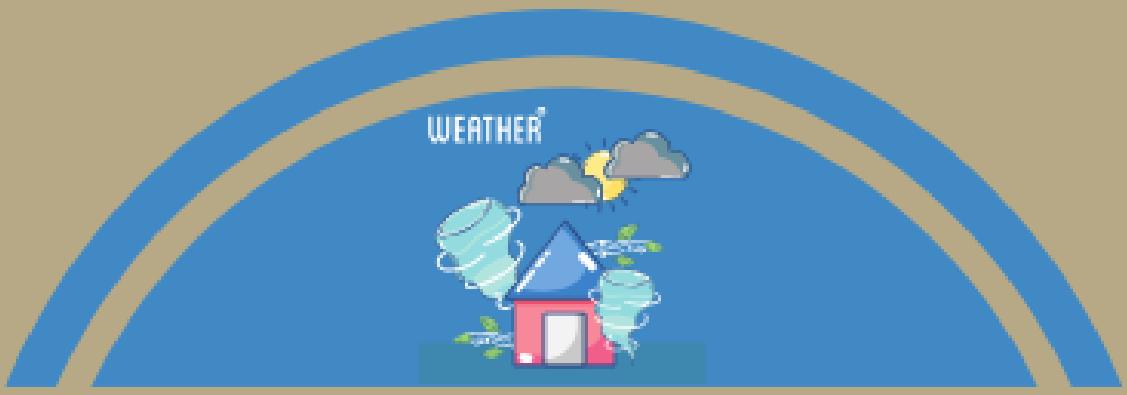

HAZARD MITIGATION PLAN

KENT COUNTY, MARYLAND

Prepared for:

Kent County
Office of Emergency Services
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Prepared by:

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May 2021

Acknowledgements

This plan was prepared on behalf of the Kent County Board of Commissioners for the Office of Emergency Services.

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A special thank you to the members of the Hazard Mitigation Planning Committee and participating municipalities.

Towns of:
Betterton, Mayor Donald E. Sutton
Chestertown, Mayor Christopher M. Cerino
Galena, Mayor John T. Carroll
Millington, Mayor Claude J. Morales, Jr.
Rock Hall, Mayor Dawn E. Jacobs

To all the individuals and organizations who gave time and thought to participate in the Kent County Hazard Mitigation Plan process. The plan is better and stronger because of your involvement.

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SECTION 1

SECTION 1 TOPICS

- INTRODUCTION
- ORGANIZING THE PLANNING PROCESS
- ASSESS RISK & CAPABILITIES
- DEVELOP A MITIGATION STRATEGY
- ADOPT & IMPLEMENT THE PLAN

PLAN UPDATE HIGHLIGHTS

New laws passed to enhance the Stafford Act have been included and with links to these laws.

2020 Stakeholder Committee more than doubled than that listed in previous plan.

Public engagement was encouraged with the development of the Kent County Hazard Mitigation Plan website for this planning process. The website informed the public of Stakeholder meetings, provided information on the plan update, and provided mitigation activities to reduce risk.

Additional new opportunities for public input was sought through an online public survey.

Hazards Profiled in 2014 Hazard Mitigation Plan were reviewed and ranked for the 2020 Plan Update.

Conducted an Enhanced Hazard Risk Assessment that includes past occurrences and future probability, as well as community perspective survey results.

New Capability Assessment using FEMA Local Mitigation Planning Handbook was included. Completed Capability Assessments for the County, and all five (5) towns were added to the plan update.

Planning Area profile included updated map, new population estimates and projections, and updated employment data.

Several meetings were conducted to develop, review, and prioritize new action items. Action items were included in appropriate hazard specific sections.

The plan update will be reviewed, and the list of action items and prioritized projects will be updated annually, with the Office of Emergency Services as the lead agency.

Introduction

The following Hazard Mitigation Plan for Kent County and its five (5) municipalities (Betterton, Chestertown, Galena, Millington, and Rock Hall) is a collaborative effort and is meant to satisfy the requirements of the following:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) - legally requires state, local, tribal, and territorial governments to develop and adopt FEMA-approved hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance.
- Disaster Mitigation Act of 2000 - 44 CFR, Part 201.6 (Code of Federal Regulations) - the Code of Federal Regulations (CFR) contain requirements and procedures to implement the hazard mitigation planning provisions of the Stafford Act.

Since the Stafford Act, additional laws have been passed that help to shape hazard mitigation policy as it stands today. These revisions are included in the Sandy Recovery Improvement Act (SRIA) of 2013, the National Flood Insurance Act of 1968, and the Water Infrastructure Improvements for the Nation (WIIN) Act of 2016.

The ongoing implementation of this Plan represents the essential aspect of comprehensive disaster mitigation planning through evaluation and understanding of potential hazards, vulnerabilities, and risks.

FEMA Hazard Mitigation Planning Process

State, **local**, tribal, and territorial governments engage in hazard mitigation planning to identify risks and vulnerabilities associated with natural disasters and develop long-term strategies for protecting people and property from future hazard events.

Kent County used the FEMA planning process to update the 2021 hazard mitigation plan. The four core steps in completing a hazard mitigation plan update included the following:

Organizing the Planning Process

At the start, Kent County and its participating municipalities focus was on assembling the resources needed for a successful mitigation plan update process. This included securing technical expertise, defining the planning area, and identifying key individuals, agencies, neighboring jurisdictions, businesses, and/or other stakeholders to participate in the process. The planning process also included opportunities for the public to participate and comment on the plan.

2020 Stakeholder Committee

A new 2020 Stakeholder Committee was assembled for this plan update. The planning committee was expanded from that used in 2014 to include stakeholders from additional departments, agencies, organizations, and members of the public.

