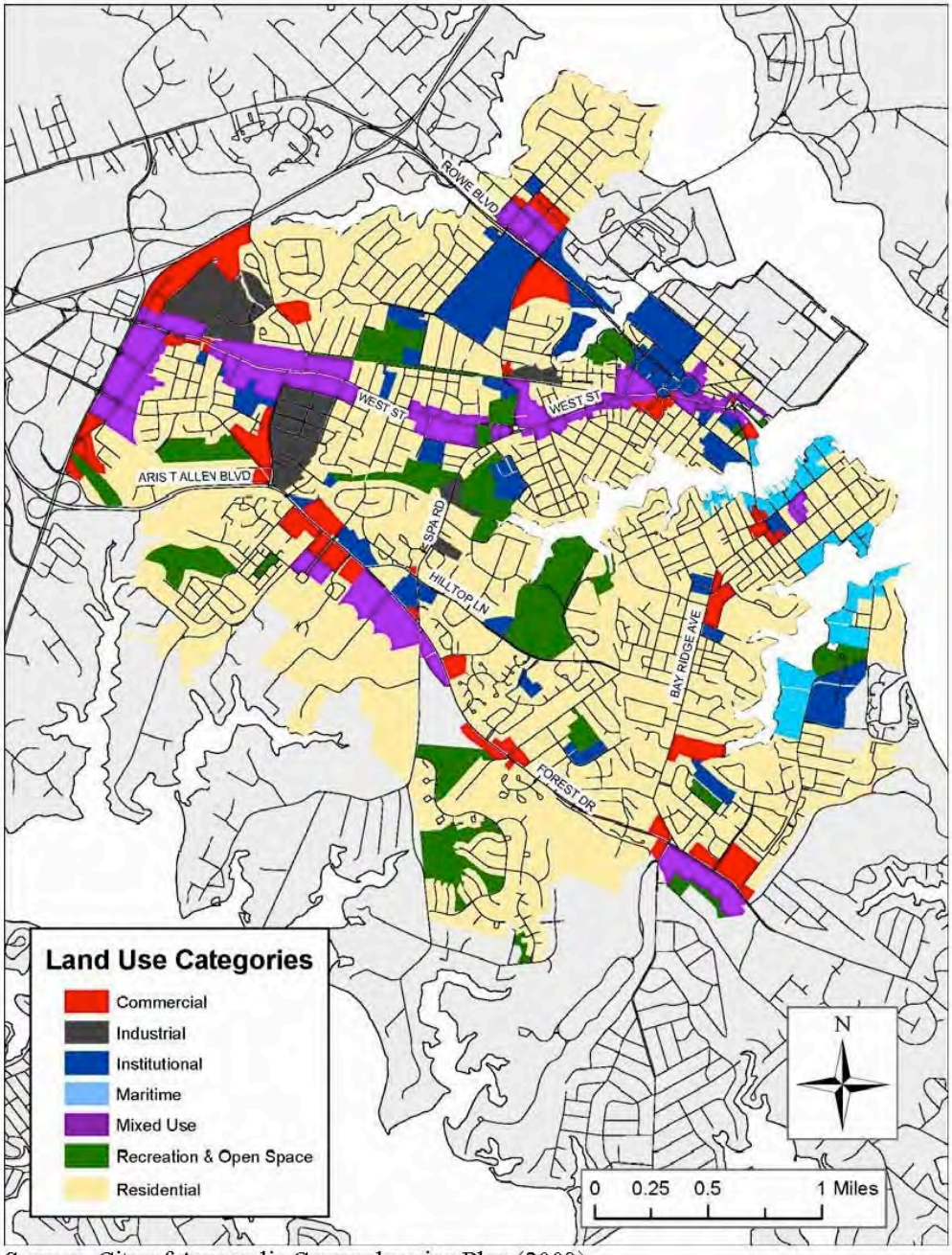
As land use changes are evaluated, decisions should be consistent with the City's Hazard Mitigation Plan.

Present Land Use



Source: City of Annapolis Comprehensive Plan (2009)

Future Land Use



Source: City of Annapolis Comprehensive Plan (2009)

HAZARD IDENTIFICATION & CRITICAL FACILITIES

1. Hazard Definitions, Identification, & Prioritization

The City of Annapolis has identified and prioritized nine hazard types during the hazard mitigation planning process. These hazards include:

1. **Coastal Hazards**
   a. Tropical Storms/Hurricanes
   b. Nor'easters
   c. Shoreline Erosion
   d. Sea Level Rise
2. **Flood**
3. **High Wind**
   a. Synoptic-Scale Winds
   b. Thunderstorm Winds
4. **Thunderstorm**
   a. Hail
   b. Lightning
5. **Winter Storm**
   a. Snow
   b. Freezing Rain
   c. Sleet
   d. Extreme Cold
6. **Tornado**
7. **Drought**
8. **Extreme Heat**
9. **Earthquake**

Coastal hazards and flooding have been identified as the City's "**High Risk**" hazards and are highlighted in blue text.

Chapters 4 through 10 within Section 2 have been organized by hazard type and include profiles, risk, and vulnerability.

2. Hazards Definitions

The following nine hazards have been identified:

a. Coastal Hazards

Coastal hazards take many forms ranging from storm systems like **tropical storms, hurricanes,** and **Nor'easters** that can cause storm surge inundation, heavy precipitation that may lead to flash flooding, and exacerbation of **shoreline erosion** to long-term hazards such as **sea level rise.** Therefore coastal hazards are to include, if applicable, **coastal storms, storm surge, hurricane, tropical storm, Nor'easter, sea level rise** and **shoreline erosion.**

b. Flood

The National Weather Service defines **coastal or tidal flooding** as the inundation of land areas along the coast caused by waters over and above normal tidal action that may originate from the ocean front, back bays, sounds, or other bodies of water. **Coastal/tidal flooding** is typically the result of storm surge, wind-driven waves, and heavy rainfall produced by hurricanes and tropical storms during the summer and fall and Nor'easters during the winter and spring.

Urban flooding occurs where there has been development within **floodplains.** Urbanization increases the magnitude and frequency of flooding by increasing impervious surfaces, increasing the speed of drainage collection, and overwhelming sewer systems.

c. High Wind

Wind is the motion of air past a given point caused by a difference in pressure from one place to another. The effects can include blowing debris, interruptions in elevated power and communications utilities, and intensified effects of winter weather. Two basic types of damaging wind events other than tropical systems affect Maryland: **synoptic-scale winds** and **thunderstorm winds**. Synoptic-scale winds are high winds that occur typically with cold frontal passages or Nor'easters. Downbursts cause the high winds in a thunderstorm.

d. Winter Storm

Winter weather can take many forms including **snow, freezing rain, sleet** and **extreme cold** that may occur singularly or in combination. Some of the most significant winter storms that affect Maryland are known as **"Nor'easters"** because they are accompanied by strong northeast winds.

e. Tornado

A tornado is a violently rotating funnel-shaped column of air that extends from a thunderstorm cloud toward the ground. Tornadoes can touch the ground with winds of over 300 mph. While relatively short-lived, tornadoes are intensely focused and are one of nature's most violent storms.

f. Thunderstorm

Thunderstorms are usually high intensity storms of short duration originating in a warm moist air mass that is either forced to rise by mountainous terrain or by colliding with a cooler dense air mass. The process of convection in the atmosphere brings about the release of moisture from the warm air mass as it rises, cools and condenses. This condensation proceeds until most of the moisture in the air mass has been precipitated. Since the motion of the air is nearly vertical, and attains high velocities, rainfall is intense and generally concentrated over a small area in a short time frame. Thunderstorms can be 10-15 miles in diameter and normally last 20-30 minutes.

g. Drought

Droughts are periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or stream flow. Although maintaining water supplies for

human use is an important aspect of drought management, drought can also have many other dramatic and detrimental effects on the environment, such as wildfire.

h. Extreme Heat

Temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as **extreme heat**. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground.

i. Earthquake

Earthquakes may last only a few seconds or may continue for up to several minutes. They can occur at any time of the day or night and at any time of the year. They are caused by stress that builds up over time as blocks of crust attempt to move but are held in place by friction along a fault. (The earth's crust is divided into large plates that continually move over, under, alongside or apart from one another atop the partly molten outer layer of the earth's core.) When the pressure to move becomes stronger than the friction holding them together, adjoining blocks of crust can suddenly slip, rupturing the fault and creating an earthquake.

3. Hazard Probability

It is assumed that hazards experienced by the City in the past may be experienced in the future, therefore identified hazard profiles include a history for each hazard and their occurrences. Information on past hazards was obtained from NOAA's National Centers for Environmental Information (NCEI) – Storm Event Database; formerly National Climatic Data Center (NCDC). The Storm Event Database currently contains data from January 1950 to November 2017, as entered by NOAA's National Weather Service (NWS). According to the NCEI's website, "*Some information appearing in Storm Data may be provided by or gathered from sources outside the National Weather Service (NWS), such as the media, law enforcement and/or other government agencies, emergency managers, private companies, individuals, etc. An effort is made to use the best available information, but because of time and resource constraints, information from these sources may be unverified by the NWS*." In addition, there is a data limitation on each hazard since storm data is geographically categorized by County or National Weather Service (NWS) Forecast Zone. Hazard history was obtained for Anne Arundel County and when possible, events directly related to the City of Annapolis was extrapolated. When applicable, additional hazard history was obtained through the City of Annapolis for inclusion in hazard chapters.

PROBABILITY & IMPACT			
Hazard	**Events/ Year Risk Rating**	**Impact Rating**	**Probability Composite Score**
Coastal Hazards	3	5	8
Flood	2	5	7
Winter Storm	3	3	6
High Wind	1	3	4
Thunderstorm	1	3	4
Tornado	1	1	2
Drought	1	1	2
Extreme Heat	1	1	2
Earthquake	1	1	2

The information obtained for hazard frequency and severity of impact has been included in the associated table. The analysis of frequency and impact results in a probability composite score for each identified hazard.

**Events/Year Risk Rating*

The events per year risk rating were determined by calculating the average number of occurrences per year and assigning the corresponding risk rating as follows:
0-0.49 events per year = 1
0.5-0.99 events per year = 2
1.0-1.49 events per year = 3
1.5-1.99 events per year = 4
2.0 + events per year = 5

**Impact Rating*

The impact rating was determined by the potential damage and losses that would result from each hazard event.
1 = Low Impact
3 = Medium Impact
5 = High Impact

****Composite Scores:*
7-10 Red-High; 5-6 Orange-Medium; 1-4 Yellow-Low

Based on the hazard history and profiles of the aforementioned hazards, they have been ranked as low, medium, or high. The hazards that have a high frequency of occurrence and have caused significant damage to the area include Coastal Hazards and Flood. This composite score is concurrent with the City's identified hazards that are ranked as "High Risk."

4. Critical Facilities

In order to assess the current risk and vulnerability of the community, an inventory of critical facilities within the limits of the City of Annapolis was compiled. Critical facilities are those facilities that warrant special attention in preparing for a disaster

and/or are of vital importance in maintaining the functioning of the community. Critical facilities listed within the plan were identified by the City of Annapolis.

Data was obtained from the David Mandell, Deputy Director of Emergency Management, and Shawn Wampler, GIS Coordinator, as well as Maryland PropertyView to aid in the development of the 2017 Annapolis Critical Facilities database. Various listings were reviewed and cross-referenced in order to develop the finalized database for the Plan.

Additional attribute columns were added to the database during the planning process and included:

- Designated Critical Facility Type;
- FEMA Flood Zone;
- Flood Depth;
- 2100 Mean Sea Level Rise Inundation Area(s)
- Storm Surge Inundation Areas *Hurricane Categories (1-4) and,
- Facilities built in 1965 or prior.

5. Critical Facility Data Compilation

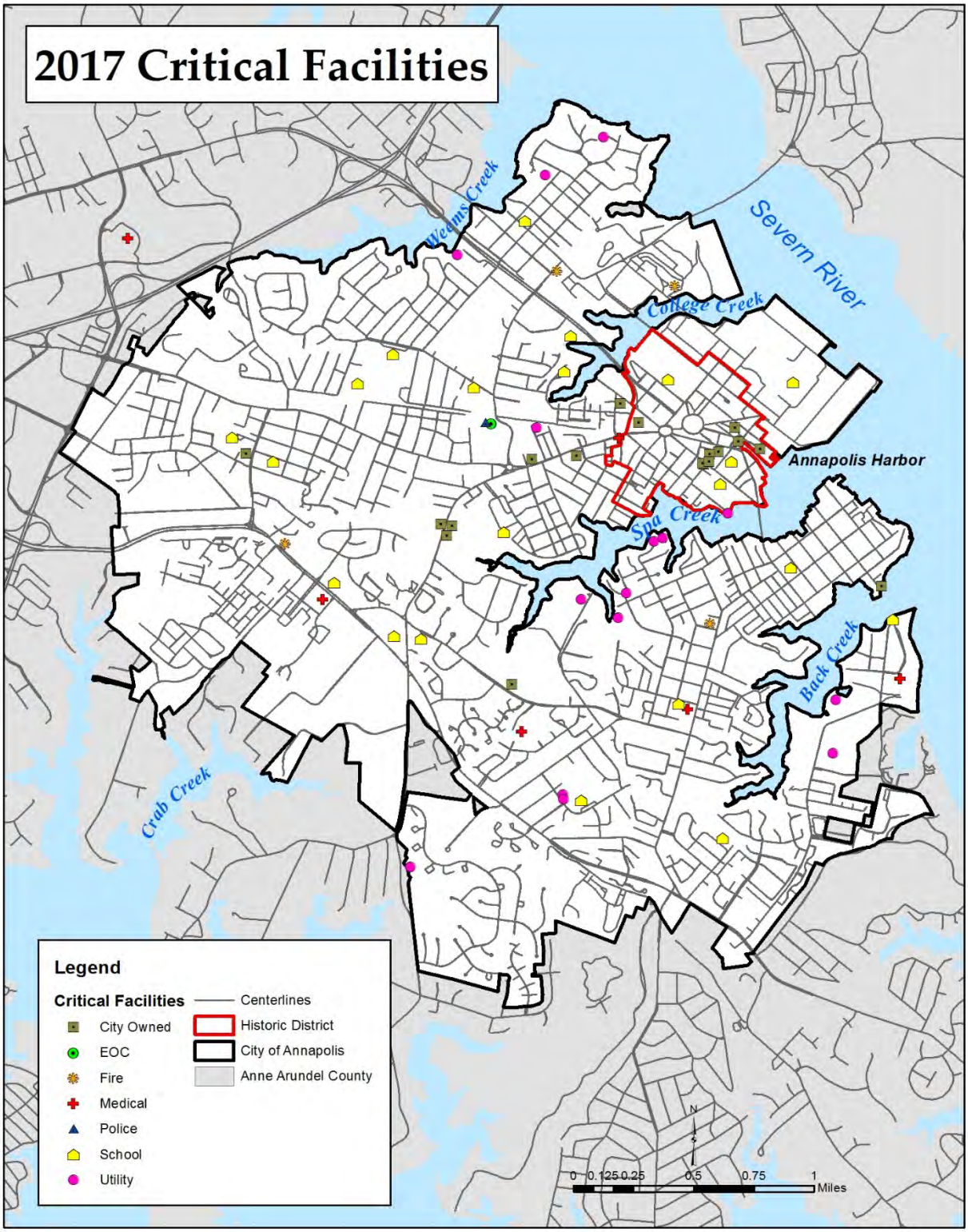
The inventory of critical facilities for the *City of Annapolis Hazard Mitigation Plan* has been compiled and listed in the table below. The detailed critical facility database has been included in Appendix A: Critical Facility Database.

CRITICAL FACILITY DATA COMPILATION			
Facility Category	**Facility Type**	**Total Facilities/Type**	**Total Facilities/Category**
City Owned	Retail	1	19
	Community Center	1	
	Garage	2	
	Historic Places	3	
	Parking Garage	4	
	Office	7	
	Parks and Recreation	1	
Education	Public	8	21
	Private	11	
	College	2	

Facility Category	Facility Type	Total Facilities/Type	Total Facilities/Category
Emergency	EOC	2	7
	Fire Station – Naval Academy	1	
	Fire/EMS Station	3	
	Police Station	1	
Medical	Hospital	1	7
	Urgent Care	3	
	Nursing Home	3	
Utility	Wastewater Pumping Station	24	37
	Water Pumping Station	6	
	Water Tower	5	
	Water Treatment Plant	1	
	Wastewater Treatment Plant	1	
Communications	PSAP: 9-1-1	1	1
TOTALS		**92**	**92**

Source: Appendix A: Critical Facility Database

The number of critical facilities total ninety- two (92). Of the ninety-two (92) facilities listed within the database, four (4) facilities are within the FEMA Special Flood Hazard Area-AE Zones (High Risk Area). These facilities include the Annapolis Maritime Museum, Market House, U.S. Naval Academy (specific buildings) and the Harbormaster Office. No facilities were found within the FEMA VE Zone. In addition, eighty-eight (88) facilities are within the FEMA X zone (shaded and un-shaded) the moderate and minimal flood risk areas. Additional flood analysis and results are found within Chapter 4: Coastal Hazards and Chapter 5: Flood. In addition, nine (9) facilities were built in or prior to 1965. This dataset was used throughout the various hazard vulnerability assessments found within Section 2 of the Plan.



Source: Smith Planning and Design & OEM

SECTION 2- HAZARD PROFILES, RISK, & VULNERABILITY

Chapter 4

COASTAL HAZARDS

Coastal Hazards

Coastal hazards take many forms ranging from storm systems like tropical storms, hurricanes, and Nor'easters that can cause storm surge inundation, heavy precipitation that may lead to flash flooding, and exacerbation of shoreline erosion to long-term hazards such as sea level rise. Therefore, coastal hazards are to include, if applicable, **coastal storms, storm surge, hurricane, tropical storm, Nor'easter, sea level rise and shoreline erosion**.

Source: http://coastalsolutions.org/projects-1/

1. Coastal Hazards Impacts

The *City of Annapolis Weather It Together Committee* held a workshop on February 16, 2017. During the workshop, stakeholders were divided into groups. Participants were provided with hazard descriptions and blank hazard impacts worksheets. Each group was provided time in which to discuss and record hazard impacts from their community perspective. Each group then assigned a group representative to review results with the *Weather It Together Committee* at-large. The following table provides community perspective impacts from coastal hazard events to the City of Annapolis.

Community Perspective - Coastal Hazards Impact	
Health & Safety of the Public	• Asbestos • Lead Paint • Raw Sewage • Vehicle Fuels/Oils • Maritime Fuel
Health & Safety of the First Responders	• OSHA Requirements • Biohazard • (PPE) Respirators, Masks, Eye Protection
Continuity of Operations (including Delivery of Services)	• Contingency Planning – Debris Removal • Where are staging areas that are Ok'd by local government?
Property, Facilities, & Infrastructure	• Ensure structural soundness – Can emergency personnel get in?

Environment	• Assess environment • Secure "safe" zones • Follow EPA standards • Trees, Fish, Plant Life, etc. All contaminated now.
Economic Conditions	• Loss of tax revenue, tourism, loss of boat show • Naval Academy would be affected • Schools – St. John's • Loss of business revenue. Will businesses be able to rebound?
Public Confidence in Government	• Weather IT Together Promotion • Community Outreach • Loss of Essential City Services • PR/Communication
Source: Weather It Together Committee Members	

2. Coastal Hazards Profile

Information obtained for both Anne Arundel and City of Annapolis using the National Center for Environmental Information (NCEI) – Storm Events Database between January 1950 and August 31, 2017 for Coastal Hazards includes: **Strong Surge/Tide, Tropical Storm, and Coastal Flood.** Data from NCEI has been included on data tables below. According to NCEI, Hurricane Storm and Tropical Depression were not recorded within the City of Annapolis. In addition, information obtained from the City of Annapolis for coastal hazards has been included as bulleted text.

a. A **storm surge** is the rise in water level above the regular high tide caused by a severe storm such as a hurricane or northeaster. These storms bring rain and heavy wind, which drives larger waves and can blow water up the Chesapeake Bay, thus causing the rivers to rise. Storm surges can create extensive storm damage, erosion, and inundation of low-lying coastal areas.

Coastal Hazard – Strong Surge/Tidal **Anne Arundel County from January 1950 – August 2017**		
6 Strong/Surge Tidal events		
Number of County/Zone areas affected:	2	
Number of Days with Event:	6	

Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	2	$1,425,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Strong Surge/Tidal**
Source: National Center for Environmental Information (NCEI), 2017		

Two Strong Surge/Tidal events were specific to the City of Annapolis:

Coastal Hazard – Strong Surge/Tidal **City of Annapolis from January 1950 – August 2017**		
Date	Event Narrative	Property Damage
April 21, 2000	Roads near City Dock were flooded around high tide.	$0
April 7, 2000	Roads near City Dock were flooded around high tide.	$0
Source: National Center for Environmental Information (NCEI), 2017		

b. **Hurricane, tropical storm, and tropical depression** are all examples of a tropical cyclone. The categories and associated characteristics are as follows:

- Hurricane: maximum sustained surface wind speed exceeds 73 mph;
- Tropical Storm: maximum sustained surface wind speed from 39-73 mph; and
- Tropical Depression: maximum sustained wind speed is less than 38 mph.

Tropical cyclones, a general term for tropical storms and hurricanes, are low pressure systems that usually form over the tropics, referred to as "cyclones" due to their rotation. Tropical cyclones are among the most powerful and destructive meteorological systems on earth. In terms of impact, high winds, heavy rain,

lightning, tornados, hail, and storm surge are all associated with tropical cyclones. In addition, as tropical cyclones move inland, they can cause severe flooding, downed trees and power lines, and structural damage.

Coastal Hazard – Tropical Storm **Anne Arundel County from January 1950 – August 2017**		
3 Tropical Storm events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	3	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	3	$4,420,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Tropical Storm**
Source: National Center for Environmental Information (NCEI), 2017		

Below is a list of the significant Coastal Hazard events in Annapolis as identified by the Maryland Department of the Environment and the City of Annapolis Department of Planning and Zoning:

- 1954 - October 14-16 -- Hurricane Hazel dumped heavy rains on North Branch of the Potomac River, causing flooding from Cumberland to Washington DC. Winds of over 100 mph were reported on Eastern Shore. The tide elevation in Annapolis was 5.34'.
- 1955 - August -- Hurricanes Diane and Connie, which arrived a week apart, produced a high tide of 4.81'.
- 1972 - June 21-24 -- Hurricane Agnes, the worst non-tidal flood in 36 years and regarded as the 100-year flood in many places, flooded many parts of the state. The tide elevation in Annapolis was 3.04'.

- 1974 - December 1 -- Storms and tidal surges caused damage statewide, especially on the Western Shore of the Bay. The tide elevation in Annapolis was 4.10.
- 1979 - Sept. 5-6 -- Hurricane David floods Rock Creek, Jones Falls, and East Branch Herbert Run. The recurrence interval was 50 - to more than 100- year. The tide elevation in Annapolis was 4.46'.
- March 28-29 -- Statewide flooding and intense coastal erosion, especially along lower Chesapeake Bay, caused two deaths.
- 1985 - Nov. 4-7 -- Hurricane Juan, combined with stationary front, caused flooding statewide, especially in the Potomac River basin. One death and $5 million in non-tidal and $16 million in tidal damages were recorded. The recurrence interval was 2 - to more than 100-year. High tide in Annapolis was 4.5'.
- 1996 - Sept. 6 -- Remnants of Hurricane Fran triggered widespread flooding in Western Maryland, especially George's Creek, causing $1.7 million in damages. In Annapolis, tides reached 5'.
- 1999 - Sept. 16 -- Hurricane Floyd produced widespread flooding on Eastern Shore, especially in northern portions. Damages were calculated at $14 million, and some places saw greater than 500-year flood. In Annapolis, tides were very close to the predicted astronomical tide and did not exceed 1.5'.
- 2003 - Sept. 18-19 -- The remnants of Hurricane Isabel caused widespread tidal surge flooding, especially in the middle portion of the Bay. High tide in Annapolis was 7.35', which is considered greater than the 100-year flood event. See Figure 4-4.
- 2005 - October 8 – Remnants of Tropical Storm Tammy caused widespread storms and resulting flooding.
- 2011 – August - Hurricane Irene made landfall and impacted much of the mid-Atlantic region. The storm caused serious injuries and deaths, damaged homes and businesses, hammered shorelines, disrupted travel, and caused over $10 billion worth of damage in the United States. Though the flooding in Annapolis was not as disruptive as Hurricane Isabel, many homes and businesses experienced flooding from the massive amounts of rainfall in the weeks during and after the storm.

c. According to the National Oceanic and Atmospheric Administration (NOAA), a **Nor'easter** is a cyclonic storm that moves along the east coast of North America. It's called "nor'easter" because the winds over coastal areas blow from a northeasterly direction.

Nor'easters may occur any time of the year, but are most frequent and strongest between September and April. These storms usually develop between Georgia and New Jersey within 100 miles of the coastline and generally move north or northeastward.

Nor'easters typically become most intense near New England and the Canadian Maritime Provinces. In addition to heavy snow and rain, Nor'easters can bring gale force winds greater than 58 miles per hour. These storms can produce rough seas, coastal flooding, and beach erosion.

The East Coast of North America provides an ideal breeding ground for Nor'easters. During winter, the polar jet stream transports cold Arctic air southward across the plains of Canada and the U.S., and eastward toward the Atlantic Ocean, as warm air from the Gulf of Mexico and the Atlantic tries to move northward. The warm waters of the Gulf Stream help keep the coastal waters relatively mild during the winter, which in turn helps warm the cold winter air over the water. This difference in temperature between the warm air over the water and cold Arctic air over the land is the area where Nor'easters are born.

d. A report on **sea level rise** recommends that the State of Maryland should plan for a rise in sea level of as much as 2 feet by 2050. Led by the University of Maryland Center for Environmental Science, the report was prepared by a panel of scientific experts in response to Governor Martin O'Malley's Executive Order on Climate Change and "Coast Smart" Construction. The projections are based on an assessment of the latest climate change science and federal guidelines.

"The State of Maryland is committed to taking the necessary actions to adapt to the rising sea and guard against the impacts of extreme storms," said Governor Martin O'Malley." In doing so, we must stay abreast of the latest climate science to ensure that we have a sound understanding of our vulnerability and are making informed decisions about how best to protect our land, infrastructure, and most importantly, the citizens of Maryland."

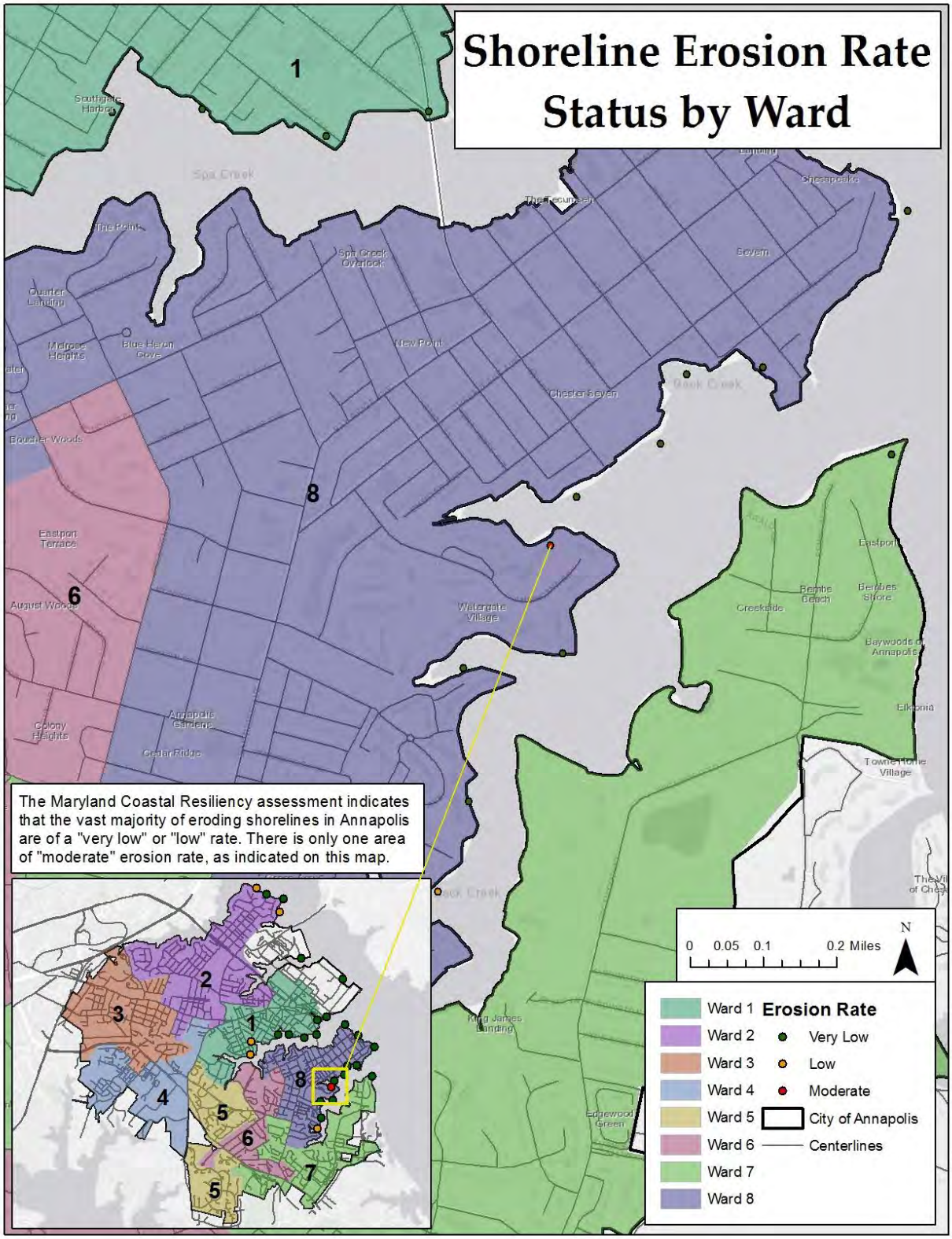
According to the National Oceanic and Atmospheric Administration data collected, Annapolis had the largest increase in nuisance flooding events at 925%, from 3.8 to 39.3 days per year. In the next fifty years, nuisance flooding is estimated to occur more than once a day.

Source: A map shows parts of Annapolis that could be under water in the next century due to sea level rise. (Courtesy Image / Capital Gazette)

e. The **shoreline erosion** rates, shown on the table below, were developed by the Virginia Institute of Marine Science (VIMS). They were clipped to the corporate limits of Annapolis as published by the Teleatlas 2009 dataset. This result was slightly edited for several shoreline areas that either should have been within the boundary or should not have been included.

City of Annapolis – Coastal Erosion Summary		
	Average Erosion Rate (ft./yr.)	**Shoreline Length (Miles)**
Accretion	0.5	1.9
Protected	0	6.3
No Change	0	3.4
Slight	-1	4.4
Low	-3	0.1
Moderate	-6	0
High	-11	0
Unknown	0 or -1	0
Total		**16.1**
Source: U.S. Army Corp of Engineers, Planning Division		

The Shoreline Erosion Rate Status by Ward map below indicates that Ward 8 is the most vulnerable to shoreline erosion. The majority of eroding shorelines in Annapolis have been designated as "very low" to "low" risk within the Maryland Coastal Resiliency Assessment, with the exception of one (1) area, designated as a "moderate" risk, depicted with a red dot on the map.



Source: Smith Planning and Design, ESRI and DNR

3. Coastal Hazards Risk & Vulnerability

Following the identification and profiling of coastal hazards, the next step in the process includes the inventory of assets, and estimation of potential losses.

a. Storm Surge Risk & Vulnerability

- The storm surge hazard areas have been mapped to depict the risk from storm surge flooding associated with the passage of hurricanes and tropical storms. According to the National Weather Service (NWS), storm surge is water from the ocean that is pushed onshore by the force of the winds. Flooding from storm surge depends on many factors, such as the track, intensity, size, and forward speed of the tropical cyclone and the characteristics of the coastline where it comes ashore or passes nearby.

> **SLOSH** stands for **S**ea, **L**ake, and **O**verland **S**urge from **H**urricanes. SLOSH is a computerized model developed by the National Weather Service (NWS) to estimate storm surge heights and winds resulting from historical, hypothetical, or predicted hurricanes. It is also the basis for hurricane evacuation studies.

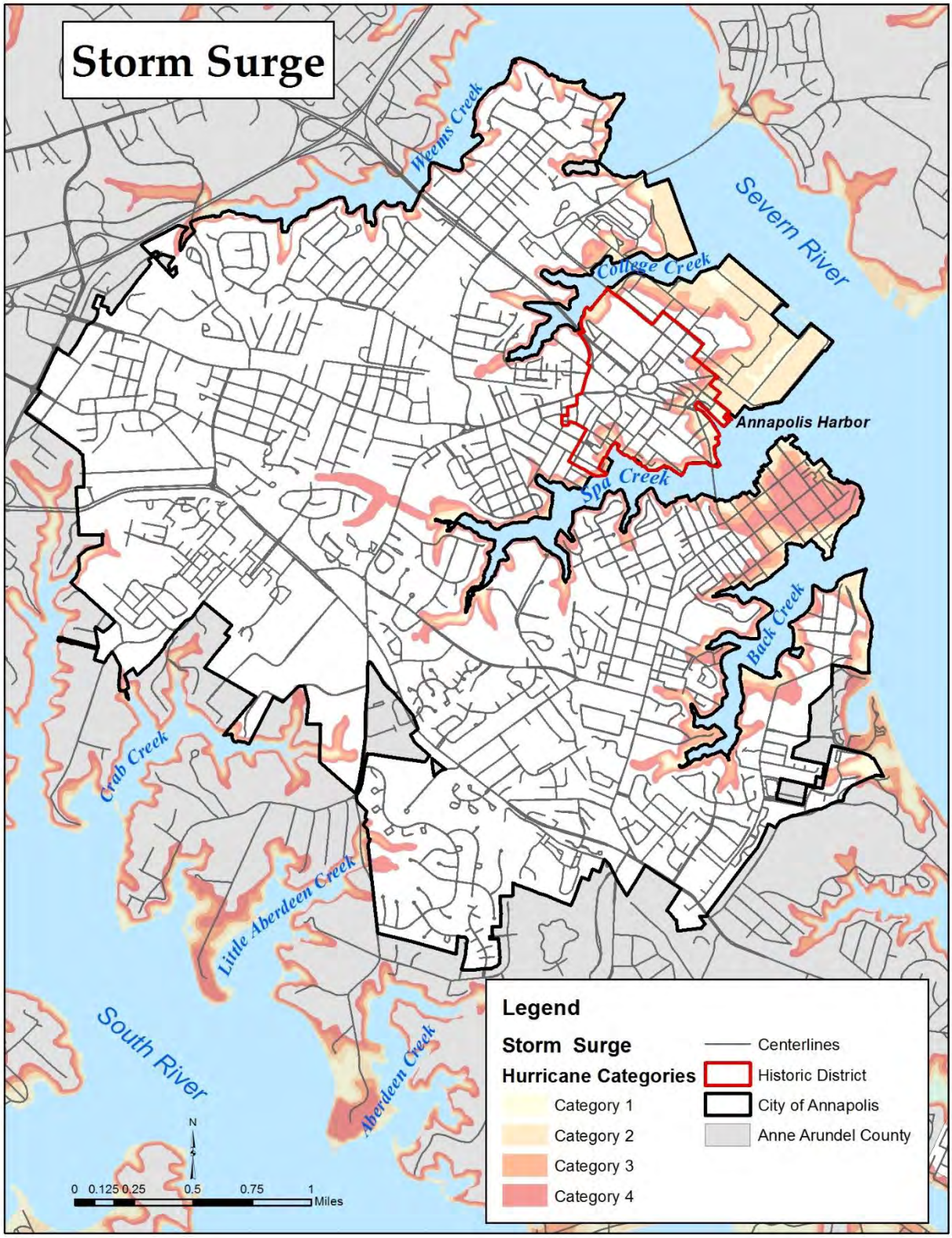
- Using the 2017 City of Annapolis Hazard Mitigation Geodatabase, assets and hazard areas were analyzed to determine vulnerability and loss estimations. The hazard area is determined using SLOSH Model Storm Surge Hurricane Categories 1-4 inundation.
- In general, storm surge occurs where winds are blowing onshore. The highest surge tends to occur near the "radius of maximum winds," or where the strongest winds of the hurricane occur.
- Hurricanes are rated for intensity by using the Saffir-Simpson Scale, which provides an estimate of the potential damage that a hurricane may cause. This scale is based upon both wind speed and surface pressure. Scale categories range from category one to five, with category one having winds from 74-95 mph and pressure greater than 980 mb, while a category five hurricane may have winds in excess of 157 mph and pressure of less than 920 mbar. The table below depicts the five categories of hurricane strength.

Saffir-Simpson Hurricane Wind Scale	
Category Wind Speed	Effects
Category 1 74-95 mph	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, and vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
Category 2 96-110 mph	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
Category 3-Major 111-129 mph	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
Category 4-Major 130-156 mph	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possible months. Most of the area will be uninhabitable for weeks or months.
Category 5-Major >157 mph	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center, 2012

This data presented on the following pages specific to hurricane storm surge inundation and risk reflects areas with a risk of storm tidal flooding from hurricanes, based on potential storm tide heights calculated by the National Weather Service's SLOSH (Sea,Lake, and Overland Surge from Hurricanes) Model. The SLOSH Basin used for mapping was Chesapeake Bay (CP5), released in 2014. This data was prepared by the U.S. Army Corps of Engineers, Baltimore District, Planning Division in January 2016. SLOSH storm tide elevations used for this mapping are based on the Maximum of Maximums (MOM) SLOSH output dataset. The MOM output elevations represent the highest calculated storm tide values based on thousands of SLOSH simulations using different combinations of approach direction, forward speed, landfall point, astronomical tide, and intensity (Category 1 through Category 4). Categories 1 through 4 refer to the Saffir-Simpson scale of hurricane intensity. This map does not reflect the expected storm tide flooding for every hurricane, or for any one particular type of hurricane. This map shows the overall footprint of the area that has some risk of storm

tide flooding from hurricanes, based on the MOM output dataset. The purpose of this data is to support hurricane emergency management planning activities. For more information on the SLOSH model and the MOM dataset, please visit http://www.nhc.noaa.gov/surge/slosh.php.



Source: Smith Planning and Design, ESRI and MD iMaps

Ward 1 contains the highest number of critical facilities at-risk to hurricane storm surge, as shown on the table below.

Critical Facilities within Storm Surge							
Facility Category	Facility Type	Facility Name	Ward	Hurricane Categories			
				Category 1	Category 2	Category 3	Category 4
City Owned	Historic Place	Annapolis Maritime Museum	8	✓			
City Owned	Retail	Market House	1	✓			
City Owned	Office	Harbormaster's Office	1	✓			
Utility	Wastewater Pump Station	Pump Station Siphon	1	✓			
School	Private	Annapolis Sailing School	7	✓	✓		
Fire	Fire Station	USNA Fire Company 46	2	✓	✓	✓	
Utility	Wastewater Pump Station	Wardour	2	✓	✓	✓	
Utility	Wastewater Pump Station	Sumner	2	✓	✓	✓	
City Owned	Historic Place	Shiplap House	1	✓	✓	✓	✓
City Owned	Office	Public Works/ Planning & Zoning	1	✓	✓	✓	✓
Medical	Nursing Home	Baywoods of Annapolis	7	✓	✓	✓	✓
School	Elementary	Eastport Elementary School	8	✓	✓	✓	✓
Utility	Wastewater Pump Station	Spa Creek	8	✓	✓	✓	✓
Source: 2017 Critical Facilities Database							

b. Sea Level Rise Risk & Vulnerability

As discussed in the FEMA *Change Adaptation Policy Statement: Excerpt from III. Background* found in the grey text box, inclusion of sea level rise into hazard mitigation planning, specifically as it relates to critical facilities, is extremely important. To that end, an assessment of critical facilities as defined in Chapter 3: Hazard Identification and Critical Facilities and 2100 mean sea level rise projections of 5.7 feet was conducted. Six (6) facilities, three (3) of which are public utilities, are located within the 2100 mean sea level rise inundation area and would be adversely impacted without the implementation of adaptive mitigation measures.

Critical Facilities within 2100 Mean Sea Level Rise

Facility Category	Facility Type	Facility Name	Ward
City Owned	Historic Place	Annapolis Maritime Museum	8
City Owned	Retail	Market House	1
City Owned	Office	Harbormaster's Office	1
Utility	Wastewater Pump Station	Pump Station Siphon	1
Utility	Wastewater Pump Station	Sumner	2
Utility	Wastewater Pump Station	Wardour	2

Source: 2017 Critical Facilities Database

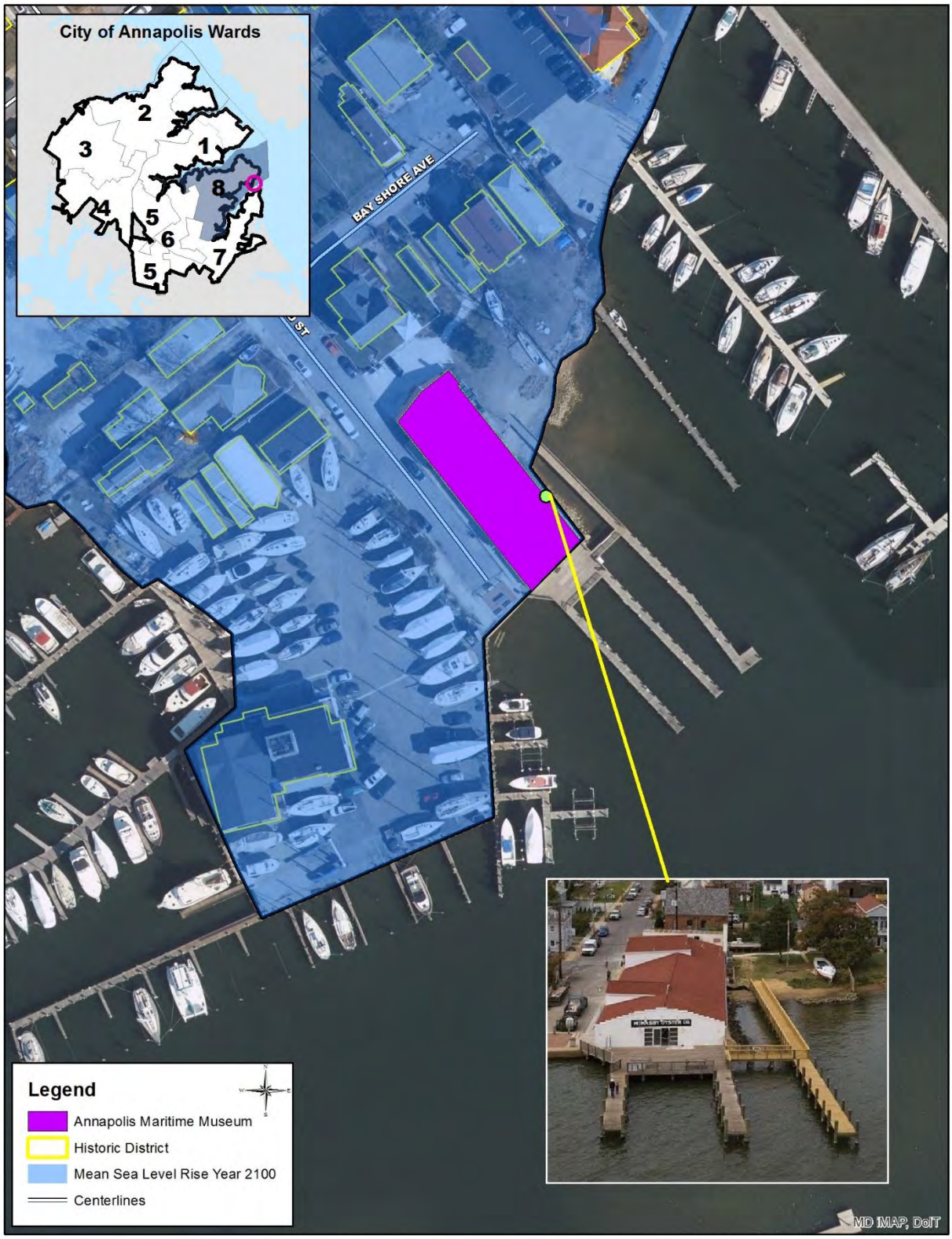
FEMA Change Adaptation Policy Statement: Excerpt from III. Background

While the scope, severity, and pace of future climate change impacts are difficult to predict, it is clear that potential changes could affect our Agency's ability to fulfill its mission. The challenges posed by climate change, such as more intense storms, frequent heavy precipitation, heat waves, drought, extreme flooding, and **higher sea levels** could significantly alter the types and magnitudes of hazards faced by communities and the emergency management professionals serving them. Some specific areas where climate change could influence our capabilities and the need for our services are:

Impacts on mitigation, preparedness, response, and recovery operations: as coastal regions become increasingly populated and developed, more frequent or severe storms may increase the requirements for emergency services and response and recovery capacity.