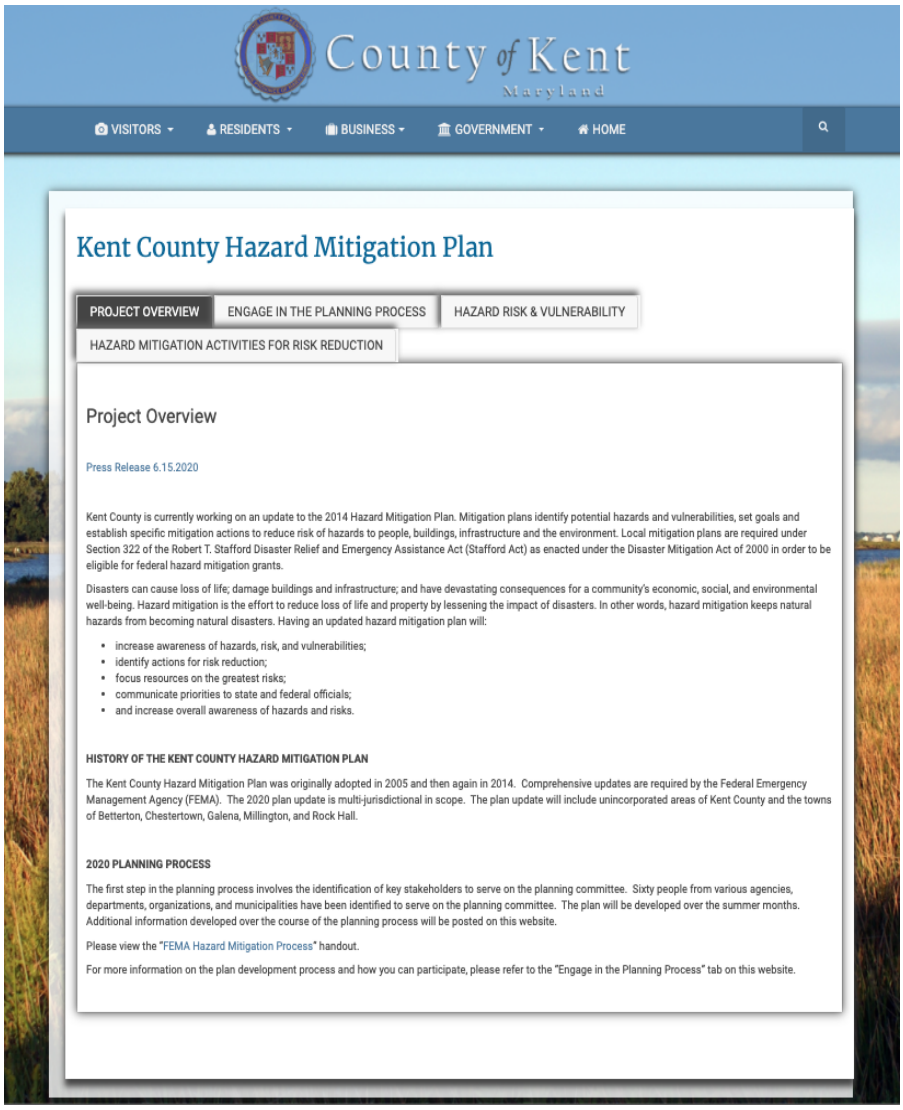
Table 1-1: 2020 Hazard Mitigation Planning Committee

Local Government	
Name	Department/Agency
P. Thomas Mason	Kent County Commissioner's Office
Ronald Fithian	
Robert N. Jacob, Jr.	
Lee Ann Myers	Kent County Human Resources & Kent County Public Information Officer
Shelley L. Heller	Kent County Administrator
Virginia Gregg	Kent County Office of Emergency Services
Wayne Darrell	
Todd McGinnis	
David Rice	
Rob Tracey	Kent County Planning, Housing, and Zoning
Stephanie Jones	
Mike Bitting	
Carla Gerber William Mackey	
Daniel Voshell	Kent County DPW - Roads
Myra S. Butler	Kent County Parks & Recreation
Bernadette Bowman	Kent County Office of Tourism
Karen Miller	Soil Conservation District
Jamie Williams	Kent County Economic Development
Education	
Name	Department/Agency
Joe Goetz	Kent County Public School Board
Tracey Williams	Kent County Public Schools - Student Services
Vandrick Hamlin	Kent County Public Schools - Mental Health & Safety Coordinator
Candace Wannamaker	Washington College

Police & Corrections	
Name	Department/Agency
Brandon McFayden	Washington College Office of Public Safety
Sheriff John Price	Kent County Sheriff's Office
John Dolgos	Chestertown Police Department
Bill Dempsey	Rock Hall Police Department
Robert Connolly	Maryland State Police
Brian Gill Jessie Haas	
Herb Dennis	Kent County Detention Center
Steve O'Melia	
Fire & Rescue	
Name	Department/Agency
Dan Menchey	Betterton Volunteer Fire Department
Allan Schauber	Kent & Queen Anne's Rescue Squad
Otis Darling	Chestertown Volunteer Fire Company
Chris Powell	Galena Volunteer Fire Department
Richard McIntyre	Millington Volunteer Fire Company
Jimmy Price	Kennedyville Volunteer Fire Company
Troy White	Rock Hall Volunteer Fire Company
Hospital & Medical	
Name	Department/Agency
Beth Coop Ron Lewis	Shore Regional Health Systems
Sharon Jefferson-Hawkins	American Red Cross
Bill Webb	Kent County Health Department
Charlene Perry	
John Beskid	
State Government	
Name	Department/Agency
Kathy Nolan	Maryland Department of Social Services
Shelly Neal-Edwards	
William Hildebrand	Maryland Emergency Management Agency (MEMA)
John Barto	Maryland Institute for Emergency Medical Services Systems (MIEMSS) - Region IV
Michael Parsons	
Geoff Donahue	Maryland Department of Environment (MDE)

Private Sector	
Name	Department/Agency
Robert Jackson	Heron Point
Lulu Hurtt	
Dawn Hofstetter David Martin	LaMotte Chemical
Richard Budden	Radio Amateur Civil Emergency Service (RACES)
Eric Reynolds	Kent County Humane Society
Barbara Jorgenson	Kent County Historical Society
Jeffrey Baggett	Private Citizen
Jim Bass	Eastern Shore Land Conservatory
Tim Trumbauer	ShoreRivers
Towns	
Name	Department/Agency
Elizabeth Greenwell	Town of Betterton
William S. Ingersoll	Town of Chestertown
Kees deMooy	Town of Chestertown
Kathleen Billmire	Town of Galena
Warren Walters	Town of Galena
Elizabeth J. Manning	Town of Millington
CJ Morales	Town of Millington
Robert S. Resele	Town of Rock Hall

Opportunities for Stakeholder & Public Engagement Throughout the Process



The Kent County government website was used as a tool for continuous public engagement throughout the plan development process. The Kent County Hazard Mitigation Plan site was available to the public beginning in June of 2020. The website contained four separate tabs, as follows:

- Project Overview
- Engage in the Planning Process
- Hazard Risk & Vulnerability
- Hazard Mitigation Activities & Risk Reduction

The public was invited to attend each of the Stakeholder Meetings, a WebEx Link was provided along with of meeting details in advance of each meeting. In addition, each meeting was recorded, and those recordings were made available on the website, along with meeting notes. This information was integrated under the "Engage in the Planning Process" tab.

Stakeholder meetings occurred throughout the plan development process, as follows:

- June 9, 2020- Stakeholder Meeting #1: Hazard Identification, Risk, Public Engagement Strategy, and 2014-2020 Mitigation Status Report;
- July 13, 2020- Stakeholder Meeting #2: Hazard Vulnerability, Website Content, Public & Stakeholder Surveys, and New Mitigation Ideas; and,
- August 27, 2020- Stakeholder Meeting #3 Capability Assessment and New Mitigation Ideas.

Minutes from each of the Stakeholder Meetings were distributed to stakeholder committee members and posted Kent County Hazard Mitigation Plan webpage. Voice recordings of each meeting were posted on the webpage, as well. Meeting minutes have been included in *Appendix C: Stakeholder and Public Engagement.*

In addition to Stakeholder Meetings, which were open to the public, other opportunities for public input were sought. An online public survey was posted on the website in June of 2020.

Excerpt from the Public Survey:

The Kent County Hazard Mitigation Plan is a project that aims to ensure the County is prepared for all kinds of hazards. The Office of Emergency Services is placing special emphasis on understanding citizens' concerns regarding hazards. Community members input to the process is incredibly valuable. This survey is being used to collect your insight and perspective.

The survey consists of 9 questions and will take an average of 4 minutes or less to complete.

We thank you sincerely for your time.

This will not be your only opportunity to provide input. You may provide your contact information at the end of the survey for additional information regarding the plan.

Public survey results collected from June through October of 2020 have been tabulated and are included in *Appendix C: Stakeholder and Public Engagement*. A total of 202 citizens participated in the survey.

A full listing of stakeholder and public engagement opportunities has been included in *Appendix C: Stakeholder and Public Engagement.*

Next, Kent County and its participating municipalities identified the characteristics and potential consequences of hazards. The plan update included geographic areas each hazard might impact and what people, property, or other assets might be vulnerable. In addition, capabilities to undertake local mitigation were documented in order to identify available resources to reduce losses, as well as any potential gaps that exist.

Assess Risk & Capabilities

Hazard Identification & Risk Assessment

The hazard identification process for Kent County involved investigating various types of natural hazards faced by the County over the past several decades. Since it is assumed that hazards experienced by the County in the past may be experienced in the future, the hazard identification process includes a history and an examination of various hazards and their occurrences. Information of past hazards was based on

history and research from historical documents and newspapers; County plans and reports; conversations with County residents; and Internet websites. Data and maps that were available online included sources such as the United States Geological Survey (USGS) and the National Weather Service. Profiling hazards involved determining the frequency or probability of future events, their severity, and factors that may affect their severity. Each hazard type has unique characteristics that can impact the County. For example, no two flood events will impact a community in the same manner. Also, the same hazard events can affect different communities in different ways based on geography, development, population distribution, age of buildings, etc. Developing hazard event profiles enables us to answer the question "how bad could a hazard get?" These profiles have been included in the various plan sections.

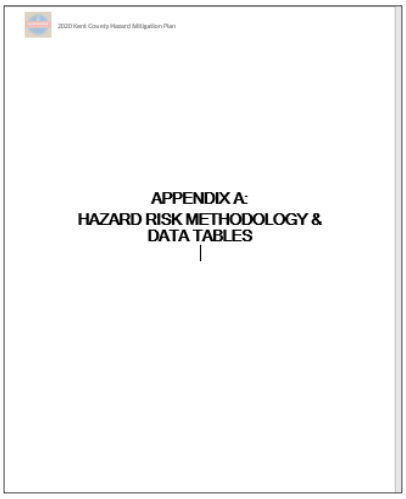
Hazard risk and vulnerability information provides the factual basis for activities proposed in the strategy portion of the hazard mitigation plan update. Understanding hazard risk and vulnerability informs proposed actions by focusing attention and resources on hazards that pose the greatest risks. One of the first steps in assessing hazard risk and vulnerability is investigating various types of natural hazards faced by the County over the past several decades. The following hazards have been documented as affecting Kent County and were assessed for inclusion in the 2021 Kent County Hazard Mitigation Plan Update. The table below provides information on hazards identified in the previous 2014 plan, and any modifications made during this plan update process.