Resiliency of critical infrastructure and various emergency assets: continuity of operations, delivery of services, and emergency response efforts may be challenged and made increasingly complex by damages or disruptions to the interconnected energy and infrastructure networks.

Inclusion of sea level rise into the hazard mitigation plan is essential, specifically as it relates to critical facilities and the continuity of essential services. Resiliency of critical infrastructure, facilities, and emergency assets must be assessed and reviewed for adaptive mitigation measures.



Source: Smith Planning and Design, ESRI and MD iMaps

Source: Smith Planning and Design, ESRI and MD iMaps

Source: Smith Planning and Design, ESRI and MD iMaps

Chapter 5

FLOOD HAZARD

Flood Hazard

Flooding can be categorized as **flash, riverine and coastal** in Maryland. Flash flooding results from a combination of rainfall intensity and duration, and is further influenced by local topography and the ground's capacity to hold water. Riverine flooding is caused by persistent moderate or heavy rain over one or more days, sometimes combined with snowmelt, causing a river to slowly rise and overflow its banks. Coastal flooding occurs when normally dry, low-lying land is flooded by seawater. The extent of coastal flooding is a function of the elevation inland floodwaters penetrates which is controlled by the topography of the coastal land exposed to flooding.

1. Flood Hazard Impacts

The *City of Annapolis Weather It Together Committee* held a workshop on February 16, 2017. During the workshop, stakeholders were divided into groups. Participants were provided with hazard descriptions and blank hazard impacts worksheets. Each group was provided time in which to discuss and record hazard impacts from their community perspective. Each group then assigned a group representative to review results with the *Weather It Together Committee* at-large. The following table provides community perspective impacts from flood hazard events to the City of Annapolis.

Chapter 5
Key Terms & Definitions

Floodplain- Any land area susceptible to being inundated by water from any source of flooding.

"Coastal *floodplain*" means those portions of the *floodplain* district subject to coastal or tidal flooding by a one hundred-year flood, where detailed study is available.

Flood zones are geographic areas that the FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (**FIRM**) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area.

A **digital elevation model** (**DEM**) is a **digital model** or 3D representation of a terrain's surface — commonly for a planet (including Earth), moon, or asteroid — created from terrain **elevation** data.

Community Perspective - Flood Impact	
Health & Safety of the Public	• Service Pro Pres.– Biohazard from Standing Water • Sewer Back-Up • Gridlock & Trapped in Structures • Evacuation Bottle Neck Outside Jurisdiction – i.e., Counties Adjacent to Annapolis • Communication Breakdown

Health & Safety of the First Responders	• Same as Above, plus • HVAC – Electrical Hazard • Egress/Panic • Exposure to: Swift Water Rescue – Transport from other Counties
Continuity of Operations (including Delivery of Services)	• Length of Power Outage • Make sure COOP Plans are identified/exercised • Loss of Pumping Station – Mitigation Activity Inspection & Flood proofing
Property, Facilities, & Infrastructure	• Cost of Operations – Both Government & → OPP Length • Displacement – Residential • Damage from Flood – Mold/Rot → Length of Displacement, Structural Underlining
Environment	• Human Health – Identified Above • Displacement of Habitat • Beach/March Erosion & Salt Water Intrusion • Potential for algae Bloom → Fish Kill
Economic Conditions	• Ties into Length of Business Closure & Ability to Deliver Goods • Impression – Potential Loss of Economic Image o Example, LA, New Orleans taken long recovery period
Public Confidence in Government	• Reaction Time Calculation – How well did they do in the response/recovery?
Source: Weather It Together Committee Members	

2. Flood Hazard Profile

Information obtained for both Anne Arundel and City of Annapolis using the National Center for Environmental Information (NCEI) – Storm Events Database between January 1950 and August 31, 2017 for Flood Hazards includes: **Flash Flood, Flood, and Heavy Rain.** Data from NCEI has been included on data tables below. In addition, information obtained from the City of Annapolis for flood hazards has been included as bulleted text.

Flood Hazard – Flash Flood Anne Arundel County from January 1950 – August 2017		
76 Flash Flood events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	49	
Number of Days with Event and Death:	1	
Number of Days with Event and Injury:	1	
Number of Days with Event and Property Damage:	12	$5,662,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Flash Flood**
Source: National Center for Environmental Information (NCEI), 2017		

Two Flash Flood events were specific to the City of Annapolis:

Flood Hazard – Flash Flood City of Annapolis from January 1950 – August 2017		
Date	Event Narrative	Property Damage
June 17, 2004	Two roads closed due to high water.	$0
June 27, 2006 to June 28, 2006	Secondary roads near Annapolis were flooded. The entrance to Laurel Park Racetrack was under several inches of water. A foot of water flooded a basement in Annapolis. Route 450 east of Crofton was closed due to high water.	$30,000.00
July 8, 2011	Intersection of St. Stephens Road and Route 450 were closed due to flash flooding.	$0
June 12, 2004	Defense highway was closed near Windermere Court due to flooding.	$0
Source: National Center for Environmental Information (NCEI), 2017		

Flood Hazard – Flood Anne Arundel County from January 1950 – August 2017		
32 Flood events		
Number of County/Zone areas affected:	2	
Number of Days with Event:	25	
Number of Days with Event and Death:	1	
Number of Days with Event and Injury:	1	
Number of Days with Event and Property Damage:	3	$106,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Flood**
Source: National Center for Environmental Information (NCEI), 2017		

Two Flood events were specific to the City of Annapolis:

Flood Hazard – Flood City of Annapolis from January 1950 – August 2017		
Date	Event Narrative	Property Damage
May 12, 2008	Anne Arundel Emergency Management as well as newspapers reported widespread flooding that closed roads across Anne Arundel County. There were several water rescues with cars washed away and driven into flooded roadways.	$100,000.00
September 8, 2011 to September 9, 2011	Numerous roadways were closed across Anne Arundel County due to flooding.	$0
Source: National Center for Environmental Information (NCEI), 2017		

Flood Hazard – Heavy Rain Anne Arundel County from January 1950 – August 2017		
92 Heavy Rain events		
Number of County/Zone areas affected:	17	
Number of Days with Event:	33	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	1	$3,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Heavy Rain**
Source: National Center for Environmental Information (NCEI), 2017		

One Heavy Rain event was specific to the City of Annapolis:

Flood Hazard – Heavy Rain City of Annapolis from January 1950 to August 2017		
Date	Event Narrative	Property Damage
June 17, 2000	In Anne Arundel County, minor flooding occurred near City Dock and West Street in Annapolis. Nickel sized hail was also reported. Winds more than 55 MPH downed trees and power lines onto roads across the county and capsized a kayak near Green bury Point.	$0
Source: National Center for Environmental Information (NCEI), 2017		

Below is a list of the significant Flood Hazard events in Annapolis as identified by the Maryland Department of the Environment and the City of Annapolis Department of Planning and Zoning:

- 1991 - October 31 --- Halloween flooding event for the costume party at the bars--- Annapolis tide reached 3.6' resulting in patrons building sand bag bridges from bar to bar at dock space.
- 2006 - June 27, - Double digit rainfall resulting from a four-day cold front produced flash flood in Annapolis caused approximately $30,000 in property damage.
- 2008 - May 12, 2008, wide spread showers and thunderstorms produced a flood that caused $100,000 in property damage in Annapolis.

In addition to **Flash Flood, Flood, and Heavy Rain, nuisance flooding** has been identified by the City of Annapolis as an additional flood hazard. An economic impact analysis of nuisance flooding was conducted for the City of Annapolis, and has been included in the Appendix of this plan.

While Annapolis, Maryland has suffered several major flood events over the decades, the City has also experienced a devastating increase in nuisance flooding during the last 50 years. Flooding events have increased 925% - from an average of 3.8 days per year (1957-1963), to 39.3 days per year (2007-2013). It is number one in the U.S. Department of Commerce National Oceanic and Atmospheric Administration's top ten U.S. areas with an increase in nuisance flooding. By 2045, nuisance flooding is estimated to occur in Annapolis more than once a day. (Source: Encroaching Tides, Union of Concerned Scientists, 2014, page 52, chart).

The assessment primarily focused of thirty-eight (38) Annapolis businesses most frequently affected by nuisance flooding and directly impacted. Key findings of the analysis include:

- Directly contributed $166,360,894 in annual business activity to the City;
- Employed 1,458 workers earning and estimated $24,764,072 in annual income;
- Are housed in properties valued at $92,975,500;
- Directly generated in estimated $973,443 in government tax revenues;
- Total annual revenue reduction due to 39.3 days of nuisance flooding is $4,109,320; and,
- Total annual wage reduction due to 39.3 days of nuisance flooding is $1,056,331.

3. Flood Hazard Risk & Vulnerability

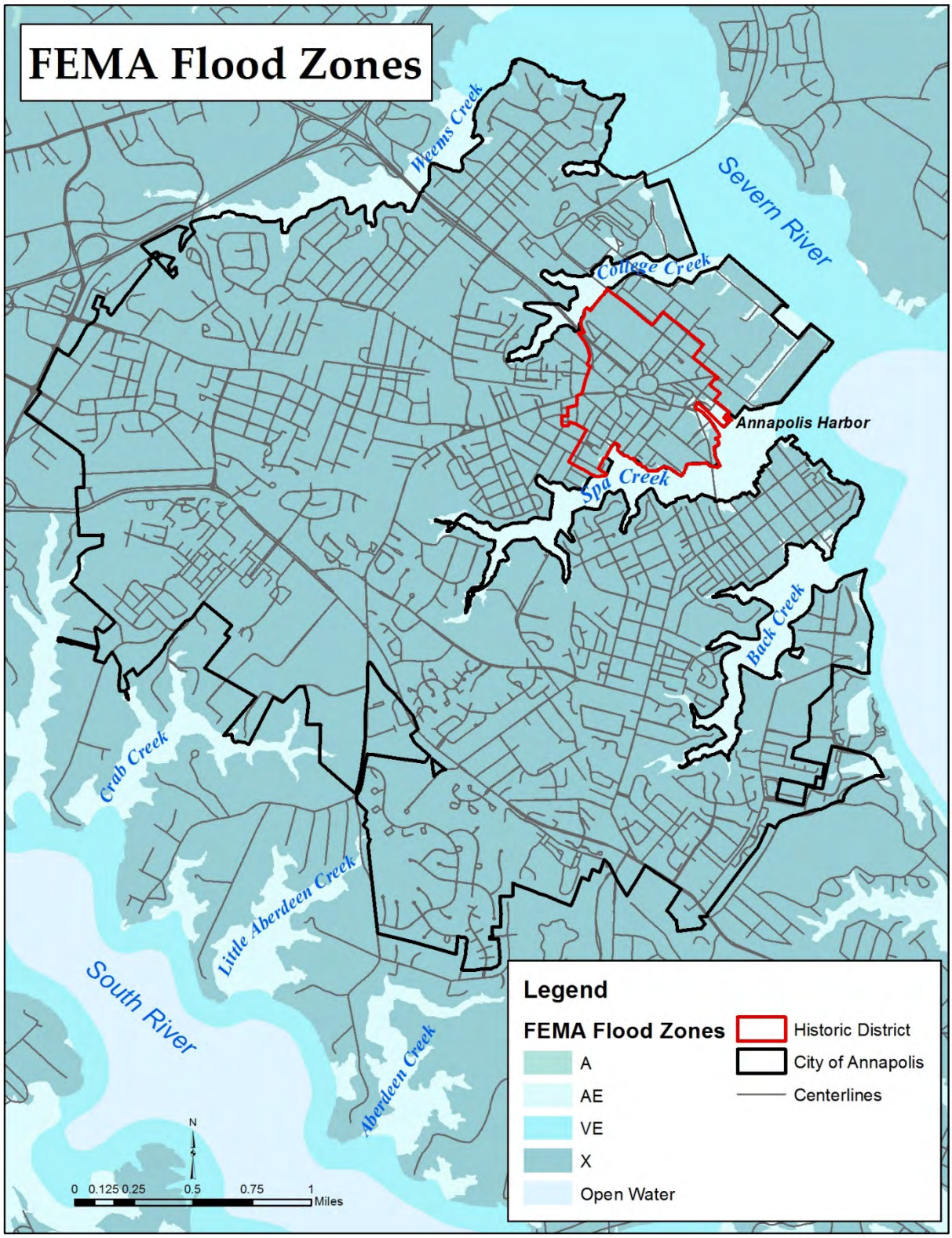
Identifying where a flood will occur does not necessarily convey flood risk; the most common method in determining flood risk and vulnerability is to determine both **probability** and **consequences**. The probability of a flood is the likelihood that a flood will occur. The consequences of a flood are the estimated impacts associated with the flood occurrence.

Source: Nuisance Flooding at City Dock, 3 feet tide on September 30, 2016, Shawn Wampler

Through Risk MAP, FEMA provides communities with updated Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) Reports that focus on the probability of floods and that show where flooding may occur as well as the calculated 1-percent-annual-chance flood elevation. The 1-percent-annual-chance flood, also known as the base flood, has a 1% chance of being equaled or exceeded in any given year.

Digital Flood Insurance Rate Map (DFIRM) contains flood inundation areas that are depicted as flood zones. Flood zones include: Zones A, AE, VE, and X (shaded and un-shaded).

Flood Zone	Description
SFHA-High Risk Areas	
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
Coastal AE	Portions of the SFHA landward of a V zone (i.e., areas where wave heights are computed as less than 3 feet) are mapped as '**A zones'** on the FIRM. While the wave forces in coastal A zones are not as severe as those in V zones, there is still an added risk of damage or destruction of buildings.
LiMWA	The LiMWA identifies areas that will be affected by waves with a 1.5 foot wave height or greater within the coastal A zone. While FEMA does not require special floodplain management standards based on LiMWA delineations, it is likely that properties and structures within the LiMWA will receive substantial damage from wave action during a 1%-annual-chance flood event.
VE	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
Moderate Risk Areas	
X (Shaded) 0.2% or 500 yr.	Moderate flood area(s), shaded area(s) shown on FIRM, are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood.
Minimum Risk Areas	
X (Un-shaded)	The areas of minimal flood hazard, which are areas outside the SFHA and higher than the elevation of the 0.2 percent-annual-chance flood, are labeled Zone X (un-shaded).
Source: Federal Emergency Management Agency	



Source: Smith Planning and Design, ERI and FEMA

a. Changes Since Last FIRM

Data indicating changes in both the Special Flood Hazard Area (SFHA) and the floodway boundary since the previous FIRM was developed quantify land area increases and decreases to the SFHA and floodway, as well as areas where flood zone designation has changed (e.g., Zone A to AE, AE to VE, shaded Zone X protected by levee to Zone AE for de-accredited levees).

Special Flood Hazard Areas (SFHA) boundaries within Anne Arundel County were updated due to new engineering analysis performed within the FEMA Flood Risk Project. The updated modeling produced new flood zone areas and new base flood elevations in some areas and leverage recently developed LiDAR-based topographic data. Data presented in this section reflects a comparison between the previous effective FIRM and new FIRM.

- Previously FIRM effective Date: October 16, 2012
- Current FIRM effective date: February 18, 2015

The table below summarizes the increases, decreases, and net change of SFHA's, Floodways, and Coastal High Hazard Areas (CHHAs) for Anne Arundel County.

Area of Study	Total Area (mi^2)	Increase (mi^2)	Decrease (mi^2)	Net Change (mi^2)
Within SFHA	32.7	0.2	3.7	-3.5
Within Floodway	0	0	0.1	-0.1
Within CHHA (Zone VE or V	9.1	0	0.1	-0.1

Source: FEMA Flood Risk Report-Anne Arundel County, Maryland Coastal Study, September 9, 2015

b. Floodplain Management Overview

The information below provides an overview of the City's floodplain management program.

Population	Percent of Population in County (Coastal)	Total Land Area (sq. mi)	Percent of Land Area in County (Coastal)	Participation NFIP	CRS Rating
38,394	100	7.2	100	Yes	10

Source: FEMA Flood Risk Report-Anne Arundel County, Maryland Coastal Study, September 9, 2015

- Past Federal Disaster Declarations for flooding= 8
- National Flood Insurance Program (NFIP) policy coverage (policies/value)= 503 policies
- NFIP Repetitive Loss Properties=5

c. Flood Risk Result Loss Estimations

HAZUS is a GIS-based risk assessment methodology and software application created by FEMA and the National Institute of Building Sciences for analyzing potential losses from floods. The City of Annapolis's coastal flood risk analysis incorporates results from a FEMA HAZUS analysis (Version 2.1 for the 2010 AAL Study Data, Version 2.2 for Flood Risk Project Refined Data), which accounts for newly modeled areas in the Coastal Flood Risk Project and newly modeled depths for the 1-percent-annual-chance flood event. Potential losses were computed using state-level tax data (parcel centroids from the Maryland Department of Planning) and local building footprints provided by Anne Arundel County to estimate loss ratios for the 1-percent-annual-chance flood scenario.

City of Annapolis: Estimated Potential Losses for Flood Event Scenarios

Flood Risk Refined Losses			
Type	**Inventory Estimated Value**	**% Of Total**	**1% (100-yr) Dollar Losses**
Residential Building & Contents	$62,900,000	59%	$9,200,000
Commercial Building & Contents	$43,400,000	41%	$7,900,000
Other Building & Contents	$20,000	<1%	$10,000
Total Building & Contents	$106,300,000	100%	$17,200,000
Business Disruption	N/A	N/A	$5,000,000
Total	$106,300,000	N/A	$22,200,00

Source: FEMA Flood Risk Report-Anne Arundel County, Maryland Coastal Study, September 9, 2015
Flood Risk Project Refined Losses calculated using HAZUS Version 2.2

The National 2010 AAL Study Data for the city of Annapolis uses features and table from the default HAZUS (Version 2.1) General Building Stock inventory data and U.S. Census and data resulting from the FEMA National 2010 Average Annualized Loss (AAL) Study.

National 2010 AAL Study Losses						
Type	**Inventory Estimated Value**	**% Of Total**	**2% (50-yr) Dollar Losses**	**2 %Loss Ratio**	**0.2 % (500-yr) Dollar Losses**	**0.2 % Loss Ratio**
Residential Building & Contents	$4,002,100,000	63%	$65,000,000	2%	$163,500,000	4%
Commercial Building & Contents	$1,570,000,000	25%	$18,100,000	1%	$38,000,000	2%
Other Building & Contents	$746,900,000	12%	$12,400,000	2%	$21,600,000	3%
Total Building & Contents	$6,319,100,000	100%	$95,500,000	2%	$223,000,000	4%
Business Disruption	N/A	N/A	$2,800,000	N/A	$4,400,000	N/A
Total	$6,319,100,000	N/A	$98,200,000	N/A	$227,500,000	N/A

Source: FEMA Flood Risk Report-Anne Arundel County, Maryland Coastal Study, September 9, 2015
National 2010 AAL Study losses calculated using HAZUS Version 2.1

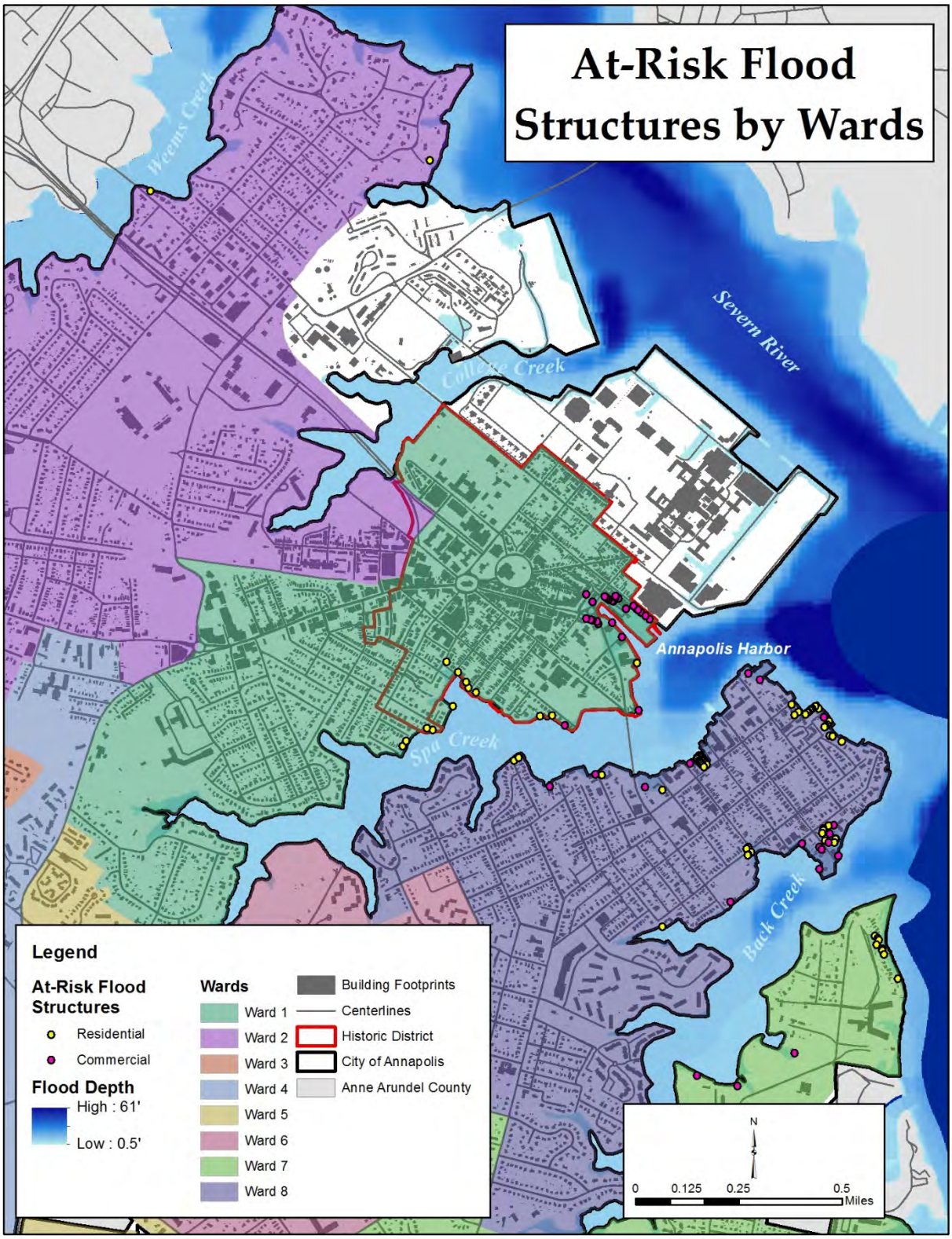
d. Residential and Commercial Structures Flood Risk Result Information

An evaluation of structures located within the high-risk area, also known as the FEMA Special Flood Hazard Area (SFHA), was conducted during the planning process. A total of one hundred twenty-six (126) structures are within the SFHA, with seventy-eight (78) of those structures identified as residential and forty-seven (47) identified as commercial. In order to further assess the flood risk to these structures, the depth of flooding was determined using each structures' lowest adjacent grade, depth of flooding from FEMA flood model, and the digital elevation model. Five (5) structures, three (3) residential and (2) commercial, were determined to a have a flood depth exceeding 5 feet of water. Results of this analysis are provided on the following table.

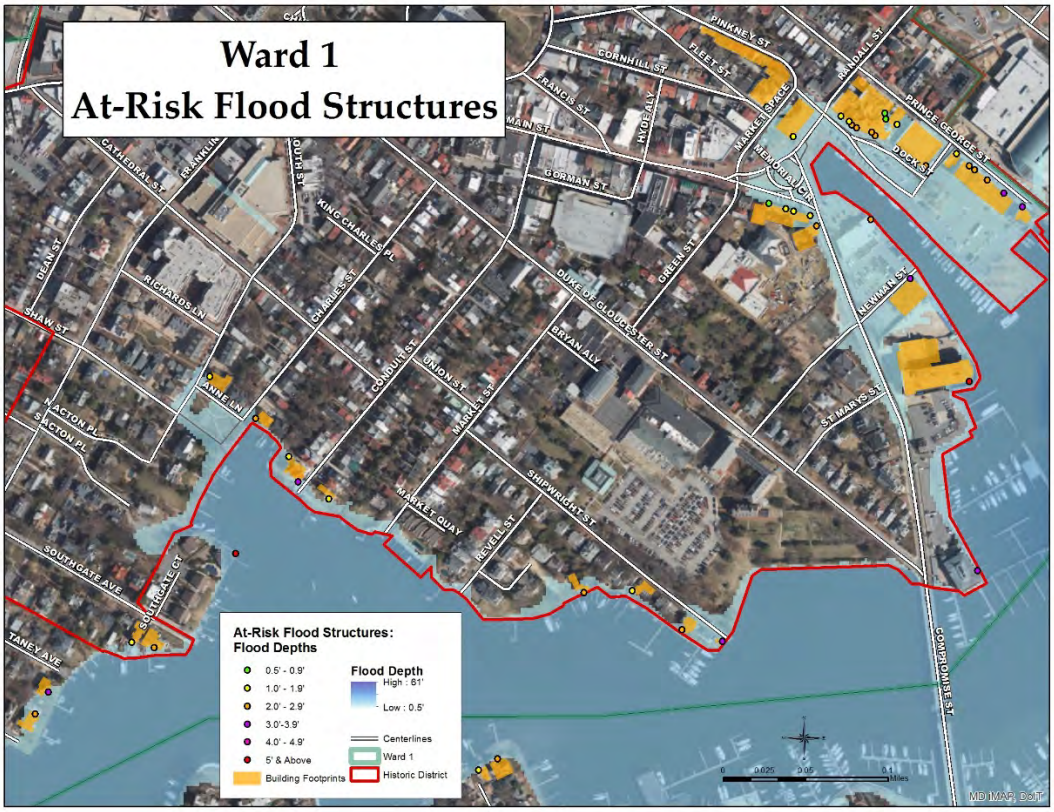
Structures Located within Special Flood Hazard Area – High Risk Areas				
Flood Depth	**Residential**	**Commercial**	**Other**	**Total**
0.5 – 0.9 feet	7	6	0	13
1.0 – 1.9 feet	22	18	0	40
2.0 – 2.9 feet	17	17	0	34
3.0 – 3.9 feet	21	4	1	26
4.0 – 4.9 feet	8	0	0	8
5.0 & above	3	2	0	5
Total	78	47	1	126
Source: 2017 City of Annapolis Building Footprints & Smith Planning & Design				

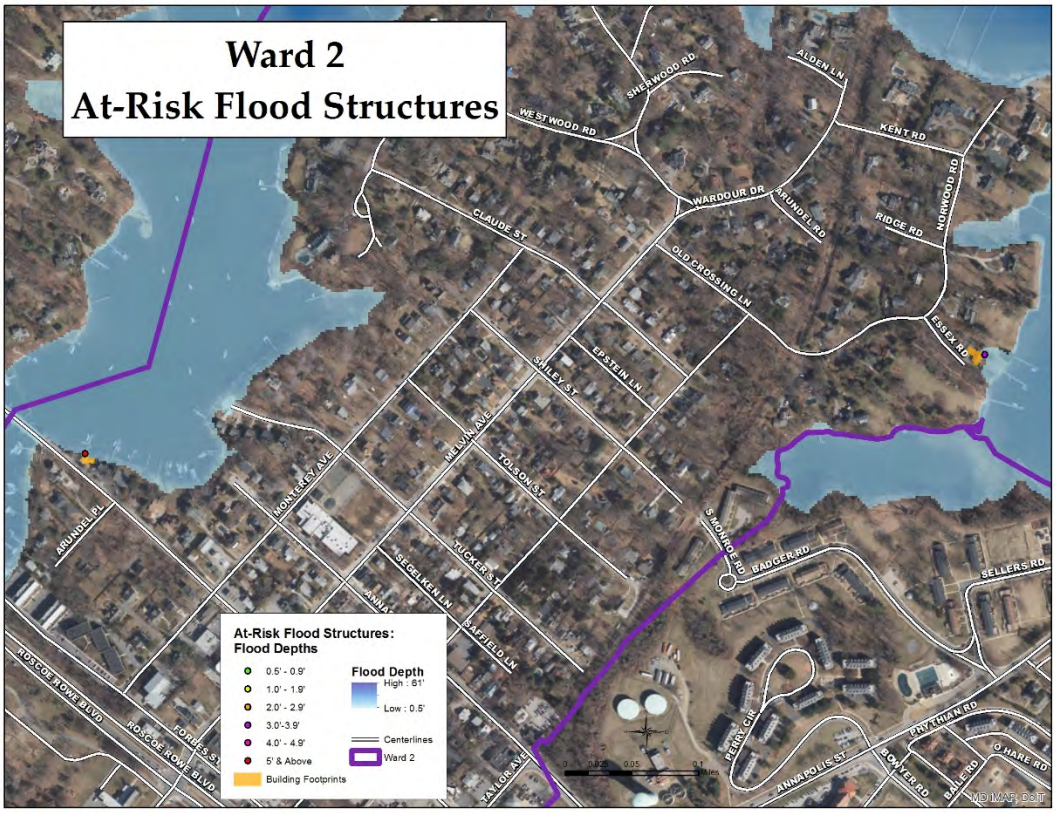
In an effort to determine the area or areas containing structures, residential and commercial, that are most susceptible to flood impacts, this data was further refined by city wards. Thirty-one (31) structures within Ward 1 are located in and around the City Dock. Both Ward 1 and Ward 8 are at the highest risk to the Flood Hazard.

Structures Located within Special Flood Hazard Area – High Risk Areas by Wards								
Flood Depth	**Ward 1**		**Ward 2**		**Ward 7**		**Ward 8**	
Structure Type	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**	**Residential**	**Commercial**
0.5 – 0.9 feet	0	4	0	0	2	0	5	2
1.0 – 1.9 feet	5	8	0	0	6	3	11	7
2.0 – 2.9 feet	4	11	0	0	0	0	13	6
3.0 – 3.9 feet	2	4	1	0	0	0	18	0
4.0 – 4.9 feet	0	0	0	0	0	0	8	0
5.0 & above	2	0	1	0	0	0	0	2
Total	13	27	2	0	8	3	55	17
Source: 2017 City of Annapolis Building Footprints & Smith Planning & Design								

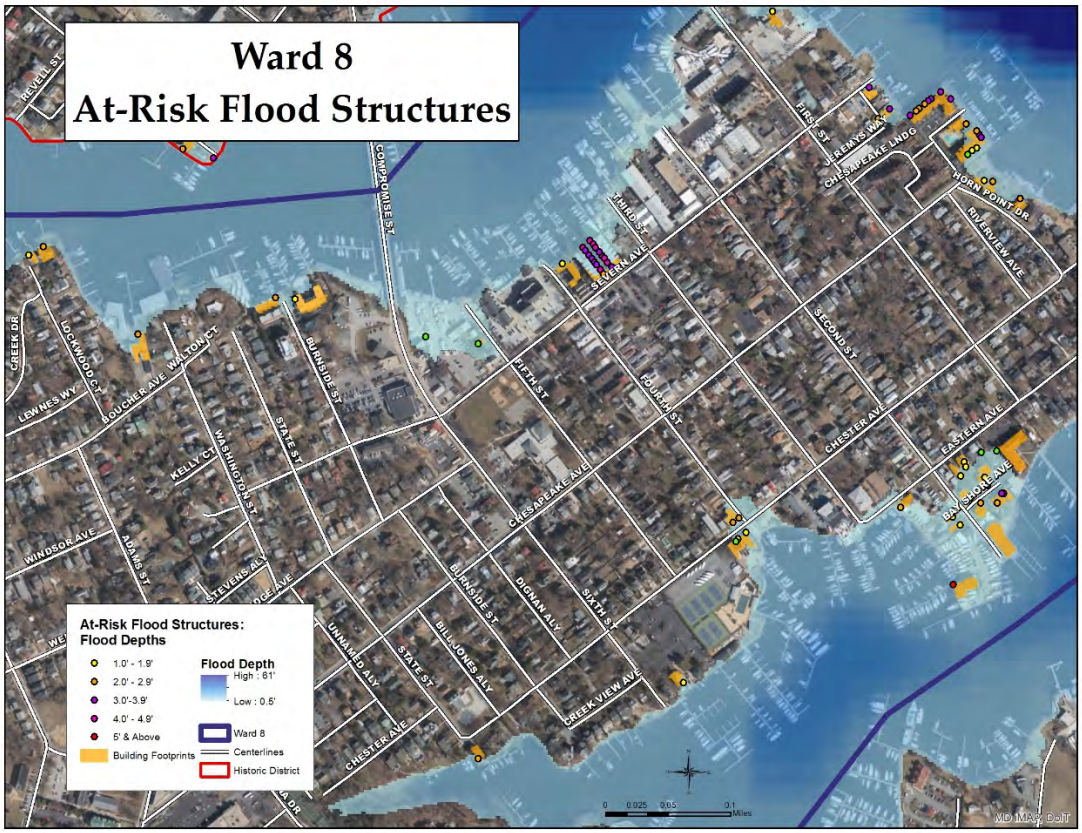


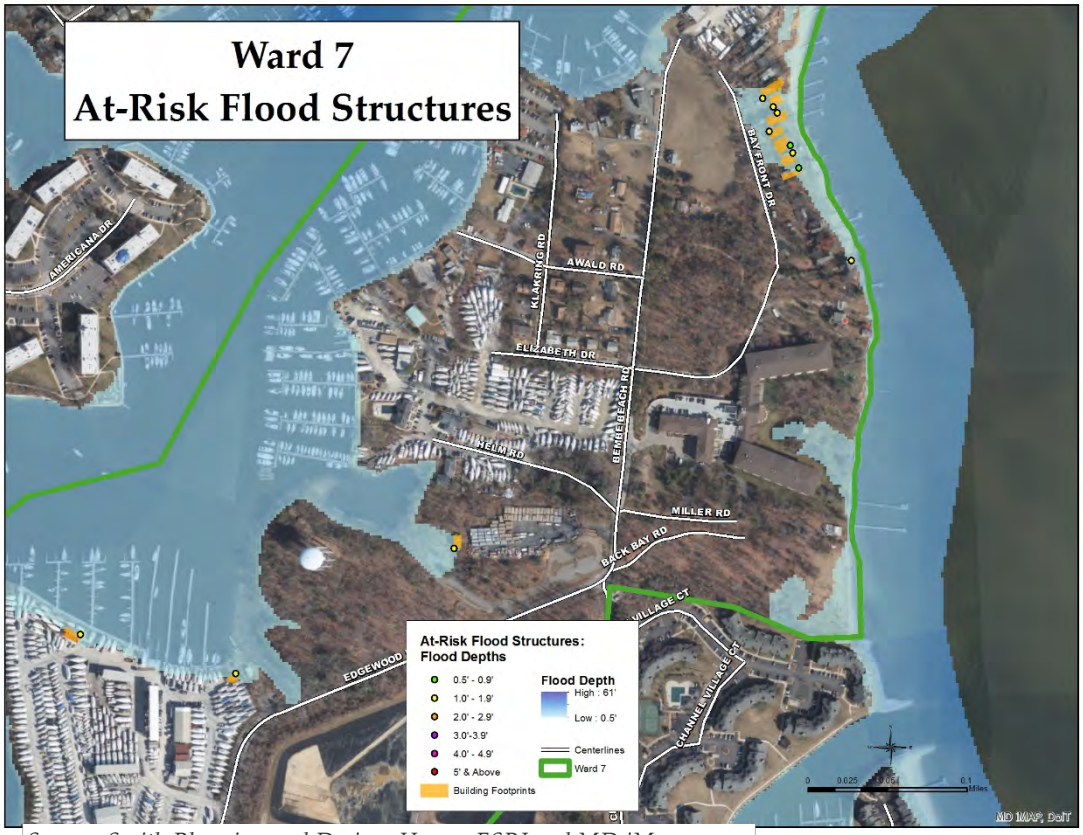
Source: Smith Planning and Design, Hazus and MD iMaps





Source: Smith Planning and Design, Hazus, ESRI and MD iMaps



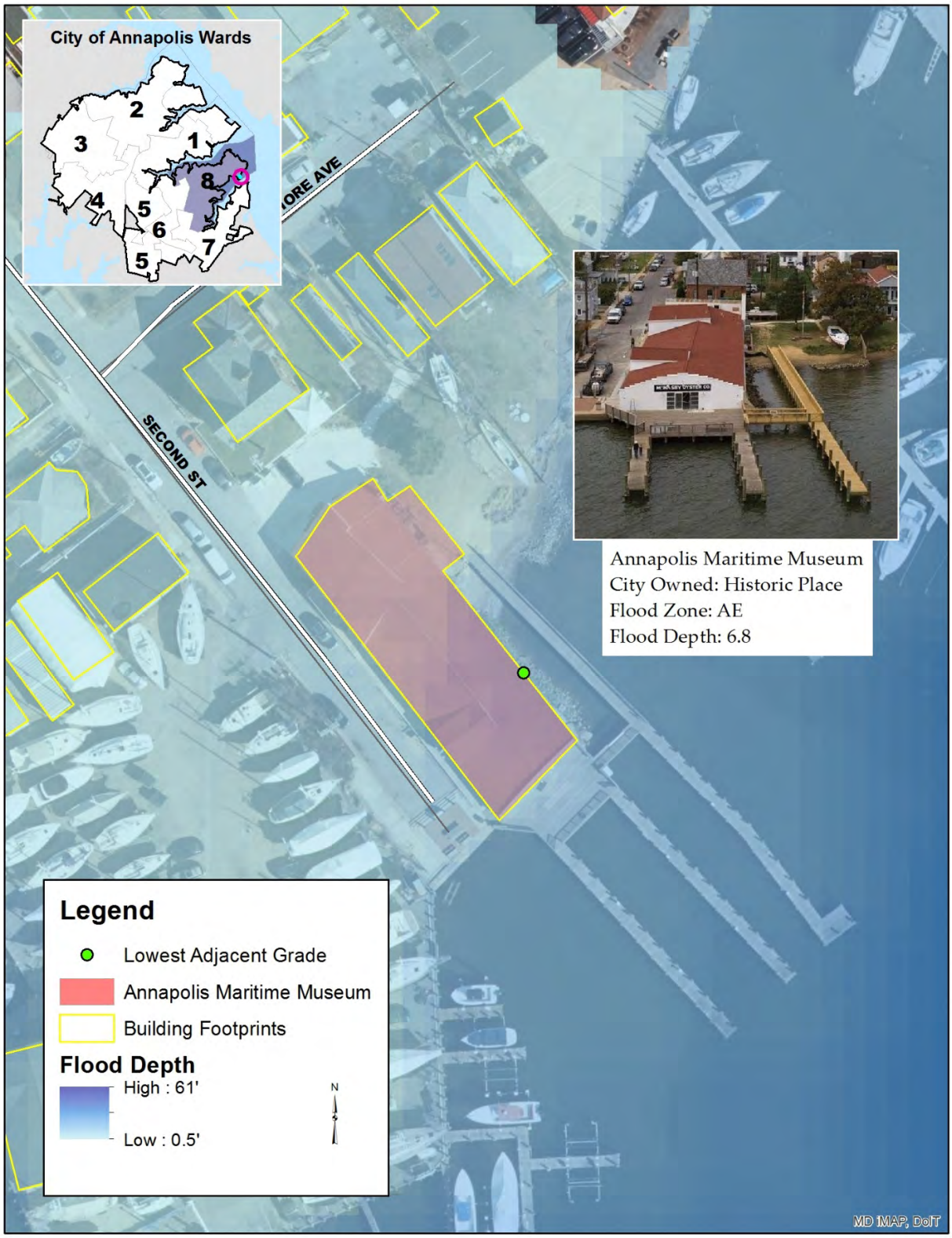


Source: Smith Planning and Design, Hazus, ESRI and MD iMaps

e. Critical Facilities Flood Risk Result Information

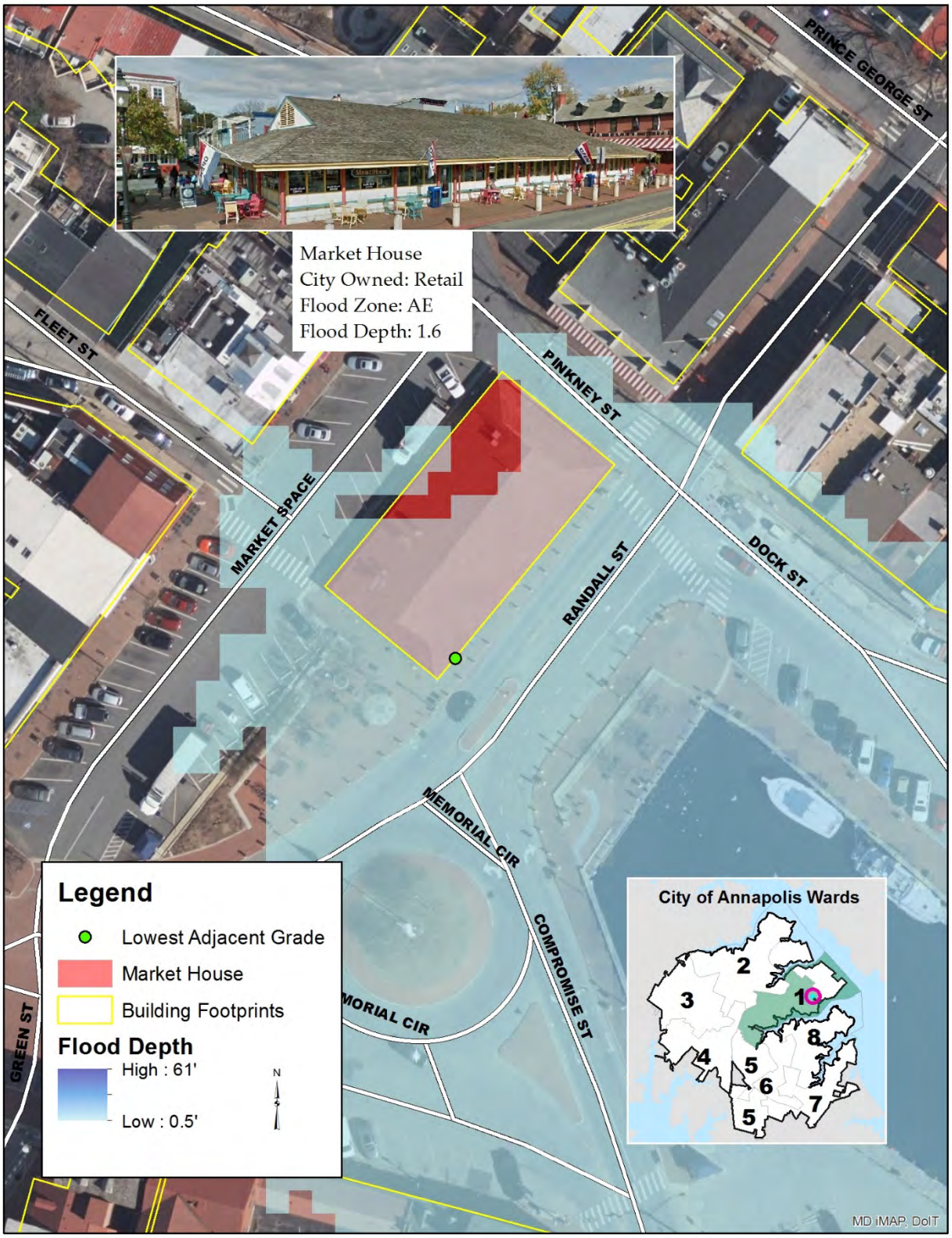
Critical facilities as defined in Chapter 3: Hazard Identification and Critical Facilities located within the high-risk flood area, also known as the FEMA Special Flood Hazard Area (SFHA), were analyzed during the planning process. Four facilities are located within the SFHA as shown on the following maps.