Table 1-2: 2020 Review of Hazards Profiled in 2014 HMP

2014 Hazards	Status	2020 Update Notes	2020 Hazard
Riverine & Coastal Flooding	Changed	Renamed to Flood	**Flood** (Flood, Flash, Heavy Rain, Coastal Storm, Storm Surge/Tide)
Hurricanes	Continued	N/A	**Hurricane** (Tropical Storm, Hurricanes, Tropical Depression)
Winter Storm/Winter Weather	Changed	Renamed to Snow & Ice Storms	**Snow & Ice Storms** (Winter Storm, Winter Weather, Blizzard, Frost/Freeze, Heavy Snow, Sleet)
Other Severe Storms ((Thunderstorms, Lightning, Hail)	Changed	Renamed to Severe Storms	**Severe Storms** (Thunderstorm Wind, Lightning, Hail)
Extreme Heat	Changed	Renamed to Extreme Temperatures and combined with Excessive Cold/ Wind Chill	**Extreme Temperatures** (Excessive Heat, Heat, Excessive Cold/ Wind Chill)
Tornadoes	Continued	N/A	**Tornado** (Tornado & Funnel Cloud)
Earthquakes	Continued	N/A	**Earthquakes**
Not Identified	New	N/A	**High Wind** (Derecho, Straight-line Winds, Strong Wind)
Not Identified	New	N/A	**Climate Adaptation** (Erosion & Sea Level Rise)
Not Identified	New	N/A	**Pandemic & Emerging Infectious Disease**
Drought, Soil Movement/ Steep Slopes, & Wildfire	Removed- Low priority hazards		

In order to assess the hazard risk for the ten (10) hazards identified in this plan update a composite score method was undertaken. The composite score method was based on a blend of quantitative and qualitative factors extracted from the National Centers for Environmental Information (NCEI), Maryland Department of Health - Maryland's NEDSS And PRISM Databases, stakeholder survey, and other available data sources. These included:

- Historical impacts, in terms of human lives and property;
- Geographic extent;
- Historical occurrence;
- Future probability, and;
- Local community perspective.


APPENDIX A:
HAZARD RISK METHODOLOGY &
DATA TABLES

Detailed information is available within *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, and Hazard Data Tables.*

The following table provides the hazard risk ranking update results. Severe storms and emergency infectious diseases were ranked as “High” risk hazards. Flood, hurricane, extreme temperatures, and high wind were ranked as “Medium High” risk hazards.

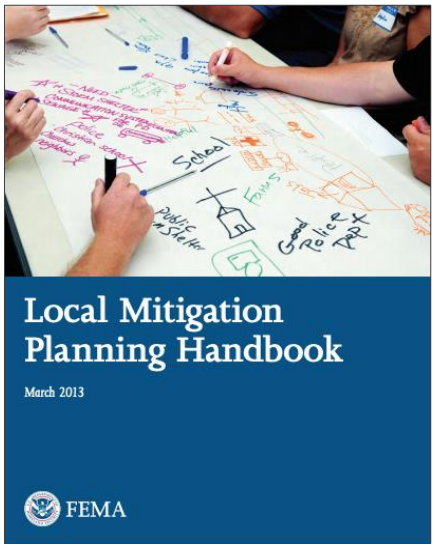
Table 1-3: New Hazard Ranking Results

Hazards	Composite Score	HAZARD RANINKG
Flood (Flood, Flash, Heavy Rain, Coastal Storm, Storm Surge/Tide)	22.5	Medium High
Hurricane (Tropical Storm, Hurricanes, Tropical Depression)	20.5	Medium High
Extreme Temperatures (Excessive Heat, Heat, Excessive Cold/Wind Chill)	22	Medium High
Tornado (Tornado & Funnel Cloud)	13.5	Medium Low
Snow & Ice Storms (Winter Storm, Winter Weather, Blizzard, Cold Wind/Chill, Frost/Freeze, Heavy Snow, Sleet)	17	Medium
Severe Storms (Thunderstorm Wind, Lightning, Hail)	25	High
High Wind (Derecho & Straight-line Winds, High Winds, Strong Wind)	22	Medium High
Earthquake	14	Medium Low
Climate Adaptation (Erosion & Sea Level Rise)	19	Medium
Emerging Infectious Diseases	27	High

Capability Assessment

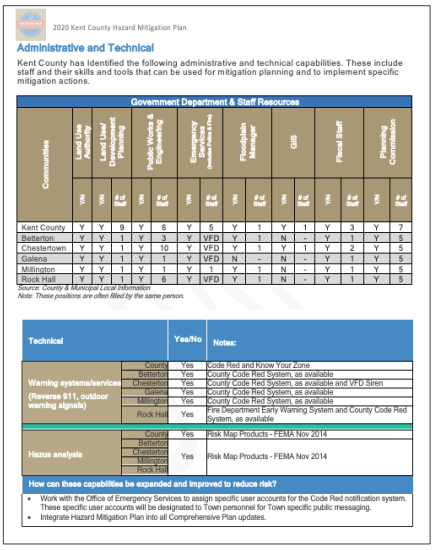
Each community has a unique set of capabilities, including authorities, policies, programs, staff, funding, and other resources available to accomplish mitigation and reduce long term vulnerability. The primary types of capabilities for reducing long-term vulnerability through mitigation planning are the following:

- Planning and regulatory
- Administrative and technical
- Financial
- Education and outreach



In order to perform a detailed capability assessment, which was not available in the previous plan version, the *FEMA Local Mitigation Planning Handbook* (Handbook), which is the official guide for local governments to develop, update and implement local mitigation plans, was utilized. The sample worksheets provided in the *FEMA Handbook-Appendix A: Capability Assessment Worksheets* were used.

The FEMA Handbook worksheets were modified slightly for County and Town participation. The worksheets were converted into PDF Fillable Forms, for ease of use by participants. In addition, each of the five (5) towns participated in separate planning meetings with Kent County Office of Emergency Services and SP&D staff in order discuss current capabilities and identify gaps.