Source: Craig Street, 3 feet tide, Harbor Masters Office, September 30, 2016, Shawn Wampler

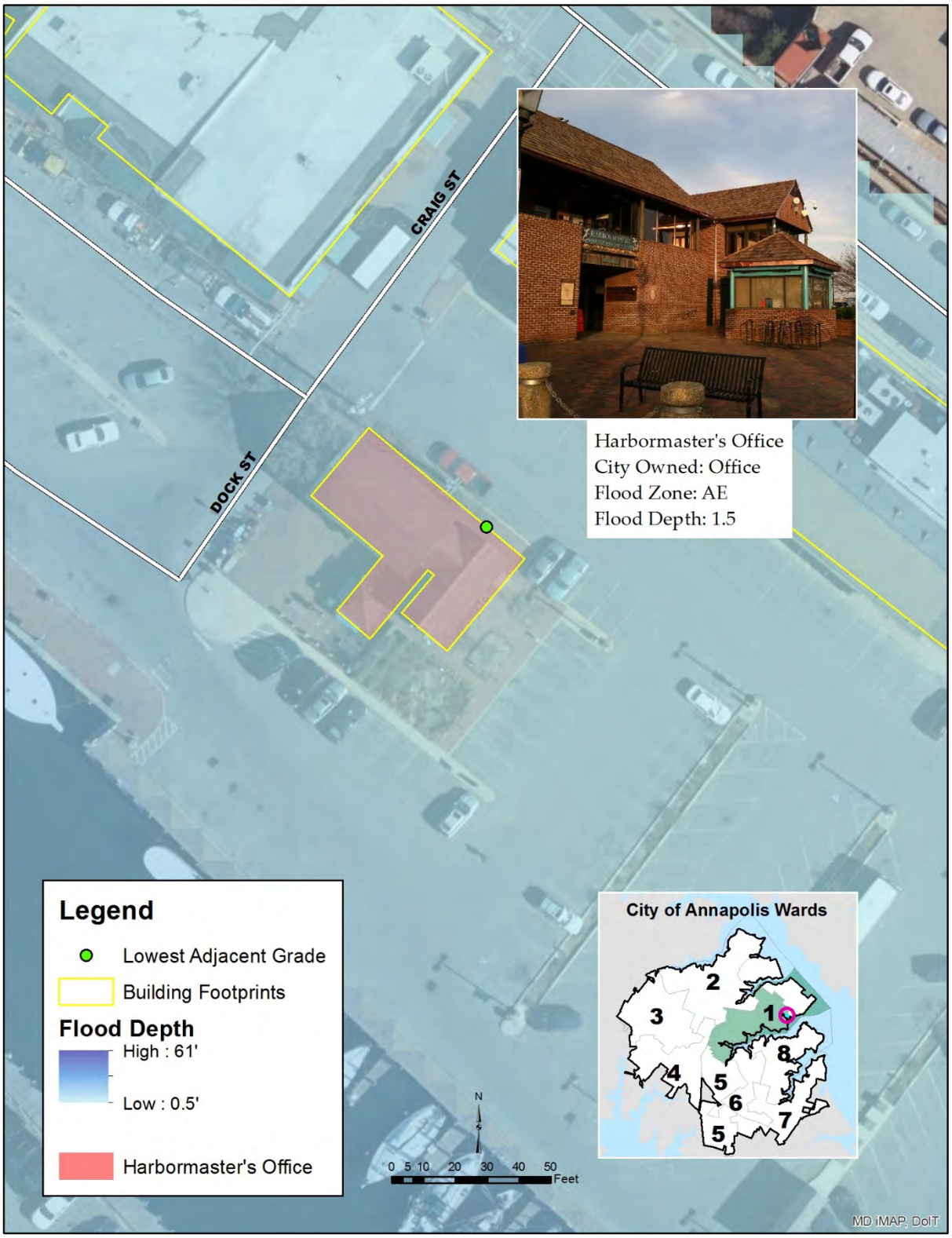


Source: Smith Planning and Design, Hazus, ESRI and MD iMaps

Source: Smith Planning and Design, Hazus, ESRI and MD iMaps



Source: Smith Planning and Design, Hazus, ESRI and MD iMaps



Source: Smith Planning and Design, Hazus, ESRI and MD iMaps

f. Economic Impact Loss Information to Nuisance Flooding

An economic impact analysis to nuisance flooding was conducted for the City of Annapolis, and has been included in the Appendix of this plan. According to the analysis, nuisance flooding for these 38 Downtown Annapolis/City Dock Businesses could ultimately, in the case of complete business and structural failure, reduce these economic impact numbers by the same amount. Again, this is only the direct impact and does not include indirect and induced costs, which would greatly increase overall economic loss.

The table below from the Annapolis Economic Impact Loss Information to Nuisance Flooding, Table 10, page 13, provides the approximate current direct impact of nuisance flooding on the 38 Downtown Annapolis/City Dock Businesses in the targeted study area and does not include indirect and induced costs, which would greatly increase overall economic impact. In addition, the economic impact of flooding will increase by additional amounts as flooding frequency increases and as the circumference of the distance from City Dock increases. Note that the lost wages are calculated based on employees unable to or asked to not report to work during flood events.

For Total 38 Downtown Annapolis/ City Dock Businesses	Annual Totals (Tables 5 & 6)	Per Day Totals (Open 365 Days Per Year)	Total Annual Per Day When Flooded - 77.46% of Previous Year	Total Annual Loss Per Day - 22.54% (100% minus 77.46%) of Previous Year	Cost of 39.3 Annual Flood Events (Previous Column x 39.3)
Revenues	$166,360,894	$455,783	$353,050	$102,733	$4,037,407
Wages	$42,764,072	$117,162	$90,754	$26,408	$1,037,845

Source: Annapolis Economic Impact Loss Information to Nuisance Flooding

Photo Source: Nuisance Flooding on Dock Street, 3 feet of tide on September 30, 2016, Shawn Wampler

g. Displaced Populations

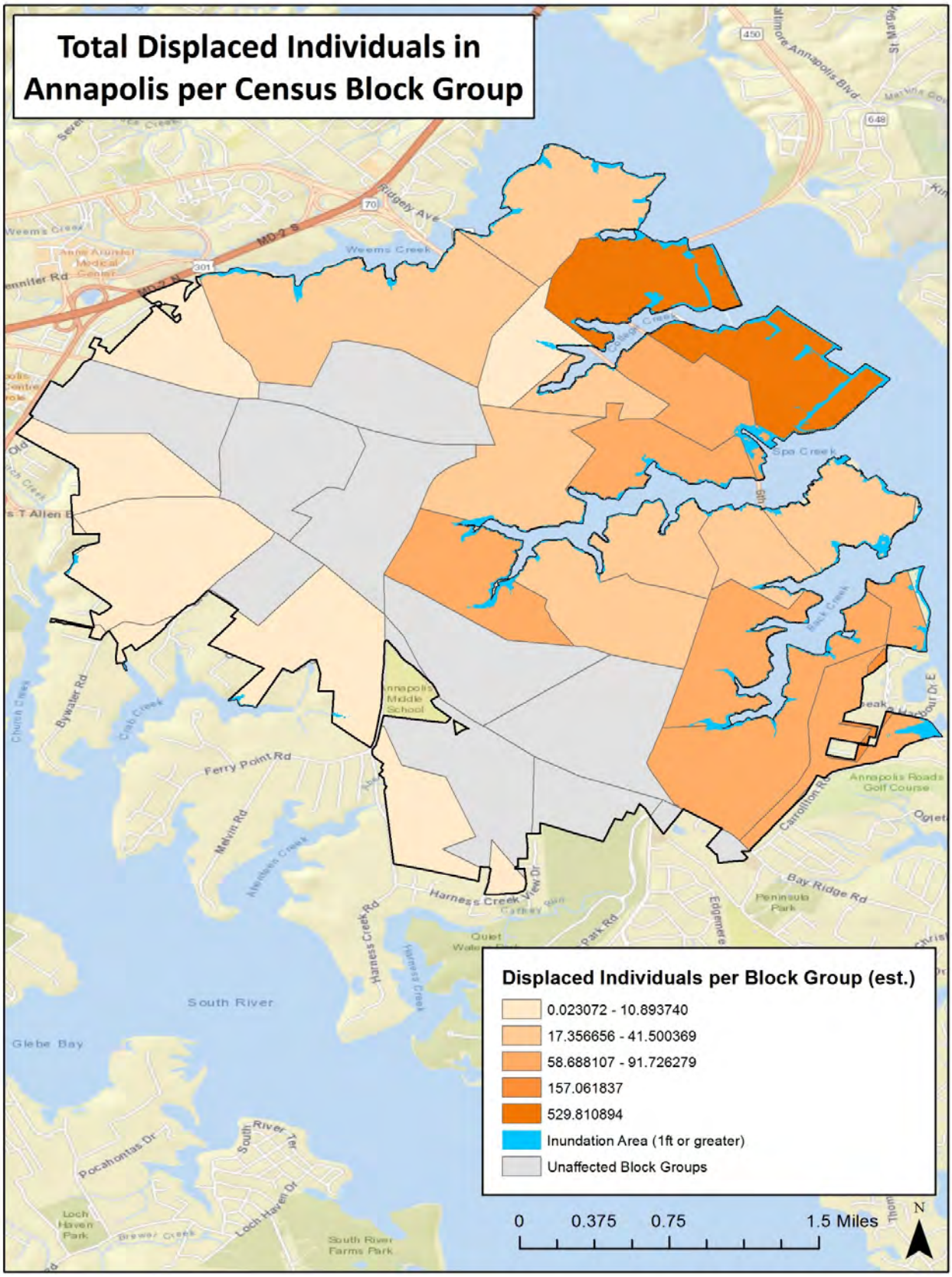
Populations, whether individuals or entire households, become displaced when physical access to their place of residence becomes blocked due to flooded roadways. It is important to estimate the amount of displacement in a community due to inundation caused by flooding because while displaced populations may suffer little to no damage to person or property, many may be in a situation where they will have to utilize a local shelter. Those seeking shelter after becoming displaced are typically lower income, those without family and/or friends in the community, and elderly or other vulnerable populations.

A community wishing to estimate their potential population displacement before a significant flood event may do so by following a methodology found within the *Hazus-MH Flood Technical Manual*. According to the manual, the ability to physically access (or not) a property due to floodwater is the controlling factor in determining displacement. Access to hazard prone areas is determined by the depth of water in specific locations inundated by floodwater. For example, a depth of six inches is typical curb height, while a depth of twelve inches is enough to cause a vehicle to float. Therefore, according to Hazus, any residential structure located in an area with a flood depth of six to twelve inches (or greater) would cause populations to become displaced.

<u>Inundation Displacement Analysis for the City of Annapolis</u>

A modified version of the methodology found within the Hazus-MH Flood Technical Manual was conducted for each Census block group within the City of Annapolis, Maryland. The analysis estimated the amount of displaced individuals per block group as well as the amount of displaced households per block group.

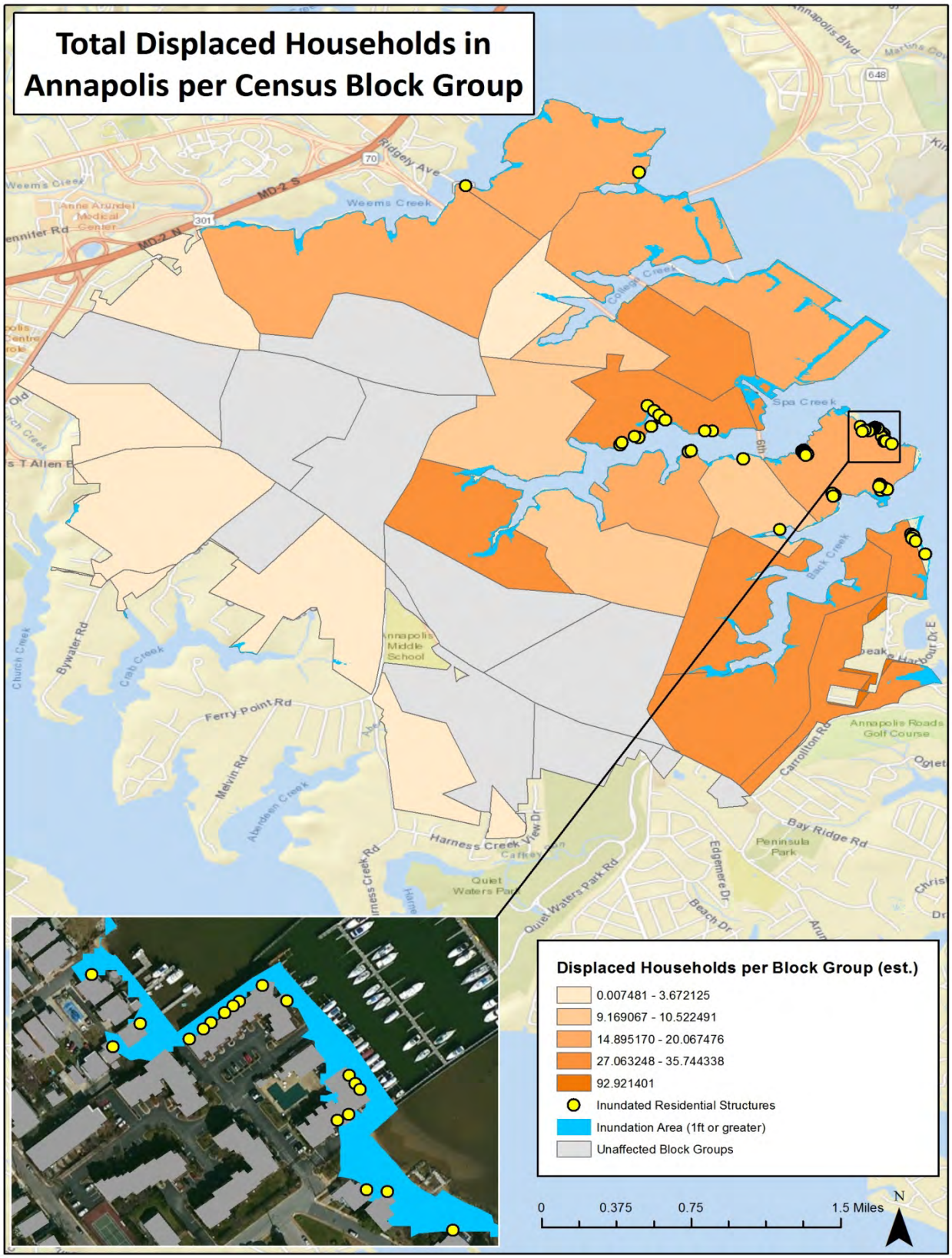
In terms of individual displacement, the analysis estimated that 22 block groups within the city limits would be affected by flood inundation of twelve inches or more. According to 2015 ACS 5-year estimates, the total population of these block groups is 32,551. The analysis concluded that only 1,341 individuals, or just over four percent of the total population, would be displaced due to inundation. The results of the analysis for individual inundation per block group can be viewed on the following map. Inundation areas are depicted in bright blue and primarily follow riverbanks and coastlines. The block group with the greatest amount of affected individuals (~530) is in the northeastern portion of the City, along the Severn River. Notably, this block group contains the U.S. Naval Academy.



Source: Smith Planning and Design, U.S. Census, ESRI and MD iMaps

In terms of household displacement, the analysis estimated that 22 block groups within the city limits would be affected by flood inundation of twelve inches or more. According to 2015 ACS 5-year estimates, the average household size within these block groups is 2.37 and the total amount of households is 11,713. The analysis based upon Hazus methodology concluded that 414 households, or 3.5 percent of the total households, would be displaced due to inundation. A more refined analysis was conducted utilizing address points gathered from the 2012 Maryland Property View database. Residential households within city limits were intersected with the inundation area to determine more specifically which households would be impacted. The results of this refined analysis indicate that only 69 households would be displaced due to flood inundation.

The results of these analyses for household inundation per block group can be viewed on the map below. Inundation areas are depicted in bright blue and primarily follow riverbanks and coastlines. The block groups with the greatest amount of affected households follow along Spa Creek, Back Creek, and the Severn River.



Source: Smith Planning and Design, U.S. Census, ESRI and MD iMaps

Methodology

The method utilized to determine displaced populations due to inundation for the City of Annapolis was provided by and based upon the Hazus-MH Flood Technical Manual. For purposes of this analysis, input requirements included census data regarding total number of households in the community and total number of individuals in a community. Optionally, to create a more robust analysis which estimates shelter requirements, the analysis can include distribution of households by income and distribution of individuals by age. In order to create the most accurate estimates as possible, 2015 ACS 5-year data was utilized.

The method for estimating inundation within Annapolis was tweaked to fit data limitations and the unique characteristics of the city, but primarily followed the basic formulas used within the Hazus MH Flood Technical Manual. The formulas for representing the number of displaced individuals and displaced households is contained within Appendix G: Displaced Individuals & Households Methodology.

Chapter 6

WINTER STORM HAZARD

Winter Storm Hazard

Winter weather can take many forms including **snow, freezing rain, sleet and extreme cold**. Some of the most significant winter storms that affect Maryland are known as "Nor'easters" because they are accompanied by strong northeast winds.

FREEZING RAIN: The NWS issues a Winter Storm Warning when 4 or more inches of snow or sleet are expected in the next 12 hours, or 6 or more inches in 24 hours, or ¼ inch or more of ice accumulation is expected.

SLEET: Rain that turns to ice before reaching the ground.

EXTREME COLD: Extremely cold air comes from every winter in at least part of the country and affect millions of people across the United States. The arctic air, together with brisk winds can lead to dangerously cold wind chill values.

NOR'EASTER: A Nor'easter is a storm along the East Coast of North America, so called because the winds over the coastal area are typically from the northeast. These storms may occur at any time of year but are most frequent and most violent between September and April.

Source: National Weather Service

1. Winter Storm Hazard Impacts

The *City of Annapolis Weather It Together Committee* held a workshop on February 16, 2017. During the workshop, stakeholders were divided into groups. Participants were provided with hazard descriptions and blank hazard impacts worksheets. Each group was provided time in which to discuss and record hazard impacts from their community perspective. Each group then assigned a group representative to review results with the *Weather It Together Committee* at-large. The following table provides community perspective impacts from winter storm hazard events to the City of Annapolis.

Source: Photo by Shawn Wampler

Community Perspective - Winter Storm Hazard Impact	
Health & Safety of the Public	• Electricity – No heat • Medical Services • Impassable Roads/Icy Conditions • Shoveling (Medical Emergencies) • Falls • Carbon Monoxide • Back-up Generators
Health & Safety of the First Responders	• Accidents/Impassable Roads • Delayed Response (People not heeding warnings)
Continuity of Operations (including Delivery of Services)	Government: • Change Shifts (Fatigue) • Emergency Shelters Open • Transportation to Work • Food • Generators • Communications • Chain of Command – What is the Priority? Other: • Government Open/Delayed • EOC Open • Roads Open • Schools Open • Senior Center
Property, Facilities, & Infrastructure	• Open Emergency Centers/Warming • Power • Centers for Public Communication (i.e., library, City Hall?) • Structural Integrity • Heat, Ice, and Dams • Lines Down • Roof Collapse
Environment	• Tree Damage • Salt • More Floods
Economic Conditions	• Business Open (Job Loss) • Loss of Revenue (State & City)

Public Confidence in Government	• Communication • Chain of Command
Source: Weather It Together Committee Members	

2. Winter Storm Hazard Profile

Information obtained for both Anne Arundel and City of Annapolis using the National Center for Environmental Information (NCEI) – Storm Events Database between January 1950 and August 31, 2017 for Winter Storm Hazards include: **Blizzard, Heavy Snow, Ice Storm, Winter Storm, Winter Weather, Cold/Wind Chill, Extreme Cold/Wind Chill, and Frost/Freeze.** Data from NCEI has been included on data tables below. According to NCEI, Sleet/Freezing Rain and Freezing Fog were not recorded within the City of Annapolis.

Winter Storm Hazard – Blizzard **Anne Arundel County from January 1950 – August 2017**		
3 Blizzard events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	3	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	1	$750,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Blizzard**
Source: National Center for Environmental Information (NCEI), 2017		

Winter Storm Hazard – Heavy Snow Anne Arundel County from January 1950 – August 2017		
7 Heavy Snow events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	7	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	1	$150,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Heavy Snow**
Source: National Center for Environmental Information (NCEI), 2017		

Winter Storm Hazard – Ice Storm Anne Arundel County from January 1950 – August 2017		
3 Ice Storm events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	3	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	1	$10,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Ice Storm**
Source: National Center for Environmental Information (NCEI), 2017		

Winter Storm Hazard – Winter Storm Anne Arundel County from January 1950 – August 2017		
31 Winter Storm events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	31	
Number of Days with Event and Death:	1	
Number of Days with Event and Injury:	2	
Number of Days with Event and Property Damage:	2	$2,005,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Winter Storm**
Source: National Center for Environmental Information (NCEI), 2017		

Winter Storm Hazard – Winter Weather Anne Arundel County from January 1950 – August 2017		
71Winter Weather events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	71	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	0	$0

Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Winter Weather**
Source: National Center for Environmental Information (NCEI), 2017		

Winter Storm Hazard – Cold/Wind Chill **Anne Arundel County from January 1950 – August 2017**		
4 Cold/Wind Chill events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	4	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	0	$0
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Cold/Wind Chill**
Source: National Center for Environmental Information (NCEI), 2016		

Winter Storm Hazard – Extreme Cold/Wind Chill **Anne Arundel County from January 1950 – August 2017**		
5 Extreme Cold/Wind Chill events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	5	

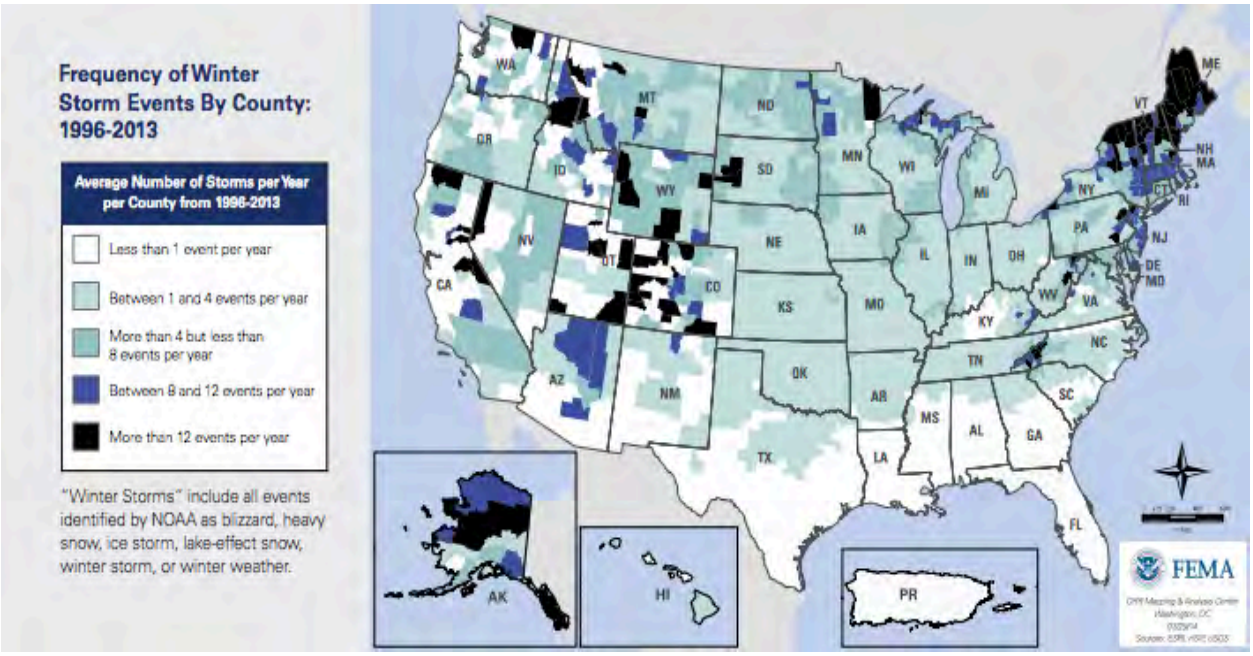
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	0	$0
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Extreme Cold/Wind Chill**
Source: National Center for Environmental Information (NCEI), 2017		

Winter Storm Hazard – Frost/Freeze **Anne Arundel County from January 1950 – August 2017**		
22 Frost/Freeze events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	21	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	0	$0
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Frost/Freeze**
Source: National Center for Environmental Information (NCEI), 2017		

3. Winter Storm Hazard Risk & Vulnerability

According to the FEMA publication *Prepare Your Organization for a Winter Storm Playbook,* the majority of injuries and death from the winter storm hazard are from vehicle accidents, carbon monoxide poisoning, and exposure--being outside too long without adequate protection.

Winter storms can occur from early autumn to late spring depending on the region of the country. The FEMA frequency of winter storm events figure below indicates that the City of Annapolis has more than 4 but less than 8 events per year.



Source: FEMA publication Prepare Your Organization for a Winter Storm Playbook

Risk to people from winter storm events include:

- Frostbite: A medical condition when the skin or body tissue is damaged from freezing. It's most common in parts of the body farthest from your heart that are exposed, such as fingers, toes, ears and nose.
- Hypothermia: A sickness when your body temperature drops below what is needed to be healthy and work properly. It is the opposite of heat stroke.

In order to increase preparedness the following are items recommended:

- Outreach to the community to ensure that members are familiar with the National Weather Service (NWS) terms that are used to describe changing weather conditions. These terms include: advisories, watches, and warnings. These terms can be used to determine the timeline and severity of an approaching storm
- Emphasize the importance of having supplies ready to stay at home for three days without power, water, or heat.
- Outreach specific to emergency communication plan for home and awareness of workplace or organizations communication plans and policies.
- Community Emergency Communication Sign-Up-the City of Annapolis uses "Notify Me", which allows community members to sign-up on the City's website for public safety alerts.

These terms can be used to determine the timeline and severity of an approaching storm.

ADVISORY: The NWS issues a Winter Weather Advisory when it expects conditions to cause significant inconveniences and may be hazardous.

WATCH: The NWS issues a Winter Storm Watch when severe winter conditions, such as heavy snow and/or ice, may affect your area but the location and timing are still uncertain. A Winter Storm Watch is issued 12 to 36 hours in advance of a potential severe storm.

WARNING: The NWS issues a Winter Storm Warning when 4 or more inches of snow or sleet are expected in the next 12 hours, or 6 or more inches in 24 hours, or ¼ inch or more of ice accumulation is expected.

Source: National Weather Service

Carbon monoxide-related deaths are highest during colder months due in part to an increased indoor use of gas-powered furnaces and alternative heating and cooking sources during power outages. Sources that produce carbon monoxide include portable generators, propane, gas-powered stoves and grills, and charcoal briquettes.

Caution: Each year, an average of 430 Americans die from unintentional carbon monoxide poisoning, and there are more than 20,000 visits to the emergency room with more than 4,000 hospitalizations.

- Never use a generator, grill, camp stove or other gasoline, propane, natural gas or charcoal burning devices inside a home, garage, basement, crawlspace or any partially enclosed area. Locate unit away from doors, windows and vents that could allow carbon monoxide to come indoors. Keep these devices at least 20 feet from doors, windows, and vents.
- The primary hazards to avoid when using alternate sources for electricity, heating or cooking are carbon monoxide poisoning, electric shock and fire.
- Install carbon monoxide alarms in central locations on every level of your home and outside sleeping areas to provide early warning of accumulating carbon monoxide.
- If the carbon monoxide alarm sounds, move quickly to a fresh air location outdoors or by an open window or door.
- Call for help from the fresh air location and remain there until emergency personnel arrive to assist you.

The City of Annapolis maintains and follows the Snow Emergency Plan. A snow emergency is declared when hazardous street conditions are created by snow, sleet or freezing rain. There are three phases of snow emergencies that may be proclaimed by the Director of Public Works in consultation with the Chief of Police. The Public Works Department is responsible for coordinating and performing snow removal from City right-of-way and City owned and leased facilities. The Recreation and Parks Department after completion of snow removal responsibilities at their facilities may provide snow removal assistance when requested by Public Works during a Snow Emergency.

- **Phase I (1-inch to 4-inches Snowfall)**
  Requires all vehicles on emergency snow routes to be equipped with all-season radials, snow tires or chains. We expect to make the emergency snow routes passable within 12 hours of the end of the snow fall, snow connector routes will be made passable within 24 hours of the end of the snow fall, and all other routes will be made passable within 36 hours of the end of the snow fall.

- **Phase II (5-inches to 8-inches Snowfall)**
  Vehicular parking is banned on emergency snow routes; in advance of a Snow Emergency, residents will be directed to move their vehicles off Snow Emergency Routes to avoid towing and impound. We expect to make emergency snow routes passable within 24 hours of the end of the snow fall; Snow Connector Routes will be made passable within 36 hours of the end of the snow fall; all other routes will be made passable within 60 hours of the end of the snow fall.
- **Phase III (9-inches to 14-inches Snowfall)**
  All vehicles will be prohibited from operating on any street within the corporate limits of Annapolis except snow equipment, emergency vehicles or others authorized by the Mayor. All previous restrictions prevail. Snow Emergency Routes will be made passable within 96 hours of the end of the snow fall, Snow Connector Routes will be made passable within 120 hours of the end of the snow fall, all other routes will be made passable within 144 hours of the end of the snow fall.
- **Phase IV (15-inches or more)**
  The City's Public Information Officer will advise the public regarding the sections of the City which Public Works crews are servicing and their approximate completion times through the City's website and other media outlets.

The City has a roadway classification system developed to ensure efficient snow removal from City right-of-way during a snow emergency. The system priorities are early clearing of the arterial and collector streets, high employment centers, schools, transit routes, and health and emergency services. Designated Snow Emergency Routes are the first priority for salting and plowing. These routes are marked with signage and are the City's arterial and collector streets.

There are thirteen (13) critical facilities built in or prior to 1967 within the City. Roof geometry affects the ability of structure to shed snow. Simple roofs with steep slopes shed snow most easily. Roofs with geometric irregularities and obstructions collect snowdrifts in an unbalanced pattern. These roof geometries include flat roofs with parapets, stepped roofs, saw-tooth roofs, and roofs with obstructions such as equipment or chimneys. Note: there are seven (7) critical facilities, which are aging structures, built in or prior to 1967, all having flat roofs, denoted on the table below.

Critical Facilities Constructed 1967 & Prior			
Facility Category	**Facility Type**	**Facility Name**	**Flat Roof**
1. City Owned	Garage	PW Utilities Garage	✓
2. City Owned	Historic Place	Shiplap House	
3. City Owned	Historic Place	Maynard-Burgess House	
4. Fire	Fire/EMS	Eastport Fire Co. 36/EMS	✓
5. Medical	Nursing Home	New Annapolis Nursing	
6. School	Elementary	Eastport Elementary School	✓
7. School	Private	Heritage Learning Center	
8. School	Private	Van Buren Street Baptist School	
9. School	Private	J Albert Adams Academy	
10. School	Private	Phoenix Academy	✓
11. School	Public	Germantown Elementary School	✓
12. School	Public	West Annapolis Elementary School	✓
13. School	Public	Mills - Parole Elementary School	✓
Source: 2017 Critical Facility Database			

Chapter 7

WIND & THUNDERSTORM HAZARDS

Wind & Thunderstorm Hazards

Wind is the motion of air past a given point caused by a difference in pressure from one place to another. The effects can include blowing debris, interruptions in elevated power and communications utilities, and intensified effects of winter weather. Two basic types of damaging wind events other than tropical systems affect Maryland: **synoptic-scale winds and thunderstorm winds**. Synoptic-scale winds are high winds that occur typically with cold frontal passages or Nor'easters. Downbursts cause the high winds in a thunderstorm.

Thunderstorms are forms of convection produced when warm moist air is overrun by dry cool air. As the warm air rises, thunderhead clouds (cumulonimbus) form and cause the strong winds, lightning, thunder, hail and rain associated with these storms. Instability can be caused by surface heating or upper-tropospheric (~50,000 feet) divergence of air (rising air parcels can also result from airflows over mountainous areas). Generally, the former "air mass" thunderstorms form on warm-season afternoons and are not severe. The latter "dynamically-driven" thunderstorms generally form in association with a cold front or other regional-scaled atmospheric disturbance. These storms can become severe, thereby producing strong winds, frequent lightning, hail, downbursts and even tornadoes.

1. Wind & Thunderstorm Hazard Impacts

The *City of Annapolis Weather It Together Committee* held a workshop on February 16, 2017. During the workshop, stakeholders were divided into groups. Participants were provided with hazard descriptions and blank hazard impacts worksheets. Each group was provided time in which to discuss and record hazard impacts from their community perspective. Each group then assigned a group representative to review results with the *Weather It Together Committee* at-large. The following table provides community perspective impacts associated with wind and thunderstorm hazard events to the City of Annapolis.

Community Perspective - Wind & Thunderstorm Impact	
Health & Safety of the Public	• Flying Debris • Debris • Downed Power Lines • Unsafe Buildings & Components • Contaminants • Power Loss • Road Blockage/Access • Water Access/Blockage
Health & Safety of the First Responders	• Same as above

Continuity of Operations (including Delivery of Services)	• Power Loss • Debris Blocking Streets
Property, Facilities, & Infrastructure	• Loss of Operations • Relocation Expenses • Access • Loss of Power • Structure Damage • Need to Secure Building (Weather Tight) • Debris Management
Environment	• Loss of Natural Resources • Water Quality – Contaminants & Debris • Impact to Endangered Species?
Economic Conditions	• Loss of Operations (Commercial, Transportation) • Access to Commercial Areas – Effect on Property Value • Overall Cost of Recovery from Event (City, Citizens)
Public Confidence in Government	• Based on Speed & Efficacy of Government Response • Dependent on Severity of Disaster • Expedited Approval Process for Repair Permits
Source: Weather It Together Committee Members	

2. Wind & Thunderstorm Hazard Profile

Information obtained for both Anne Arundel and City of Annapolis using the National Center for Environmental Information (NCEI) – Storm Events Database between January 1950 and August 31, 2017 for Wind Hazards includes: **High Wind, Strong Wind, and Thunderstorm Wind.** Data from NCEI has been included on data tables below.

Wind Hazard – High Wind **Anne Arundel County from January 1950 – August 2017**		
27 High Wind events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	27	

Number of Days with Event and Death:	1	
Number of Days with Event and Injury:	2	
Number of Days with Event and Property Damage:	13	$2,398,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**High Wind**
Source: National Center for Environmental Information (NCEI), 2017		

Wind Hazard – Strong Wind **Anne Arundel County from January 1950 – August 2017**		
24 Strong Wind events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	24	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	2	
Number of Days with Event and Property Damage:	14	$863,350.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Strong Wind**
Source: National Center for Environmental Information (NCEI), 2017		

Wind Hazard – Thunderstorm Wind **Anne Arundel County from January 1950 – August 2017**		
405 Thunderstorm Wind events		
Number of County/Zone areas affected:	1	

Number of Days with Event:	224	
Number of Days with Event and Death:	1	
Number of Days with Event and Injury:	5	
Number of Days with Event and Property Damage:	118	$3,884,000.00
Number of Days with Event and Crop Damage:	9	$18,250.00
Number of Event Types reported:	1	**Thunderstorm Wind**
Source: National Center for Environmental Information (NCEI), 2017		

Twenty-Seven Thunderstorm Wind events were specific to the City of Annapolis:

Wind Hazard – Thunderstorm Wind **City of Annapolis from January 1950 to August 2017**		
Date	Event Narrative	Property Damage
July 1, 1995	N/A	$10,000.00
November 26, 1996	An apparent microburst produced a small swath of damage in the west portion of Annapolis during the pre-dawn hours of the 26th. The event was part of a bow-echo which developed ahead of a strong cold front. Damage included: a blown-out front window of a Volvo/Subaru dealership at 1930 West Street; a portion a roof off at a pawnbroker shop next door; a door ripped from a home on nearby Forest Drive. Debris, including parts of trees, telephone poles, shrubs, and dirt, was strewn along Forest Drive	$50,000.00
July 9, 1997	Three racing sailboats were flipped in Annapolis Harbor just east of the Naval Academy sea wall. Two boats were brought upright, but one remained overturned and allegedly sunk. No persons were injured. Approximately 8,000 Baltimore Gas and Electric customers lost power during the storm.	$10,000.00
July 28, 1997	A bow-echo squall line produced scattered tree and wire damage in the Annapolis/Severna Park section of eastern Anne Arundel Co. At least eight large limbs were downed in Annapolis, with additional	$8,000.00

	tree damage in nearby Severna Park. The combination of lightning and wind left an estimated 18,000 customers without power immediately after the storm.	
June 2, 1998	The episode concluded in Maryland with a few wind damage reports on the western shore of the Chesapeake Bay just before midnight. Winds blew out the door to the Annapolis (Anne Arundel Co) city fire department station, and knocked several large trees down in Eastport at approximately the same time.	$3,000.00
June 2, 1998	The episode concluded in Maryland with a few wind damage reports on the western shore of the Chesapeake Bay just before midnight. Winds blew out the door to the Annapolis (Anne Arundel Co) city fire department station, and knocked several large trees down in Eastport at approximately the same time. Note: This event was shown twice in the database. It did record different property damage amounts.	$10,000.00
June 14, 1999	Electrical wires downed	$14,000.00
May 10, 2000	Trees and power lines were downed.	$10,000.00
June 30, 2001	In Anne Arundel County, numerous trees were downed by high wind. Poplar trees were downed by Annapolis Mall and power outages were reported. A wind gust of 60 MPH was estimated in Annapolis where pea sized hail fell. A wind gust of 60 MPH was estimated.	$0
May 14, 2002	In Anne Arundel County, trees and a few power lines were downed in Annapolis, Glen Burnie, and Midlothian.	$2,000.00
June 16, 2005	Tree and power line damage was reported in the area. Reports indicated more than 10,000 power outages at one time.	$0
July 4, 2006	20 to 30 trees were downed on houses in Annapolis.	$250,000.00
July 23, 2008	A local newspaper reported downed trees and power lines in Annapolis.	$4,000.00
July 25, 2010	A wind gust of 62 mph was recorded at Annapolis.	$0
November 17, 2010	Large branches and old trees were down at Chinquapin Crest.	$2,000.00

November 17, 2010	Winds moved multiple secured airplanes from their parking lots at Lee Airport. One plane was significantly damaged.	$10,000.00
June 29, 2012	Derecho event: A wind gust of 61 knots was measured at Lee Airport. Note: The City of Annapolis EOC was activated around the clock for one week. The City experienced a power outage for four days.	$0
June 13, 2013	A large tree fell next to the Annapolis Police Station on Taylor Street damaging a fence, a vehicle and breaking a window in the building.	$5,000.00
June 23, 2015	A tree was reported down at the intersection of Ferry Point Rd and Harness Creek Rd.	$1,000.00
July 9, 2015	A tree was reported down on wires near the intersection of Lees Lane and Wendlyn Way.	$1,000.00
July 22, 2017	A weak boundary moved into the area, but hot and humid conditions led to moderate to high amounts of instability. An upper-level trough increased winds aloft which caused storms associated with the boundary to become severe.	$0
July 24, 2017	A boundary remained over Maryland near and east of Interstate 95. The boundary triggered showers and thunderstorms. Moderate to high amounts of instability along with stronger winds aloft led to some storms becoming severe.	$0
Source: National Center for Environmental Information (NCEI), 2017		

Information obtained for both Anne Arundel and City of Annapolis using the National Center for Environmental Information (NCEI) – Storm Events Database between January 1950 and August 31, 2017 for Thunderstorm Hazards include: **Hail and Lightning.** Data from NCEI has been included on data tables below.

Thunderstorm Hazard – Hail **Anne Arundel County from January 1950 – August 2017**		
72 Hail events		
Number of County/Zone areas affected:	1	

Number of Days with Event:	44	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	4	$17,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Hail**
Source: National Center for Environmental Information (NCEI), 2017		

Three Hail events were specific to the City of Annapolis:

Thunderstorm Hazard – Hail **City of Annapolis from January 1950 to August 2017**		
Date	Event Narrative	Property Damage
June 17, 2000	In Anne Arundel County, minor flooding occurred near City Dock and West Street in Annapolis. Nickel sized hail was also reported.	$0
July 16, 2000	In Anne Arundel County, trees and power lines were downed. Quarter sized hail fell on Route 2 south of Annapolis.	$0
June 26, 2009	A potent cold front combined with plenty of instability to trigger showers and thunderstorms. Some thunderstorms were severe, producing damaging winds and large hail. Penny size hail was reported near Annapolis.	$0
Source: National Center for Environmental Information (NCEI), 2017		

Thunderstorm Hazard – Lightning Anne Arundel County from January 1950 – August 2017		
36 Lightning events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	30	
Number of Days with Event and Death:	2	
Number of Days with Event and Injury:	8	
Number of Days with Event and Property Damage:	18	$1,419,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Lightning**
Source: National Center for Environmental Information (NCEI), 2017		

Six Lightning events were specific to the City of Annapolis:

Thunderstorm Hazard – Lightning City of Annapolis from January 1950 to August 2017		
Date	Event Narrative	Property Damage
August 10, 1998	An area of thunderstorms, containing frequent lightning, moved through Carroll, Baltimore, Howard, and Anne Arundel Cos. A 12-year-old boy was struck by lightning while fishing at the Annapolis Naval Station marina just before 5 PM EDT. He was given CPR for several minutes by an off-duty Navy employee, and was successfully resuscitated.	$0
June 14, 1999	Lightning strike damaged appliances inside a home	$5,000.00
August 20, 1999	Tree downed onto home after being hit by lightning	$5,000.00
June 17, 2000	A 58-year-old man was killed and 8 people were injured after lightning struck the tree they were standing under near the athletic	$0

	field at Annapolis Middle School.	
June 5, 2002	The Maryland State House dome was struck by lightning.	$0
August 3, 2003	Lightning struck 20 feet from a man. He was injured after being knocked down by the bolt.	$0
Source: National Center for Environmental Information (NCEI), 2017		

3. Wind & Thunderstorm Risk & Vulnerability

Critical facilities constructed prior to modern building codes are susceptible to wind related hazards.

Critical Facilities Constructed 1967 & Prior			
Facility Category	**Facility Type**	**Facility Name**	**Flat Roof**
City Owned	Garage	PW Utilities Garage	✓
City Owned	Historic Place	Shiplap House	
City Owned	Historic Place	Maynard-Burgess House	
Fire	Fire/EMS	Eastport Fire Co. 36/EMS	✓
Medical	Nursing Home	New Annapolis Nursing	
School	Elementary	Eastport Elementary School	✓
School	Private	Heritage Learning Center	
School	Private	Van Buren Street Baptist School	
School	Private	J Albert Adams Academy	
School	Private	Phoenix Academy	✓
School	Public	Germantown Elementary School	✓
School	Public	West Annapolis Elementary School	✓
School	Public	Mills - Parole Elementary School	✓
Source: 2017 Critical Facilities Database			

In addition, critical communications infrastructure, specifically communication towers are at-risk to wind related hazards.

Source: Smith Planning and Design, ESRI and MD iMaps

TORNADO HAZARD

Tornado Hazard

A tornado is a violently rotating funnel-shaped column of air that extends from a thunderstorm cloud toward the ground. Tornadoes can touch the ground with winds of over 300 mph. While relatively short-lived, tornadoes are intensely focused and are one of nature's most violent storms.

1. Tornado Hazard Impacts

The *City of Annapolis Weather It Together Committee* held a workshop on February 16, 2017. During the workshop, stakeholders were divided into groups. Participants were provided with hazard descriptions and blank hazard impacts worksheets. Each group was provided time in which to discuss and record hazard impacts from their community perspective. Each group then assigned a group representative to review results with the *Weather It Together Committee* at-large. The following table provides community perspective impacts from tornado hazard events to the City of Annapolis.

Community Perspective - Tornado Impact	
Health & Safety of the Public	• Collapsed Structures • Flying Debris • Downed Wires • Public Access, Emergency Service Access
Health & Safety of the First Responders	• Same as above
Continuity of Operations (including Delivery of Services)	• Continuity of Operations of Transit • Role of Parking Facility • Historic Integrity • Impacts of Direct Hits on Critical Infrastructure o Waste Water Plant, Fresh Water Plant, Bridges, Hospitals, ADOT
Property, Facilities, & Infrastructure	• Impacts of Direct Hits on Critical Infrastructure o Waste Water Plant, Fresh Water Plant, Bridges, Hospitals, ADOT • Cleanups, Staging Locations • Impacts on Parks • Secure Facilities Against Wind Damage
Environment	• Loss to Tree Canopy, Stormwater Management • Habitat Loss • Erosion

Economic Conditions	• Depends on Area of Impact o Continuity of Business & Services
Public Confidence in Government	• Communications • Availability of Plans • Emergency Supplies, Shelters • Warning System
Source: Weather It Together Committee Members	

2. Tornado Hazard Profile

Information obtained for both Anne Arundel and City of Annapolis using the National Center for Environmental Information (NCEI) – Storm Events Database between January 1950 and August 31, 2017 for Tornado Hazards include: **Funnel Cloud, Tornado, and Waterspout.** Data from NCEI has been included on data tables below.

Tornado Hazard – Funnel Cloud **Anne Arundel County from January 1950 – August 2017**		
3 Funnel Cloud events		
Number of County/Zone areas affected:	3	
Number of Days with Event:	2	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	0	$0
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Funnel Cloud**
Source: National Center for Environmental Information (NCEI), 2017		

Tornado Hazard – Tornado Anne Arundel County from January 1950 – August 2017		
21 Tornado events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	17	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	1	
Number of Days with Event and Property Damage:	16	$7,121,000.00
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Tornado**
Source: National Center for Environmental Information (NCEI), 2017		

Tornado Hazard – Waterspout Anne Arundel County from January 1950 – August 2017		
1 Waterspout event		
Number of County/Zone areas affected:	1	
Number of Days with Event:	1	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	0	$0
Number of Days with Event and Crop Damage:	0	$0
Number of Event Types reported:	1	**Waterspout**
Source: National Center for Environmental Information (NCEI), 2017		

One Waterspout event was specific to the City of Annapolis:

Tornado Hazard – Waterspout City of Annapolis from January 1950 to August 2017		
Date	Event Narrative	Property Damage
January 18, 1999	Spotted over Chesapeake Bay moving toward Kent Island	$0
Source: National Center for Environmental Information (NCEI), 2017		

3. Tornado Hazard Risk & Vulnerability

Critical facilities built prior to modern building codes are at higher risk to wind related hazards, specifically tornado events. Upgrading these facilities with impact resistant glass will mitigate all high wind events including hurricanes, high winds events, thunderstorms, and tornados.

Critical Facilities Constructed 1967 & Prior		
Facility Category	**Facility Type**	**Facility Name**
City Owned	Garage	PW Utilities Garage
City Owned	Historic Place	Shiplap House
City Owned	Historic Place	Maynard-Burgess House
Fire	Fire/EMS	Eastport Fire Co. 36/EMS
Medical	Nursing Home	New Annapolis Nursing
School	Elementary	Eastport Elementary School
School	Private	Heritage Learning Center
School	Private	Van Buren Street Baptist School
School	Private	J Albert Adams Academy
School	Private	Phoenix Academy
School	Public	Germantown Elementary School

School	Public	West Annapolis Elementary School
School	Public	Mills - Parole Elementary School
Source: 2017 Critical Facilities Database		

There is only one (1) mobile home located within the city limits. It is located along the western border next to MD 665.

DROUGHT & EXTREME HEAT HAZARDS

Drought & Extreme Heat Hazard

Droughts are periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or stream flow. Although maintaining water supplies for human use is an important aspect of drought management, drought can also have many other dramatic and detrimental effects on the environment and wildlife.

Temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as **extreme heat**. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground.

1. Drought & Extreme Heat Hazard Impacts

The *City of Annapolis Weather It Together Committee* held a workshop on February 16, 2017. During the workshop, stakeholders were divided into groups. Participants were provided with hazard descriptions and blank hazard impacts worksheets. Each group was provided time in which to discuss and record hazard impacts from their community perspective. Each group then assigned a group representative to review results with the *Weather It Together Committee* at-large. The following table provides community perspective impacts associated with drought and extreme heat hazard events to the City of Annapolis.

Community Perspective - Drought & Extreme Heat Hazard Impact	
Health & Safety of the Public	• At Risk Populations – Breathing, Asthma • No Air Conditioning • Power Outage • Hospitals Increased Need • Public Housing

Health & Safety of the First Responders	• Breathing
	• Gear Fighting Fires
	• Heat Related Illness:
	  o Heat Cramps
	  o Heat Stroke
	  o Exhaustion
	• Increase rehabilitation during fire fighting activity
	• Increase the number of medical & mass casualties related to heat

Continuity of Operations (including Delivery of Services)	• Outages Impact Availability of Services • Roads buckling – Effects Transportation • Cooling Centers • Government Closed due to potential power outages • Businesses Closed
Property, Facilities, & Infrastructure	• Restrictions on Water Usage • Traffic • Cooling Centers
Environment	• Air Quality • Red Code Alert Days • Loss of Vegetation • Increase Salinity in Bay
Economic Conditions	• Fire Potential • Increased Cost of Energy • Exhaustion
Public Confidence in Government	• Lack of planning that could affect confidence
Source: Weather It Together Committee Members	

2. Drought & Extreme Heat Hazard Profile

Information obtained for both Anne Arundel and City of Annapolis using the National Center for Environmental Information (NCEI) – Storm Events Database between January 1950 and August 31, 2017 for Drought Hazards include: **Drought and Excessive Heat.** Data from NCEI has been included on the tables below.

Drought Hazard – Drought **Anne Arundel County from January 1950 – August 2017**		
12 Drought events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	12	
Number of Days with Event and Death:	0	
Number of Days with Event and Injury:	0	
Number of Days with Event and Property Damage:	0	$0

Number of Days with Event and Crop Damage:	1	$1,670,000.00
Number of Event Types reported:	1	**Drought**
Source: National Center for Environmental Information (NCEI), 2017		

Drought Hazard – Excessive Heat **Anne Arundel County from January 1950 – August 2017**		
5 Excessive Heat events		
Number of County/Zone areas affected:	1	
Number of Days with Event:	5	
Number of Days with Event and Death:	1	
Number of Days with Event and Injury:	1	
Number of Days with Event and Property Damage:	0	
Number of Days with Event and Crop Damage:	0	
Number of Event Types reported:	1	**Excessive Heat**
Source: National Center for Environmental Information (NCEI), 2017		

The Center for Climate and Energy Solutions reported the following information regarding extreme heat and climate change:

> *During the past decade, daily record high temperatures have occurred twice as often as record lows across the continental United States, up from a near 1:1 ratio in 1950. By midcentury, if greenhouse gas emissions are not significantly curtailed, scientists expect 20 record highs for every low. The ratio could be 50:1 by the end of the century. By the 2050's, many of the Mid-Atlantic States including urban parts of Maryland and Delaware could see a doubling of days per year above 95 degrees F.*
>
> *Extreme heat can also increase the risk of other types of disasters. When heat occurs in conjunction with a lack of rain, drought can occur. This, in turn, can encourage more extreme heat, as the sun's energy acts to heat the air and land surface, rather than to evaporate water. Hot dry conditions also increase the risk of wildfires, like the ones in 2013 in Colorado that were fueled by record high heat and an ongoing drought.*

Highlights from the April, 2016 *Maryland Climate and Health Profile* produced by the Maryland Department of Health and Mental Hygiene indicate that the occurrence of summertime extreme heat events more than doubled during the 1980's, 1990's, and 2000 in Maryland compared to the 1960's and 1970's. Modeling indicates that extreme heat events are projected to rise across all counties in Maryland into 2040. Additional highlighted data includes:

- Extreme heat events increased the risk of heart attacks in Maryland by 11%.
- The increase in heart attack related extreme heat events was much higher among non-Hispanic blacks compared to non-Hispanic whites (27% vs. 9%).

Demographic – Race/Ethnicity Hospitalizations for Heart Attack in Maryland		
Characteristic Race/Ethnicity	**Number of Cases**	**Percentage of Cases**
Non-Hispanic White	95,555	69%
Non-Hispanic Black	28,293	20%
Hispanic	1,632	1%
Other Races	5,987	4%
Unreported	7,198	5%
Source: Maryland Climate and Health Profile Report, April 2016		

- Compared to 2010, increases in the frequency of extreme heat events during summer months in 2040 are projected to result in a higher rate of hospitalization for heart attack in Maryland.
- Compared to 2010, increases in the frequency of extreme heat events during summer months in 2040 are projected to result in a higher rate of hospitalization for asthma in Maryland.

3. Drought & Extreme Heat Hazard Risk & Vulnerability

Heat disorders are associated with the Heat Index as shown on the table below.

Heat Index & Heat Disorders	
Heat Index	**Possible Heat Disorders**
130 or Higher	Heatstroke/sunstroke highly likely with continued exposure.
105-130	Sunstroke, heat cramps or heat exhaustion likely and heatstroke possible with prolonged exposure and/or physical activity.
90-105	Sunstroke, heat cramps and heat exhaustion possible with prolonged

	exposure and/or physical activity.
80-90	Fatigue possible with prolonged exposure and/or physical activity.
Source: NOAA, NWS	

Note: Heat index refers to atmospheric as well as inside conditions such as a vehicle or building.

Extreme temperatures for prolonged periods of times may result in heat disorders. The City of Annapolis along with Anne Arundel County offers cooling centers to help citizens during periods of extreme heat. The City of Annapolis routinely opens the cooling centers when the heat index temperatures exceed 105°. Recently, July 13-14, 2017, the City opened the Roger "Pip" Moyer Community Recreation Center, while Anne Arundel County Department of Aging and Disabilities opened cooling centers at various senior centers.

Chapter 10

EARTHQUAKE HAZARD

Earthquake Hazard

An earthquake is ground shaking caused by a sudden movement of rock in the earth's crust. Such movements occur along faults, which are thin zones of crushed rock separating blocks of crust. When one block suddenly slips and moves relative to the other along a fault, the energy released creates vibrations called seismic waves that radiate up through the crust to the earth's surface, causing the ground to shake.

1. Earthquake Hazard Impacts

The *City of Annapolis Weather It Together Committee* held a workshop on February 16, 2017. During the workshop, stakeholders were divided into groups. Participants were provided with hazard descriptions and blank hazard impacts worksheets. Each group was provided time in which to discuss and record hazard impacts from their community perspective. Each group then assigned a group representative to review results with the *Weather It Together Committee* at-large. The following table provides community perspective impacts from earthquake events to the City of Annapolis.

Community Perspective - Earthquake Hazard Impact	
Health & Safety of the Public	• Looting • Body Injury • Evacuation of Vulnerable Population • Risk of Fire
Health & Safety of the First Responders	• Falling Debris • Biohazard • Closed roads & debris may effect response capabilities • Risk of Fire
Continuity of Operations (including Delivery of Services)	• Structural damage to Police/Fire equipment • Transportation network damage (i.e., roads) • Cell Towers/Radio Operations
Property, Facilities, & Infrastructure	• Structural Damage • Cell Phone Infrastructure • Water Treatment Plant Damage
Environment	• Pipe Ruptures/Gas Lines/Water Mains
Economic Conditions	• Cost of rebuilding structures & infrastructure • Looting • Loss of Commercial Industry
Public Confidence in Government	• Communications to Public
Source: Weather It Together Committee Members	

2. Earthquake Hazard Profile

Detailed below is a significant Earthquake event in Annapolis as identified by the Maryland Department of the Environment and the City of Annapolis Department of Planning and Zoning:

- Recently, on August 23, 2011, a 5.8 magnitude earthquake struck Mineral, Virginia, approximately 125 miles SW of the City of Annapolis and was felt throughout the City. Some structures sustained minor damage.
- According to the Maryland Geologic Survey, two historic earthquakes that occurred in the general location of the City of Annapolis included:
    - April 25, 1758, a 3.5 magnitude; and, January 30, 1876, no earthquake magnitude provided.

3. Earthquake Risk & Vulnerability

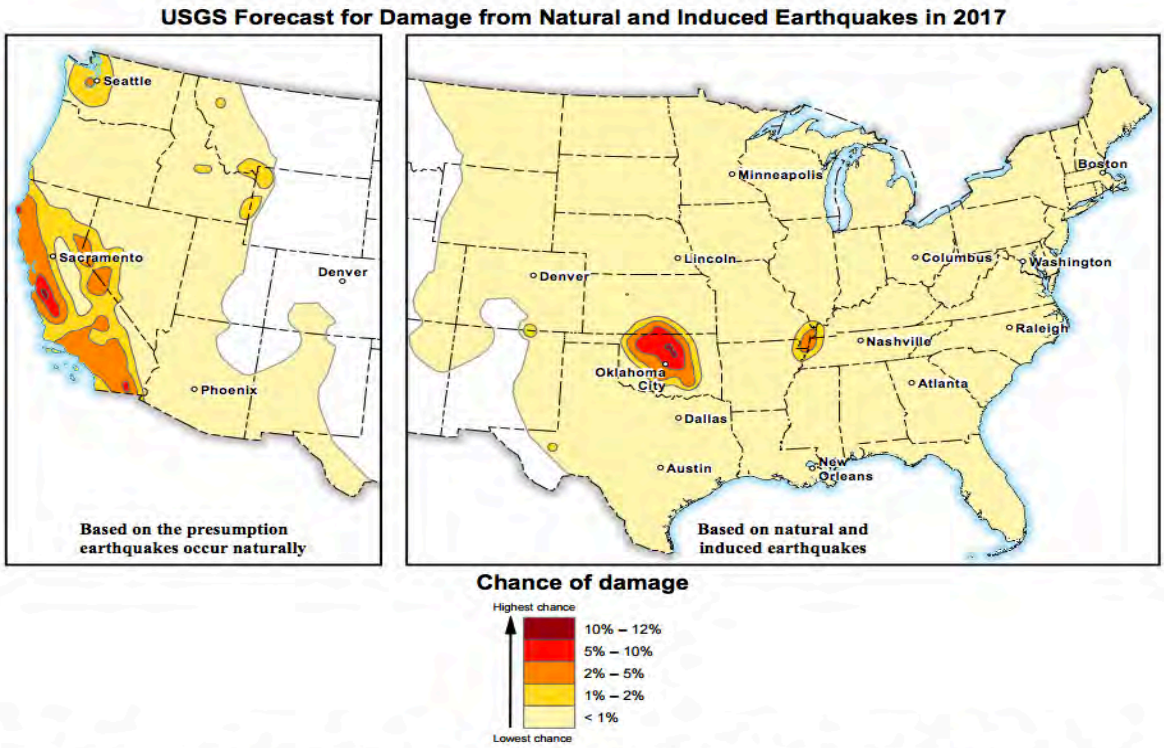
According to the Federal Emergency management Agency (FEMA) seismic hazard levels differ significantly across the United States, both between and within states.

The U.S Geological Survey (USGS) has produced a one-year 2017 seismic hazard forecast for the central and eastern United States from induced and natural earthquakes that updates the 2016 one-year forecast; this map is intended to provide information to the public and to facilitate the development of induced seismicity forecasting models, methods, and data. The 2017 hazard model applies the same methodology and input logic tree as the 2016 forecast, but with an updated earthquake catalog. As shown on the map, page 10-3, the eastern Unites States, Maryland specifically, has less than a 1-percent chance of earthquake damage.

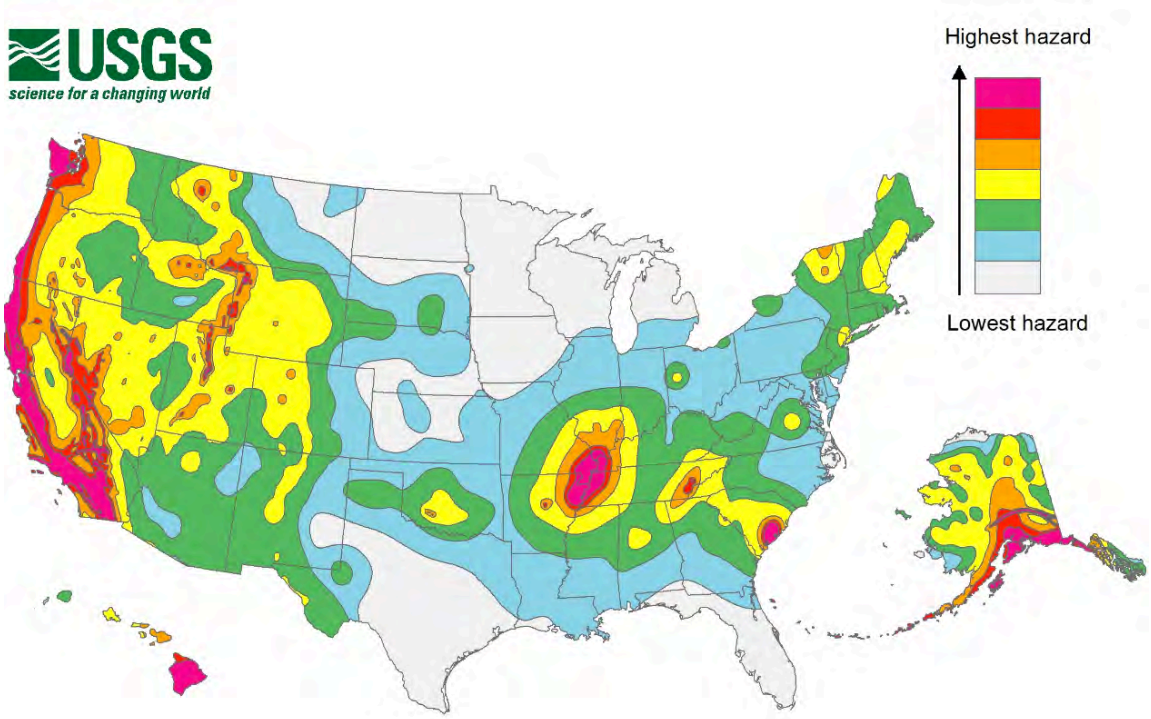
The following excerpt contains USGS Long-Term 2014 Model information, which indicates that the City of Annapolis is within a earthquake low-risk area:

The 2014 U.S. Geological Survey (USGS) National Seismic Hazard Maps display earthquake ground motions for various probability levels across the United States and are applied in seismic provisions of building codes, insurance rate structures, risk assessments, and other public policy. The updated maps represent an assessment of the best available science in earthquake hazards and incorporate new findings on earthquake ground shaking, faults, seismicity, and geodesy. The USGS National Seismic Hazard Mapping Project developed these maps by incorporating information on potential earthquakes and associated ground shaking obtained from interaction in science and engineering workshops involving hundreds of participants, review by several science organizations and State surveys, and advice from expert panels and a Steering Committee. The new probabilistic hazard maps represent an update of the seismic hazard maps; previous versions were developed by Petersen and others (2008) and Frankel and others (2002), using the methodology developed Frankel

and others (1996). Algermissen and Perkins (1976) published the first probabilistic seismic hazard map of the United States which was updated in Algermissen and others (1990).



USGS map displaying potential to experience damage from natural or human-induced earthquakes in 2017. Chances range from less than 1 percent to 12 percent.



According to FEMA E-74 Reducing the Risk of Nonstructural Earthquake Damage –a Practical Guide dated December 2012, due to the low risk of earthquake and minimal to low potential for shaking due to seismic activity, the need for seismic anchorage and bracing of non-structural components is not necessary. However, if located in a low level of shaking area and if the facility is not an essential facility, then only parapets and exterior unreinforced masonry walls should be considered for seismic retrofit.

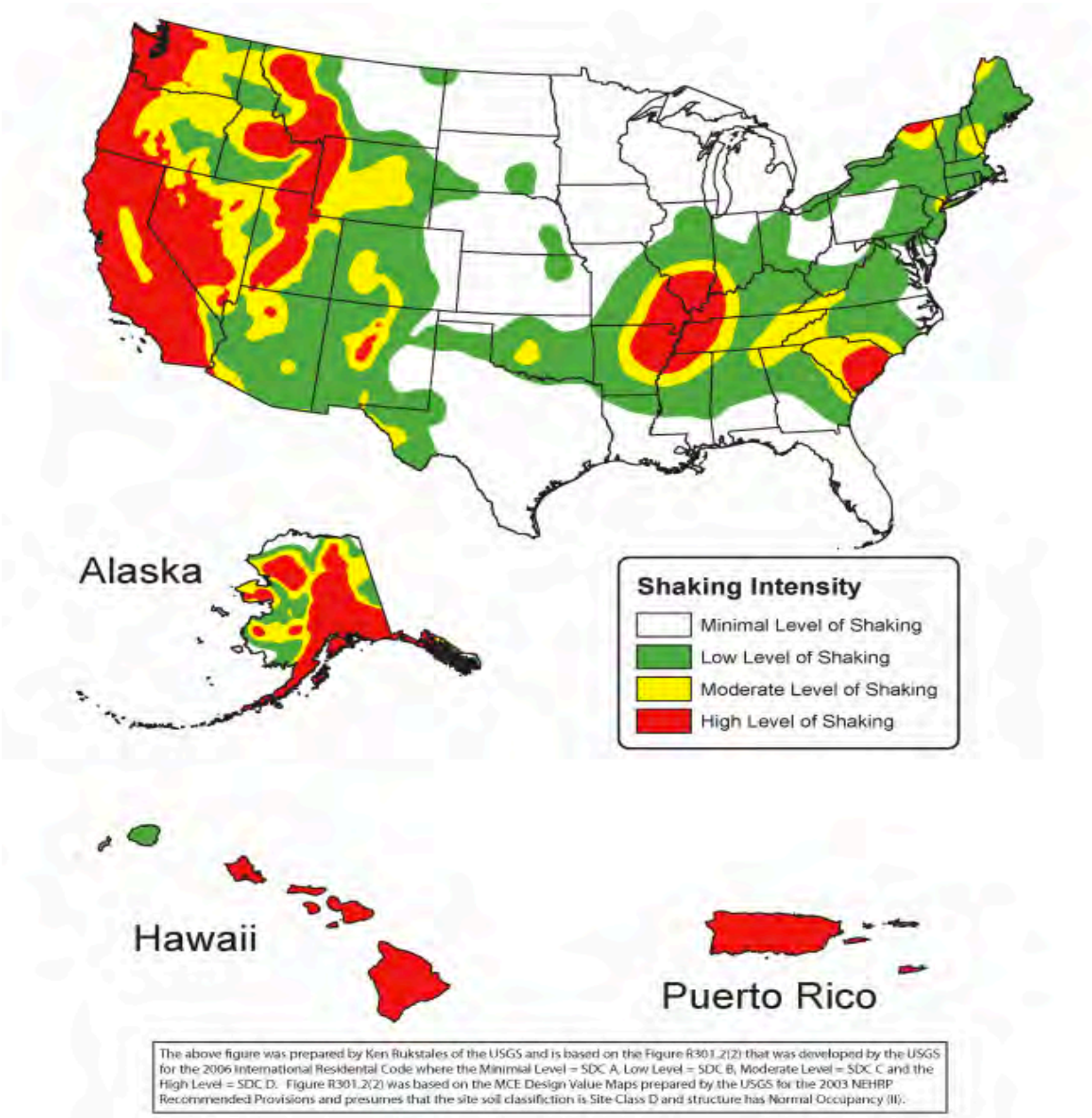


Figure 3.2.1-1 Map of probable shaking intensity in the United States.

Critical facilities within the City of Annapolis include:

Critical Facility Data Compilation			
Facility Category	**Facility Type**	**Total Facilities/Type**	**Total Facilities/Category**
City Owned	Retail	1	19
	Community Center	1	
	Garage	2	
	Historic Places	3	
	Parking Garage	4	
	Office	7	
	Parks and Recreation	1	
Education	Public	8	21
	Private	11	
	College	2	
Emergency	EOC	2	7
	Fire Station	1	
	-- Naval Academy Fire Company #46 – Mutual Aid		
	Fire/EMS Station	3	
	Police Station	1	
Medical	Hospital	1	7
	Urgent Care	3	
	Nursing Home	3	
Utility	Wastewater Pumping Station	24	37
	Water Pumping Station	6	
	Water Tower	5	
	Water Treatment Plant	1	
	Wastewater Treatment Plant	1	
Communications	PSAP: 9-1-1	1	1
TOTALS		**92**	**92**

Source: 2017 Critical Facility Database

According to the FEMA *E-74 Reducing the Risk of Nonstructural Earthquake Damage –a Practical Guide* dated December 2012, essential facilities located in a low-level shaking area may want to consider seismic retrofit.

The first step toward reducing the nonstructural hazards in an existing building is to perform a survey to assess the extent and magnitude of the potential risks. This chapter includes survey guidelines for nonstructural components and describes the inventory form, the checklist, and the risk ratings that are included in the appendices. In order to make informed decisions regarding nonstructural seismic risks, owners and managers will need to address the following questions:

- *What types of nonstructural components are present in a particular facility?*
- *Are these items adequately braced or anchored?*
- *How will a specific nonstructural item perform in an earthquake, and what are the consequences of failure of that item in terms of life safety, property loss, and functional loss?*
- *If the decision is made to upgrade a facility, which problems should be addressed first?*

The focus of this guide is on reducing nonstructural seismic hazards, particularly in those areas where the seismic shaking intensity is expected to be moderate or high and where significant structural hazards do not exist or will be addressed independently. A simplified map of probable shaking intensities is presented in Figure 3.2.1-1. If the expected shaking for the facility in question is minimal, then the survey procedures and seismic protection measures described in this guide might be undertaken on a voluntary basis but may not be necessary, and in most cases they would not be required for new construction.

Following the review of the above referenced technical guides, and information presented herein, the City of Annapolis vulnerability to earthquakes is low. That being said, critical facilities may be examined for proper anchorage and bracing of non-structural components.

SECTION 3- MITIGATION STRATEGIES, PLAN MAINTENANCE, & IMPLEMENTATION

MITIGATION STATUS REPORT

1. Previous Mitigation Actions Identified

Mitigation action items identified in the *2012 City of Annapolis Natural Hazard Mitigation Plan Update*, listed in the table below, were reviewed and discussed. A significant number of mitigation actions identified in the previous versions of the City's hazard mitigations plans focused heavily on preparedness and public outreach activities, many of which are ongoing.

2012 MITIGATION PROJECT STATUS
2012 Mitigation Projects
Project B: Develop a public awareness campaign that will be a long-term initiative providing consistent educational opportunities to advance the community's knowledge and skills. Outreach activities could include the following: • Displays in public buildings or shopping malls • Articles and special sections in newspapers • Radio and TV (public access) news releases and interview shows • Property protection video for cable TV programs or to loan to organizations • Presentations at meetings of neighborhood groups, realtors, bankers, or other special interest groups • Presentations at community association meetings • Training sessions from related organizations, such as the American Red Cross • Website with hyperlinks to other sources of information • Newspaper inserts, tax and utility bill inserts • Classroom curriculum on disaster preparedness and safety
2018 Status: Ongoing This is a core OEM mission and this project will never end.
Project I: Using tools already developed by other governments in the State of Maryland, customize and distribute brochures and other educational materials on summer weather tips – in both English and Spanish. This project carries a medium priority level and will be completed by the Spring of 2013. It will be produced by the Office of Emergency Management and professionally printed at an approximate cost of $1,000.
Project J: Using tools already developed by other governments in the State of Maryland, customize and distribute brochures and other educational materials on flood hazards – in both English and Spanish.
Project P: Using tools already developed by other governments in the State of Maryland, customize and distribute brochures and other educational materials on hurricane preparedness, shelter locations and use, boater safety – in both English and Spanish. This project carries a medium priority level and will be completed by the Spring of 2013. It will be produced by the Office of Emergency Management and professionally printed at an approximate cost of $200.

Project R: Specific to severe thunderstorms has been implemented by using tools already developed by other governments in the State of Maryland. Brochures and other educational materials on severe weather tips have been customized and distributed in both English and Spanish.
2018 Status: Complete Projects I, J, P, and R have been combined by distributing a comprehensive "Emergency Preparedness Guide" in both English and Spanish. It describes how the public should prepare for and respond to a number of hazards including floods, hurricanes, extreme temperatures, and more. This project has been completed, though OEM will continue to provide information to the public in both English and Spanish.
Project Q: Offer training programs to residents and property owners on mitigation measures such as window boarding and flood damage prevention. This project carries a medium priority level and will be completed within two years by staff at the Office of Emergency Management. The cost will be minimal.
2018 Status: Ongoing The Weather It Together team hosted a workshop that discussed property and business planning for flooding events and also included a speaker from the Maryland Insurance Administration. OEM aims to provide more detailed information in this regard in the future.
Project U: Provide public education (on safe driving and driving only if it is required; also stock up on food, water, batteries, and other supplies) to prepare people for the storm. This project carries a medium priority level and will be completed within two years by staff at the Office of Emergency Management. The estimated cost is minimal.
2018 Status: Ongoing OEM regularly presents this information to community groups as a core function and responsibility. Emergency Management will continue to find every opportunity to educate the public on basic preparedness.
Project S: Ensure that residents are forewarned and prepares the City with supplies to face winter storms.
2018 Status: Ongoing Ensuring the public stays informed is another core OEM function. OEM uses the Prepare Me Annapolis app to provide emergency notifications to the public. OEM also engages with media outlets including WNAV radio and the Capital Gazette. Social media is also a critical tool to keep the public aware of potential weather threats.
Project T: Ensure that adequate quantities of salt and sand are stocked to expedite road clearing.
2018 Status: Ongoing OEM works with Public Works and Finance to ensure an adequate supply of salt is in place for the winter season. OEM has also approached the Maryland Emergency Management Agency for support during particularly harsh winter seasons to assure a supply if regular suppliers are out of stock. It is necessary to continue this project every year for winter storm preparedness.

Project V: Protect utilities, including underground pipelines, and avoids other disruptions of utilities that may be impacted and interrupted from exposure to hazards such as hail, icy conditions, high winds, etc.
2018 Status: Ongoing OEM works with Public Works and BGE to mitigate damage to utilities in advance of storms by encouraging the partners to trim trees, use generators, and take additional precautions.
Project W: Ensure that vegetation that lies in close proximity to utilities are examined and trimmed on a regular basis by BGE and, wherever possible, power lines are installed underground.
2018 Status: Ongoing Annapolis participates in BGE's tree maintenance program, which cuts back vegetation and reduces risks to power lines.
Project X: Seek to increase community awareness and introduces the concept of buffers (pruning back overhanging branches from trees) and windbreaks (planting tall trees to reduce wind velocity or low shrubs to trap snow) to protect against winter storms and winds.
2018 Status: Ongoing Emergency Management focuses both on educating the public as to personal safety and property protection relating to winter storms and winds and will continue to do so.

Note: The majority of projects classified as "ongoing" such as, educating the public and providing emergency information, are core functions that will continue.

2. 2012 Public Outreach Mitigation Actions Status

Since the last mitigation plan was completed, the Office of Emergency Management (OEM) has designated a Public Information Officer (PIO) (currently the Deputy Director). The PIO and the Director have both authored articles and appeared on WNAV radio on several occasions to discuss seasonal preparedness as well as major initiatives. OEM has delivered dozens of presentations to civic associations, resident associations, businesses, preparedness expositions, and other groups.

OEM started the Severe Weather Awareness Poster Contest for fourth grade students in 2014. This contest has expanded every year since, attracting hundreds of entries over the years from three area elementary schools. The contest encourages students to illustrate how they and their families prepare for disasters. Winning students earn the privilege of serving as "Emergency Managers for a Day" and go on to make presentations to their classmates. This initiative is a significant outreach success and will hopefully continue for years to come.

Another recent focus of the Office of Emergency Management is to encourage businesses to create business continuity plans. OEM has collaborated with multiple businesses to draft

these plans to prepare for disasters and has helped to train their employees in the plans' implementation.

OEM produced and distributed a severe weather informational flyer in both English and Spanish to community members. In addition, OEM has distributed flood and hurricane preparedness related outreach materials provided by FEMA.

OEM conducts public education as a matter of routine at the start of hurricane season, flooding season, and the winter snow season, as well as before each storm to encourage the public to prepare and details the City of Annapolis readiness actions. The Office of Emergency Management considers public education for storm preparation to be an ongoing outreach responsibility as these outreach efforts could directly save lives.

Training programs for residents on mitigation measures such as floodproofing has been rolled into the **Weather It Together Project** in conjunction with Planning & Zoning. The Weather It Together Team, of which Emergency Management is a core member, have held multiple town hall and community meetings on these and other topics including proper insurance coverage. In fact, on January 17th of 2017, the Weather It Together Team hosted a Business and Residential Meeting, providing an overview of the National Flood Insurance Program and flood related mapping information from the Maryland Department of the Environment.

3. 2012 Mitigation Strategy for Reducing Flood Risk

The City's Department of Neighborhood and Environmental Programs received a study entitled: *Flood Mitigation Strategies for the City of Annapolis, MD: City Dock and Eastport Area.* This detailed study examined the nature and extent of flooding in Annapolis and accounted for future projected impacts. It included an analysis of several mitigation strategies and the benefits and cost of each. As part of the implementation of the study, the replacement of 700 linear feet of steel sheet pile bulkhead surrounding a portion of the area known as "Ego Alley" was completed in April of 2016. Additional implementation items from the study have been included within Chapter 12: New Mitigation Goals, Objectives, and Actions.

The U.S. Army Corp of Engineers completed an inventory and survey of the entire downtown Annapolis stormwater system in 2016. The inventory included documentation of inlet grate and manhole elevations, pipe inverts, pipe sizes, and materials. Additional implementation items from the inventory have been included within Chapter 12: New Mitigation Goals, Objectives, and Actions.

NEW MITIGATION GOALS, OBJECTIVES, & PROJECTS

1. Introduction

The goals and objectives presented herein help to guide the City of Annapolis in identifying and selecting mitigation actions strategies to address hazard vulnerabilities. The actions address the vulnerabilities discussed in Section 2 by identifying measures that will help the City avoid, prevent, or otherwise reduce damages and downtime resulting from hazards.

While the hazard identification, risk and vulnerability assessments presented in Section 2 of the plan document identified potential hazards, the affected areas, and facilities in the City vulnerable to them, Section 3 identifies strategies and specific actions that address these vulnerabilities and reduce the risk from natural hazards.

2. Goals and Objectives

Goal	Goals are general guidelines that explain what you want to achieve. They are usually broad policy-type statements, long-term and represent global visions.
Objective	Objectives define strategies or implementation steps to attain the identified goals. Unlike goals, they are specific and measurable.
Projects & Actions	Are the specific steps (projects, policies, and programs) that advance a given objective. They are highly focused, specific, and measurable.

The goals and objectives from previous plan iterations published in 2005, 2007 and in 2012 were reviewed by stakeholders, who then revised the goals and objectives as necessary and created additional goals and objectives for inclusion in the 2017 Plan. These goals and objectives represent the City's vision for reducing damages caused by flooding and other natural hazards and creating community resilience.

An overarching goal in both this plan document and the Weather It Together Cultural Resources Hazard Mitigation effort:

Public and property owners in Annapolis will incorporate hazard mitigation improvements into their routine maintenance, repair and rehabilitation projects to protect cultural resources from tidal flooding, sea level rise and other natural disasters.

Goals and objectives have been categorized into **six broad categories**.

Prevention. Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.

Prevention Goal #1: Implement and enforce floodplain management ordinance.

Objectives:

a. Encourage the utilization of appropriate construction practices in order to prevent or minimize flood damage in the future;
b. Minimize flooding of water supply and sanitary sewage disposal systems;
c. Maintain natural drainage;
d. Reduce financial burdens imposed on the community, its governmental units and its residents, by discouraging unwise design and construction of development in areas subject to flooding;
e. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;
f. Minimize prolonged business interruptions;
g. Minimize damage to public facilities and other utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges;
h. Reinforce that those who build in and occupy special flood hazard areas should assume responsibility for their actions;
i. Minimize the impact of development on adjacent properties within and near flood-prone areas;
j. Provide that the flood storage and conveyance functions of floodplains are maintained;
k. Minimize the impact of development on the natural and beneficial functions of floodplains;
l. Prevent floodplain uses that are either hazardous or environmentally incompatible; and
m. Meet community participation requirements of the National Flood Insurance Program as set forth in the Code of Federal Regulations (CFR) at 44 Section 59.22.

Prevention Goal #2: Integrate hazard mitigation planning, recommendations, and mitigation strategies into other City planning tools and documents.

Objective;

a. Review Safe Growth Audit plan integration recommendations for implementation.
    - **Recommendation #1:** Integrate the new 2017 Hazard Mitigation Plan into existing City plans, policies, codes, and programs that guide development.
    - **Recommendation #2:** Review 2009 City of Annapolis Comprehensive Plan, Chapter 4 – Transportation, and discuss if the transportation plan limits access to hazards areas.
    - **Recommendation #3:** In reviewing the excerpt below from the 2009 City of Annapolis Comprehensive Plan, Chapter 7 – Environment, it may prove helpful to review and identify specific potential protection and opportunity areas. Identify and display on maps:
        i. Steep slopes that are located near water bodies;
        ii. Open space contiguous to existing natural areas for the establishment of potential wildlife corridors.
        iii. Review open space and conservation easements for connectivity.

Property Protection. Actions that involve the modification of existing critical and public facilities, buildings, structures, and public infrastructure to protect them from hazards. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and infrastructure modification.

Property Protection Goal #1: Ensure public funds are used in the most efficient and cost-effective manner.

Objectives:

a. Prioritize new mitigation projects, starting with sites facing the greatest threat to life, health and property.
b. Use public funds to protect public services and critical facilities.

Property Protection Goal #2: Encourage property-owner self-protection and mitigation measures.

Objective:

a. Assist property owners with hazard mitigation grant programs specific to property protection where benefits exceed cost.

Property Protection Goal #3: Protect infrastructure and facilities.

Objectives:

a. Upgrade and/or replace public infrastructure including roads and stormwater management facilities to include mitigation into the project design and construction.
b. Improve roadways used in flood hazard events to mitigate life-threatening road conditions.

Public Education and Awareness. Undertake actions to inform and educate citizens, elected officials, and property owners about potential ways to mitigate for hazards that can occur in the City. Such actions include outreach programs, projects, real estate disclosure, hazard information centers, and school-age and adult education programs.

Public Education and Awareness Goal #1: Create awareness among residents and businesses of potential hazards and how can protect themselves and their property from Hazard impacts.

Objectives:

a. Publicize and encourage the use of appropriate hazard mitigation best practices.
b. Increase the proportion of businesses and residences that carry flood insurance.
c. Encourage and maximize public-private mitigation outreach initiatives.

Natural Resource Protection. Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural protection systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration preservation.

Natural Resource Protection Goal #1: Protect and restore environmentally sensitive areas and other natural resources within the City.

Objective:

a. Protect open space contiguous to existing natural areas, including waterways, to establish and protect natural vegetative buffers, floodplain, wetland, and wildlife corridors.

Natural Resource Protection Goal #2: Protect the Chesapeake Bay tributaries surrounding the City of Annapolis to the maximum extent practicable.

Objective:

a. Establish open space and recreation areas in flood hazard areas.

Emergency Services & Emergency Management Activities. Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems and emergency response services.

Emergency Services & Emergency Management Activities Goal #1: Provide assistance to City departments to ensure the continued operation and continuity of emergency services and government.

Emergency Services & Emergency Management Activities Goal #2: Improve coordination and communications with other departments, agencies, and organizations.

Objectives:

a. Establish and maintain lasting partnerships.
b. Streamline policies to eliminate conflicts and duplication of efforts.
c. Incorporate hazard mitigation into activities of other organizations.

Structural Projects. Actions that involve the construction of structures to reduce the impact of a hazard event. Such structures include dams, levees, floodwalls, seawalls, retaining walls, barrier islands, and safe rooms.

Structural Projects Goal #1: Protect existing community assets, including critical facilities, from damages and impacts caused by natural hazards.

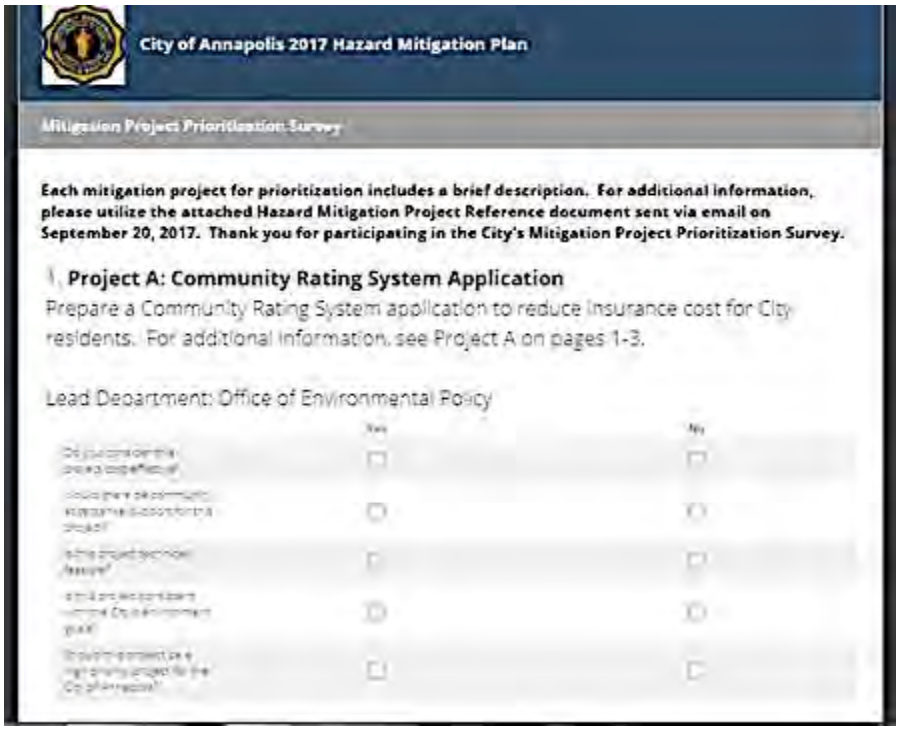
Objective:

a. Undertake cost-effective measures to repair, replace, or install flood control structures.

3. Projects and Actions

Eleven total mitigation projects were identified during the plan development process. These projects are robust and represent stakeholder engagement throughout the planning process as well as the goals and objectives of the plan. In order to prioritize the projects, a survey was developed and distributed to forty-seven individuals. The survey contained the same five questions for each project and was limited to yes/no answers, along with a comment section for use by respondents. The five questions included:

1. *Do you consider this project cost effective?*
2. *Would there be community acceptance/support for this project?*
3. *Is this project technically feasible?*
4. *Is this project consistent with the City's environmental goals?*
5. *Should this project be a "High" priority project for the City of Annapolis?*


City of Annapolis 2017 Hazard Mitigation Plan

Mitigation Project Prioritization Survey

Each mitigation project for prioritization includes a brief description. For additional information, please utilize the attached Hazard Mitigation Project Reference document sent via email on September 20, 2017. Thank you for participating in the City's Mitigation Project Prioritization Survey.

Project A: Community Rating System Application

Prepare a Community Rating System application to reduce insurance cost for City residents. For additional information, see Project A on pages 1-3.

Lead Department: Office of Environmental Policy

Survey results yielded six "High" priority projects. Project sheets detailing the project, associated goals, responsible entity(s), estimated cost, and potential grant funding sources are included within this plan chapter.