2020 Kent County Hazard Mitigation Plan

Administrative and Technical

Kent County has Identified the following administrative and technical capabilities. These include staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions.

Government Department & Staff Resources

Communities	Land Use Authority		Land Use/ Development Planning		Public Works & Engineering		Emergency Services (Police/Fire/EMS)		Floodplain Manager		GIS		Fiscal Staff		Planning Commission	
	Y/N		Y/N		Y/N		Y/N		Y/N		Y/N		Y/N		Y/N	
Kent County	Y	Y	9	Y	6	Y	5	Y	1	Y	1	Y	3	Y	7	
Betterton	Y	Y	1	Y	3	Y	VFD	Y	1	N	-	Y	1	Y	5	
Chestertown	Y	Y	1	Y	10	Y	VFD	Y	1	Y	1	Y	2	Y	5	
Galena	Y	Y	1	Y	1	Y	VFD	N	-	N	-	Y	1	Y	5	
Millington	Y	Y	1	Y	1	Y	1	Y	1	N	-	Y	1	Y	5	
Rock Hall	Y	Y	1	Y	6	Y	VFD	Y	1	N	-	Y	1	Y	5	

Source: County & Municipal Local Information
Note: These positions are often filled by the same person.

Technical		Yes/No	Notes:
Warning systems/services (Reverse 911, outdoor warning signals)	County	Yes	Code Red and Know Your Zone
	Betterton	Yes	County Code Red System, as available
	Chestertown	Yes	County Code Red System, as available and VFD Siren
	Galena	Yes	County Code Red System, as available
	Millington	Yes	County Code Red System, as available
	Rock Hall	Yes	Fire Department Early Warning System and County Code Red System, as available
Hazus analysis	County	Yes	Risk Map Products - FEMA Nov 2014
	Betterton	Yes	Risk Map Products - FEMA Nov 2014
	Chestertown		
	Millington		
	Rock Hall		

How can these capabilities be expanded and improved to reduce risk?

- Work with the Office of Emergency Services to assign specific user accounts for the Code Red notification system. These specific user accounts will be designated to Town personnel for Town specific public messaging.
- Integrate Hazard Mitigation Plan into all Comprehensive Plan updates.

Town meetings occurred on the following dates:

- August 18, 2020- Town of Rock Hall;
- September 16, 2020- Town of Millington;
- September 17, 2020- Town of Chestertown;
- September 22, 2020- Town of Betterton; and,
- September 29, 2020- Town of Galena.

Completed capability assessments for the County, and all five (5) towns have been included in *Appendix D: Capability Assessment* of this plan. In addition, capabilities are highlighted for both the county and the five (5) towns within the hazard specifics sections of the plan update.

Planning Area Profile

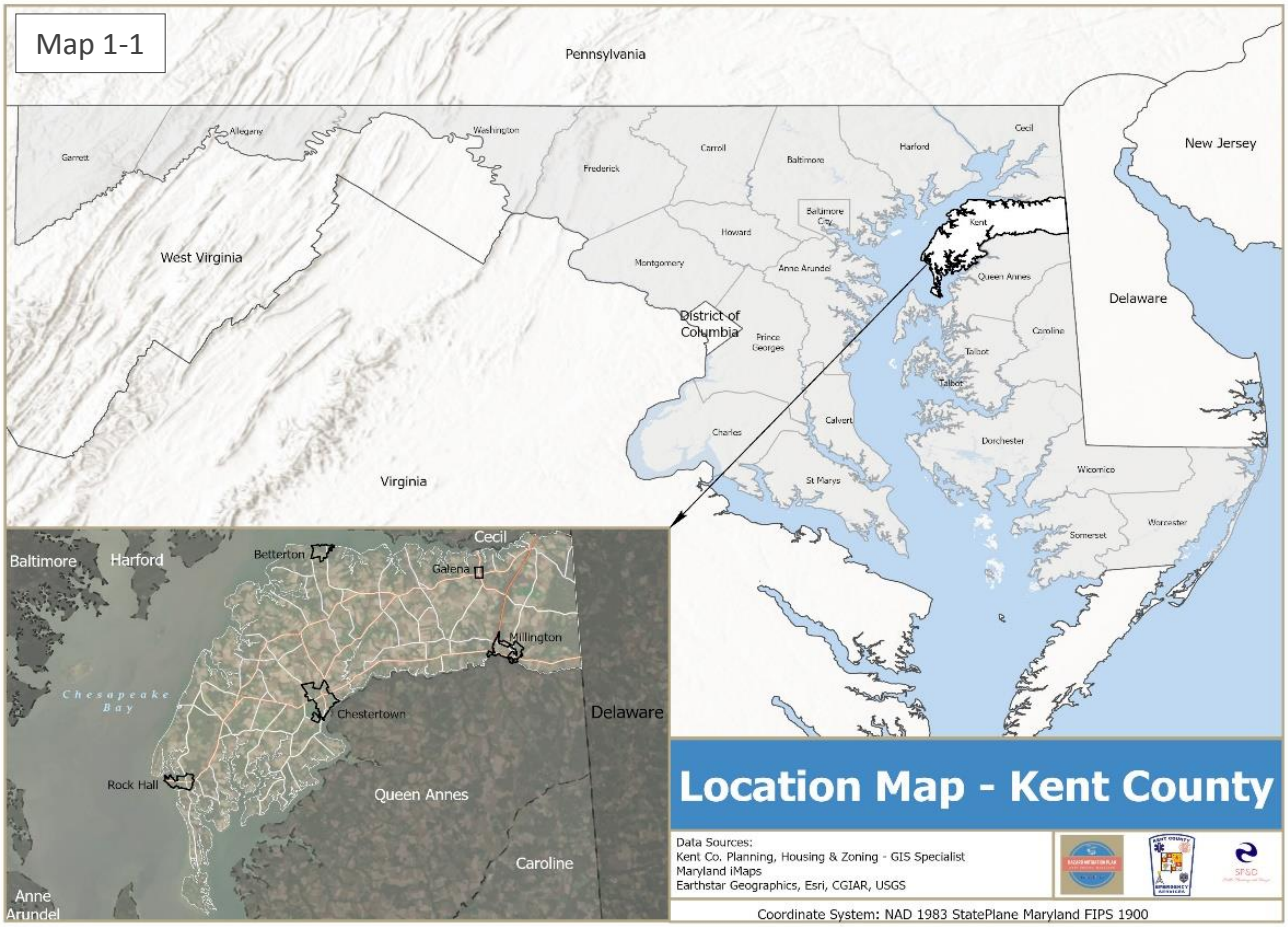
Physical Condition

Kent County, founded in 1642, is the second oldest County in Maryland. Prior to European colonization, the area was inhabited by a mosaic of different native societies, including the Tockwoghs and Wicomisses. Early settlers were greeted with the magnificent expanse of the Chesapeake Bay, the beautiful Chester and Sassafras Rivers, waters teeming with fish, myriads of

waterfowl, mighty forests, and rich soil. Although much has changed since then, much remains the same. The hallmarks of Kent County continue to be the Chesapeake Bay, its tributaries, and rich farmland. These resources shaped much of the County's economy, culture and character and they continue to serve as the foundation of the Comprehensive Plan.

Kent County is located on the northern portion of the Delmarva Peninsula on the eastern side of the Chesapeake Bay directly opposite Baltimore. The County is bordered on the north by the Sassafras River, which separates it from Cecil County, and on the south by the Chester River, which separates it from Queen Anne's County. The western border is formed by the Chesapeake Bay, and the eastern boundary is formed by the Delaware State Line. The County has a total land area of 178,428 acres or approximately 281 square miles and has 79,006 acres of water within its boundaries. Five (5) incorporated towns–Betterton, Chestertown, Galena, Millington, and Rock Hall–are located in Kent County. Chestertown is the County seat.

A railroad line runs from Chestertown north to Worton and eastward through the County to Delaware and points north. Both Maryland Route 213 (Chesapeake Country National Scenic Byway) and U.S. Route 301 cross the County in a generally north-south direction. These highways are parts of the main connection to the Baltimore-Washington area by way of the Bay Bridge and U.S. Route 40 and Interstate 95.



The Development Pattern

The early development of Kent County was devoted almost exclusively to the conversion of wooded land to agricultural use. Several early settlements were established on waterways as shipping points for agricultural products. These settlements grew into the towns of Chestertown on the Chester River, Rock Hall on the Bay, and Georgetown and Betterton on the Sassafras River. Betterton later grew more as a resort center than as a trade center or shipping point. As more land was converted to agriculture, small trading communities formed in the central County at crossroads, or later where roads crossed the Pennsylvania Railroad. Galena, Still Pond, and Fairlee are examples of the former; Massey, Kennedyville and Worton grew up at railroad crossings. Rock Hall, with a good harbor off the Bay, grew as a center for fishing and boat building. Millington grew around a grain mill near the headwaters of the Chester River. Chestertown, as the County seat, became the largest town and principal trade and business center for the County and later home to Washington College and some agriculture-related industry.

In addition to the residences clustered around the towns, small groups of houses grew in isolated locations originally in strips along existing roads and later in subdivisions. Some of these were occupied by farm workers, but an increasing number were occupied by families supported by jobs in the towns. The scattered pattern of rural, non-farm residences is supplemented by a substantial number of dwellings along the waterfront. This scattered pattern of development continued as Kent County's population began to increase and the interest in vacation and retirement homes increased. In particular, the number of waterfront and rural subdivisions increased. The desire for large rural lots increased with the desire for second homes.

Main elements of the commercial pattern are located in the towns and along the highways on the outskirts of the towns. Other small spots of commerce are located along highways or at crossroads in outlying areas. Most industry is also located near the towns and villages. Larger public and semi- public uses include the country club golf courses near Chestertown and at Great Oak on Fairlee Creek, Worton Park, Betterton Beach, Turners Creek Park, and the four wildlife reservations: the federal area on Eastern Neck Island, the two state areas – Sassafras Natural Resources Management area and the Millington Wildlife Management Area and Chesapeake Farms, a private demonstration area on the west fork of Langford Creek.

Land Use/Land Cover data from the Maryland Department of Planning is shown in Table 1-4. Between 2002 and 2010, the County saw a 9.5% increase in developed lands but only a 0.8% decrease in resource lands. Overall, the County has been successful in encouraging development in areas where it is appropriate and out of the countryside.

Table 1-4: Land Use

	Land Use in Acres		Land Use Change	
	2002[3]	2010[2]	2002-2010	
	Acres	Acres	Acres	Percent
Very Low Density Residential[1]	3,681	4,397	716	19.5%
Low Density Residential	6,096	6,371	275	4.5%

Medium Density Residential	1,987	2,128	141	7.1%
High Density Residential	165	227	62	37.9%
Commercial	887	994	107	12.1%
Industrial	38	38	0	0.0%
Other Developed Lands/ Institutional /Transportation[1]	1,465	1,518	53	3.6%
Total Developed Lands[5]	**14,319**	**15,673**	**1,354**	**9.5%**
Agriculture	117,228	116,313	-915	-0.8%
Forest	42,460	41,997	-464	-1.1%
Extractive/Barren/Bare	49	49	0	0.0%
Wetland	4,372	4,397	24	0.6%
Total Resource Lands[5]	**164,109**	**162,755**	**-1,354**	**-0.8%**
Total Land	178,428	178,428		
Water	79,006	79,006		