Project	Project Title	Descriptions	Priority Ranking
A	Community Rating System Application	Prevention Prepare a CRS application to reduce insurance cost for City residents.	HIGH
B	Annapolis Flood Mitigation – Drainage Improvements	Structural Project Complete $11.5 million in drainage improvements, which will have benefits exceeding $200 million.	HIGH
C	Repetitive Loss Properties Flood Mitigation	Property Protection Consider and identify mitigation strategies for repetitive loss properties, including but not limited to acquisition, reconstruction, relocation, and/or elevation.	LOW
D	Repetitive Loss Public Outreach	Public Education & Awareness Target the 126 properties located within the FEMA Special Flood Hazard Areas for flood mitigation outreach.	HIGH
E	Flood Mitigation Measures for Critical Facilities	Property Protection Consider and identify mitigation strategies for Critical Facilities, including but not limited to acquisition, reconstruction, relocation, and/or elevation.	MEDIUM
F	Safe Growth Audit Recommendations	Prevention Integrate Safe Growth Audit findings and recommendation into plans, policies, codes, and programs.	HIGH
G	Flood Mitigation Assistance Plan	Prevention Develop a FEMA – approved and adopted Flood Mitigation Plan that complies with the requirements of 44 CFR Part 78.	HIGH

Project	Project Title	Descriptions	Priority Ranking
H	Conservation Easement	Natural Resource Project Work with landowner and the Conservancy Board to place property located at 520 4th Street under a conservation easement.	LOW
I	City Dock Commercial Property Outreach	Public Education & Awareness Continue to engage and share information with project partners, specifically the thirty-eight property owners in and around City Dock.	**HIGH**
J	Winter Storm Hazard-Critical Facility Technical Assessments	Structural Project Assess the eight (8) critical facilities for current snow load capacity and structural integrity. These facilities are aging structures, built in or prior to 1967 and all having flat roofs.	MEDIUM
K	Hazard Mitigation & Preparedness All-Hazards Outreach	Public Education & Awareness Create a hazard mitigation and preparedness committee to develop new outreach strategies and campaigns.	MEDIUM

PROJECT A: Community Rating System Application

Action items are directly related to the Community Rating System and may be implemented separately or concurrently as discussed in the following project.

Hazard: Flood
Project A: Actions
Action #1: Work with MDE to complete CRS (Community Rating System) application process. The CRS rating reduces the cost of flood insurance for all county residents.
Action #2: Develop and administer outreach programs to identified business organizations that should prepare for flood events.
Action #3: Target residents with literature on flood related issues and protection measures. According to FEMA, April 30, 2017, NFIP flood insurance policies in effect with the City of Annapolis total 401, however 126 structures are located in the SFHA (high risk area), while all other structures are located within the FEMA X zones (shaded and unshaded) moderate and minimal flood risk.

DISCUSSION: The Community Rating System (CRS) can be an important part of any town, city, or entire County with floodplains. According to FEMA, the CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum National Flood Insurance Program (NFIP) requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS:

- Reduce flood losses;
- Facilitate accurate insurance rating; and
- Promote the awareness of flood insurance

Responsible Organizations: City of Annapolis Office of Environmental Policy

Estimated Costs: Staff Time

Possible Funding Sources: MDE Technical Assistance; CoastSmart Communities Grant

Timeline for Implementation: 2019

For CRS participating communities, flood insurance premium rates are discounted in increments of five percent. For example, a Class 1 community would receive a forty-five percent premium discount; while a Class 9 would receive a five percent discount (a Class 10 is not participating in the CRS and does not receive discounts). The CRS classes for local communities are based on 18 creditable activities, organized under four categories:

- Public Information
- Mapping and Regulations
- Flood Damage Reduction
- Flood Preparedness

PROJECT: Prepare a CRS application to reduce insurance costs for city residents. Currently, the City of Annapolis is rated as a "10" CRS community, meaning that the city is compliant with the NFIP, however the city does not qualify for flood insurance discounts. As of April 30, 2017, there are 404 NFIP policyholders in the county with $463,831 being paid in insurance premiums. On average, city policyholders pay $1,156.69 per year in flood insurance. By participating in the CRS, policyholders could potentially save between $57.83 (5%) to $520.51 (45%) per year. The 2017 Community Rating System (CRS) Coordinator's Manual details activities and elements for CRS credit. The following table was taken from this guide and depicts the point system for activities.

NFIP/CRS

Master List of Community Rating System (CRS) Activities and Elements

300 Series: Public Information Activities			Max	Page
310 (Elevation Certificates)				
a	EC	Elevation Certificates after CRS application	38	310-12
b	ECPO	Elevation Certificate on post-FIRM buildings	48	310-13
c	ECPR	Elevation Certificate on pre-FIRM buildings	30	310-15
320 (Map Information Service)				
a	MI1	Providing insurance information from FIRM	30	320-8
b	MI2	LiMWA/floodway info/CBRS area	20	320-10
c	MI3	Other flood problems not shown on FIRM	20	320-11
d	MI4	Flood depth data	20	320-11
e	MI5	Special flood-related hazards	20	320-13
f	MI6	Historical/repetitive flood information	20	320-14
g	MI7	Natural floodplain functions	20	320-15
330 (Outreach Projects)				
a	OP	Outreach projects	200	330-6
b	FRP	Flood response preparations	50	330-9
c	PPI	Program for Public Information bonus	N/A	330-14
d	STK	Stakeholder bonus	50	330-20
340 (Hazard Disclosure)				
a	DFH	Real estate agent disclosure of SFHA	35	340-3
b	ODR	Other disclosure requirements	25	340-5
c	REB	Real estate brochure	12	340-7
d	DOH	Disclosure of other hazards	8	340-10
350 (Flood Protection Information)				
a	LIB	Library	10	350-3
b	LPD	Locally pertinent documents in the library	10	350-5
c	WEB	Website	105	350-7
360 (Flood Protection Assistance)				
a	PPA	Property protection advice	40	360-4
b	PPV	Advice after a site visit	45	360-6
c	FAA	Financial assistance advice	15	360-7
d	TNG	Training	10	360-10
370 (Flood Insurance Promotion)				
a	FIA	Flood insurance assessment	15	370-3
b	CP	Coverage plan	15	370-6
c	CPI	Plan implementation	60	370-9
d	TA	Technical assistance	20	370-12

400 Series: Mapping and Regulations			Max
410 (Floodplain Mapping)			
a	NS	New study	350
b	LEV	Leverage	N/A
c	SR	State review	60
d	HSS	Higher study standards	200
e	FWS	Floodway standard	140
f	MAPSH	Special hazards mapping	100
420 (Open Space Preservation)			
a	OSP	Preserved open space	1,450
b	DR	Deed restriction	50
c	NFOS	Natural functions open space	350
d	SHOS	Special hazards open space	150
e	CEOS	Coastal erosion open space	750
f	OSI	Open space incentives	250
g	LZ	Low density zoning	600
h	NSP	Natural shoreline protection	120
430 (Higher Regulatory Standards)			
a	DL	Development limitations	1,330
b	FRB	Freeboard	500
c	FDN	Foundation protection	80
d	CSI	Cumulative substantial improvements	90
e	LSI	Lower substantial improvements	20
f	PCF	Protection of critical facilities	80
g	ENL	Enclosure limits	240
h	BC	Building code	100
i	LDP	Local drainage protection	120
j	MHP	Manufactured home park	15
k	CAZ	Coastal A Zone regulations	500
l	SHR	Special hazards regulations	100
m	TSR	Tsunami hazard regulations	50
n	CER	Coastal erosion regulations	370
o	OHS	Other higher standards	100
p	SMS	State-mandated standards	20
q	RA	Regulations administration	67

NFIP/CRS

Master List of Community Rating System (CRS) Activities and Elements

400 Series: Mapping and Regulations			Max	Page
440 (Flood Data Maintenance)				
a	AMD	Additional map data	160	440-3
b	FM	FIRM maintenance	15	440-8
c	BMM	Benchmark maintenance	27	440-9
d	EDM	Erosion data maintenance	20	440-13
450 (Stormwater Management)				
a	SMR	Stormwater management regulations	380	450-4
b	WMP	Watershed master plan	315	450-14
c	ESC	Erosion and sedimentation control	40	450-19
d	WQ	Water quality regulations	20	450-20
500 Series: Flood Damage Reduction Activities				
510 (Floodplain Management Planning)				
a	FPM	Floodplain management planning	382	510-4
b	RLAA	Repetitive loss area analysis	140	510-29
c	NFP	Natural floodplain functions plan	100	510-35
520 (Acquisition and Relocation)				
	All	All Acquisition and relocation of buildings	2,250	520-4
530 (Flood Protection)				
	PB(R)	Retrofitted buildings	1,600	530-2
	PB(S)	Structural flood control & drainage projects	1,000	530-2
540 (Drainage System Maintenance)				
a	CDR	Channel debris removal	200	540-5
b	PSM	Problem site maintenance	50	540-11
c	CIP	Capital improvements program	70	540-13
d	SDR	Stream dumping regulations	30	540-16
e	SBM	Storage basin maintenance	120	540-18

600 Series: Warning and Response			Max
610 (Flood Warning and Response)			
a	FTR	Flood threat recognition system	75
b	EWD	Emergency warning dissemination	75
c	FRO	Flood response operations plan	115
d	CFP	Critical facilities planning	75
e	SRC	StormReady community	25
f	TRC	TsunamiReady community	30
620 (Levees)			
a	LM	Levee maintenance	95
b	LFR	Levee failure threat recognition	30
c	LFW	Levee failure warning	50
d	LFO	Levee failure response operations	30
e	LCF	Levee failure critical facilities	30
630 (Dams)			
a	SDS	State dam safety program	45
b	DFR	Dam failure threat recognition	30
c	DFW	Dam failure warning	35
d	DFO	Dam failure response operations	30
e	DCF	Dam failure critical facilities	20

PROJECT B: Annapolis Flood Mitigation-Drainage Improvements

Action items are directly related to the Annapolis Flood Mitigation Project and may be implemented separately or concurrently as discussed in the following project.

Hazards: Coastal Hazard & Flood
Project B: Actions
Action #1: Complete and submit proposal for grant funding.
Action #2: Generate a broad base of community support for the project, specifically targeting those locations, which would benefit the most from the project.
Action #3: Begin the "next steps" as listed in this profile, focusing first on any items necessary for funding.

DISCUSSION: The Annapolis Flood Mitigation Project seeks to mitigate damages to repeatedly flooded commercial properties via drainage improvements. There are 44 recorded events from 2005-2015 (~4.4 events per year) where MLLW (mean lower low water) was 3 feet or greater. In some cases, multiple flood events occurred within the same year, but were added and entered as one single event. Roughly 39 commercial buildings would benefit from drainage improvements along several streets, including:

- Compromise Street;
- Craig Street;
- Dock Street;
- Main Street;
- Market Space;
- Newman Street; and
- Prince George Street.

The Annapolis Market House, at 25 Market Space, is prone to nuisance flooding and is just one of the buildings that would benefit from drainage improvements.

PROJECT: The drainage improvements are expected to cost just over $11.5 million to implement and have benefits exceeding $200 million. Therefore, the mitigation benefits would outweigh the project costs by 1,739%. To further break down the costs, each building would cost $295,761 to mitigate and would provide varying amounts of

Responsible Organizations: City of Annapolis Public Works

Estimated Costs: $11,534,679

Estimated Benefits: $203,881,502

Possible Funding Sources: Unified Hazard Mitigation Grant Program; FEMA Flood Mitigation Assistance Program

Timeline for Implementation: Within 2 years of funding obtainment

value from said mitigation depending upon the building.

The latest concept design states the project could have a 50-year life, while the useful life of the pumps and some engineering components is 30 years. However, the rate of sea level rise could affect the life of this project. It is expected that after the mitigation project is completed, there should be no OEM or Police operations needed or severe nuisance flooding for any event below 3.9 feet MLLW.

Next Steps (some steps may be done concurrently):

1. Move from concept to final design;
2. Creation of design specification package;
3. Start/complete applicable forms, permits, and licenses and;
4. Execute project.

PROJECT C: Repetitive Loss Properties Flood Mitigation

The action item is directly related to the Repetitive Loss Properties (RLP) and may be implemented separately or concurrently as discussed in the following project.

Hazard: Flood
Project C: Action
Action #1: Mitigate the five (5) repetitive loss properties located within the City.

DISCUSSION: Identifying areas of repetitive loss within a community is a good indicator to use in determining areas of high flood damage vulnerability. While flood damage is not necessarily limited to these areas, repetitive loss data provides location indicators for areas where structures are experiencing recurring and costly flooding damage.

FEMA defines a Repetitive Loss Property (RLP) as:

- A property for which two or more claims of more than $1,000 have been paid by the NFIP within a ten-year period since 1978.

FEMA defines a Severe Repetitive Loss Property (SRL) as:

- A property that has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or
- A property for which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

Responsible Organizations: City of Annapolis Planning & Zoning; City of Annapolis Office of Emergency Management; Maryland Emergency Management Agency (MEMA); Maryland Department of Environment (MDE); Federal Emergency Management Agency (FEMA)

Estimated Costs: Median Price of Similar Properties in the City plus $10,000-20,000 for additional costs

Possible Funding Sources: FEMA Hazard Mitigation Grant Program (HMPG); FEMA Pre-Disaster Mitigation Grant Program (PDM): FEMA Increased Cost of Compliance Coverage (ICC); Small Business Administration Pre-Disaster Mitigation Loan Program

Timeline for Implementation: 1-3 years

There are currently five (5) repetitive loss properties identified within the City of Annapolis. The RL properties are located within Ward 1 (three (3) properties) and Ward 8 (two (2) properties). These properties consist of two (2) marinas, one (1) social club, one (1) shopping center, and one (1) apartment building. Three (3) repetitive loss properties are within the Historic District of Annapolis (Appendix B: NFIP & CRS).

PROJECT: Consider the acquisition, reconstruction, relocation, and/or elevation of the most vulnerable flood-prone properties within the City, including but not limited to repetitive loss properties. These strategies would eliminate or reduce the damage to property and the disruption of life caused by repeated flooding of the same properties.

Depending on the severity of flooding at each location, another possibility is to mitigate the structure so it is well above the base flood elevation. Additional reconstruction mitigation strategies to minimize or eliminate property damage before a flood event occurs include: grading the property, elevating and securing electrical appliances, placing all low lying electrical fixtures on separate electrical circuits, and using flood resistant materials on exterior surfaces.

Acquiring buildings and removing them from the floodplain is not only the most effective flood protection measure available, it is also a way to convert a problem area into a community asset and obtain environmental benefits. The acquisition process would include: contacting the property owner and determining the willingness to sell, obtaining property assessment information, and eventually applying for funding. Once property is acquired, the City should ensure the removal of all structures located on the property and remains as open space in perpetuity.

PROJECT D: Repetitive Loss Public Outreach

Hazard: Flood
Project D: Action
Action #1: Implement an annual outreach project to the properties in the mapped repetitive loss areas that have insurable buildings.

DISCUSSION: According to the 2017 CRS Coordinator's Manual, in order to receive CRS credit for Activity 504, a Category B community must implement an annual outreach project to the properties in the mapped repetitive loss areas that have insurable buildings, and include a copy of the project with its application and annual recertification.

Responsible Organizations: City of Annapolis Planning & Zoning; City of Annapolis Office of Emergency Management; City of Annapolis Office of Environmental Policy

Estimated Costs: Staff Time

Possible Funding Sources: FEMA Hazard Mitigation Grant Program (HMPG); FEMA Pre-Disaster Mitigation Grant Program (PDM)

Timeline for Implementation: Ongoing

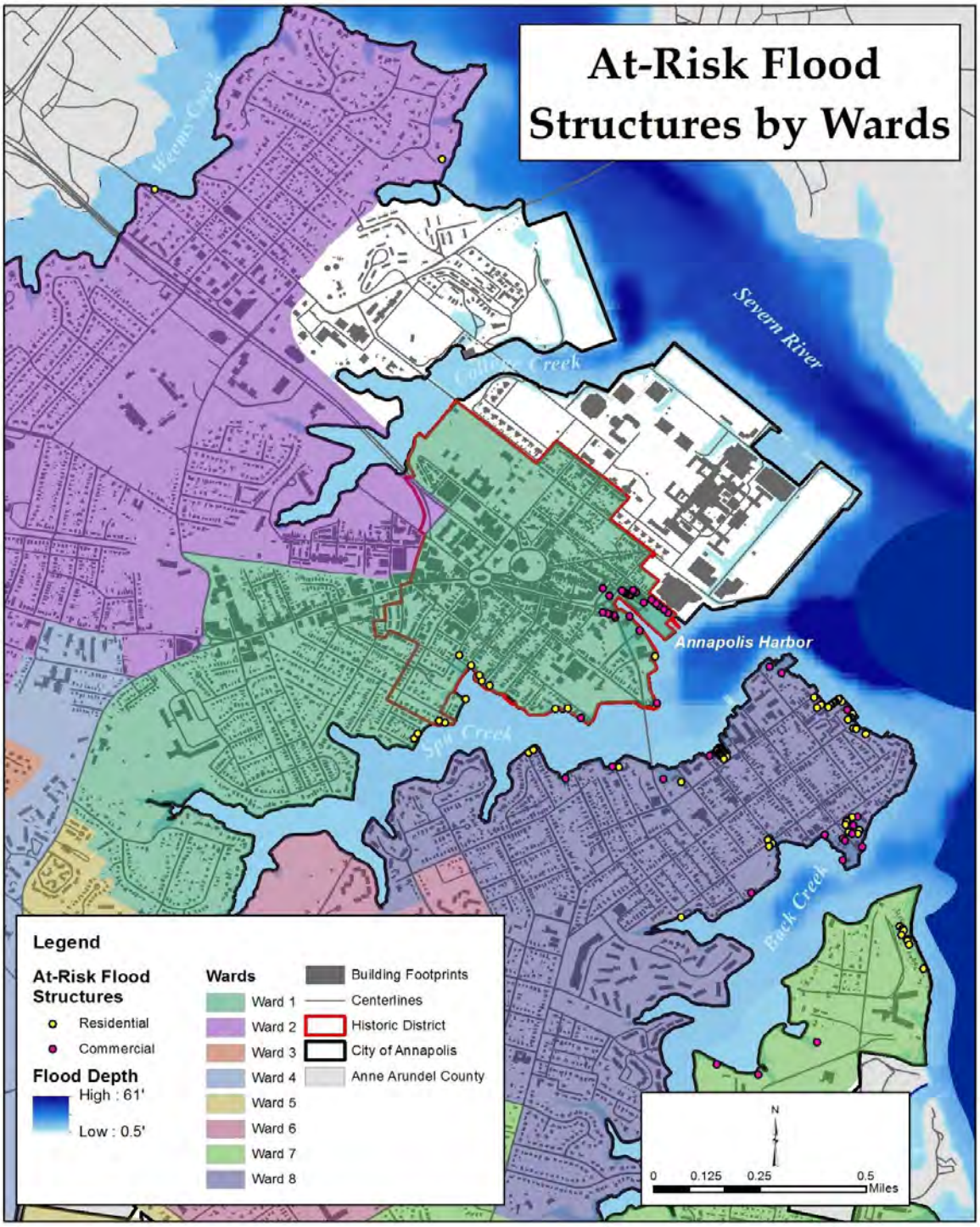
The outreach project must advise the recipient of four things:

1. That the property is in or near an area subject to flooding;
2. What property protection measures are appropriate for the flood situation;
3. What sources of financial assistance may be available for property protection measures; and,
4. Basic facts about flood insurance.

The outreach project must be delivered to all properties near repetitive loss areas, not just the properties on the FEMA list. This may be done in one of two ways:

1. An outreach project that is distributed each year to the properties in the repetitive loss areas that have insurable buildings. This project may also be submitted for credit as a targeted outreach project under Activity 330.
2. An annual outreach project developed as part of a Program for Public Information (PPI) credited under Activity 330. The PPI Committee may conclude that there are more effective ways to inform repetitive loss area residents than mailing a notice once a year. The PPI may use a different approach, such as neighborhood meetings, provided the PPI document identifies the priority audience for the service and discusses the best way to reach that audience. For continued PPI credit, the committee must annually evaluate the effectiveness of the outreach projects and revise them as needed.

This outreach project could be targeted at the 126 properties located within the Federal Emergency Management Agency (FEMA) Special Flood Hazard Areas, Flood Zones AE and VE. The following map depicts the location and structure types (residential or commercial) of the 126 properties.



The following table provides the address, city and flood depth for each of the at-risk structures depicted above.

At-Risk Flood Structures		
Address	**City**	**Flood Depth**
[redacted]	Eastport	1.1
[redacted]	Eastport	1.3
[redacted]	Eastport	1.6
[redacted]	Eastport	1.3
[redacted]	Eastport	1.7
[redacted]	Eastport	6.8
[redacted]	Eastport	5.3
[redacted]	Eastport	1.6
[redacted]	Eastport	0.5
[redacted]	Eastport	1.6
[redacted]	Annapolis	1.3
[redacted]	Eastport	1.6
[redacted]	Eastport	1.2
[redacted]	Eastport	1.4
[redacted]	Eastport	1.3
[redacted]	Eastport	0.9
[redacted]	Eastport	1.1
[redacted]	Eastport	0.5
[redacted]	Eastport	1.5
[redacted]	Eastport	2.1
[redacted]	Eastport	3.0
[redacted]	Eastport	3.0
[redacted]	Eastport	2.6
[redacted]	Eastport	2.9
[redacted]	Eastport	1.5
[redacted]	Annapolis	2.0
[redacted]	Eastport	2.9
[redacted]	Eastport	3.3
[redacted]	Eastport	3.3
[redacted]	Eastport	1.8
[redacted]	Eastport	1.6
[redacted]	Eastport	0.5
[redacted]	Eastport	3.4
[redacted]	Eastport	3.6
[redacted]	Eastport	3.0
[redacted]	Eastport	3.3
[redacted]	Eastport	2.6
[redacted]	Eastport	2.8
[redacted]	Eastport	2.6
[redacted]	Eastport	3.5

[redacted]	Eastport	2.6
[redacted]	Eastport	1.8
[redacted]	Eastport	1.4
[redacted]	Eastport	1.1
[redacted]	Eastport	0.5
[redacted]	Eastport	2.1
[redacted]	Annapolis	2.8
[redacted]	Annapolis	6.0
[redacted]	Annapolis	3.8
[redacted]	Annapolis	2.7
[redacted]	Annapolis	2.0
[redacted]	Annapolis	3.1
[redacted]	Annapolis	1.8
[redacted]	Annapolis	1.8
[redacted]	Annapolis	2.2
[redacted]	Annapolis	2.7
[redacted]	Annapolis	2.3
[redacted]	Annapolis	2.0
[redacted]	Annapolis	2.1
[redacted]	Annapolis	1.4
[redacted]	Annapolis	1.6
[redacted]	Eastport	0.8
[redacted]	Eastport	0.5
[redacted]	Eastport	1.0
[redacted]	Eastport	1.0
[redacted]	Eastport	1.0
[redacted]	Eastport	2.1
[redacted]	Annapolis	3.1
[redacted]	Eastport	1.4
[redacted]	Eastport	2.8
[redacted]	Eastport	2.1
[redacted]	Eastport	1.8
[redacted]	Eastport	2.0
[redacted]	Annapolis	1.7
[redacted]	Annapolis	1.9
[redacted]	Annapolis	1.5
[redacted]	Annapolis	0.7
[redacted]	Annapolis	0.5
[redacted]	Annapolis	1.6
[redacted]	Annapolis	3.7
[redacted]	Annapolis	2.9
[redacted]	Annapolis	2.4
[redacted]	Annapolis	1.8
[redacted]	Annapolis	2.7

[redacted]	Annapolis	1.8
[redacted]	Annapolis	1.0
[redacted]	Annapolis	0.7
[redacted]	Annapolis	5.1
[redacted]	Eastport	3.1
[redacted]	Eastport	3.1
[redacted]	Eastport	2.7
[redacted]	EASTPORT	0.5 – 4.0
[redacted]	Eastport	0.5
[redacted]	Annapolis	3.5
[redacted]	Annapolis	1.8
[redacted]	Annapolis	2.8
[redacted]	Annapolis	2.2
[redacted]	Annapolis	1.5
[redacted]	Annapolis	6.0
[redacted]	Annapolis	3.9
[redacted]	Eastport	0.7
Street Numbers Were Not Provided for The Following in Maryland Property View.		
[redacted]	Eastport	2.0
[redacted]	Annapolis	5.7
[redacted]	Annapolis	1.2
[redacted]	Eastport	1.7
[redacted]	Annapolis	1.0
[redacted]	Annapolis	2.8
[redacted]	Annapolis	1.6
[redacted]	Annapolis	3.3
[redacted]	Annapolis	2.8
[redacted]	Annapolis	2.5

An example of the outreach project is as follows:

Dear Resident:

You have received this letter because your property is in an area that has been flooded several times. Our community is concerned about repetitive flooding and has an active program to help you protect yourself and your property from future flooding, but here are some things you can do:

1. *Check with the Building Department on the extent of past flooding in your area. Department staff can tell you about the causes of repetitive flooding, what the City is doing about it, and what would be an appropriate flood protection level. The staff can visit your property to discuss flood protection alternatives.*

2. *Prepare for flooding by doing the following:*
   - *Know how to shut off the electricity and gas to your house when a flood comes.*
   - *Make a list of emergency numbers and identify a safe place to go.*
   - *Make a household inventory, especially of basement contents.*
   - *Put insurance policies, valuable papers, medicine, etc., in a safe place.*
   - *Collect and put cleaning supplies, camera, waterproof boots, etc., in a handy place.*
   - *Develop a disaster response plan. See the Red Cross' website at www.redcross.org for information about preparing your home and family for a disaster.*
   - *Get a copy of Repairing Your Flooded Home. We have copies at the Public Works Department or it can be found on the Red Cross' website, too.*

3. *Consider some permanent flood protection measures.*
   - *Mark your fuse or breaker box to show the circuits to the floodable areas. Turning off the power to the basement before a flood can reduce property damage and save lives.*
   - *Consider elevating your house above flood levels.*
   - *Check your building for water entry points, such as basement windows, the basement stairwell, doors, and dryer vents. These can be protected with low walls or temporary shields.*
   - *Install a floor drain plug, standpipe, overhead sewer, or sewer backup valve to prevent sewer backup flooding.*
   - *More information can be found at FEMA's website, www.ready.gov/floods.*
   - *Note that some flood protection measures may need a building permit and others may not be safe for your type of building, so be sure to talk to the Building Department.*

PROJECT E: Flood Mitigation Measures for Critical Facilities

Hazards: Coastal Hazard & Flood
Project E: Actions
Action #1: Identify past mitigation measures that have been taken for critical facilities within the FEMA Special Flood Hazard Area (SFHA) AE-Zone and determine their status (completion, level of success, etc.).
Action #2: Identify new cost-effective mitigation measures for each facility (4) identified as flood-prone, considering both current and future conditions.
Action #3: Match specific grant funding sources to mitigation measures identified in Action #2, and complete grant applications.

Action items are directly related to the critical facilities flood mitigation measures and may be implemented separately or concurrently as discussed in the following project.

DISCUSSION: Critical facilities are those facilities that warrant special attention in preparing for a disaster and/or are of vital importance in maintaining the functioning of the community. According to FEMA, typical critical facilities include hospitals, fire stations, police stations, storage of critical records, and similar facilities. A critical facility should not be located in a floodplain if at all possible. If a critical facility must be located in a floodplain it should be provided a higher level of protection (i.e. mitigation) so that it can continue to function and provide services after the flood.

According to the 2017 Annapolis Critical Facilities database, there are ninety-three (93) critical facilities within the City of Annapolis. Of these critical facilities, four (4) facilities are within the FEMA Special Flood Hazard Area-AE Zone, which is a high-risk area. These critical facilities include:

1. Annapolis Maritime Museum (City owned: historic place);
2. Pump Station Siphon (Utility: wastewater pump station);
3. Market House (City owned: retail); and,
4. Harbormaster's Office (City owned: office).

Responsible Organizations: City of Annapolis Public Works; Office of Emergency Management; Office of Environmental Policy; City of Annapolis Planning & Zoning

Estimated Costs: Staff Time

Possible Funding Sources: Community Development Block Grants; CoastSmart Communities Grant Program; U.S. Army Corp of Engineers; FEMA Increased Cost of Compliance Coverage (ICC); USDA Natural Resources Conservation Service; Small Business Administration (SBA) Pre-disaster Mitigation Loan Program.

In addition to being within the SFHA, all four of these critical facilities are at-risk to hurricane category level 1 storm surge as well as 2100 mean sea level rise.

PROJECT: The Annapolis Maritime Museum was severely impacted by Hurricane Isabel. Storm surge from Hurricane Isabel was 8.3 feet over mean low tide. In addition to the storm surge, the location of the Maritime Museum at the mouth of Back Creek, where the fetch crossed the Chesapeake Bay added additional problems and wave action. Specifically, wind built up waves on top of the storm surge resulted in more structural damage than that of other buildings within Annapolis. Mitigation measures were completed at the Museum and included the raising of utilities. Given the projected flood depth, hurricane category 1 inundation area, and mean sea level rise, this structure is expected to receive further damages from flood hazards. Mitigation measures that elevate the structure and/or relocates the structure would be reasonable and prove cost-effective. A structural analysis would be necessary to determine the feasibility of elevation and/or relocation of this historic structure.

PROJECT F: Safe Growth Audit Recommendations

Action items are directly related to the Safe Growth Audit Recommendations and may be implemented separately or concurrently as discussed in the following project.

DISCUSSION: Generally described as the routine consideration and management of hazard risks in the community's existing planning framework – plan integration is the collection of plans, policies, codes, and programs that guide development in your community, how those are maintained and implemented, and the roles of people, agencies, and departments in evaluating and updating them.

Hazards: All-Hazards
Project F: Actions
Action #1: Integrate elements of the new 2017 Hazard Mitigation Plan into existing City plans, policies, codes, and programs that guide development.
Action #2: Review 2009 City of Annapolis Comprehensive Plan, Chapter 4 – Transportation, and discuss if the transportation plan limits access to hazards areas.
Action #3: Review and identify specific potential protection and opportunity areas. Identify and display on maps: • Open space contiguous to existing natural areas for the establishment of potential wildlife corridors. • Review open space and conservation easements for connectivity.

During the development of the 2017 Hazard Mitigation Plan, a Safe Growth Audit was performed as a way to assess how well the existing planning tools address hazard risks and community resiliency. Safe Growth Audit questions provided a systematic way to review local planning tools and identify the presence of, or need for, hazard-related actions.

Local documents reviewed during the Safe Growth Audit include:

- 2009 Annapolis Comprehensive Plan;
- 2015-2020 Capital Improvement Program Proposed – City of Annapolis;
- Zoning Ordinance; and,
- Subdivision of Land.

Responsible Organizations: City of Annapolis Planning and Zoning; City of Annapolis Public Works

Estimated Costs: Staff Time

Possible Funding Sources: N/A

Timeline for Implementation: 2019

PROJECT: Assess land-use planning and ordinances in order to help the City avoid hazards. The following could aid in mitigating hazards and manage development so as to reduce exposure to hazards:

- Prepare design guidelines for hazardous areas;
- Steer development to hazard-free land;
- Purchase properties in hazard-prone locations; and,
- Use project-specific design to reduce hazard exposure.

Attempt to rectify known deficiencies or potential weaknesses within the transportation system in association to hazards within Chapter 4: Transportation of the Comprehensive Plan. Review existing transportation routes and potentially modify in order to protect citizens from a hazard or remove them from a hazard area.

Develop mapping products that displays steep slopes and their proximity to water bodies, open space areas that are contiguous to existing natural areas for the establishment of potential wildlife corridors, and review open space and conservation easements for connectivity.

PROJECT G: Flood Mitigation Assistance Plan

Hazards: Coastal Hazard & Flood
Project G: Actions
Action #1: Expand on Chapter 4: Coastal Hazards and Chapter 5: Flood of the 2017 City of Annapolis Hazard Mitigation Plan.
Action #2: Integrate components of the Flood Mitigation Plan into existing City plans, policies, codes, and programs that guide development.

Action items are directly related to the Flood Mitigation Plan and may be implemented separately or concurrently as discussed in the following project.

DISCUSSION: The purpose of a Flood Mitigation Plan (FMP) is to assist State and local governments in funding cost-effective actions that reduce or eliminate the long-term risk of flood damage to human life, buildings, and other insured structures. The long-term goal of FMP is to reduce or eliminate claims under the National Flood Insurance Program (NFIP) through mitigation activities.

CRS information – The City of Annapolis obtains the maximum points available for completing a Flood Mitigation Plan.

- **Floodplain Management Planning (FMP):** The most credit is for the first element, a community-wide floodplain management plan**,** credit is also available for multi-hazard mitigation plans, multi-jurisdictional floodplain management and hazard mitigation plans, and floodplain management plans prepared for the U.S. Army Corps of Engineers.

PROJECT: A Flood Mitigation Plan will articulate a comprehensive strategy for implementing technically feasible flood mitigation activities for the area affected by the plan. The outcome of the project will result in a FEMA-approved and adopted Flood Mitigation Plan that complies with the requirements of 44 CFR Part 78.

Responsible Organizations: City of Annapolis Office of Environmental Policy; and Office of Emergency Management

Estimated Costs: $35,000

Possible Funding Sources: Flood Mitigation Assistance Program

Timeline for Implementation:
Grant Application **–** 2018
Plan Development – 2019 - 2020

At a minimum, the plan will include the following required elements:

a) Description of the planning process and public involvement. Public involvement may include workshops, public meetings, or public hearings.
b) Description of the existing flood hazard and identification of the flood risk, including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential.
c) Identification and description of floodplain management goals for the area covered by the plan.
d) Identification and evaluation of cost-effective and technically feasible mitigation actions considered.
e) Presentation of the strategy for reducing flood risks and continued compliance with the NFIP, and procedures for ensuring implementation, reviewing progress, and recommending revisions to the plan.
f) Documentation of formal plan adoption by the legal entity submitting the plan.

PROJECT H: Conservation Easement

Action items are directly related to the placement of this flood-prone property into the conservation easement program as discussed in the following project.

DISCUSSION: The property located at 520 Fourth Street, lot size 0.191 acres, is currently a vacant lot. The structure has been demolished. The property was considered a dangerous structure owing to the fact that the chimney was threatening a neighboring property. In addition, the property is located in the 500 –year floodplain, and in a category 2 hurricane storm surge inundation area.

Hazards: Coastal Hazard & Flood
Project H: Actions
Action #1: Review property located at 520 fourth street and discuss conservation easement process with current property owner to determine level of interest.
Action #2: Introduce property as a potential conservation easement to Conservancy Board.

What is a conservation easement?

A conservation easement is a legal agreement to preserve land in its natural state or to enhance its environmental potential without transferring the land's ownership. The landowner still owns the land, but agrees not to develop it inconsistently with environmental preservation requirements.

The specific terms of the easement can be tailored to fit the needs of both the landowner and the community. The Conservancy Board would manage the easement on behalf of the City in accordance with the terms agreed upon.

Tax Benefits

Easements donated for conservation purposes may be considered "charitable deductions." Tax benefits that may be derived from a conservation easement are:
- A 15-year real property tax credit on the unimproved land;
- A reduction of federal estate taxes; or,
- A reduction of federal income taxes for a period of up to 6 years,

Responsible Organizations: City of Annapolis Office of Environmental Policy; and Conservancy Board.

Estimated Costs: TBD

Possible Funding Sources: Land Trust

Timeline for Implementation: 1-2 years

PROJECT: Work with landowner and the Conservancy Board to place property located at 520 Fourth Street under a conservation easement.

PROJECT I: City Dock Commercial Property Outreach

Action items are directly related to the continuation of information sharing and consensus building with City Dock commercial property owners as discussed in the following project.

DISCUSSION: Thirty-eight commercial properties in and around City Dock worked diligently with Office of Emergency Management staff to obtain and prepare the necessary documentation needed to perform a benefit-cost analysis. The benefit-cost analysis was a vital component of the grant application submitted under Project B: Annapolis Flood Mitigation-Drainage Improvements.

Hazards: Coastal Hazard & Flood
Project I: Actions
Action #1: Reach out to all (38) property owners, providing a status update of the flood mitigation-drainage improvements grant application.
Action #2: Engage in a round table discussion and/or charette with property owners to determine additional measures that may be undertaken either individually and/or collectively over the next 5 years.

PROJECT: Continue to engage and share information with project partners, specifically the thirty-eight property owners in and around City Dock. During the course of preparing the grant application discussed in Project B, relationships were formed and enthusiasm for flood mitigation was increased. New ideas for additional mitigation measures and adaptive planning may be generated through the continuation of this partnership.

Responsible Organizations: City of Annapolis Office of Emergency Management; City of Annapolis Economic Development

Estimated Costs: Staff Time

Possible Funding Sources: N/A

Timeline for Implementation: Ongoing

PROJECT J: Winter Storm Hazard-Critical Facility Technical Assessments

Action items are directly related to the winter storm mitigation as discussed in the following project.

DISCUSSION: There are thirteen (13) critical facilities built in or prior to 1967 within the City. Roof geometry affects the ability of structure to shed snow. Simple roofs with steep slopes shed snow most easily. Roofs with geometric irregularities and obstructions collect snowdrifts in an unbalanced pattern. These roof geometries include flat roofs with parapets, stepped roofs, saw-tooth roofs, and roofs with obstructions such as equipment or chimneys.

Hazard: Winter Storm
Project J: Actions
Action #1: Conduct a preliminary assessment to determine which, if any of the (7) critical facilities listed on the table are meeting the current building code standard for snow load.
Action #2: Conduct technical assessment on those critical facilities that are not up to code, determined in action #1.

Excerpt from the City of Annapolis-Code of Ordinances

17.11.146 - Critical and essential facilities

Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from flood, wind, snow or earthquakes. [Note: See Maryland Building Performance Standards, Sec. 1602 and Table 1604.5.] Critical and essential facilities typically include hospitals, fire stations, police stations, storage of critical records, facilities that handle or store hazardous materials, and similar facilities.

PROJECT: There are seven (7) critical facilities which are aging structures, built in or prior to 1967, all having flat roofs, denoted on the table below. These facilities should be assessed for current snow load capacity and structural integrity.

Responsible Organizations: City of Annapolis Public Works; City of Annapolis Planning and Zoning; and Office of Emergency Management.

Estimated Costs: Staff Time

Possible Funding Sources: N/A

Timeline for Implementation: 1-2 years

Critical Facilities Constructed 1967 & Prior			
Facility Category	**Facility Type**	**Facility Name**	**Flat Roof**
1. City Owned	Garage	PW Utilities Garage	✓
2. Fire	Fire/EMS	Eastport Fire Co. 36/EMS	✓
3. School	Elementary	Eastport Elementary School	✓
4. School	Private	Phoenix Academy	✓
5. School	Public	Germantown Elementary School	✓
6. School	Public	West Annapolis Elementary School	✓
7. School	Public	Mills - Parole Elementary School	✓

PROJECT K: Hazard Mitigation & Preparedness All-Hazards Outreach

Action items are directly related to the public outreach that targets all-hazard mitigation and preparedness as discussed in the following project.

Hazards: All-Hazards
Project K: Actions
Action #1: Identify hazard mitigation and preparedness outreach committee participants and issue meeting invitation.
Action #2: Develop ideas and a multi-year timeline/schedule for implementation.

DISCUSSION: Public outreach for hazard preparedness is an ongoing effort for the Office of Emergency Management (OEM). Finding new and improved methods to deliver hazard information is a primary goal of the OEM.

PROJECT: Create a hazard mitigation and preparedness committee to develop new outreach strategies and campaigns. Increasing the number of people, agencies, and stakeholders involved in the process will help to generate new ideas and provide focus to any and all outreach events, print material, and on-line information that is provided to the public over the next five-year planning cycle. Information such as: generator use safety, snow load requirements, and signs of roof or structural problems are examples of next step public outreach for the upcoming winter season.

Responsible Organizations: City of Office of Emergency Management and partners.

Estimated Costs: $1,500-$3,000 annually for outreach materials

Possible Funding Sources: FEMA Hazard Mitigation Grant Program (HMPG); Staff Time

Timeline for Implementation: Ongoing

COMMUNITY CAPABILITIES & PLAN INTEGRATION

1. Safety Services

Safety services provided within the City include Emergency Medical Services (EMS), emergency notification services, and police services.

- **Emergency Medical Services-**

The Annapolis Fire Department's EMS Division exists to provide emergency and non-emergency health care, rescue and related services to the citizens and visitors of the City of Annapolis. The EMS Division is overseen by the Battalion Chief of Special Operations, who is supported by the EMS Captain. All EMS providers follow the Maryland State Protocols as published by the Maryland Institute for Emergency Medical Services System (MIEMSS). In 2016, the EMS Division responded to over 8,500 calls for service, this included incidents where a person was found to be in cardiac arrest. The Department is proud that they currently have a resuscitation rate of 25% compared to the National average of only 10%.

The Annapolis Fire Department has a complement of career Basic Life Support (BLS) providers and Advanced Life Support (ALS) providers that are cross-trained as firefighters. Since 1975 the Annapolis Fire Department has grown from 7 ALS providers to 49 ALS providers. The department now operates 5 ALS transport units, 1 BLS transport unit, 2 gators with BLS providers/equipment, 1 bariatric capable response unit, and 1 ALS Engine with 1 EMS Lieutenant per shift.

The EMS Division also operates 2 specialty units. During special events the EMS Division can field 2 ALS Bike Medic teams, which allow the medics to have more mobility in large crowds. Also, the Division operates a tactical medical team, which provides medical coverage to the Annapolis Police Department's SWAT team.

- **Emergency Notification Services-**

Citizens are encouraged to sign-up to notifications from Annapolis and Anne Arundel County during emergency situations. The City of Annapolis in collaboration with Anne Arundel County has developed an emergency telephone notification system to contact residents and businesses quickly in the case of an emergency. Through the CodeRED system, the City can send out automated telephone messages quickly and efficiently in the event of an emergency. The brief message will provide information on the emergency situation and any important instructions. The CodeRED emergency telephone alert system is an additional measure of safety the City believes is important to protect the community. If electric power is interrupted, citizens may not be able to depend upon radio and TV. Additional emergency alert information via radio is provided on: WNAV, 1430AM and 99.9FM.

An additional emergency notification tool is the "Prepare Me Annapolis Application." The Office of Emergency Management released the app, Prepare Me Annapolis, which can be downloaded for free and will promptly send alerts, notifications, and other essential information, including:

- CodeRED Sign Up
- Contact Information
- BGE Power Outage Status
- Preparedness Tips
- Customizable Emergency Kit Checklist
- School and Government Closings
- Severe Weather Updates
- Social Media Access
- Shelter Information
- Traffic Updates

- **Police Services-**

The Annapolis Police Department is committed to providing pertinent, helpful services to all communities. Some of these services include:

- Annapolis Night Reference & Alarm Registration- This information will be used by the Annapolis Police Department to make contact when emergencies or problems occur and no one is present at the business or residence
- CCTV Cameras- Through strategic and analytic tactics the Annapolis Police Department places CCTV cameras in areas of the City where a need is demonstrated.
- Community Crime Map- Use the LexisNexis Community Crime Map to see recent crimes in Annapolis. You can also sign up for customized email alerts based on a location and type of crime.
- Hispanic Liaison- The Latino Liaison Office is here to help meet the safety needs of the Latino community and to increase the trust and communication between Latino community and Annapolis Police Department (APD).
- Safe Stations- A program to combat the growing heroin and opioid addiction crisis.
- Security Surveys- Security surveys for both residential and commercial properties.

- Speed & Red Light Cameras-
  The City of Annapolis has three speed enforcement cameras that can be positioned in school zones throughout the city.

In addition, the Police Department has a new free service, mobile application (app) for smartphones. This app allows users to receive real-time alerts and immediate access to the latest police department news, crime maps, and social media accounts. The mobile app provides a "one stop shop" for police department information. The app provides links to daily police reports and press releases, crime maps for Annapolis, crime prevention tips, the police department event calendar, as well as direct links to the department's Facebook, Twitter, YouTube, and Flickr accounts. Users can also find a listing of important police department phone numbers, including the anonymous tip line.

New 2017 Program – Safe Stations

Effective April 20th, 2017 the Annapolis Police Department as well as every Annapolis Fire Station, every Anne Arundel County Fire Station, as well as all County police stations, will be a designated as a safe environment for individuals looking for assistance to start their path to recovery from heroin/opioid addiction.

This is a City of Annapolis and Anne Arundel County cooperative effort to combat the heroin and opioid addiction crisis that is gripping our communities.

Source: https://www.annapolis.gov/1196/Safe-Stations

- **Annapolis Fire Department-**

The Annapolis Fire Department (AFD) exists to provide a safe environment for the community by minimizing the impact of fire and injury through public education, quality service, emergency preparedness and an overall culture of safety.