Source: Maryland Department of Planning, Land Use/Land Cover

1. *Two new categories have been added to the 2010 Land Use/Land Cover layer update: very low-density residential development (191,192) and transportation (80).*
2. *Updates/modifications to the 2010 land use/land cover layers used the 2007 NAIP aerial imagery and parcel information from Maryland Property View 2008.*
3. *The original 2002 data were mapped using geo-rectified LANDSAT satellite imagery and 2000 MD Property View. In 2010 two new land use categories were added, transportation and very low density residential making it necessary to modify the 2002 land use/land cover layer to incorporate these categories for comparative purposes. Additionally, better imagery and property data information were used to make further modifications. The enhanced 2002 dataset is available upon request.*
4. *Very low density residential was not mapped in 1973, so there is no data associated with changes. Transportation was not mapped in 1973.*
5. *As noted above, new land use categories were added in 2010 and associated adjustments were made to 2002 data. Similar adjustments were not made to 1973 data, making it impossible to know how much change from 1973 is due to new development since then, versus misclassified land uses at that time. For these reasons, we suggest reliance only on change statistics for the aggregate land use categories, Total Developed and Total Resource Lands.*

Note: Check out the Land Use/Land Cover Report for additional data

Natural Features

Located in the Atlantic Coastal Plain, Kent County is comparatively low-lying, with relief seldom exceeding 80 feet. The eastern and central portions of the County are characterized by a broad, gently rolling plain; the northwestern section is deeply incised by streams. These streams have steep banks along their shorelines and in some cases bluffs 20 to 80 feet high. The character of the southwestern portion of the County is one of flat plains and terraces sloping toward the water.

Kent County is underlain by deposits of sand, clay, sandy clay and silt, greensand, and marls resting on crystalline rocks. These rocks slope to the south and southeast at the rate of 60-150 feet per mile. The depth of the Coastal Plain sediments ranges from 900 feet in the northeastern portion to 2,200 feet in the southeastern portion.

Soils

The open, flat expanses of rich fertile soil that blankets the County is a gift of immeasurable value. Approximately 57% of the County is defined as prime farmland as compared with 23% of Maryland as a whole. The County has some of the best farmland in the United States and this combined

with the proximity to a variety of markets makes Kent County an ideal location for agribusinesses to thrive.

Natural, Historic, and Cultural Resources

The natural resources important to Kent County are clean air, prime agricultural land, tidal marshes, non-tidal wetlands, woodlands, large forests, ground water, the Chesapeake Bay, the Chester River, the Sassafras River and their tributaries, ponds, mineral resources, landscapes of agriculture, waterfront, open space, historic sites, dark nighttime skies and a peaceful, unhurried atmosphere.

The County also values its diverse ecosystems. The County has hedgerows, cropped fields, shorelines, meadows, forests, wetlands, submerged aquatic vegetation, and other plants. The varied wildlife includes deer, small mammals, reptiles and amphibians, waterfowl, game birds, songbirds, colonial nesting water birds, raptors, fish, crabs, and many species of shellfish.

The Chesapeake Bay, Chester and Sassafras Rivers and their major tributaries are the most significant water bodies in the County. Kent is in the Upper Eastern Shore Watershed which may be divided into the Sassafras, Still Pond/Fairlee, Langford, Lower Chester, Middle Chester, and Upper Chester sub watersheds. Each of these sub watersheds has a diverse assemblage of sensitive species, wetlands, forest, and other significant habitat areas.

Kent County is one of the oldest working landscapes in North America and one of the last intact colonial and early American landscapes anywhere. Archeological sites, historic buildings, old churches, and traditional landscapes are all evidence of Kent County's long and significant history. These historic sites and structures remind us of our cultural richness and provide a reassuring sense of time and place. The importance of these resources has been recognized by the state and federal governments through the designation of Maryland Routes 213, 20, and a portion of 445 as a National Scenic Byway and the inclusion of the majority of the County in the Stories of the Chesapeake Heritage Area.

Current and Projected Demographic Characteristics

Kent County continues to have the lowest population of any county in Maryland. According to the U.S. Census Bureau Population Division, July 1, 2019 population estimate of 19,422 for Kent County represents approximately a 3.8% decrease since 2010. This growth rate has been significantly lower than nearby counties in the Upper Eastern Shore region since 2010. The Maryland Department of Planning projects Kent County's population will reach 21,600 by the year 2025, 22,100 by the year 2030, 22,550 by the year 2035, 23,000 by the year 2040 and 23,450 by 2045.

The County’s population density (people per square mile) did not change significantly from 1960 to 1980. However, the County’s population density has increased slightly from 2000 to 2010 to 72.9 people per square mile. Between 2010 and 2019, the State of Maryland’s population has increased 4.7%, while Kent County’s population has decreased by -3.8%. However, the Towns of Betterton, Rock Hall, and Galena populations have increased, 11.3%, 3.9%, and 15.9%, respectively.

Table 1-5: Population			
State/Jurisdiction	2010 Census	Population Estimates	Percent Change 4/2010*-7/1/2019
State of Maryland	5,773,552	6,045,680 (July 2019)	4.7%
Upper Eastern Shore	239,951	243,245 (July 2019	1.4%
Kent County	20,197	19,422 (July 2019)	-3.8%
**Betterton	345	384 (2018 ACS)	11.3%
**Chestertown	5,252	5,113 (2018 ACS)	-2.6%
**Galena	612	708 (2018 ACS)	15.9%
**Millington	642	600 (2018 ACS)	-6.5%
**Rock Hall	1,310	1,361 (2018 ACS)	3.9%

Source: Census of Population 2010 and Population Division, U.S. Census, Release date March 26, 2020
**2010 Census estimates base reflects changes to the April 1, 2010 population due to the Census County Question Resolution Program.*
***2018 American Community Survey (ACS) 5 Year Estimates*

Kent County's population reflects an out-migration of young adults and an in-migration of older age groups, especially those of retirement age. Since 2010, there has been a slow but steady decline in the number of school-age children, while the number of citizens over 65 has continued to increase. The Maryland Department of Planning projects this trend to continue. In 2010, the median age was 45.6 compared to 38 years for the State. Over 27.1% of the County's population was over 65 years old compared to almost 15.9% for the State.