The Operations Section is the largest division within the Annapolis Fire Department and is responsible for emergency medical services, fire suppression, rescue activities and mitigation of disasters. The department operates from 3 stations with 3 engine companies, 2 truck companies, 1 squad and 3 advance life support medical units, a duty Battalion Chief and an EMS Supervisor. In addition, Annapolis fire personnel operate

out of the Neck Station, located just outside of the City limits. The City of Annapolis and Anne Arundel County work cooperatively under a mutual aid agreement to provide services for the community. The personnel assigned to the Operations Section routinely conduct fire/safety inspections of commercial properties and marinas. They participate in public education programs and will conduct home fire safety and smoke alarm checks on request.

The Special Operations Division is responsible for the specialty teams within the Operations Section and includes:

- Bike medics
- Bomb squad services
- Hazardous materials response
- Marine rescue/firefighting
- Tactical medics
- Technical rescue response
- Weapons of mass destruction response
- These teams are all collateral duties of personnel assigned to the three stations.

2. Office of Emergency Management-Annapolis Fire Department

The City of Annapolis Office of Emergency Management provides vision, direction, and subject matter expertise in order to coordinate the City's all hazards emergency preparedness, response, recovery, and mitigation efforts and develop an overall culture of safety. By coordinating response efforts between departments and stakeholders, the Emergency Operations Center (EOC) allows the City to provide faster and more effective and comprehensive incident response and to avoid duplicated efforts, which may result in a waste of limited resources. The Office of Emergency Management launched the Emergency Operations Center in September 2010. The Emergency Operations Center is a state of the art facility, which serves as the "nerve center" for the City's response and recovery efforts before, during and after an incident. The Emergency Operations Center allows the Office of Emergency Management to provide a coordinated incident response by bringing department representatives and local stakeholders together, providing them with access to emergency management tools, such as: CCTV cameras, alert and notification systems, a comprehensive electronic incident management tool, mapping capabilities and integrated audio and visual technologies.

Effective communication is a key emergency management resource. In order to serve the community, the Office of Emergency Management has developed an Annapolis Call Center within the Emergency Operations Center, which enables City departments to prioritize and track public inquiries and comments. When activated in major emergencies, the public can reach the Annapolis Call Center by contacting 410-260-2211. Call takers are trained to provide the public with pertinent information and to handle requests for City services. The Joint Information Center is under the direction of and coordinates with the City Chief Communications Officer.

3. Snow Services

The City of Annapolis makes every attempt to make the streets "passable" for essential vehicle travel. Icy conditions are handled by applying deicing agents; however, thawing capabilities of salt are greatly diminished at temperatures below 20°F. Chapter 6: Winter Storm contains snow emergency streets within the City.

4. Harbormaster-Hurricane and Storms Notice

The City of Annapolis and its Harbormaster monitors and assesses weather conditions relating to any significant storm or hurricane and determines whether to close the City mooring and dock facilities. If the decision is to close, a special notice to this effect is physically posted on all boats found at those facilities. Electronic communication may become unreliable at such times and such special notices may not necessarily be posted on-line.

If the City mooring and dock facility closes and boat(s) have not yet vacated and relocated, the owner is solely and entirely liable for personal injuries or that they or their guests/passengers may sustain, or for any death that may occur, and for damages to their vessel, to other vessels, to the City mooring and dock facility, or to riparian property, resulting from failure to vacate and relocate. The City of Annapolis assumes no responsibility for any such personal injuries, death or property damage.

Vessels left unattended at the City mooring and dock facility after notice that it has closed are subject to impound and towing at the owner's expense; and to storage ashore at the owner's expense, pursuant to authority of the City Code, Section 15.04.030, and the owner shall be subject to all lawful fines and other legal remedies.

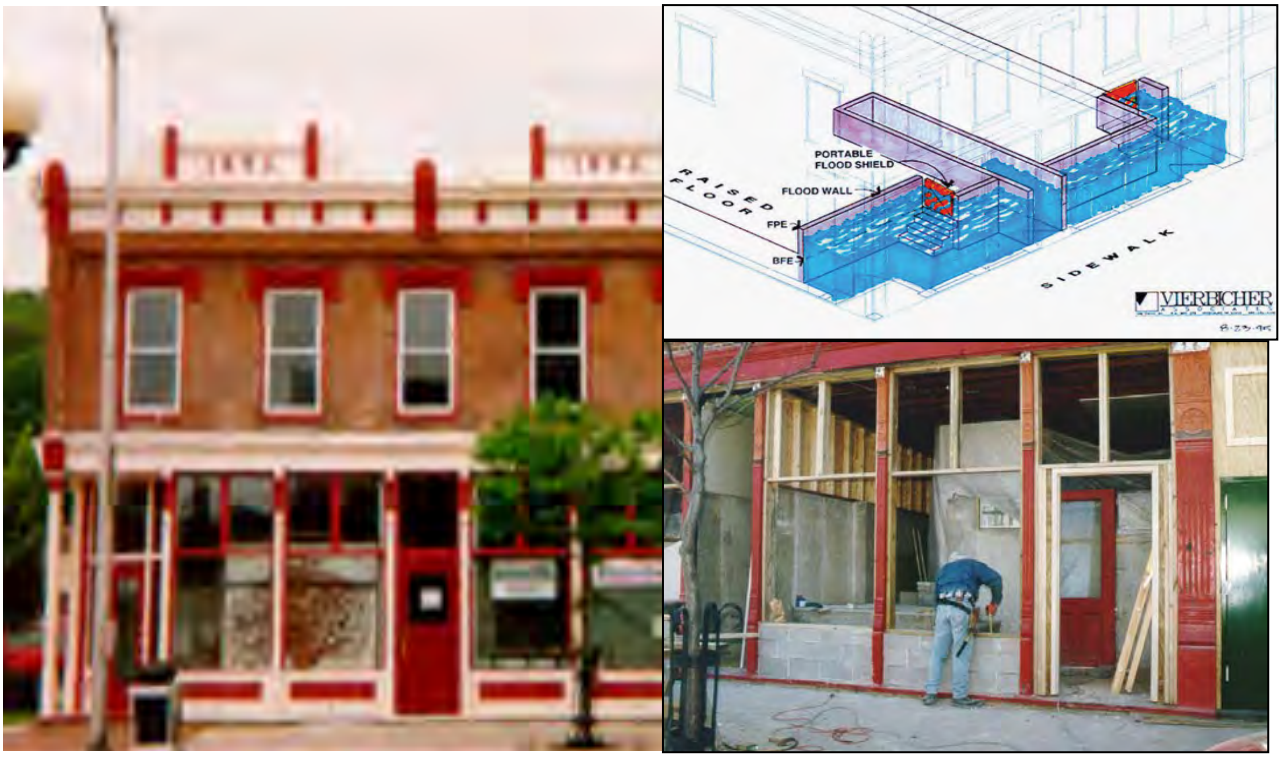
5. Weather It Together

Weather It Together was launched by the City of Annapolis in response to the threats identified in the City's Natural Hazard Mitigation Plan (2012) and the City Dock Master Plan (2014) to the impacts of sea level rise and tidal flooding on the Annapolis Historic District. The long-term concern for the accelerating rate of sea level rise and the devastation realized by Hurricane Sandy created a sense of urgency in Annapolis for the development of a Cultural Resource Hazard Mitigation Plan.

This plan, *Weather It Together*, has been 3 years in development, engaged over 2,500 local stakeholders, been showcased at 70 workshops, and resulted in 8 major projects proposed for completion over the next 5 years to mitigate the potential loss associated with natural disasters, sea-level rise, subsidence, and tidal flooding to the City of Annapolis. The *Weather It Together* planning process requires organizing staff and financial resources, identifying affected properties, establishing critical partnerships, assessing risks to vulnerable properties and infrastructure, developing mitigation strategies, implementing protection measures and monitoring progress towards sustainable adaptation efforts.

6. Current Local Economic Incentives Offered

City property tax credit applied to certified expenses for hazard mitigation/adaptation equal to 25% of rehabilitation cost on residential and income producing properties (including interior improvements).



Source: Weather It Together-Lisa Craig PowerPoint

7. Flood Improvement Projects

An original project outlined in the *2012 Natural Hazard Mitigation Plan Update* has been expanded and included in a new 2017 application for $3M in funds from the Hazard Mitigation Grant Program. The proposed flood control improvements of the project include backflow preventers/flap valves installed in all storm drains that outlet into "Ego

Alley". During high tide conditions, all stormwater collecting behind the closed storm drains would need to be pumped into Ego Alley. A pump station, more localized pumps, and/or stormwater storage options will be considered as part of the flood control improvements.

Additionally, in April 2016, replacement of 700 LF of steel sheet pile bulkhead surrounding a portion of "Ego Alley" was completed. A feature of that project included raising the concrete cap seawall to a uniform elevation so that the seawall could be incorporated into a future flood mitigation plan that would protect against storm surges.

The City has an Engineering Consultant under contract who is currently developing three detailed stormwater and flood mitigation design concepts that will consider feasibility, constructability and cost.
The concepts will likely contain three flood mitigation components:

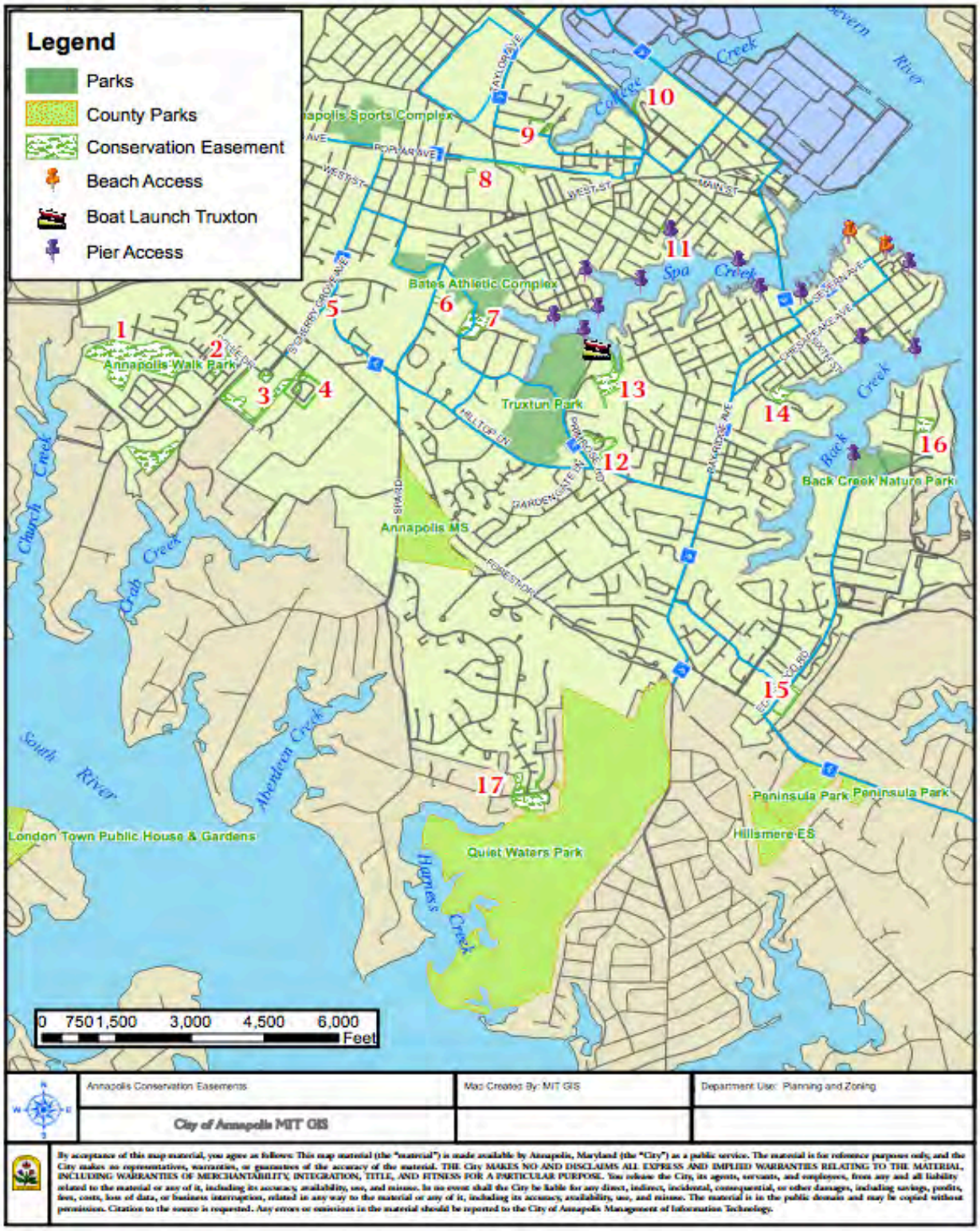
1. Installation of up to seven backflow preventer valves at storm drains downtown and at City Dock,
2. Construction of underground pumping stations on City property, and
3. Storm drain improvements to ensure proper water conveyance through the system as well as a bypass and overflow system that carries the stormwater to the pumping stations during high tide conditions.

Backflow valves will prevent tidal water from flowing through storm drains and onto roads and structures around City Dock and Compromise Street, affording protection from normal, extreme, and hurricane tides. Pumping stations and associated storm drain work will prevent storm water from collecting on streets during elevated tides when the backflow valves have closed, and will force the water back into the harbor and away from businesses, historic residential buildings, City facilities, and busy downtown streets. As a whole, the system will guard against tidal waters coming through storm drains into downtown Annapolis and will move storm water through the storm drains and outfalls with the assistance of the pumping stations. This solution builds on the 2012 study, *Flood Mitigation Strategies For the City of Annapolis, MD: City Dock and Eastport Area*, which identifies pumping stations as a viable option for flood mitigation efforts. The proposed project also builds on the *2012 City of Annapolis Natural Hazard Mitigation Plan Update*, which referenced the use of backflow preventer valves as an effective strategy for reducing flood risk that Annapolis plans to adopt.

8. Natural Resource Protection

A goal for the City of Annapolis is to protect the existing tree canopy. Trees provide many benefits in urban settings. They improve our air quality, increase our economic vitality, provide energy conservation, reduce storm water runoff, and provide shade. Large development areas within the City are often required to create a portion of the property as a conservation easement. The easement is required to remain in a natural state. The Annapolis Conservancy Board administers and manages the conservation easements. Their goal is to preserve the environmentally sensitive land. Current easements are listed below:

- Silopanna Road
- Action's Landing
- Adams Park
- Annapolis Ridge
- Annapolis Walk
- August Woods/Vytar
- Baywoods
- Beechwood Hill
- Bloomsbury Square
- Boucher Landing
- Brewer Avenue
- Dutch Glen
- Gardens of Annapolis
- Georgetown Grove
- Harbor View
- Harness Creek
- Hawkins Cove
- Kingsport-
- Regatta Bay I
- Regatta Bay II
- Riders Glen
- Severn House
- South Cherry Grove-
- The Landings (Painters Hill)
- Truxton Court
- Truxton Heights
- Village Greens of Annapolis
- Windmills


Legend
Parks
County Parks
Conservation Easement
Beach Access
Boat Launch Truxton
Pier Access
Annapolis Sports Complex
Bates Athletic Complex
Annapolis Walk Park
Truxtun Park
Annapolis MS
Back Creek Nature Park
Peninsula Park
Peninsula Park
Hillsmere ES
Quiet Waters Park
London Town Public House & Gardens
Church Creek
Crab Creek
South River
Aberdeen Creek
Harness Creek
Spa Creek
Back Creek
College Creek
Severn River
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0 750 1,500 3,000 4,500 6,000 Feet
Annapolis Conservation Easements
Map Created By: MIT GIS
Department Use: Planning and Zoning
City of Annapolis MIT GIS

9. Plan Integration-Safe Growth Audit

a. Introduction

Generally described as the routine consideration and management of hazard risks in the community's existing planning framework – plan integration is the collection of plans, policies, codes, and programs that guide development in your community, how those are maintained and implemented, and the roles of people, agencies, and departments in evaluating and updating them. Effective integration of hazard mitigation occurs when your community's planning framework leads to development patterns that do not increase risks from known hazards or lead to redevelopment that reduces risk from known hazards.

b. Safe Growth Audit

During the preparation of the *2017 City of Annapolis Hazard Mitigation Plan*, a Safe Growth Audit was conducted. Performing a Safe Growth Audit is a way to assess how well the existing planning tools address hazard risks and community resiliency. Safe Growth Audit questions provide a systematic way to review local planning tools and identify the presence of, or need for, hazard-related actions.

> ***The goal of SAFE GROWTH is to build environments that are safe for current and future generations and to protect building, transportation, utilities, and the natural environment from damage.***

Local documents reviewed during the Safe Growth Audit include:

- 2009 Annapolis Comprehensive Plan;
- 2015-2020 Capital Improvement Program Proposed – City of Annapolis;
- Zoning Ordinance; and,
- Subdivision of Land

PLAN	*LOCATION*
COMPREHENSIVE PLAN	
LAND USE	
Does the future land-use map clearly identify natural hazard areas?	Yes 2009 City of Annapolis Comprehensive Plan Chapter 3 – Land Use and Economic Development Figure 3-3 Generalized Proposed Land Use Map Pg. 22 Chapter 7 – Environment Figure 7-4 Critical Areas Figure 7-5 Conservation Easement Map Figure 7-6 Steep Slopes and Floodplain Map Figure 7-7 Potential 1 Meter Sea Level Rise Map Pg. 100-103
Do the land-use policies discourage development or redevelopment within hazard areas?	Yes 2009 City of Annapolis Comprehensive Plan Chapter 3 – Land Use and Economic Development Policy Recommendations Policy 1 through Policy 11 Pg. 33-40
Does the Plan provide adequate space for expected future growth in areas located outside natural hazard areas?	Yes 2009 City of Annapolis Comprehensive Plan Chapter 3 – Land Use and Economic Development Land Use Plan Opportunity Areas Pg. 21 through 32 Chapter 5 – Municipal Growth and Community Facilities Basis for projecting water and sewer infrastructure needs Pg. 63 through 78 Chapter 9 – Water Resources For the sake of infrastructure planning, they represent a build-out scenario as if the entirety of each Opportunity Area were to redevelop. Pg. 115 through 132
TRANSPORTATION	
Does the transportation plan limit access to hazard areas?	No.
Is the transportation policy used to guide growth to safe locations?	Yes 2009 City of Annapolis Comprehensive Plan Chapter 4 – Transportation Policy Recommendations & Major Projects

	Policy 1 through Policy 10 Pg. 51 through 61
Are movement systems designed to function under disaster conditions (e.g., evacuation)?	No 2009 City of Annapolis Comprehensive Plan Chapter 4 – Transportation Primary Challenges The movement of people and goods throughout the city and to and from the growing residential and shopping areas adjacent to the city is also now extensive. Special events to which the City plays host also add to congestion and parking problems at certain times of the year. All of this is complicated by geography and the fact that access to and from the regional highway system is confined to only a few routes. The area highway system is operating at or near its capacity, so even minor disruptions (e.g. an accident) can cause gridlock on the network of streets and highways serving the city. Continued regional growth will contribute to the city's transportation challenges. Pg. 41
ENVIRONMENTAL MANAGEMENT	
Are environmental systems that protect development from hazard identified and mapped?	Yes 2009 City of Annapolis Comprehensive Plan Chapter 7 – Environment Figure 7-6 Steep Slopes and Floodplain Map Pg. 102
Do environmental policies maintain and restore protective ecosystems?	Yes 2009 City of Annapolis Comprehensive Plan Chapter 7 – Environment **Policy 2. Protect and restore environmentally sensitive areas and other natural resources within the City** 2.1 Steep slopes that are located near water bodies should be protected by conservation easements when possible. When conservation easements are not possible, the City should enforce the preservation of all vegetation and trees along these slopes in order to prevent damage to the shoreline. 2.2 Every effort should be made to protect open space contiguous to existing natural areas to establish and protect wildlife corridors. 2.3 Naturalized yards are encouraged over traditional landscaping. Naturalized yards favor plantings that include trees, shrubs, and groundcover plants that tolerate

	the natural rainfall patterns of the city and urban soils. 2.4 Through the Annapolis Conservancy Board, the City should obtain conservation easements to meet the objective of protecting the city's natural resources generally and environmentally sensitive areas specifically. Conservation easements should connect open space where possible. The City should consider limiting rear-lot easements, establishing incentives for developers to remove invasive species during the initial grading process, and acquiring fee simple dedications for small areas in minor subdivisions. 2.5 To help achieve the City's environmental goals and ensure high quality development, the City will create a Site Design Manual that will replace the 1986 Parking and Landscaping Manual. The Site Design Manual will provide guidance on design of the landscape on public and private development sites. This will include planting with a preference for water conserving plants and plants tolerant of urban soils, rainwater management, tree preservation, and soil management. Best management practices for handling the impacts of development, use of pervious and impervious paving materials, design of parking areas, lighting, internal circulation, and other matters related to site development should also be addressed in the Manual. The Site Design Manual will aim to make the site design process more predictable. The Manual will be coordinated with the City's Green Building standards and other sections of the City Code governing trees and other planting, grading, critical areas, and rainwater. Pg. 95 through 96
Do environmental policies provide incentives to development that is located outside of protective ecosystems?	Yes 2009 City of Annapolis Comprehensive Plan Chapter 7 – Environment **Policy 2. Protect and restore environmentally sensitive areas and other natural resources within the City** 2.4 Through the Annapolis Conservancy Board, the City should obtain conservation easements to meet the objective of protecting the city's natural resources generally and environmentally sensitive areas specifically. Conservation easements should connect open space where possible. The City should consider limiting rear-lot easements, establishing **incentives** for developers to remove invasive species during the initial grading process, and acquiring fee simple dedications for small areas in minor subdivisions.

	Pg. 95
PUBLIC SAFETY	
Are the goals and policies of the comprehensive plan related to the FEMA Local Hazard Mitigation Plan?	Yes 2009 City of Annapolis Comprehensive Plan Chapter 3 – Land Use and Economic Development **Policy 10. Evaluate risks from sea level rise in decisions involving land use along the waterfront.** The parts of the established downtown which are prone to severe flooding and may be expected to be impacted by sea level rise should be the subject of a study to determine the costs and benefits of public decision-making in mitigating property damage. Refer to Figure 7-7 and Policy 3 in Ch. 7 – Environment for further treatment of the City's policy position on sea level rise. Notwithstanding this, land use in areas that are prone to flooding should be evaluated carefully when land use changes are proposed. As land use changes are evaluated, decisions should be consistent with the City's Hazard Mitigation Plan. The Hazard Mitigation Plan (HMP) is prepared according to regulations issued by the Federal Emergency Management Agency (FEMA) in response to the Federal Disaster Mitigation Act of 2000. The Federal Disaster Mitigation Act of 2000 was created "to provide an orderly and continuing means of assistance by the Federal Government to State and local governments in carrying out their responsibilities to alleviate the suffering and damage which result from disasters." The City is required to prepare the HMG in order to be eligible for FEMA funds in the event of a disaster. Pg. 40
Is safety explicitly included in the plan's growth and development policies?	Yes.
Does the monitoring and implementation section of the plan cover safe growth objectives??	Yes 2009 City of Annapolis Comprehensive Plan Chapter 10 – Implementation Pg. 133 through 140

ZONING ORDINANCE	
Does the zoning ordinance conform to the comprehensive plan in terms of discouraging development or redevelopment within natural hazard areas?	Yes Annapolis, Maryland Zoning Ordinance Title 21- Planning and Zoning
Does the ordinance contain natural hazard overlay zones that set conditions for land use within such zones?	Yes Annapolis, Maryland Zoning Ordinance Title 21- Planning and Zoning Chapter 21.54 Critical Area Overlay 21.54.010 – Purpose The purpose of the critical area overlay district is to foster more sensitive development activity for certain shoreline areas so as to minimize damage to water quality and natural habitats. This district is consistent with and supports the State critical area law and critical area criteria as well as the City of Annapolis Critical Area Program.
Do rezoning procedures recognize natural hazard areas as limits on zoning changes that allow greater intensity or density use?	Yes Annapolis, Maryland Zoning Ordinance Chapter 21.54 Critical Area Overlay **21.54.080 - Development requirements—** **Intensely developed areas.** Habitat Protection Areas. 1. Developers shall determine whether there are any habitat protection areas on the project site, or whether development on the site could adversely affect such areas off-site. 2. In developing the site, roads, bridges and utilities shall not be located in a habitat protection area, even if the habitat area is outside the buffer, unless it is determined by the City that no feasible alternative exists. Where roads, bridges or utilities must cross such areas, they must be designed, constructed and maintained to protect the habitats, to provide maximum erosion protection, and to maintain hydrologic processes and water quality. 3. The developer shall protect any wildlife corridors or habitat protection areas located in forests and developed woodlands.

	21.54.140 - Change of area designation. A. Limited development areas may be changed to intensely developed areas, but only under the procedures in this section. B. No more than eleven acres of land in the critical area may be changed from limited development area to intensely developed area or from resource conservation area to another classification. C. Areas proposed for change must be mapped and must include an analysis of the manner in which the areas designated conform to the locational guidelines specified in Subsection E of this section. The developer shall be responsible for preparing this submission for the Department of Planning and Zoning. D. The map and the analysis shall be submitted by Department of Planning and Zoning to the Critical Area Commission for approval before development may occur on the site. E. To identify new intensely developed areas, the following locational guidelines shall be used: 1. Locate in existing limited development areas or adjacent to existing intensely developed areas; 2. Minimize impacts to habitat protection areas and resource conservation areas; 3. Should be at least three hundred feet from tidal waters or tidal wetlands if located in existing resource conservation areas.
SUBDIVISION REGULATIONS	
Do the subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas?	Yes Annapolis, Maryland Subdivision Ordinance Title 20 – Subdivisions **20.24.130 - Lots.** G. Except as provided in Subsection H of this section, if the gross development area of the property includes any property within the Resource Conservation Area of the Critical Area Overlay, density shall be determined as follows: 1. The gross development area for that portion of the property within the Resource Conservation Area of the Critical Area Overlay shall be calculated separately from the remainder of the site.

	2. Under Section 21.54.100, new residential development in a Resource Conservation Area is permitted if the density of such development does not exceed one dwelling unit per twenty acres. If the property has less than twenty acres in the Resource Conservation Area, one dwelling unit is allowed, unless: a. There are other portions of the property designated Limited Development Area or Intensely Developed Area, in which case development in the Resource Conservation Area portion of the property is not permitted, or b. There is an existing lot or lots of record, in which case development may be in accordance with the grandfathering provisions of Section 21.54.150. 3. For the remainder of the property not located within the Resource Conservation Area of the Critical Area Overlay, the maximum number of dwelling units permitted shall be determined by dividing the gross development area not located in the Resource Conservation Area by the minimum lot area per dwelling unit required by the zoning district or districts in which the area is located.
Do the regulations provide for conservation subdivision or cluster subdivisions in order to conserve environmental resources?	Annapolis, Maryland Zoning Ordinance Title 21 – Planning and Zoning **21.54.080 - Development requirements—Intensely developed areas.** D. Cluster Development. Cluster development is encouraged, to the extent practicable, to reduce impervious surfaces and maximize areas of natural vegetation. **21.54.090 - Development requirements—Limited development areas.** H. Impervious Surfaces. 5. The City of Annapolis may allow a property owner to exceed the impervious surface limits provided in Subsections (H)(2) and (H)(3) of this section if the following conditions exist: g. Cluster development is encouraged, to the extent practicable, to reduce impervious surfaces and maximize areas of natural vegetation. J. Cluster Development. Cluster development is encouraged, to the extent practicable, to reduce impervious surfaces and maximize areas of natural vegetation.
Do the regulations allow density transfer where hazard areas exist?	No.

CAPITAL IMPROVEMENT PROGRAM AND INFRASTRUCTURE POLICIES	
Does the capital improvement program provide funding for hazard mitigation projects identified in the FEMA Mitigation Plan?	Yes Capital Improvement Program – Proposed Fiscal year 2015-2020 City of Annapolis, Maryland Landfill Gas Mitigation Pg. 11 City Dock Infrastructure Pg. 29 Long Term Projects: Flood Control Infrastructure The study, "Flood Mitigation Strategies for the City of Annapolis: City Dock and Eastport Area" was completed in 2011. The goals of the study include the identification of structural options for protecting property in flood threatened areas and estimating design and construction costs associated with the structural protection measures. This study was the basis of the Flooding/Stormwater components of the City Dock Infrastructure project and will inform for future capital projects in other parts of the city.
Does the capital improvement program limit expenditures on projects that would encourage development in areas vulnerable to natural hazards?	No.

Source: 2017 City of Annapolis Hazard Mitigation Planning Committee

c. Recommendations

Following the completion of the Safe Growth Audit, the following recommendations should be considered for implementation.

- **Recommendation #1:** Integrate the new 2017 Hazard Mitigation Plan into existing City plans, policies, codes, and programs that guide development.
- **Recommendation #2:** Review 2009 City of Annapolis Comprehensive Plan, Chapter 4 – Transportation, and discuss if the transportation plan limits access to hazards areas.
- **Recommendation #3:** In reviewing the excerpt below from the 2009 City of Annapolis Comprehensive Plan, Chapter 7 – Environment, it may prove helpful to review and identify specific potential protection and opportunity areas. Identify and display on maps:
    - Steep slopes that are located near water bodies;
    - Open space contiguous to existing natural areas for the establishment of potential wildlife corridors.
    - Review open space and conservation easements for connectivity.

Policy 2. Protect and restore environmentally sensitive areas and other natural resources within the City

2.1 Steep slopes that are located near water bodies should be protected by conservation easements when possible. When conservation easements are not possible, the City should enforce the preservation of all vegetation and trees along these slopes in order to prevent damage to the shoreline.

2.2 Every effort should be made to protect open space contiguous to existing natural areas to establish and protect wildlife corridors.

2.3 Naturalized yards are encouraged over traditional landscaping. Naturalized yards favor plantings that include trees, shrubs, and groundcover plants that tolerate the natural rainfall patterns of the city and urban soils.

2.4 Through the Annapolis Conservancy Board, the City should obtain conservation easements to meet the objective of protecting the city's natural resources generally and environmentally sensitive areas specifically. Conservation easements should connect open space where possible. The City should consider limiting rear-lot easements, establishing incentives for developers to remove invasive species during the initial grading process, and acquiring fee simple dedications for small areas in minor subdivisions.

2.5 To help achieve the City's environmental goals and ensure high quality development, the City will create a Site Design Manual that will replace the 1986 Parking and Landscaping Manual. The Site Design Manual will provide guidance on design of the landscape on public and private development sites. This will include planting with a preference for water conserving

plants and plants tolerant of urban soils, rainwater management, tree preservation, and soil management. Best management practices for handling the impacts of development, use of pervious and impervious paving materials, design of parking areas, lighting, internal circulation, and other matters related to site development should also be addressed in the Manual. The Site Design Manual will aim to make the site design process more predictable. The Manual will be coordinated with the City's Green Building standards and other sections of the City Code governing trees and other planting, grading, critical areas, and rainwater.
Pg. 95 through 96

Chapter 14

PLAN IMPLEMENTATION & MONITORING

1. Plan Implementation

This Plan document serves as a road map for evaluating hazards, identifying resources and capabilities, selecting appropriate actions, and developing and implementing mitigation measures to eliminate or reduce future impacts from those hazards. The implementation and completion of mitigation measures will protect the health, safety, and welfare of the City's residents. Implementation of the plan is a critical component of strengthening the resilience of and continued vitality of the City of Annapolis.

Implementation of the plan includes the completion of eight mitigation projects that were identified by stakeholders and prioritized. An extensive listing of potential funding sources available to assist in the implementation of the identified mitigation projects has been included at the end of this chapter for reference.

2. Monitoring the Plan

Monitoring, evaluating, and updating the plan are critical to maintaining its relevance. Effective implementation of mitigation projects pave the way for continued momentum in the planning process and provides direction for the future. This section identifies who will be responsible for monitoring, evaluating, and updating the Plan, and what those responsibilities entail. This section also lays out the method and schedule of these and describes how the public will be involved on a continuing basis.

The City of Annapolis Office of Emergency Management (OEM) has been designated as the main entity responsible for maintaining and monitoring the plan. The OEM will continue to work with stakeholders, specifically the Weather It Together group, during the next five-year planning cycle. OEM will oversee the progress made on the implementation of the identified mitigation actions and update the plan, as needed, to reflect changing conditions. OEM will therefore serve as the focal point for coordinating citywide hazard mitigation efforts.

The Office of Emergency Management in cooperation with community stakeholders will involve the public during the evaluation and update of the plan, as appropriate, through annual public education activities, public workshops, and public hearings. The City's website will serve as a means of communication by providing information specific to hazard mitigation and preparedness initiatives.

At a minimum the plan will be evaluated annually. The implementation matrix will serve as a tool to assist in the evaluation of mitigation projects.

Project	Project Title & Priority Ranking	Descriptions	Implementation Timeframe		Responsible Organization(s)	Project Completion Yearly Review (Yes/No)				
			Short Term (0-2 years)	Long Term (0-5 years)		Year 1	Year 2	Year 3	Year 4	Year 5
A	Community Rating System Application **HIGH**	Prevention Prepare a CRS application to reduce insurance cost for City residents.	✓		Office of Environmental Policy					
B	Annapolis Flood Mitigation – Drainage Improvements **HIGH**	Structural Project Complete $11.5 million in drainage improvements, which will have benefits exceeding $200 million.		✓	Public Works					
C	Repetitive Loss Properties Flood Mitigation LOW	Property Protection Consider and identify mitigation strategies for repetitive loss properties, including but not limited to acquisition, reconstruction, relocation, and/or elevation.		✓	- Planning & Zoning - Office of Environmental Policy - Office of Emergency Management - MDE, MEMA & FEMA					
D	Repetitive Loss Public Outreach **HIGH**	Public Education & Awareness Target the 126 properties located within the FEMA Special Flood Hazard Areas for flood mitigation outreach.	✓		- Planning & Zoning - Office of Environmental Policy - Office of Emergency Management					

Project	Project Title & Priority Ranking	Descriptions	Implementation Timeframe		Responsible Organization(s)	Project Completion Yearly Review (Yes/No)				
			Short Term (0-2 years)	Long Term (0-5 years)		Year 1	Year 2	Year 3	Year 4	Year 5
E	Flood Mitigation Measures for Critical Facilities MEDIUM	Property Protection Consider and identify mitigation strategies for Critical Facilities, including but not limited to acquisition, reconstruction, relocation, and/or elevation.		✓	- Office of Environmental Policy - Office of Emergency Management - Public Works - Planning & Zoning					
F	Safe Growth Audit Recommendations **HIGH**	Prevention Integrate Safe Growth Audit findings and recommendation into plans, policies, codes, and programs.	✓		- Planning and Zoning - Public Works					
G	Flood Mitigation Assistance Plan **HIGH**	Prevention Develop a FEMA – approved and adopted Flood Mitigation Plan that complies with the requirements of 44 CFR Part 78. Work with landowner and the Conservancy Board to place property located at 520 4th Street under a conservation easement.		✓	- Office of Environmental Policy - Office of Emergency Management					

Project	Project Title & Priority Ranking	Descriptions	Implementation Timeframe		Responsible Organization(s)	Project Completion Yearly Review (Yes/No)				
			Short Term (0-2 years)	Long Term (0-5 years)		Year 1	Year 2	Year 3	Year 4	Year 5
H	Conservation Easement LOW	Natural Resource Project Work with landowner(s) and the Conservancy Board to place property located at 520 4th Street under a conservation easement.	✓		- Office of Environmental Policy - Conservancy Board					
I	City Dock Commercial Property Outreach **HIGH**	Public Outreach Continue to engage and share information with project partners, specifically the thirty-eight property owners in and around City Dock.		✓	- Office of Emergency Management - Economic Development					
J	Winter Storm Hazard-Critical Facility Technical Assessments MEDIUM	Structural Project Assessed the eight (8) critical facilities built in or prior to 1967 and have flat roofs for current snow load capacity and structural integrity.	✓		- Public Works - Planning & Zoning - Office of Emergency Management					
K	Hazard Mitigation & Preparedness All-Hazards Outreach MEDIUM	Public Outreach Create a hazard mitigation and preparedness committee to develop new outreach strategies and campaigns.		✓	- Office of Emergency Management - Additional Partners					

APPENDIX

APPENDIX A- CRITICAL FACILITY DATABASE & METHODOLOGY

1. Data Methodology

A Critical Facilities inventory was developed for utilization in the 2017 City of Annapolis Hazard Mitigation Plan. Data was obtained from David Mandell, Deputy Director of Emergency Management and Shawn Wampler, GIS Coordinator. For the 2017 City of Annapolis Hazard Mitigation Plan, Smith Planning and Design included the critical facility types in the Vulnerability Analysis. The following steps detail the data methodology.

Step 1. A critical facilities Microsoft Excel worksheet provided by the Office of Emergency Management was cross-referenced with the GIS database provided by the GIS Coordinator, which contained existing facilities.

Step 2. Necessary information for each facility was extrapolated from the 2013 Anne Arundel County Maryland Property View Database. Information obtained included: account number, address, improved value, year built and facilities descriptions.

Step 3. The Office of Emergency Management reviewed the database for further modifications and/or additions.

Step 4. Additional attribute columns were added and include: designated critical facility category and type, FEMA flood zone, flood depth, 2100 mean sea level rise inundation area, and storm surge inundation areas.

Step 5. Once the database was finalized, facilities were included on hazard inundation mapping and utilized in tables for Section 2 of the Plan, Vulnerability Analysis.

2. Critical Facility Database

A total of ninety-two (92) critical facilities were identified. The detailed critical facility database is listed in the table below.

Facility Category	Facility Type	Facility Name	Address	City	Flood Zone	Flood Depth	Cat 1	Cat 2	Cat 3	Cat 4	SLR 100
City Owned	Community Center	Stanton Community Center	92 W. Washington Place	Annapolis	X	0	0	0	0	0	No
City Owned	Garage	PW Shed, Garage	932 Spa Road	Annapolis	X	0	0	0	0	0	No
City Owned	Garage	PW Utilities Garage	937 Spa Road	Annapolis	X	0	0	0	0	0	No
City Owned	Historic Place	Annapolis Maritime Museum	723 2nd Street	Eastport	AE	6.8	1	0	0	0	Yes
City Owned	Historic Place	Maynard-Burgess House	163 Duke of Gloucester Street	Annapolis	X	0	0	0	0	0	No
City Owned	Historic Place	Shiplap House	18 Pinkney Street	Annapolis	X	0	0	0	0	4	No
City Owned	Office	Management of Information Technology	161 Duke of Gloucester Street	Annapolis	X	0	0	0	0	0	No
City Owned	Office	Public Works Administration, PR, Planning & Zoning	145 Gorman Street	Annapolis	X	0	0	0	3	0	No
City Owned	Office	Department of Transportation	308 Chinquapin Round Road	Annapolis	X	0	0	0	0	0	No
City Owned	Office	PW Services/Operations - E-cycling	935 Spa Road	Annapolis	X	0	0	0	0	0	No
City Owned	Office	Office of Emergency Management	199 Taylor Avenue	Annapolis	X	0	0	0	0	0	No
City Owned	Office	City Hall	160 Duke of Gloucester Street	Annapolis	X	0	0	0	0	0	No
City Owned	Office	Harbormaster's Office	1 Dock Street	Annapolis	AE	1.5	1	0	0	0	Yes
City Owned	Parking Garage	Noah Hillman Garage	150 Gorman Street	Annapolis	X	0	0	0	0	0	No
City Owned	Parking Garage	Knighton Garage	1A Colonial Avenue	Annapolis	X	0	0	0	0	0	No
City Owned	Parking Garage	Gott's Court Garage	25 Northwest Street	Annapolis	X	0	0	0	0	0	No
City Owned	Parking Garage	Park Place Garage	1 Park Place	Annapolis	X	0	0	0	0	0	No
City Owned	Parks and Recreation	Pip Moyer Recreation	273 Hilltop Lane	Annapolis	X	0	0	0	0	0	No
City Owned	Retail	Market House	25 Market Space	Annapolis	AE	1.6	1	0	0	0	Yes
EOC	EOC	Emergency Operations Center	199 Taylor Avenue	Annapolis	X	0	0	0	0	0	No

Facility Category	Facility Type	Facility Name	Address	City	Flood Zone	Flood Depth	Cat 1	Cat 2	Cat 3	Cat 4	SLR 100
Fire	Fire	USNA Fire Co. 46	446 Fire Station Road	Annapolis	X	0	0	0	3	0	No
Note: Federal Installation assists City of Annapolis via mutual aid.											
Fire	Fire/EMS	Eastport Fire Co. 36/EMS	914 Bay Ridge Avenue	Eastport	X	0	0	0	0	0	No
Fire	Fire/EMS	Forest Drive Fire Co. 35/EMS	1790 Forest Drive	Annapolis	X	0	0	0	0	0	No
Fire	Fire/EMS	Taylor Ave Fire Station/EMS	620 Taylor Avenue	Annapolis	X	0	0	0	0	0	No
Medical	Hospital	Anne Arundel Medical Center	2001 Medical Parkway	Annapolis	X	0	0	0	0	0	No
Medical	Nursing Home	Baywoods of Annapolis	7101 Bay Front Drive	Eastport	X	0	0	0	3	0	No
Medical	Nursing Home	Genesis HealthCare - Spa Creek Center	35 Milkshake Lane	Eastport	X	0	0	0	0	0	No
Medical	Nursing Home	New Annapolis Nursing	900 Van Buren Street	Eastport	X	0	0	0	0	0	No
Medical	Urgent Care	Green Street Urgent Care	79 West Street	Annapolis	X	0	0	0	0	0	No
Medical	Urgent Care	Evolve Medical Clinic	509 S. Cherry Grove Avenue	Annapolis	X	0	0	0	0	0	No
Police	Police	Annapolis Police Department	199 Taylor Avenue	Annapolis	X	0	0	0	0	0	No
School	College	St. Johns College	60 College Avenue	Annapolis	X	0	0	0	0	0	No
School	College	US Naval Academy	121 Blake Road	Annapolis	X	0	0	0	0	4	Yes
School	Public	Georgetown East Elementary School	111 Dogwood Road	Eastport	X	0	0	0	0	0	No
School	Public	Annapolis Elementary School	180 Green Street	Annapolis	X	0	0	0	0	0	No
School	Public	Eastport Elementary School	420 5th Street	Eastport	X	0	0	0	0	4	No
School	Private	Heritage Learning Center	1740 Forest Drive	Annapolis	X	0	0	0	0	0	No
School	Private	Saint Martin's Lutheran Church School	1120 Spa Road	Eastport	X	0	0	0	0	0	No
School	Private	Alpha-Beta Jewish Day School	1125 Spa Road	Eastport	X	0	0	0	0	0	No
School	Private	Van Buren Street Baptist School	911 Van Buren Street	Eastport	X	0	0	0	0	0	No

Facility Category	Facility Type	Facility Name	Address	City	Flood Zone	Flood Depth	Cat 1	Cat 2	Cat 3	Cat 4	SLR 100
School	Private	St. Mary's Catholic School	113 Duke of Gloucester Street	Annapolis	X	0	0	0	0	0	No
School	Private	For Rapture Learning Institute	1834 George Avenue	Annapolis	X	0	0	0	0	0	No
School	Private	J Albert Adams Academy	245 Clay Street	Annapolis	X	0	0	0	0	0	No
School	Private	Calvary Center	301 Roscoe Rowe Blvd.	Annapolis	X	0	0	0	0	0	No
School	Private	Annapolis Sailing School	7001 Bembe Beach Road	Annapolis	X	0	0	2	0	0	No
School	Private	Phoenix Academy	1411 Cedar Park Road	Annapolis	X	0	0	0	0	0	No
School	Private	Book of Life Academy	913 Cedar Park Road	Annapolis	X	0	0	0	0	0	No
School	Public	West Annapolis Elementary School	210 Annapolis Street	Annapolis	X	0	0	0	0	0	No
School	Public	Mills/Parole Elementary School	1 George and Marion Phelps Lane	Annapolis	X	0	0	0	0	0	No
School	Public	Tyler Heights Elementary School	200 Janwal Street	Annapolis	X	0	0	0	0	0	No
School	Public	Bates Middle School	701 Chase Avenue	Annapolis	X	0	0	0	0	0	No
School	Public	Germantown Elementary School	200 Windell Avenue	Annapolis	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	Wardour	1 Alden Lane	Annapolis	X	0	0	0	3	0	Yes
Utility	Wastewater Pump Station	Spa Creek	1225 Boucher Avenue	Eastport	X	0	0	0	0	4	No
Utility	Wastewater Pump Station	West Annapolis	307 Monterey Avenue	Annapolis	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	The Point #1, underground	4 President Point Drive	Eastport	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	The Point #2, Underground	11 President Point Drive	Eastport	X	0	0	0	0	4	No

Facility Category	Facility Type	Facility Name	Address	City	Flood Zone	Flood Depth	Cat 1	Cat 2	Cat 3	Cat 4	SLR 100
Utility	Wastewater Pump Station	Sumner	413 Schley Road	Annapolis	X	0	0	0	0	4	Yes
Utility	Wastewater Pump Station	Shearwater lift and force main	5 Spa Creek Landing	Eastport	X	0	0	0	0	4	No
Utility	Wastewater Pump Station	Hunt Meadows	3061 Harness Creek Road	Eastport	X	0	0	0	0	4	No
Utility	Wastewater Pump Station	Pump Station Siphon	1 Shipwright Street	Annapolis	AE	3.5	1	0	0	0	Yes
Utility	Wastewater Pump Station	Truxtun Heights at Spa Creek	275 Pump House Road	Annapolis	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	Admiral Heights	31 Bristol Drive	Annapolis	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	Annapolis Roads	1111 Lake Heron Drive	Annapolis	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	Belmont	7458 Edgewood Road	Annapolis	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	Bembe Point Underground	Bay Front Drive	Annapolis	X	0	0	2	0	0	No
Utility	Wastewater Pump Station	Newtowne 22	Juliana Circle East	Annapolis	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	Parole Fairfax	2035 Forest Drive	Annapolis	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	Admiral Heights Pump Station	160 Porter Drive	Annapolis	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	Bywater Estates Pump Station	1808 Whiton Court	Annapolis	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	Admiral Heights Pump Station	441 Admiral Drive	Annapolis	X	0	0	0	0	4	No
Utility	Wastewater Pump Station	Eastport Pump Station	713 Second Street	Annapolis	AE	2.0	1	0	0	0	Yes

Facility Category	Facility Type	Facility Name	Address	City	Flood Zone	Flood Depth	Cat 1	Cat 2	Cat 3	Cat 4	SLR 100
Utility	Wastewater Pump Station	Pump Station Underground	986 Awald Road	Annapolis	X	0	0	2	0	0	No
Utility	Wastewater Pump Station	Pump Station Underground Lift	701 Bywater Road	Annapolis	X	0	0	0	0	0	No
Utility	Wastewater Pump Station	Underground	270 Hanover Street	Annapolis	X	0	0	0	0	0	No
Utility	Water Pump Station	Well Pump House #9	298 Defense Highway	Annapolis	A	0	0	0	0	4	No
Utility	Water Pump Station	Water pumping station with suction pump house	Defense Highway	Annapolis	X	0	0	0	0	0	No
Utility	Water Pump Station	Well pump house #2	Defense Highway	Annapolis	X	0	0	0	0	0	No
Utility	Water Pump Station	Well pump house #5	Defense Highway	Annapolis	X	0	0	0	0	0	No
Utility	Water Pump Station	Well pump house #6	Defense Highway	Annapolis	X	0	0	0	0	0	No
Utility	Water Pump Station	Well pump house #7	Defense Highway	Annapolis	X	0	0	0	0	0	No
Utility	Water Tower	Water tank tower, Janwall #1	204 Janwall Street	Annapolis	X	0	0	0	0	0	No
Utility	Water Tower	Water tank tower, Jefferson	40 Jefferson Place	Annapolis	X	0	0	0	0	0	No
Utility	Water Tower	Bembe Point	7458 Edgewood Road	Eastport	X	0	0	0	0	0	No
Utility	Water Tower	Water tank tower, Janwall #2	204 Janwall Street	Annapolis	X	0	0	0	0	0	No
Utility	Water Tower	Water Tower	412 Farragut Road	Annapolis	X	0	0	0	0	0	No
Utility	WTP	Water Treatment Plant	260 Defense Highway	Annapolis	X	0	0	0	0	0	No
Utility	WWTP	Wastewater Treatment Plant	7228 Edgewood Road	Annapolis	X	0	0	0	0	0	No

APPENDIX B- NFIP & CRS

OFFICIAL USE ONLY

NATIONAL FLOOD INSURANCE PROGRAM & COMMUNITY RATING SYSTEM

Please note the Privacy Act protects the information within Appendix B of this plan. Therefore, Appendix B is for Official Use Only and not for public dissemination. If there is interest in the National Flood Insurance Program or Community Rating System, please contact:

David Mandell
Deputy Director
City of Annapolis
Office of Emergency Management
199 Taylor Avenue
Annapolis, MD 21401
Office: (410) 216-9167
Cell: (410) 320-2559

APPENDIX C-

FUNDING SOURCES

Note: Updated June 2017

The following is a list of Federal and State Grants that may assist in implementing local All Hazard Mitigation Plans. *This information is subject to change at any time, contact the federal or state agency for current grant status.*					
Grant Program Name	**Address and Telephone Contact Information**	**Eligible Activities**	**Federal, State and Local Cost Share Requirements**	**Other Program Characteristics**	**Grant Application Due Date**
Federal Emergency Management Agency, Hazard Mitigation Grant Program (HMGP)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	All Hazards Mitigation Planning. Acquisition, relocation, elevation and flood-proofing of flood-prone insured properties, flood mitigation planning, wind retrofit, stormwater improvements, education and awareness.	Federal - 75% Non Federal - 25%	Local government must be in compliance with the National Flood Insurance Program to be eligible. Projects must be cost effective, environmentally sound and solve a problem. Repetitive loss properties are a high priority.	After a Presidential Disaster Declaration
Federal Emergency Management Agency, Pre Disaster Mitigation Grant Program (PDM)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations.	Federal - 75% Non Federal - 25%	PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.	Annual-Spring/Summer
Federal Emergency Management Agency, Flood Mitigation Assistance Program (FMA)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	Assist States and communities to implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program.	RL: Federal - 90% Non Federal - 10% SRL: Federal - 100% Non Federal - 0%	Available once a Flood Mitigation Plan has been developed and approved by FEMA.	Annual-Spring/Summer
National Flood Insurance Program (NFIP)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	Provides financial protection by enabling persons to purchase insurance against floods, mudslide or flood related erosion.	Varies	Includes Federally backed insurance against flooding, available to individuals and businesses that participate in the NFIP	Anytime

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Increased Cost of Compliance	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	ICC coverage provides payment to help cover the cost of mitigation activities that will reduce the risk of future flood damage to a building. If a Flood Insurance Policy Holder suffers a flood loss and is declared to be substantially or repetitively damaged, ICC will pay up to 30,000 to bring the building into compliance with State or community floodplain management laws or ordinances. Usually this means elevating or relocating the building so that it is above the base flood elevation (BFE).	Varies	Once the local jurisdiction determines the building is substantially or repetitively damaged, the policy holder can contact insurance agent to file an ICC claim.	Anytime
U.S. Economic Development Administration, Economic Adjustment Program	U.S. Department of Commerce Economic Development Administration Curtis Center, 601 Walnut Street, Ste 140 South Philadelphia, PA 19106-3323 215-597-4603	Improvements and reconstruction of public facilities after a disaster or industry closing. Research studies designed to facilitate economic development.	Federal - 50%-70% Local- 30%-50%	Documenting economic distress, job impact and proposing a project that is consistent with a Comprehensive Economic Development Strategy are important funding selection criteria.	Anytime
U.S Economic Development Administration, Public Works and Development Facilities	U.S. Department of Commerce Economic Development Administration Curtis Center, 601 Walnut Street, Ste 140 South Philadelphia, PA 19106-3323 215-597-4603	Water and sewer, Industrial access roads, rail spurs, port improvements technological and related infrastructure	Federal - 50%-70% Local- 30%-50%	Documenting economic distress, job impact and projects that is consistency with a Comprehensive Economic Development Strategy are important funding selection criteria.	Quarterly Basis

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Small Business Administration (SBA) Pre-disaster Mitigation Loan Program	James Rivera, Office of Disaster Assistance, Small Business Administration, 409 3rd Street, SW, STE 6050 Washington, DC 20416;202-205-6734	Activities done for the purpose of protecting real and personal property against disaster related damage.	No information	The mitigation measures must protect property or contents from damage that may be caused by future disasters and must conform to the priorities and goals of the state or local government's mitigation plan.	
Community Development Block Grants / States Program	U.S Department of Housing and Urban Development, Office of Block Grant Assistance, 451 7th Street SW., Washington, DC 20410-7000;202-708-1112	Used for long-term recovery needs, such as: rehabilitation residential and commercial building; homeownership assistance, including down-payment assistance and interest rate subsidies; building new replacement housing; code enforcement; acquiring, construction, or reconstructing public facilities.	No information	Citizen participation procedures must be followed. At least 70 percent of funds must be used for activities that principally benefit persons of low and moderate income. Formula grants to States for non-entitlement communities.	After a Presidential Disaster Declaration
Fire Suppression Assistance Program	Infrastructure Division, Response and Recovery Directorate, FEMA, 500 C Street SW., Washington DC 20024; 202-646-2500.	Provides real-time assistance for the suppression of any fire on public (non-Federal) or privately owned forest or grassland that threatens to become a major disaster.	Federal - 70% Local - 30%	The State must first meet annual floor cost (if percent of average fiscal year fire costs) on a single declared fire. After the State's out-of-pocket expenses exceed twice the average fiscal year costs, funds are made available for 100 percent of all costs for each declared fire.	Funds from President's Disaster Relief Fund for use in a designated emergency or major disaster area.
Historic Preservation: Repair and Restoration of Disaster-Damaged Historic Properties	Infrastructure Division, Response and Recovery Directorate, FEMA, 500 C Street SW., Washington DC 20024; 202-646-4621.	To evaluate the effects of repairs to, restoration of, or mitigation hazards to disaster-damaged historic structures working in concert with the requirements of the Stafford Act.	Federal - 75% Local - 25%	Eligible to State and local governments, and any political subdivision of a State. Also, eligible are private non-profit organizations that operate educational, utility, emergency, or medical facilities.	After a Presidential Disaster Declaration

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Transportation: Emergency Relief Program	Federal Transit Authority, FHWA, DOT, 1200 New Jersey Avenue Washington, DC 20590; 202-366-4043	Provides aid for the repair of Federal-aid roads and roads on Federal lands.	Federal - 100%	Application is submitted by the State department of transportation for damages to Federal-aid highway routes, and by the applicable Federal agency for damages to roads on Federal lands.	After serious damage to Federal-aid roads or roads on Federal lands caused by a natural disaster or by catastrophic failure.
Animals: Emergency Haying and Grazing	Emergency and Non-insured Assistance Programs, FSA, USDA, 1400 Independence Ave, SW, Washington, DC 20013; 202-720-4053	To help livestock producers in approved counties when the growth and yield of hay and pasture have been substantially reduced because of a widespread natural disaster.	No information	Assistance is provided by the Secretary of Agriculture to harvest hay or graze cropland or other commercial use of forage devoted to the Conservation Reserve Program (CRP0 in response to a drought or other similar emergency.	Anytime
Emergency Watershed Protection Program	Natural Resources Conservation Service 1400 Independence Avenue, SW Washington, DC 20250	Implementing emergency recovery measures for runoff retardation and erosion prevention to relieve imminent hazards to life and property created by a natural disaster that causes a sudden impairment of a watershed.	Federal - 75% Local - 25%	It cannot fund operation and maintenance work or repair private or public transportation facilities or utilities. The work cannot adversely affect downstream water rights and funds cannot be used to install measures not essential to the reduction of hazards.	TBD
Watershed Protection and Flood Prevention Program	Natural Resources Conservation Service 1400 Independence Avenue, SW Washington, DC 20250	To provide technical and financial assistance in carrying out works of improvement to protect, develop, and utilize the land and water resources in watersheds.	Varies due to project type.	Watershed area must not exceed 250,000 acres. Capacity of a single structure is limited to 25,000 acre-feet of total capacity and 12,500 acre-feet of floodwater detention capacity.	TBD

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Watershed Surveys and Planning	Natural Resources Conservation Service 1400 Independence Avenue, SW Washington, DC 20250	To provide planning assistance to Federal, State, and local agencies for the development of coordinated water and related programs in watersheds and river basins. Emphasis is on flood damage reduction, erosion control, water conservation, preservation of wetlands and water quality improvements.	No information	These watershed plans form the basis for installing needed works of improvement and include estimated benefits and costs, cost-sharing, operation and maintenance arrangements, and other information necessary to justify the need for Federal assistance in carrying out the plan.	Anytime
Emergency Advance Measures for Flood Prevention	USACE 441 G Street, NW, Washington DC 20314; 202-761-0011	To perform activities prior to flooding or flood fight that would assist in protecting against loss of life and damages to property due to flooding.	No information	There must be an immediate threat of unusual flooding present before advance measures can be considered. Any work performed under this program will be temporary in nature and must have a favorable benefit cost ratio.	Governor of State must request assistance
Emergency Streambank and Shoreline Protection	USACE 441 G Street, NW, Washington DC 20314; 202-761-0011	Authorizes the construction of emergency streambank protection measures to prevent damage to highways, bridge approaches, municipal water supply systems, sewage disposal plants, and other essential public works facilities endangered by floods or storms due to bank erosion.	No information	Churches, hospitals, schools, and other non-profit service facilities may also be protected under this program. This authority does not apply to privately-owned property or structures.	TBD

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Small Flood Control Projects	USACE 441 G Street, NW, Washington DC 20314; 202-761-0011	Authorizes the construction of small flood control projects that have not already been specifically authorized by Congress.	No information	There are two general categories of projects: structural and nonstructural. Structural projects may include levees, floodwalls, diversion channels, pumping plants, and bridge modifications. Nonstructural projects have little or no effect on water surface elevations, and may include flood proofing, the relocation of structures, and flood warning systems.	TBD
Flood: Emergency Advance Measures for Flood Prevention	USACE 441 G Street, NW, Washington DC 20314; 202-761-0011	To mitigate, before an event, the potential loss of life and damages to property due to floods.	No information	Assistance may consist of temporary levees, channel cleaning, preparation for abnormal snowpacks, etc.	Governor of State must request assistance
Continuing Authorities Program (CAP)	USACE 441 G Street, NW, Washington DC 20314; 202-761-0011	Initiates a short reconnaissance effort to determine Federal interest in proceeding. If there is interest, a feasibility study is performed.	Federal - 65% Local-35%	A local sponsor must identify the problem and request assistance. Small flood control projects are also available.	Anytime
Hazardous Materials: State Access to the Oil Spill Liability Trust Fund	Director, USCG National Pollution Funds Center, U.S. Coast Guard Stop 7605 2703 Martin Luther King Jr. Avenue, SE Washington, DC 20593-7605 202-795-6000	To encourage greater State participation in response to actual or threatened discharges of oil.	No information	Eligible to States and U.S. Trust Territories and possessions.	Anytime

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Emergency Management Assistance (EMA)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	Funds may be used for salaries, travel expenses, and other administrative cost essential to the day-to-day operations of State and Local emergency management agencies. Program also includes management processes that ensure coordinated planning, accountability for progress, and trained qualified staffing.	Federal - 50%	EMA funded activities may include specific mitigation management efforts not otherwise eligible for Federal funding. Management Assistance program funds may not be used for construction, repairs, equipment, materials or physical operations required for damage mitigation projects for public or private buildings, roads, bridges, or other facilities.	Anytime
Maryland Program Open Space	Department of Natural Resources 580 Taylor Ave. Annapolis, MD 21401 410-260-8445	Local provides financial and technical assistance to local subdivisions for the planning, acquisition, and/or development of recreation land or open space areas.	A local governing body may use up to $25,000 annually from its 100% (Acquisition) money to fund planning projects that update the Local Land Preservation and Recreation Plans.	Acquires outdoor recreation and open space areas for public use. Administers funds made available to local communities for open and recreational space by the Outdoor Recreation Land Loan of 1969 and from the Land and Water Conservation Fund of the National Park Service, U.S. Department of the Interior.	July 1st

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Maryland Recreational Trails Program	Maryland Scenic Byways /Recreational Trails Program* Office of Planning & Preliminary Engineering State Highway Administration 707 N Calvert Street Baltimore, MD 21201 (p) 410.545.8637 (f) 410.209-5012 tmaxwell@sha.state.md.us	Maintenance and restoration of existing recreational trail; Development and rehabilitation of trailside facilities and trail linkages; Purchase and lease of trail construction equipment; Construction of new trails; Acquisition of easements or property for recreational trails or recreational trail corridors; and Implementation of interpretive/educational programs to promote intrinsic qualities, safety, and environmental protection, as those objectives relate to the use of recreational trails.	Administered by the State Highway Administration (SHA), this program matches federal funds with local funds or in-kind contributions to implement trail projects. Projects can be sponsored by a county or municipal government, a private non-profit agency, a community group or an individual (non-governmental agencies must secure an appropriate government agency as a co-sponsor). Federal funds administered by the State Highway Administration are available for up to 80% of the project cost, matched by at least 20% funding from the project sponsor. Matching funds must be committed and documented in the local jurisdiction's budget. A Memorandum of Understanding outlining funding and project implementation responsibilities will be prepared by SHA and signed by all parties before the project funds are released.	Projects must meet state and federal environmental regulatory requirements (NEPA, MEPA, Section 106, Section 4(f)). SHA will provide assistance to the project sponsor to acquire these approvals.	July 1st

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
CoastSmart Communities Grant (CCG) Program	Maryland Department of Natural Resources Chesapeake and Coastal Service (p) 410.260.8718 (f) 410.260.8739 sasha.land@maryland.gov	Municipalities and counties in the coastal zone are eligible to apply for and receive funds: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George's, Queen Anne's, St. Mary's, Somerset, Talbot, Wicomico, and Worcester counties and Baltimore City. Funding for a one-year project that contributes to understanding, planning for, or implementing planning and outreach measures to address coastal hazard issues.	Up to $75,000 annually	Track A can fund flood vulnerability and risk assessments, updates to planning documents (e.g. hazard mitigation plans, zoning ordinances, building codes, floodplain ordinances, comprehensive plans), education and outreach campaigns and materials, applications to FEMA's Community Rating System in concert with other task outcomes, support for adopting an updated plan and integrating the plan into day-to-day existing planning processes that reduce overall flood risk due to tidal events or stormwater and rain events.	TBD

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Green Infrastructure Resiliency Grant Program	Maryland Department of Natural Resources Chesapeake and Coastal Service (p) 410.260.8799 (f) 410.260.8739 (e) megan.granato@maryland.gov	Municipalities and counties within the Maryland portion of the Chesapeake Bay watershed are eligible to apply for and receive funds. Please note that projects proposed in Cecil, Garrett and Worcester counties must be located within the portions of those counties that are within the watershed in order to be eligible. Funding for one year for Phase 1 and Phase 2 projects and up to 2 years for Phase 3 projects that will assess stormwater management needs associated with localized flooding and design or construct targeted green infrastructure practices to address those needs.	Up to $100,000 per project	Track B can fund watershed assessments that focus on determining local flood risks and how green infrastructure can be used to address those risks, site or watershed-level green infrastructure implementation plans, and green infrastructure project designs. This track can also fund construction of green infrastructure projects. In order to apply for construction funding, all applicable permit preapplication meetings must be complete.	TBD

Grant Program Name	Address and Telephone Contact Information	Eligible Activities	Federal, State and Local Cost Share Requirements	Other Program Characteristics	Grant Application Due Date
Maryland Community Parks and Playgrounds Program	Department of Natural Resources 580 Taylor Ave. Annapolis, MD 21401 410-260-8445	1) development of new parks 2) rehabilitation of existing parks 3) expansion or improvement of existing parks 4) purchase and installation of playground equipment 5) development of environmentally oriented parks and recreation projects 6) development of new trails or extension of existing trails 7) creation of access points to water recreation resources 8) acquisition of land to create new parks.	The source of funds for this program is primarily State General Obligation Bonds, which may be authorized on an annual basis. The Community Parks and Playgrounds Program provides funding to incorporated municipalities and Baltimore City. Grants may be for up to 100% of the project cost and are selected on a competitive basis. Each applicant will be limited to one (1) Grant Proposal List submission package, which may contain several prioritized projects, per award cycle.	The Department of Natural Resources works to provide opportunities for Marylanders, especially our children, to experience nature. The Department has developed a website that provides information about Nature Play Spaces. Nature Play Spaces are one of the many types of public recreation projects eligible for consideration for Community Parks and Playgrounds grant funding. While land acquisition costs may be considered for project funding, the highest priority will be placed on capital costs associated with park development and improvement.	TBD

APPENDIX D – LIST OF ACRONYMS

1. List of Acronyms

- Average Annualized Loss (AAL)
- Benefit Cost Analysis (BCA)
- Coastal High Hazard Areas (CHHAs)
- Community Rating System (CRS)
- Continuity of Operation Plan (COOP)
- Cultural Resource Hazard Mitigation Plan (CRHMP)
- Department of Natural Resources (DNR)
- Digital Flood Insurance Rate Maps (DFIRMs)
- Emergency Operations Centers (EOCs)
- Federal Emergency Management Agency (FEMA)
- Flood Insurance Rate Maps (FIRMs)
- Flood Insurance Study (FIS)
- Flood Risk Reports (FRR)
- Geographic Information System (GIS)
- Hazard Identification Risk Assessment (HIRA)
- Hazard Mitigation Assistance (HMA)
- Hazard Mitigation Grant Program (HMGP)
- Hazard Mitigation Plan (HMP)
- Homeowners Flood Insurance Affordability Act (HFIAA)
- Light Detection and Ranging (LiDAR)
- Maryland Department of Environment (MDE)
- Maryland Department of Housing and Community Development (DHCD)
- Maryland Department of Human Resources (DHR)
- Maryland Department of Planning (MDP)
- Maryland Department of Transportation (MDOT)
- Maryland Emergency Management Agency (MEMA)
- Maryland Environment Trust (MET)
- Maryland Historic Trust (MHT)
- Maryland Insurance Administration (MIA)
- Maryland Port Administration (MPA)
- Maryland's Coastal Resiliency Assessment
- National Center Environmental Information (NCEI)
- National Flood Insurance Program (NFIP)
- National Oceanic Atmospheric Administration (NOAA)
- Natural Resources Defense Council (NRDC)
- Office of Emergency Management (OEM)
- Pre-Disaster Mitigation (PDM)
- Priority Funding Areas (PFAs)

- Public Information Officer (PIO)
- Repetitive Loss (RL)
- Risk Mapping, Assessment and Planning (Risk MAP)
- Sea-Level Rise (SLR)
- Severe Repetitive Loss (SRL)
- Special Flood Hazard Areas (SFHA)
- State Highway Administration (SHA)
- Storm Surge Inundation Maps (SIMMs)
- Stormwater Management (SWM)
- US Army Corps of Engineers (USACE)
- User Defined Data (UDD)
- Water Treatment Plant (WTP)
- Wastewater Treatment Plant (WWTP)

APPENDIX E - SOURCES OF INFORMATION

Sources identified within each plan chapter are provided below. Background information and data sources used within the plan and listed below are varied, however, primary sources include the City of Annapolis, State Agencies and other associated organizations. Where applicable, website hyper-links are embedded into the plan and source listing for direct user access.

SECTION 1 – PLANNING AREA & PLAN DEVELOPMENT

Chapter 1

Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288) as amended.
Website: https://www.fema.gov/media-library-data/1490360363533-a531e65a3e1e63b8b2cfb7d3da7a785c/Stafford_ActselectHSA2016.

Disaster Mitigation Act of 2000
Website: http://www.fema.gov/media-library/assets/documents/4596

Federal Emergency Management Agency. Local Mitigation Planning Handbook. March 2013. Website: www.fema.gov

Chapter 2

Prepared by City of Annapolis – Office of Emergency Management. 2012 City of Annapolis Natural Hazard Mitigation Plan. 2012.

Prepared by U.S. Census Bureau. U.S. Census Bureau-American Fact Finder. 2017.
Website: https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

Prepared by U.S. Census Bureau. American Community Survey. 2017.
Website: www.census.gov

Prepared by City of Annapolis Planning and Zoning: Comprehensive Planning. 2009 Annapolis Comprehensive Plan. October 2009.
Website: https://www.annapolis.gov/DocumentCenter/Home/View/1240

Chapter 3

Prepared by Maryland Department of Planning. MdProperty View Advanced Desktop GIS to use with ESRI's ArcGIS Software.
Website: http://planning.maryland.gov/OurProducts/downloadFiles.shtml

Prepared by City of Annapolis - Management Information Technology. City of Annapolis GIS Database. 2017.

Prepared by City of Annapolis Office of Emergency Management. Critical Facilities Listing. 2017.

SECTION 2 – HAZARD PROFILES, RISK, & VULNERABILITY

Chapter 4

Prepared by NOAA - National Center for Environmental Information. Storm Events Database. 2017.
Website: https://www.ncdc.noaa.gov/stormevents/

Prepared by City of Annapolis Historic Preservation Division. Weather It Together. 2017. Website: https://www.annapolis.gov/885/Weather-It-Together

Prepared by National Oceanic and Atmospheric Administration. National Hurricane Center.
Website: http://www.ncdec.noaa.gov

Prepared Maryland Department of Environment. Maryland's Climate Change and CoastSmart Executive Order. November 19, 2016.
Website: http://climatechange.maryland.gov/news-events/governor-omalley-issues-executive-order-to-expand-commission-on-climate-change/

U.S. Army Corps of Engineers, Baltimore District, Planning Division, January 2016SLOSH Basin – Chesapeake Bay (CP5), 2014
Website: http://www.nab.usace.army.mil/

Center for Resources Management – Virginia Institute of Marine Science
Shoreline Erosion Rates, 2002-2006
Website: http://ccrm.vims.edu/ccrmp/index.html

Prepared by Federal Emergency Management Agency. FEMA Climate Change Adaptation Policy Statement. 2012.
Website: https://www.fema.gov/media-library-data/20130726-1919-25045-3330/508_climate_change_policy_statement.pdf

Chapter 5

Prepared by City of Annapolis Historic Preservation Division. Weather It Together. 2017. Website: https://www.annapolis.gov/885/Weather-It-Together

Prepared by NOAA - National Center for Environmental Information. Storm Events Database. 2017.
Website: https://www.ncdc.noaa.gov/stormevents/

Prepared by Union of Concerned Scientists. Encroaching Tides-How Sea Level Rise and Tidal Flooding Threaten U.S. East and Gulf Coast Communities over the Next 30 Years. October 2014.
Website: http://www.ucsusa.org/sites/default/files/attach/2014/10/encroaching-tides-full-report.pdf

Prepared by Federal Emergency Management Agency. Flood Insurance Study-Anne Arundel County, Maryland and Incorporated Areas. February 18, 2015.
Website:https://map1.msc.fema.gov/data/24/S/PDF/24003CV000B.pdf?LOC=cd048d3eeb54e19f9589219e834f9c51

Prepared by Federal Emergency Management Agency. Flood Zones. 2017.
Website: https://www.fema.gov/flood-zones

Prepared by Federal Emergency Management Agency. Flood Risk Report-Anne Arundel County, Maryland Coastal Study: Report Number 001. September 9, 2015.
Website:https://map1.msc.fema.gov/data/FRP/FRR_24003C_Coastal_20150909.pdf?LOC=5e4c74efd233a163604605774d309f11

Prepared by Department of Homeland Security and Federal Emergency Management Agency-Mitigation Division. Multi-Hazard Loss Estimation Methodology Flood Model-Hazus-MH Technical Manual. 2017.
Website: https://www.fema.gov/media-library-data/20130726-1820-25045-8292/hzmh2_1_fl_tm.pdf

Prepared by U.S. Census Bureau. American Community Survey-5-year Estimates. 2017.
Website: www.census.gov

Chapter 6

Prepared by NOAA - National Center for Environmental Information. Storm Events Database. 2017.
Website: https://www.ncdc.noaa.gov/stormevents/

Prepared by America's PrepareAthon! and Federal Emergency Management Agency. Prepare Your Organization for a Winter Storm Playbook.
Website: https://www.fema.gov/media-library-data/1409866131999-cd67474088f6e1eef8997242f261ed1a/prepareathon_playbook_winter_storms_final_090414_508a.pdf

Prepared by National Weather Service. Winter Storm Warning Definitions. 2017
Website: https://www.weather.gov/lwx/WarningsDefined

Chapter 7

Prepared by NOAA - National Center for Environmental Information. Storm Events Database. 2017.
Website: https://www.ncdc.noaa.gov/stormevents/

Chapter 8

Prepared by NOAA - National Center for Environmental Information. Storm Events Database. 2017.
Website: https://www.ncdc.noaa.gov/stormevents/

Chapter 9

Prepared by NOAA - National Center for Environmental Information. Storm Events Database. 2017.
Website: https://www.ncdc.noaa.gov/stormevents/

Prepared by Center for Climate and Energy Solutions. Extreme Heat and Climate Change. 2017.

Website: https://www.c2es.org/science-impacts/extreme-weather/extreme-heat

Prepared by Maryland Department of Health and Mental Hygiene. Maryland Climate and Health Profile Report. April 2016.
Website:http://mde.maryland.gov/programs/Air/ClimateChange/MCCC/ARWG/MarylandClimateandHealthProfileReport.pdf

Chapter 10

Prepared by U.S. Geological Survey. Earthquake Magnitude and Intensity. 2017.
Website: https://earthquake.usgs.gov/learn/topics/mag_vs_int.php

Prepared by Federal Emergency Management Agency. Reducing the Risk of Nonstructural Earthquake Damage – a Practical Guide. 2012.
Website: https://www.fema.gov/media-library/assets/documents/21405

Prepared by U.S. Geological Survey. 2014 Long-Term Model. 2017.
Website: https://earthquake.usgs.gov/hazards/hazmaps/conterminous/index.php#2014

SECTION 3 – MITIGATION STRATEGIES, PLAN MAINTENANCE, & IMPLEMENTATION

Chapter 11

Prepared by City of Annapolis Office of Emergency Management. 2012 Natural Hazard Mitigation Plan Update. 2012.

Prepared by Whitney, Bailey, Co & Magnani, LLC for City of Annapolis Department of Neighborhood and Environmental Programs. Flood Mitigation Strategies for the City of Annapolis, MD: City Dock and Eastport Area. December 2012.
Website: https://www.annapolis.gov/DocumentCenter/Home/View/5953

Chapter 13

Prepared by Whitney, Bailey, Co & Magnani, LLC for City of Annapolis Department of Neighborhood and Environmental Programs. Flood Mitigation Strategies for the City of Annapolis, MD: City Dock and Eastport Area. December 2012.
Website: https://www.annapolis.gov/DocumentCenter/Home/View/5953

Prepared by Whitney, Bailey, Co & Magnani, LLC for City of Annapolis Department of Neighborhood and Environmental Programs. Preliminary Sea Level Rise Study for the City of Annapolis, MD Eastport Area. March 2011.
Website: https://www.annapolis.gov/DocumentCenter/Home/View/5952

Prepared by City of Annapolis Planning and Zoning: Comprehensive Planning. 2009 Annapolis Comprehensive Plan. October 2009.
Website: https://www.annapolis.gov/DocumentCenter/Home/View/1240

Prepared by City of Annapolis. Capital Improvement Program-Fiscal Year 201-2020. 2017.
Website: https://www.annapolis.gov/ArchiveCenter/ViewFile/Item/1672

Prepared by City of Annapolis Planning and Zoning. Charter and Code of the City of Annapolis. 2017.
Website:https://library.municode.com/md/annapolis/codes/code_of_ordinances?nodeId=CHCOAN01

Prepared by City of Annapolis Planning and Zoning. Title 20-Subdivisions. 2017.
Website:https://library.municode.com/md/annapolis/codes/code_of_ordinances?nodeId=TIT20SU

Mapping Sources

Prepared by Smith Planning and Design and City of Annapolis Office of Emergency Services. GIS Database-2017 Critical Facilities Database. 2017.

Prepared by City of Annapolis Management Information Technology, GIS Coordinator. GIS Database-Facilities and Wards, City of Annapolis, MD. 2017.

Prepared by U.S. Army Corps of Engineers, Baltimore District, Planning Division. GIS Data Layer-Hurricane Storm Surge. January 2016.
Website: http://www.nhc.noaa.gov/surge/slosh.php

Prepared by FEMA. GIS Database- FRD_24003C_Coastal_Geodatabase. September 2015.
Website: https://msc.fema.gov/portal/advanceSearch#searchresultsanchor

Prepared by State Highway Administration, Salisbury University, NOAA, USACE, USGS, MD iMAP. GIS Data Layer-WEAT_MeanSeaLevelByCounty_2100. November 2016.
Website: http://data.imap.maryland.gov/datasets/maryland-mean-sea-level-by-county-in-2100

Prepared by MD iMAP, DoIT. GIS Data Layer- Imagery\MD_ThreeInchImagery. May 2017. http://data.imap.maryland.gov/datasets/maryland-imagery-acquisition-flight-information-3-inch-imagery-tile-grid

Prepared by the Maryland Department of Planning, Planning Data Services. GIS Data Layer-MdProperty View Data Points. June 2014. Website:
http://planning.maryland.gov/OurProducts/PropertyMapProducts/PropertyMapProducts.shtm

Prepared by DNR. GIS Data Layer- Maryland Coastal Resiliency Assessment - Shoreline Hazard Index. March 2016. Website: http://data.imap.maryland.gov/datasets/maryland-coastal-resiliency-assessment-shoreline-hazard-index

Prepared by U.S. Census Bureau. GIS Database- Census Bureau's MAF/TIGER Database. 2016. Website: https://www.census.gov/geo/maps-data/data/tiger-geodatabases.html

APPENDIX F – MEETING PRESENTATIONS

Downtown Annapolis- Flooding during Hurricane Isabel in 2003.
Source: http://climatechange.maryland.gov/science/

Plan Components

I. Planning Area & Plan Development Process
- Community Profile
- Hazard Identification

II. Hazard Profiles, Risk, & Vulnerability
- Coastal Hazards, Flood, Severe Winter Storm, Tornado, High Wind & Thunderstorms, Drought & Extreme Heat, Earthquake

III. Mitigation Strategies, Plan Maintenance, and Implementation
- Mitigation Status Report
- New Mitigation Goals, Objectives, & Actions
- Plan Integration
- Plan Implementation & Monitoring

Appendix
- Geodatabase & Data Methodology
- NFIP & CRS
- Sources
- List of Acronyms
- Meeting Notes & Public Outreach Documentation

Work Session Topics

- Hazard Identification
- Risk & Vulnerability
- Plan Integration
- NFIP & CRS
- Hazard Impacts

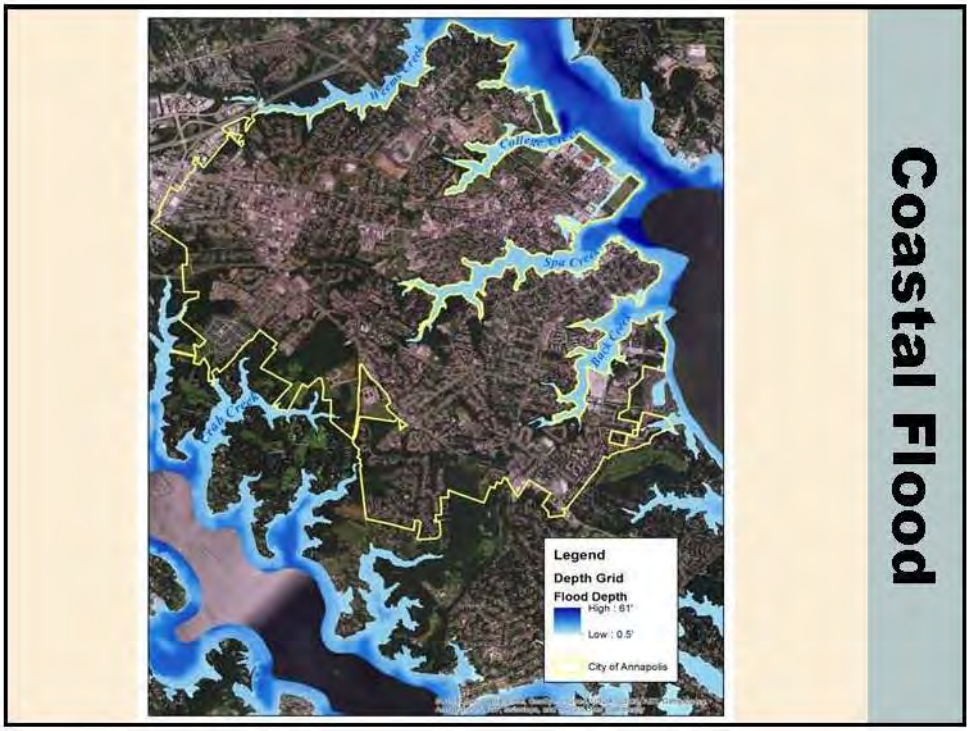
Hazard Identification

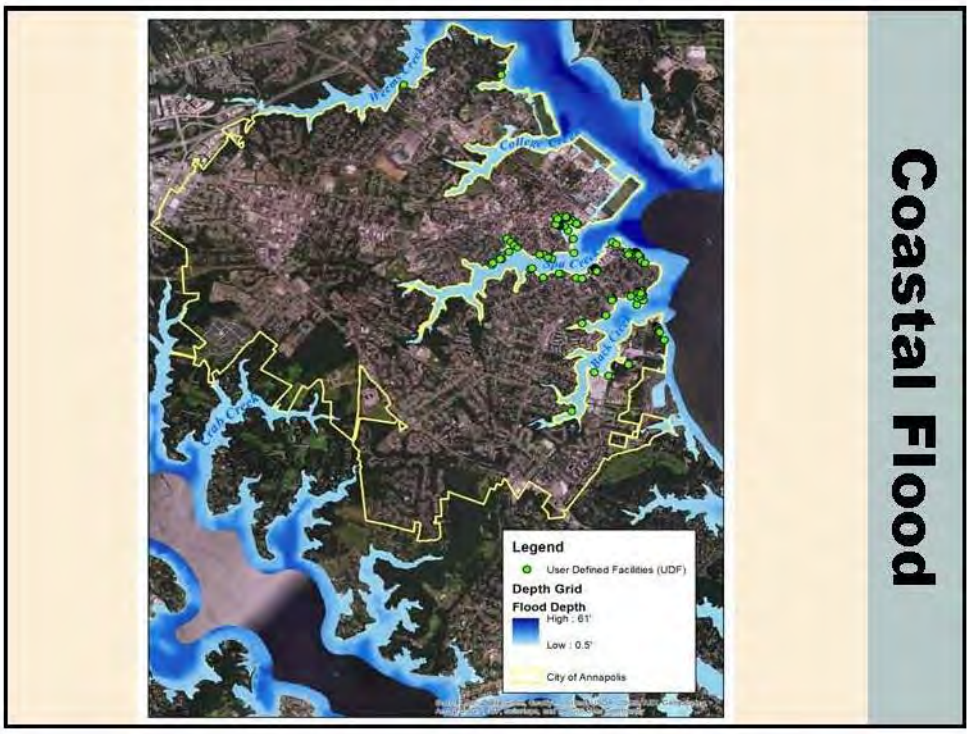
- Coastal Hazards (Hurricanes & tropical Storms, **Nor'easter,** shoreline erosion, and sea level rise)
- Flood (Riverine & Coastal)
- Severe Winter Storm
- Tornado
- High Wind & Thunderstorms
- Drought & Extreme Heat
- Earthquake.

Risk & Vulnerability

- Coastal Flood (DFIRM & DEM)
  - Flood zones are geographic areas that the FEMA has **defined** according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (**FIRM**) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area.
  - A **digital elevation model** (**DEM**) is a **digital model** or 3D representation of a terrain's surface — commonly for a planet (including Earth), moon, or asteroid — created from terrain **elevation** data.
  - **Hazus** is a geographic information system-based natural hazard analysis tool developed and freely distributed by the Federal Emergency Management Agency (FEMA). In 1997 FEMA released its first edition of a commercial off-the-shelf loss and risk assessment software package built on GIS technology.
- Hurricane: Storm Surge (SLOSH)
  - **SLOSH** stands for Sea, Lake, and Overland Surge from Hurricanes. It is a computerized **model** developed by the National Weather Service (NWS) to estimate storm surge heights and winds resulting from historical, hypothetical, or predicted hurricanes. ... It is also the basis for Hurricane Evacuation Studies (HES).

Coastal Flood

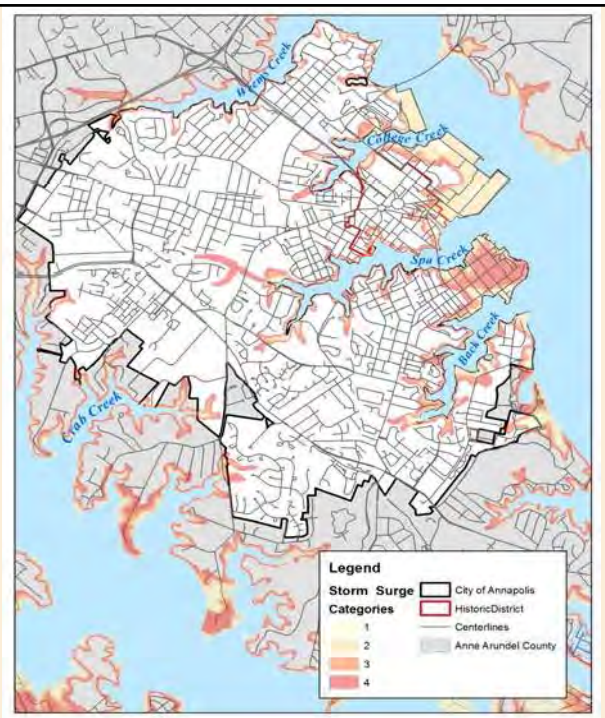

Coastal Flood
Legend
Depth Grid
Flood Depth
High : 61'
Low : 0.5'
City of Annapolis


Coastal Flood
Legend
User Defined Facilities (UDF)
Depth Grid
Flood Depth
High : 61'
Low : 0.5'
City of Annapolis

Coastal Flood

At-Risk Summary				
Jurisdiction	**Total**	**Residential**	**Commercial**	**Other**
City of Annapolis	$106,300,000	$62,900,000	$43,400,000	$20,000

Loss Estimations				
Jurisdiction	**Total**	**Residential**	**Commercial**	**Other**
City of Annapolis	$20,000	$9,200,000	$7,900,000	$10,000



Critical Facilities

Geodatabase

Table

Annapolis_CF

ACCTID	Facility_	Name	ADDRESS	CITY	ZIPC	OWNNAME1
020600001406365	EOC	City of Annapolis Management of Info T	161 DUKE OF GLOUCESTER ST	ANNAPOLI	21401	CITY OF ANNAPOLIS MAYOR & AL
020600001406373	Fire	Annapolis Fire_Headquarters	1790 FOREST DR	ANNAPOLI	21401	MAYOR & CITY COUNCIL
020600090051430	Fire	Taylor Ave Fire Station	620 TAYLOR AVE	ANNAPOLI	21401	CITY OF ANNAPOLIS FIRE STATION
020600090109741	Medical	Residential Property	814 CEDAR PARK ROAD	ANNAPOLI	21401	BELLO MACHRE INC
020661090087170	Medical	Condos_Apartments	626 ISLAND CREEK CT	ANNAPOLI	21401	MAIN STREET HOUSING INC
020655106017301	Medical	Residential Property	1612 MARGARET AVE	ANNAPOLI	21401	LANGTON GREEN INC
020655100154037	Medical	Parole Health Center	1950 DREW ST	ANNAPOLI	21401	COMM HEALTH CENTER AT PAROL
020600000138075	Police	Annapolis Police Station	199 TAYLOR AVE	ANNAPOLI	21401	ANNAPOLIS CITY POLICE
020200000214025	School	Hillsmere Elementary School	3052 Arundel on the Bay Road	ANNAPOLI	21403	ANNE ARUNDEL COUNTY BD OF E
020695500154109	School	Georgetown East Elementary School	111 Dogwood Rd	ANNAPOLI	21403	ANNE ARUNDEL COUNTY BD OF E
020600000154201	School	Germantown Elementary School	200 Windell Ave	ANNAPOLI	21403	ANNE ARUNDEL COUNTY BD OF E
020600000154205	School	Wiley H Bates Middle School	701 Chase St	ANNAPOLI	21401	ANNE ARUNDEL COUNTY BD OF E
020600000154207	School	Annapolis Elementary School	180 Green St	ANNAPOLI	21401	ANNE ARUNDEL COUNTY BD OF E
020600000154208	School	Eastport Elementary Schools	420 5th St	ANNAPOLI	21403	ANNE ARUNDEL COUNTY BD OF E

MAP	GRID	PARCEL	DESCCAUSE	ACRES	YEAR	SQFTS	DESCGRAD	DESCCNST	DESC STYL	DESCBLDG	RFMMPVL	BLDG_	FldZnn	Historic
0052	0019	1052	SAFETY Fire Station	0.041		0					263200		X	
0051	0010	0101	SAFETY Fire Station	2.05	1977	17450	GRAD Below Average	0	SAFETY Fire Station	SAFETY Fire Station	1267800	02	X	N
0049	0022	2007	SAFETY Fire Station	0.836	1987	15834	GRAD Average	0	SAFETY Fire Station	SAFETY Fire Station	2220400	02	X	N
0051	0009	0999		0.290		1610	GRAD Average	CNST Siding	STRY 2 Story With Basement	DWEL Standard Unit	203000		X	
0051	0009	0240		0.038	1996	1198	GRAD Below Average	CNST Siding	STRY Tk Center 2 Story With	DWEL Center Unit	87100		X	N
0051	0023	2377		0.173	2003	2463	GRAD Average	CNST Siding	STRY 1 1/2 Story With Base	DWEL Standard Unit	275700		X	N
0051	0014	0396	OFFICE Building Medical	0.37	1948	2896	GRAD Economy	0	OFFICE Building Medical	OFFICE Building Medical	364900	01	X	Y
0051	0010	1206	SAFETY Police Station	4.09	1972	25040	GRAD Below Average	0	PUBLIC Government Building	PUBLIC Government Bull	2192100	02	X	N
0057	0007	0139	COMMUNITY School	15.86	1967	43859	GRAD Average	0	SCHOOL Elementary	SCHOOL Elementary	4126200	01	X	N
0052	0020	2067	COMMUNITY School	10.53	1971	85439	GRAD Below Average	0	SCHOOL Elementary	SCHOOL Elementary	5830600	01	X	N
0051	0012	1201	COMMUNITY School	38	1967	94816	GRAD Below Average	0	SCHOOL Elementary	SCHOOL Elementary	6610800	01	X	N
0051	0003	0351	COMMUNITY School	24.92	1952	24803	GRAD Below Average	0	SCHOOL High	SCHOOL High	19354800	02	X	Y
0052	0020	1257	COMMUNITY School	2.88		0		0			2878200		X	
0052	0009	0326	COMMUNITY School	3	1906	29442	GRAD Below Average	0	SCHOOL Elementary	SCHOOL Elementary	2832800	02	X	Y
0051	0017	1796	PUBLIC County Property	5.01		0		0			54200		X	
0052	0020	1263	COMMUNITY Church/Re	10.18		0		0			7085700		X	
0051	0019	1902	COMMUNITY Church/Re	9.34	1975	48037	GRAD Above Average	0	COMMUNITY Church	COMMUNITY Church	5794700	01	X	N
0045	0012	0383		4.1	1906	4729	GRAD Above Average	0	STRY 2 Story With Basement	DWEL Standard Unit	405000		X	Y
0051	0001	0022	PUBLIC County Property	0.310		27004	GRAD Below Average	0	REC Gymnasium	REC Gymnasium	1912200	02	X	
0045	0018	0115	COMMUNITY School	2.43	1955	37266	GRAD Below Average	0	SCHOOL Elementary	SCHOOL Elementary	2892800	02	X	Y
0045	0013	0463	COMMUNITY School	14.71	1962	37032	GRAD Below Average	0	SCHOOL Elementary	SCHOOL Elementary	3290500	01	X	Y
0051	0016	0430	COMMUNITY School	8.8	1954	49450	GRAD Below Average	0	SCHOOL Elementary	SCHOOL Elementary	3867600	01	X	Y
0051	0012	1201	COMMUNITY School	30	1967	94016	GRAD Below Average	0	SCHOOL Elementary	SCHOOL Elementary	6610000	01	X	N
0051	0003	0351	COMMUNITY School	24.92	1952	24803	GRAD Below Average	0	SCHOOL High	SCHOOL High	19354800	02	X	Y
0052	0007	0456	COMMUNITY School	31.17		0		0			177473400		X	

Geodatabase

- Account ID
- Name
- Address
- Year Built
- Square Footage
- Facility Description
- Structure Material
- Improvement Value
- Facility Type
- Critical/Public Facility
- Repetitive Loss Property
- Flood Zone
- Flood Depth
- Storm Surge Category
- Hazard Risk

Plan Integration

Linking hazard mitigation principles and actions with various community plans in order to increase resiliency.

Safe Growth Audit

Assessment of existing planning tools that address hazard risks and community resiliency.

- 2009 Annapolis Comprehensive Plan
  - Land Use
  - Transportation
  - Environmental Management
  - Public Safety
- 2015-2020 Capital Improvement Plan Proposed
  - Capital Improvement Program & Infrastructure Policies
- Zoning Ordinance; and
- Subdivision of Land-Regulations

NFIP & CRS

National Flood Insurance Program-NFIP

In 1968, Congress created the **National Flood Insurance Program** (**NFIP**) to help provide a means for property owners to financially protect themselves.
The **NFIP**offers **flood insurance** to homeowners, renters, and business owners if their community participates in the **NFIP**.

Community Rating System-CRS

The **Community Rating System** (CRS) 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%.

CRS Planning Steps & Hazard Mitigation Plan

Check ✔ if Item Meets Both CRS & Part 201	Location within 2016 Hazard Mitigation Plan	CRS Planning Steps (Activity 510)	Local Hazard Mitigation Planning Handbook Tasks (44 CFR Part 201)
✔ ✔	Pages 1-3 thru 1-7	**Step 1.** Organize	**Task 1:** Determine the Planning Area and Resources **Task 2:** Build the Planning Team
✔	Page 1-7	Step 2. Involve the public	**Task 3:** Create an Outreach Strategy
✔	Chapter 13-Community Capabilities	Step 3. Coordinate	Task 4: Review Community Capabilities
✔	Chapter 4-Coastal Storm & Chapter 8-Flood	Step 4. Assess the hazard	Task 5: Conduct a Risk Assessment
✔	Chapter 4-Coastal Storm & Chapter 8-Flood	Step 5. Assess the problem	
✔	Pages 14-2 thru 14-5	Step 6. Set goals	Task 6: Develop a Mitigation Strategy
✔	Pages 14-6 thru 14-11	Step 7. Review possible activities	
✔		Step 8. Draft an action plan	
✔	Page 1-7	Step 9. Adopt the plan	Task 8: Review and Adopt the Plan
✔	Chapter 15-Plan Maintenance & Implementation	Step 10. Implement, evaluate, revise	Task 7: Keep the Plan Current Task 9: Create a Safe and Resilient Community

510 Floodplain Management Planning Checklist

1. Organize and Prepare Plan (max. 15)
   a. Involvement with Planning Office (4)
   b. Planning Committee (9)
   c. Process formally created by the community's governing board (2)
2. Involve the Public (max. 120)
   a. Planning process conducted through a planning committee (60)
   b. Public meetings held at the beginning of the planning process (15)
   c. Public meeting held on draft plan (15)
   d. Other public information activities to encourage input (up to 30)
3. Coordinate with other agencies (max. 35)
   a. Review existing studies and plans (5)
   b. Coordinating with communities and other agencies (up to 30)
4. Assess the Hazard (max. 35)
   a. Plan includes assessment of flood hazard with:
      1) Map of known flood hazard (5)
      2) Description of known flood hazard (5)
      3) Discussion of past floods (5)
   b. Plan includes assessment of less frequent floods (10)
   c. Plan includes assessment of areas likely to flood (5)

NFIP & CRS

510 Floodplain Management Planning Checklist

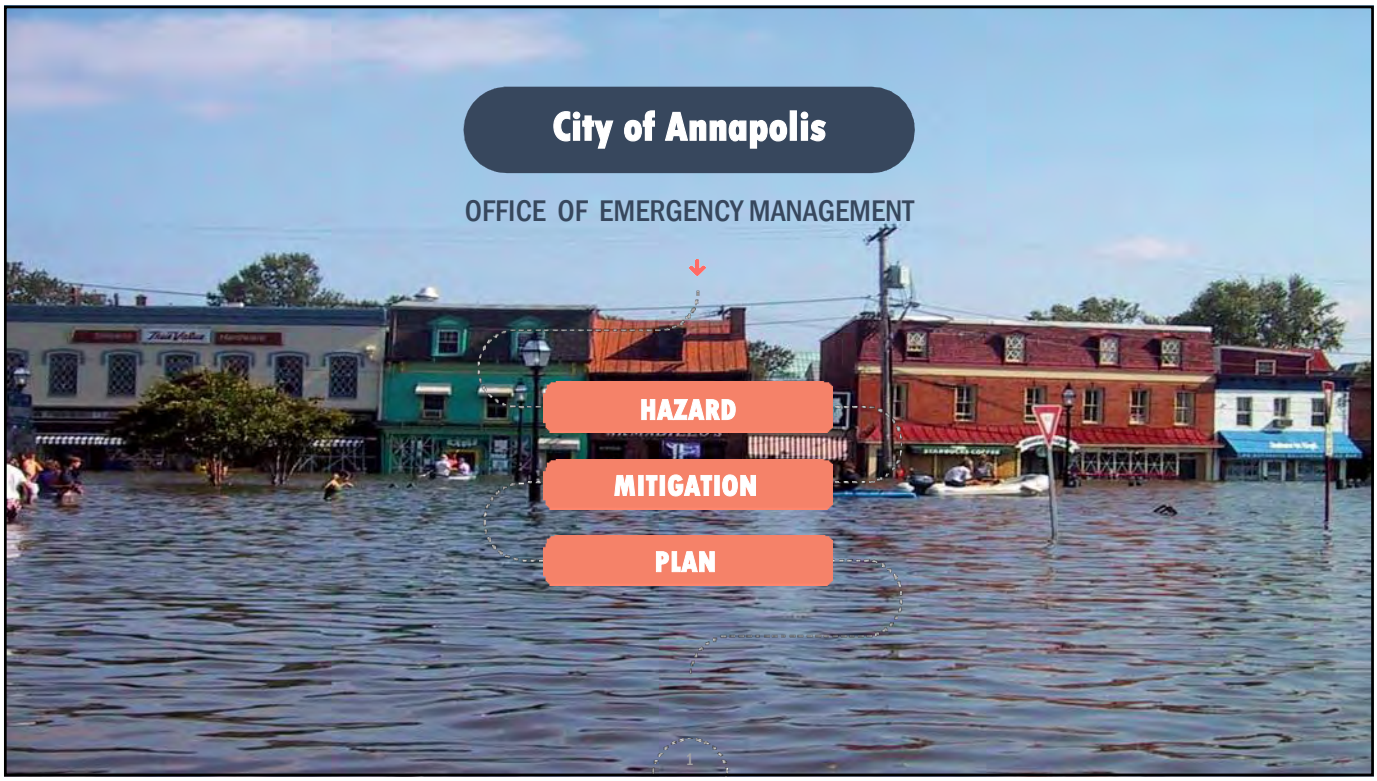
4. Cont. Assess the Hazard (max. 35)
   a. The plan describes other natural hazards (5)
5. Assess the Problem (max. 52)
   a. Summary of each hazard identified in the hazard assessment and their community impact (2)
   b. Description of the impact of the hazards on: (max 25)
      1) Life, safety, health, procedures for warning and evacuation (5)
      2) Public health including health hazards to floodwaters/mold (5)
      3) Critical facilities and infrastructure (5)
      4) The community's economy and tax base (5)
      5) Number and types of affected buildings (5)
   c. Review of all damaged buildings/insurance claims (5)
   d. Areas that provide natural floodplain functions (5)
   e. Development/redevelopment/population trends (7)
   f. Impact of future flooding conditions outlined in Step 4, item c (5)
6. Set Goals (2)

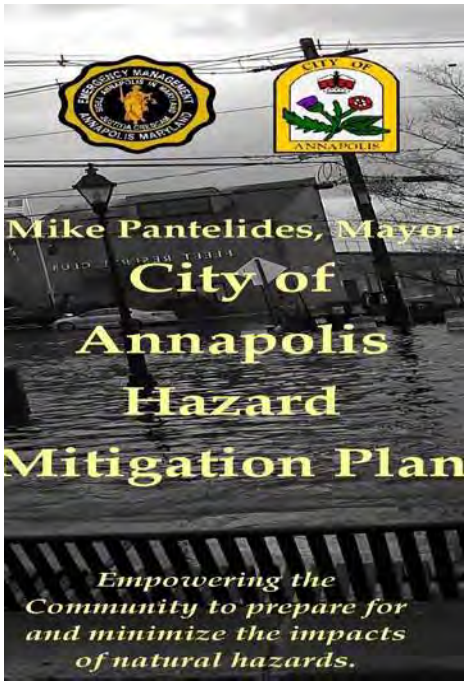
NFIP & CRS

510 Floodplain Management Planning Checklist

7. Review Possible Activities (max. 35)
   a. Preventative activities (5)
   b. Floodplain management regulatory/current & future conditions (5)
   c. Property acquisition activities (5)
   d. Natural resource protection activities (5)
   e. Emergency services activities (5)
   f. Structural projects activities (5)
   g. Public Information activities (5)
8. Draft an Action Plan (max. 60)
   a. Actions must be prioritized (Required)
      1) Recommended activities from 5 of the 6 categories (45)
   b. Post-disaster mitigation policies and procedures
   c. Action items for mitigation of other hazards
9. Adopt Plan (2)
10. Implement, Evaluate and Revise (max. 26)
    a. Procedures to monitor and recommend revisions (2)
    b. Same planning committee or successor committee that qualifies under Section 511.a.2 (a) does the evaluation (24)

NFIP & CRS





OVERVIEW

DISATER MITIGATION ACT OF 2000

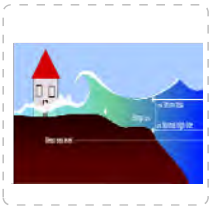
DMA 2000 (Public Law 106-390) provides the legal basis for FEMA mitigation planning requirements for State, local and Indian Tribal governments as a condition of mitigation grant assistance. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by repealing the previous mitigation planning provisions and replacing them with a new set of requirements that emphasize the need for State, local, and Indian Tribal entities to closely coordinate mitigation planning and implementation efforts.

PLANNING → FUNDING

2

HAZARD MITIGATION

THIS IS WHAT WE FOCUS ON



RESOURCES

STAKEHOLDER ENGAGEMENT, STAFF RESOURCES, AND CURRENT COMMUNITY CAPABILITIES

.

HAZARD PROFILES

HAZARD IDENTIFICATION, PAST OCCURRENCES & IMPACTS.

RISK & VULNERABILITY

WHO AND WHAT IS AT-RISK

STRATEGIES

WHAT ARE WE GOING TO DO MOVING FORWARD

3

HISTORY

2005

ANNAPOLIS HAZARD MITIGATION PLAN

2012

ANNAPOLIS NATURAL HAZARD MITIGATION PLAN UPDATE

2006 & 2007

AMENDMENTS

UNDERWAY

WEATHER IT TOGETHER- CULTURAL RESOURCES ADAPTION & HAZARD MITIGATION PLAN

4

EXAMPLES

Critical Facilities within Storm Surge

Facility Category	Facility Type	Facility Name	Hurricane Categories			
			Category 1	Category 2	Category 3	Category 4
City Owned	Historic Place	Annapolis Maritime Museum	✓			
City Owned	Retail	Market House	✓			
City Owned	Office	Harbormaster's Office	✓			
School	College	US Naval Academy	✓			
Utility	Wastewater Pump Station	Pump Station Siphon	✓			
School	Private	Annapolis Sailing School		✓		
City Owned	Office	Public Works/ Planning & Zoning			✓	
Fire	Fire Station	USNA Fire Company 46			✓	
Medical	Nursing Home	Baywoods of Annapolis			✓	
Utility	Wastewater Pump Station	Wardour			✓	
City Owned	Historic Place	Shiplap House				✓
School	Elementary	Eastport Elementary School				✓
Utility	Wastewater Pump Station	Spa Creek				✓
Utility	Wastewater Pump Station	Point #2, Underground				✓
Utility	Wastewater	Sumner				✓

EXAMPLES

Critical Facilities Constructed 1967 & Prior

Facility Category	Facility Type	Facility Name	Flat Roof
City Owned	Garage	PW Shed, Garage	✓
City Owned	Garage	PW Utilities Garage	✓
City Owned	Historic Place	Shiplap House	
City Owned	Historic Place	Maynard-Burgess House	
City Owned	Office	PW Services/Operations - E-cycling	✓
Fire	Fire/EMS	Eastport Fire Co. 36/EMS	✓
Medical	Hospital	Baltimore Washington Medical Center	✓
Medical	Nursing Home	New Annapolis Nursing	
School	Elementary	Eastport Elementary School	✓
School	Private	Heritage Learning Center	
School	Private	Van Buren Street Baptist School	
School	Private	J Albert Adams Academy	
School	Private	Phoenix Academy	✓
School	Public	Germantown Elementary School	✓
School	Public	West Annapolis Elementary School	✓
School	Public	Mills - Parole Elementary School	✓

Structures Located within Special Flood Hazard Area – High Risk Areas

Flood Depth	Residential	Commercial	Other	Total
0.5 – 0.9 feet	7	6	0	13
1.0 – 1.9 feet	22	18	0	40
2.0 – 2.9 feet	17	17	0	34
3.0 – 3.9 feet	21	4	1	26
4.0 – 4.9 feet	8	0	0	8
5.0 & above	3	2	0	5
Total	78	47	1	126

NEXT STEPS
WHERE WE GO FROM HERE
MITIGATION IDEAS
JUNE
JULY
PRIORITIZATION & DRAFT PLAN
REVIEW & ADOPTION
AUG
IMPLEMENTATION
7

PLANNING COMMITTEE	
Name	**Organization**
Jen Sparenberg	Maryland Historical Trust
Mark James	Maryland Emergency Management Agency
Sasha Land	Department of Natural Resources/CoastSmart Communities
Sharon Kennedy	Historic Preservation Commission
Alex DeWeese	Critical Area Commission
Christine Dunham	Smithsonian Environmental Research Center
Chris Goedeke	SERVPRO
Brian McCabe	SERVPRO
Diane Whittles	SERVPRO
Doug Myers	Chesapeake Bay Foundation
Marier Brown	Annapolis Department of Planning
Lisa Grieco	Annapolis Department of Public Works - Engineer
Sally Nash	Annapolis Department of Planning – Chief of Comprehensive Planning
Hollis Minor	Annapolis Economic Development Manager
Dana Litowitz	Johnson Mirmiran & Thompson
Kevin Wagner	Maryland Department of Environment
Kristie Baynard	Marstel-Day
Eileen Fogarty	Fogarty Group
Ross Arnett	Annapolis City Council
Michael Dowling	Cultural Resource Hazard Mitigation Plan – Team Member
Dave Mandell	Annapolis Office of Emergency Management

Stakeholders were divided into eight groups based upon hazards identified within the risk assessment. Groups were asked to discuss and provide information on the impact/consequence handout. Each group presented their findings for further discussion and refinement by the entire stakeholder committee.

Hazard Impact	
Health & Safety of the Public	
Health & Safety of the First Responders	
Continuity of Operations (including Delivery of Services)	
Property, Facilities, & Infrastructure	
Environment	
Economic Conditions	
Public Confidence in Government	

APPENDIX G – PUBLIC OUTREACH DOCUMENTATION

Throughout the plan development and review process, Office of Emergency Management pursues opportunities for community input specific to priorities for implementation of the City of Annapolis Hazard Mitigation Plan.

City of Annapolis
Office of Emergency Management
Kevin Simmons,
Deputy Fire Chief &
Director of Emergency Management

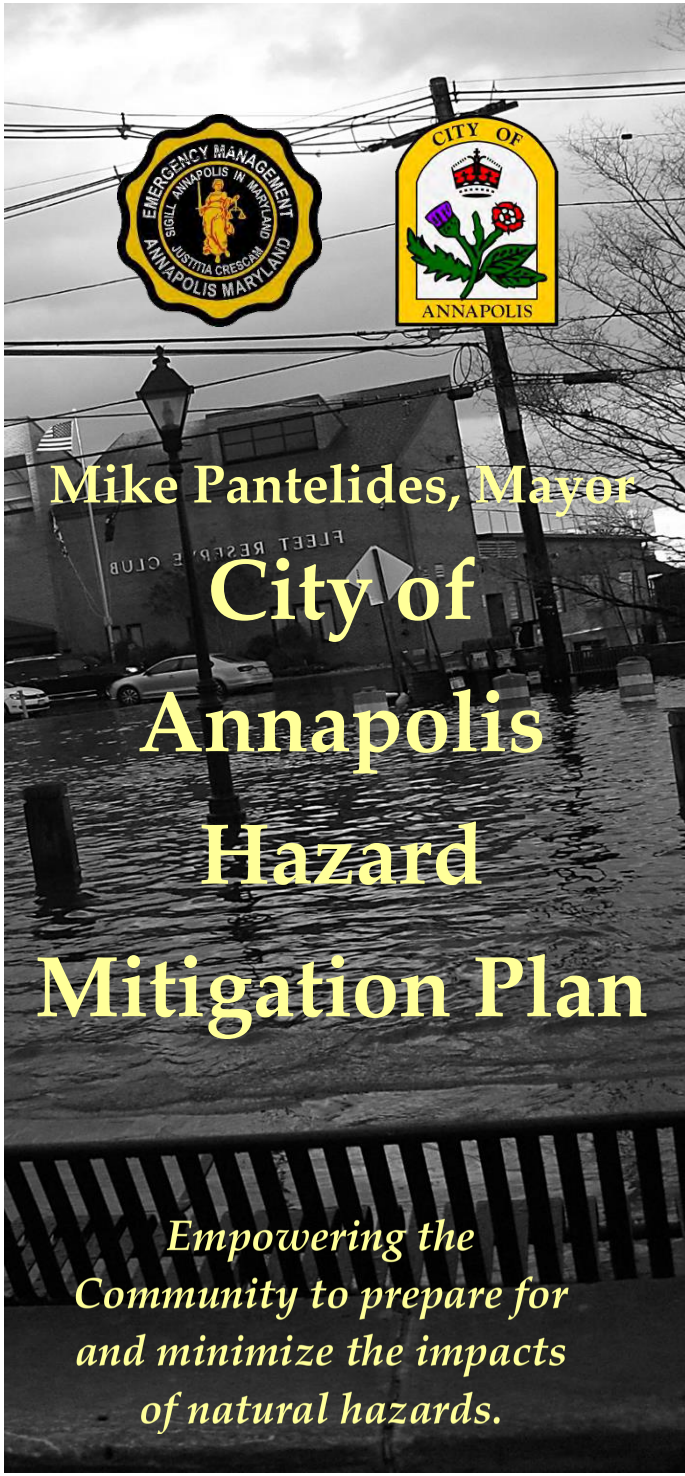
199 Taylor Avenue
Annapolis, MD 21401

Phone: 410-216-9167

Fax: 410-216-9189

Website:
https://www.annapolis.gov/260/Office-of-Emergency-Management

City of Annapolis
Office of Emergency Management
199 Taylor Avenue
Annapolis, MD 21401



Mike Pantelides, Mayor

City of Annapolis Hazard Mitigation Plan

Empowering the Community to prepare for and minimize the impacts of natural hazards.

Hazard Mitigation

Hazard mitigation is sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.

Hazard Mitigation Planning

The City of Annapolis has been engaged in hazard mitigation planning since 2004, when the first Hazard Mitigation Planning Committee was formed. The following hazard mitigation plans have been developed and adopted by the City of Annapolis:

- 2005 Annapolis Hazard Mitigation Plan;
- Plan amendments incorporated in both 2006 & 2007; and,
- 2012 Annapolis Natural Hazard Mitigation Plan Update.

At this time, the five (5) year update of the Plan must be completed to meet planning requirements set forth in the Disaster Mitigation Act of 2000.

Guiding Principles for Developing *City of Annapolis Hazard Mitigation Plan*

- Focus on the mitigation strategy. The mitigation strategy is the plan's primary purpose. All other sections contribute to and inform the mitigation strategy and specific hazard mitigation actions.
- Process is an important as the plan itself. In mitigation planning, as with most other planning efforts, the plan is only as good as the process and people involved in its development. The plan will serve as the written record, or documentation, of the planning process.
- This is our community's plan. To have value, our plan must represent the current needs and values of the Annapolis and be useful for stakeholders and partners.

Hazards Impacting Annapolis

The following hazards have been identified as to having the greatest impact on the City of Annapolis:

- Coastal Hazards including: Coastal Storm, storm surge, hurricane, tropical storm, and Nor'easter
- Flood
- Winter Storm
- Tornado
- Thunderstorm
- Wildfire
- Drought
- High Wind

Planning Partners

- Weather It Together Core Team & Steering Committee
- Fire
- Police
- Public Works
- Transportation
- Recreation & Parks
- Mayor's Office
- Office of Law
- Planning & Zoning
- Management of Information Technology
- Finance
- Human Resources
- City Council
- Anne Arundel County
- Maryland Emergency Management Agency
- Maryland Historical Trust
- Maryland Department of Environment
- Maryland Department of Natural Resources

WEATHER IT TOGETHER: PROTECT OUR HISTORIC SEAPORT

Open House and Public Forum

Sponsored by the City of Annapolis
Annapolis Waterfront Marriott
June 15 / 5:30 – 8:30 pm

5:30- 6 pm Exhibitor's Open House & Refreshments

- Annapolis Planning & Zoning Department / Dept. of Public Works
- Annapolis Office of Emergency Management
- Chesapeake Bay Foundation
- US Naval Academy
- Maryland Resilience Partnership
- SERVPRO of Annapolis/Severna Park
- Urban Land Institute

6 pm Welcome: Alderman Joe Budge

Remarks: Mayor Michael Pantelides

6:15 pm Remarks: Secretary Mark Bolton / MD Dept. of Natural Resources

6:30 pm Remarks: Director Elizabeth Hughes / MD Historical Trust

6:45 pm Presentation: Sara Phillips / US Naval Academy – Sea Level Rise Advisory Council

7 pm Presentation: Annapolis Hazard Mitigation Plan

Chief Kevin Simmons & Deputy Chief David Mandell

Annapolis Office of Emergency Management

Lisa Craig, Chief of Historic Preservation, Don Bain, Engineer &

Hollis Minor, Economic Development Manager

Weather It Together – Planning & Zoning

7:45 pm	Exercise: Community Input on Plan Priorities
8:15 pm	Survey Results
8:30 pm	Fair Winds and Following Seas!

The *Weather It Together: Protect our Historic Seaport* Public Forum will engage attendees in identifying priorities for hazard mitigation and adaptation projects important to protecting the architectural heritage, community character and resident / visitor experience in Annapolis. Project updates from Federal, State and Local agency representatives will provide the most current information regarding where Annapolis is positioned to respond to and prepare for near term hazards such as tidal flooding, unexpected natural hazards such as hurricanes and the longer-term consequences of sea level rise & subsidence. Public and private sector exhibitors will be on hand to provide information for property owners looking for tips on emergency preparedness and response.

Weather It Together was launched by the City of Annapolis in response to the threats identified in the City's Natural Hazard Mitigation Plan (2012) and the City Dock Master Plan (2014) to the impacts of sea level rise and tidal flooding on the Annapolis Historic District. The long-term concern for the accelerating rate of sea level rise and the devastation realized by Hurricane Sandy created a sense of urgency in Annapolis for the development of a Cultural Resource Hazard Mitigation Plan.

This plan, *Weather It Together*, has been 3 years in development, engaged over 2,500 local stakeholders, been showcased at 70 workshops, resulted in 8 major projects proposed for completion over the next 5 years to mitigate the potential loss associated with natural disasters, sea-level rise, subsidence, and tidal flooding to the City of Annapolis. The *Weather It Together* planning process requires organizing staff and financial resources, identifying affected properties, establishing critical partnerships, assessing risks to vulnerable properties and infrastructure, developing mitigation strategies, implementing protection measures and monitoring progress towards sustainable adaptation efforts.

This *Weather It Together* Open House & Public Forum is our final community input opportunity to the priorities for implementation of the City of Annapolis Cultural Resource Hazard Mitigation Plan. We look forward to the involvement of all city residents.

MAYOR PANTELIDES INVITES BUSINESSES AND RESIDENTS TO

FLOOD INSURANCE, WHAT YOU NEED TO KNOW:

HOW DOES THE NATIONAL FLOOD INSURANCE PROGRAM KEEP ANNAPOLIS AFLOAT?

A property owner's insurance policy covers most disasters, but it won't cover flood damage. Private insurers long ago deemed flood loss, which accounts for most disaster losses in the United States, as "too big to insure." So people who live in a high risk flood zone (also known as a Special Flood Hazard Area) and have a federally-backed mortgage must purchase flood insurance through the National Flood Insurance Program (NFIP), which was established in 1968 to make flood insurance more affordable.

The National Flood Insurance Program aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations. These efforts help mitigate the effects of flooding on new and improved structures. Overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically.

Join our Weather It Together partners from the Federal Emergency Management Agency (FEMA) and the Maryland Department of the Environment (MDE) to learn more about how you can insure your home and business property through the National Flood Insurance Program (NFIP).

SPEAKERS INCLUDE:

Richard Sobota, Senior Insurance Specialist, FEMA Region III

Walter McGuckin, Regional Support Team Lead and Region III Manager

Kevin Wagner, Natural Resources Planner, MDE

PARTNERS:

Maryland Department of the Environment

TUESDAY, JANUARY 24

Co-hosted by

the Ward One Resident Association

This evening gathering for residential property owners in Annapolis will be at the **Annapolis Waterfront Hotel, Harborside Room**, 80 Compromise Street from **6:30 to 8:30 pm**. One-on-One consultations can be scheduled in advance or onsite.

Limited Seating!

Please RSVP to president@wardone.org

WEDNESDAY, JANUARY 25

Co-hosted by

ANNE ARUNDEL COUNTY CHAMBER OF COMMERCE

DOWNTOWN ANNAPOLIS PARTNERSHIP — BE A PART OF IT

This morning workshop for commercial property owners and businesses will be at the **Annapolis City Hall Council Chambers**, 160 Duke of Gloucester St. from **8 to 10 am**. One-on-One consultations can be scheduled in advance or onsite.

Please RSVP to histpres@annapolis.gov

ANNAPOLIS WEATHER IT TOGETHER

KEEPING HISTORY ABOVE WATER ANNAPOLIS, MD

City of Annapolis

160 Duke Of Gloucester Street
Annapolis, MD 21401

Regular Agenda - Final

City Council

Monday, January 8, 2018 | **7:00 PM** | **Mayor John T. Chambers, Jr. City Council Chambers**

Call to Order

Mayor Buckley

Invocation

Alderwoman Tierney

Pledge of Allegiance

Mayor Buckley

Roll Call

City Clerk Watkins-Eldridge

Approval of Agenda

Ceremonial Items

Ward One Holiday Light Contest

Petitions, Reports and Communications

A. Reports by Committee

B. Comments by the General Public

C. Update from the Mayor

Public Hearings

Market House Tenant Proposals

Discussion on Market House Tenant Proposals

Consent Calendar

CCM121117 **Regular Meeting Minutes**

Attachments: RegularMinutesDecember 11, 2017.pdf

First Readers

O-1-18 **Public Ethics and Financial Disclosure - For the purpose of updating and amending the Ethics Code of Annapolis pursuant to the passage of HB 1386, effective October 1, 2017 and HB 879, effective January 1, 2019; clarifying certain definitions; ensuring City officials and employees are aware of their responsibilities pursuant to the Ethics Code; extending conflict of interest provisions to include lobbyists; amending the use of prestige of office restrictions; changing current policy regarding the reviewing and copying of financial disclosure statements by the public; removing the Alcoholic Beverage Control Board members from the financial disclosure filing requirements in accordance with recently enacted state law; making minor editorial changes; and matters generally relating to updating and amending the Ethics Code.**

Sponsors: Buckley

Attachments: O-1-18 Ethics Code Amendments Ordinance.docx
O-1-18 Ethics Code Staff Report.docx
O-1-18 Ethics Code Amendments Summary.pdf

O-2-18 **Water Service Agreement - MidAtlantic IRA, LLC - For the purpose of authorizing a water service agreement providing for the extension of City water service to 3032 Arundel on the Bay Road located in Anne Arundel County; and matters generally relating to providing said water service outside the City limits.**

Sponsors: Buckley

Attachments: O-2-18 MidAtlantic IRA, LLC Water Service Agrmt and Ordinance.docx
O-2-18 Exhibit A.pdf
O-2-18 Staff Report.docx

O-3-18 **Abandoned Vehicles - For the purpose of permitting an authorized agent of the City of Annapolis to exercise limited enforcement authority in the impoundment of abandoned vehicles; establishing a fine for leaving wrecked or nonoperating vehicles on public property; and matters generally relating to the abandonment of vehicles.**

Sponsors: Tierney

Attachments: O-3-18 Abandoned vehicles.docx
O-3-18 Staff Report.docx

R-1-18 **Wrecked or Nonoperating Vehicles on Public Property - Fine - For the purpose of establishing a fine for a violation of Section 12.44.030.A of the Code of the City of Annapolis concerning leaving wrecked or nonoperating vehicles on public property.**

Sponsors: Tierney

Attachments: R-1-18 Wrecked or nonoperating vehicles on public property - Fine.docx

R-1-18 and O-3-18 Staff Report.docx

End of Consent Calendar

Legislative Action

First Readers

R-2-18 **City of Annapolis Natural Hazard Mitigation Plan - 2018 Update - For the purpose of adopting the 2018 City of Annapolis Natural Hazard Mitigation Plan, as required by the Federal Emergency Management Agency, to maintain eligibility for disaster funding for large scale emergencies and disasters, as well as mitigation grant funding.**

Sponsors: Buckley, Finlayson and Rodriguez

Attachments: R-2-18 Natural Hazard Mitigation Plan - Updated.docx

R-2-18 Staff Report.docx

2018 City of Annapolis Hazard Mitigation Plan Update_Public Version FINAL.pdf

Adjournment

Anyone needing reasonable accommodation to be able to participate in a public meeting held by the City of Annapolis should contact Regina Watkins-Eldridge at 410.263.7942, by MD Relay (711), or by email at cityclerk@annapolis.gov at least five days prior to the meeting date to request assistance.

We encourage citizens to attend and participate in City Council Meetings. If you are unable to attend, the meetings can be viewed live on Channel 99/100 for all Comcast subscribers and on Channel 34 for Verizon customers. The meeting can also be viewed on computer and mobile devices by going to http://bit.ly/1gCd4pL during the meetings.

City of Annapolis

160 Duke Of Gloucester Street
Annapolis, MD 21401

Special Agenda - Final

City Council

Monday, March 19, 2018 | **7:00 PM** | **Mayor John T. Chambers, Jr. City Council Chambers**

Call to Order

Mayor Buckley

Invocation

Alderwoman Henson

Pledge of Allegiance

Mayor Buckley

Roll Call

City Clerk Watkins-Eldridge

Approval of Agenda

Petitions, Reports and Communications

A. Reports by Committee

B. Comments by the General Public

C. Update from the Mayor

Consent Calendar

First Readers

O-14-18 **Development Review Process Amendments - For the purpose of clarifying the notice requirements for community meetings; clarifying the project applicability requirements for required community meetings; designating the Office of the Mayor as the point of contact for obtaining a list of associations whose membership could be affected by a proposed development; making minor editorial corrections; and matters generally relating to the review process for all significant and substantial projects.**

Sponsors: Arnett

Attachments: O-14-18 Development Review Amendments Ordinance.docx
O-14-18 Staff Report.docx

O-15-18 **Lease of City Property - Truxtun Park Wet Slip - For the purpose of authorizing a lease between the City of Annapolis and Mission BBQ Management, LLC for use of a City-owned wet slip at Truxtun Park, Annapolis, Maryland for docking vessel(s) and carrying on a business of barbeque restaurant services.**

Sponsors: Buckley

Attachments: O-15-18 MissionBBQ-TruxtonPier-LeaseAgmt
O-15-18 Staff Report.docx

End of Consent Calendar

Public Hearings Cont.

O-8-18 **Adequate Public Facilities - Adequate School Facilities - Standards - For the purpose of amending the test for additional school capacity by requiring schools with enrollment greater than ninety five percent of the State-Rated Capacity to be listed as closed on the annual school utilization chart; and matters generally relating to adequate school facilities.**

Sponsors: Arnett, Savidge and Rodriguez

Attachments: O-8-18 Adequate School Facilities Standards.docx
O-8-18 Staff Report.docx
O-8-18 Fiscal Impact.pdf

Legislative History

2/12/18	City Council	adopt on first reader
2/12/18	City Council	refer to the Rules & City Government Committee
2/12/18	City Council	refer to the Transportation Committee
3/12/18	City Council	declare the public hearing left open
3/12/18	City Council	refer to the Housing and Human Welfare

Public Hearings

O-13-18 **City Emblems - Prohibited Uses - For the purpose of regulating the use of the City seal, City flag, and City logo.**

Sponsors: Savidge

Attachments: O-13-18 City Emblems Ordinance.docx
O-13-18 Staff Report.docx

Legislative History

3/12/18	City Council	adopt on first reader

3/12/18	City Council	refer to the Finance Committee
3/12/18	City Council	refer to the Rules & City Government Committee

Legislative Action

First Readers

Proposed motion to suspend the rules to adopt R-11-18 at the meeting of its introduction.

R-11-18 **Amended 2018 City of Annapolis Natural Hazard Mitigation Plan - For the purpose of adopting as amended the 2018 City of Annapolis Natural Hazard Mitigation Plan, as required by the Federal Emergency Management Agency, to maintain eligibility for disaster funding for large scale emergencies and disasters, as well as mitigation grant funding.**

Sponsors: Buckley, Arnett, Finlayson, Henson, Paone, Pindell Charles, Rodriguez and Tierney

Attachments: R-11-18 Amended 2018 Natural Hazard Mitigation Plan.docx

R-11-18 Staff Report.docx

Proposed motion to suspend the rules to adopt R-12-18 at the meeting of its introduction.

R-12-18 **City Council and Standing Committee Meetings - Electronic Participation - For the purpose of authorizing Alderwoman Finlayson to participate in City Council and Standing Committee meetings via electronic communications equipment for a limited period of time.**

Sponsors: Arnett and Savidge

Attachments: R-12-18 Finlayson Electronic Attendance of Meetings.docx

Second Readers

O-3-18 **Abandoned Vehicles - For the purpose of permitting an authorized agent of the City of Annapolis to exercise limited enforcement authority in the impoundment of abandoned vehicles; establishing a fine for leaving wrecked or nonoperating vehicles on public property; and matters generally relating to the abandonment of vehicles.**

Sponsors: Tierney

Attachments:

O-3-18 Abandoned vehicles.docx

O-3-18 Staff Report.docx

O-3-18 Fiscal Impact.pdf

O-3-18 Transportation Bd Findings.pdf

O-3-18 Public Safety Cmte Proposed Amendments.docx

O-3-18 Transportation Cmte Proposed Amendments.docx

O-3-18 Rodriquez Proposed Amendment.docx

O-3-18 Tierney Proposed Amendment.docx

Legislative History

1/22/18	City Council	declare the public hearing left open
2/12/18	City Council	declare the public hearing closed
3/5/18	Public Safety Committee	recommend with amendments
3/8/18	Transportation Committee	recommend favorably
3/12/18	City Council	postpone

O-12-18

Boards, Commissions, Committees and Authorities - Attendance at Meetings - For the purpose of permitting members of certain Boards, Commissions, Committees and Authorities to attend meetings via telephone conference; limiting the attendance of members via telephone conference to non-quasi-judicial government units; permitting attendance by a member via telephone conference to count toward the meeting quorum; and matters generally relating to permitting certain meeting attendance via telephone conference.

Sponsors: Buckley

Attachments:

O-12-18 Attendance_at_meetings.docx

O-12-18 Staff Report.docx

O-12-18 Fiscal Impact.pdf

O-12-18 Mayor's Proposed Amendments.docx

Legislative History

2/26/18	City Council	adopt on first reader
2/26/18	City Council	refer to the Rules & City Government Committee
3/12/18	City Council	declare the public hearing closed
3/13/18	Rules & City Government Committee	recommend unfavorably

For the Good of the Order

City Government Offices will be Closed in Observance of Maryland Day (3/26/18) and Good Friday (3/30/18)

Adjournment

Anyone needing reasonable accommodation to be able to participate in a public meeting held by the City of Annapolis should contact Regina Watkins-Eldridge at 410.263.7942, by MD Relay (711), or by email at cityclerk@annapolis.gov at least five days prior to the meeting date to request assistance.

We encourage citizens to attend and participate in City Council Meetings. If you are unable to attend, the meetings can be viewed live on Channel 99/100 for all Comcast subscribers and on Channel 34 for Verizon customers. The meeting can also be viewed on computer and mobile devices by going to http://bit.ly/1gCd4pL during the meetings.

APPENDIX H – DISPLACED INDIVIDUALS & HOUSEHOLDS METHODOLOGY

Methodology

The method utilized to determine displaced populations due to inundation for the City of Annapolis was provided by and based upon the Hazus-MH Flood Technical Manual. For purposes of this analysis, input requirements included census data regarding total number of households in the community and total number of individuals in a community. Optionally, to create a more robust analysis which estimates shelter requirements, the analysis can include distribution of households by income and distribution of individuals by age. In order to create the most accurate estimates as possible, 2015 ACS 5-year data was utilized.

The method for estimating inundation within Annapolis was tweaked to fit data limitations and the unique characteristics of the city, but primarily followed the following basic formulas:

The formula for representing the number of displaced inidividuals is:

$$\#DI_{IN} = \sum_{j=1}^{n} POP_{IN}$$

where:

$\#DI_{IN}$	=	The number of displaced individuals as a result of inundation where $d \geq i$
POP_{IN}	=	The population of a census block located within the area of inundation defined by $d \geq i$
J	=	the number of census blocks within the flooded area defined by $d \geq i$
D	=	depth of flooding
I	=	the depth of flooding at which travel into the area is restricted.

The formula for representing the number of displaced households is:

$$\#DH_{IN} = \sum_{j=1}^{n} H_{IN}$$

where:

$\#DH_{IN}$	=	The number of displaced households as a result of inundation where $d \geq i$
H_{IN}	=	The number of households in a census block located within the area of inundation defined by $d \geq i$
J	=	the number of census blocks within the flooded area defined by $d \geq i$
D	=	depth of flooding
I	=	the depth of flooding at which travel into the area is restricted.

The only adjustment made to either formula to estimate the number of displaced individuals and households for Annapolis was the use of the Census Block Group instead of the Census Block, which is the suggested unit of analysis. The use of the block group instead of the block was required due to limitations in data availability.
Following data collection and cleaning, the analysis became a matter of inputing the required data into excel and calculating individual and household displacement based on the above formulas. The data and results were formatted in such a way so they could be imported into ArcMap for visualization and manipulation purposes at the block group. Aside from the use of the block group as the unit of analysis for displacement, some scaling was performed on the total population and total household data for 4 of the 22 affected block groups. This decision was made because the block groups were "clipped" in ArcMap based on the official boundary for the City of Annapolis. While the areas of the vast majority of block groups remained intact within the city limits, several did not. It was determined that if 50% or more of the area of the block group was within the city limits then the numbers for total population and household would stay at their original value. The four block groups with 50% or less of their areas within the city limits were scaled as follows:

Population/Household Scaling for Select Block Groups	
Block Group	**Percent of Original Value**
1500000US240037025001	**25%**
1500000US240037025004	**25%**
1500000US240037026013	**50%**
1500000US240037063023	**50%**
Source: 2010 U.S. Census Data and Smith Planning & Design	