Table 1-6: Population Projections by Age								
	2010	2015	2020	2025	2030	2035	2040	2045
Age	Pop.	Pop.	Pop.	Pop.	Pop.	Pop.	Pop.	Pop.
0-4	995	757	772	736	755	791	808	815
5-19	3,436	3,224	3,416	3,258	3,084	3,077	3,147	3,296
20-44	5,503	5,109	5,092	5,185	5,217	4,956	4,910	5,086
45-64	5,866	5,640	5,861	5,625	5,286	5,395	5,620	5,660
65+	4,397	4,875	5,755	6,794	7,758	8,329	8,511	8,600
Total	**20,197**	**19,605**	**20,896**	**21,598**	**22,100**	**22,548**	**22,996**	**23,457**

Source: Census of Population, Maryland Department of Planning, January 2018

Business and Economic Characteristics

According to the Maryland Department of Labor, Office of Workforce Information and Performance (civilian employees only, in 2018, the county's 723 businesses employ 7,969 workers. Such diverse businesses as Chester River Health System, Washington College, Dixon Valve & Coupling and David A. Bramble call Kent County home. In addition, in 2018 Maryland State Department of Education; Maryland Higher Education Commission reports Washington College, offers over 25 major fields of study in both undergraduate and graduate programs to 1,334 students.

Kent County encourages growth and development of clean industrial and agriculture-related businesses. Close proximity to the Chesapeake Bay and major tributaries offers opportunities for environmental, aquaculture and tourism businesses.

Table 1-7: Top 10 Employers (2018-2019)		
Employer	Product /Service	Employment
Washington College	Higher education	550
Dixon Valve & Coupling	Valves and couplings	385
UM Shore Medical Center at Chestertown	Medical services	270
LaMotte	Chemical testing equipment	240
Heron Point of Chestertown	Nursing care	225
David A. Bramble	Paving and road constr.	210
Kent Center	Services for the disabled	175
Gillespie & Son and Gillespie Precast	Concrete products	135
YMCA Camp Tockwogh*	Recreation facility	130
Angelica Nurseries*	Plants and flowers	115

Source: "Brief Economic Facts, Kent County, Maryland," Maryland DBED, 2018-2019
Excludes post offices, state, and local governments; includes higher education
** Includes seasonal workers*

Future Trends

As development in the county and population density increase, natural hazards may present an increased threat to the people and structures of the County and also an increased need to mitigate. Between 2010 and July 2019, the County's population decreased by -3.8%. The U.S. Census projects a 2.31 percent increase from 2020 to 2045.

Building codes currently in place do not always address extreme conditions occasionally experienced in the County. Older structures built before 1940 or the establishment of building codes are particularly susceptible to damage. Natural hazards can also cause power supply disruptions and upset transportation systems.

The entire county may be affected by natural hazards. However, aged, dilapidated, and poorly constructed buildings, and buildings not constructed to applicable building codes are more susceptible to weather hazards. According to the *2018 American Community Survey 5-Year Estimates*, Kent County consists of a total of 10,065 housing units. Approximately 2,505 (+/-293) of those housing units were built prior to 1940, approximately 23.5 percent of the County's housing units. Manufactured housing units are especially susceptible to extreme weather events.

Develop a Mitigation Strategy

Mitigation strategies from the *2014 Kent County Hazard Mitigation Plan* were assessed early in the plan update process. Responsible entities listed for each of the previously identified mitigation action items were provided individualized fillable PDF's for status update purposes. Responses were reviewed and discussed by the planning committee. A *2014-2020 Mitigation Status Report* was developed as a result of this update effort and is included in *Appendix B.* Mitigation action items that were incomplete were later reviewed for applicability and potential inclusion the new mitigation strategy portions of the plan update.

During this plan update, Kent County and its participating municipalities set priorities and developed long-term strategies and action items for avoiding or minimizing the undesired effects of disasters. The new mitigation strategy portions of the plan update address how the mitigation actions identified will be implemented and administered.

In order to develop, review, and prioritize new action items, stakeholders were divided into various groups and a series of mitigation workshops were held, as follows:

- October 15, 2020- Public Awareness and Education;
- October 15, 2020- Emergency Services;
- October 16, 2020- Prevention, Property and Natural Resources Protection; and,
- October 26, 2020- Public Health and Emergency Medical Group Workshop.

The new mitigation action items have been included in the hazard specific sections of the plan and in *Appendix E: 2020-2025 Mitigation Action Items & Prioritization*.

Adopt & Implement the Plan

Kent County adopted and approved the plan on? The adopted County Plan is posted on the Kent County Government website. The Towns of Betterton, Galena, Rock Hall, Millington and Chestertown are in the process of Plan adoption.

To ensure success, the plan will remain a relevant, living document through routine maintenance over the course of the five-year planning cycle. The plan will be updated every five (5) years, however, a review and update of the County's list of action items and prioritized projects will occur annually, with the Office of Emergency Services as the lead agency. In order to complete a review of municipal actions items, Emergency Services staff will attend at least one (1) regularly scheduled monthly meeting with representatives from all five (5) towns annually. Subsequently, a status report will be submitted to the Kent County Commissioners annually. During the first 5-year cycle, the County did not complete annual evaluations of the Plan; however, the County will strive to ensure that annual reviews occur during the next cycle.

The Plan's annual review is also identified in the Kent County Comprehensive Plan. The County, as required by State laws, has prepared and continues to prepare a variety of specific plans and ordinances (Comprehensive Water and Sewerage, Solid Waste, Zoning Ordinance, Subdivision Regulations, Sediment Control, Stormwater Management, etc.). While providing more detailed information and policy, all plans and laws shall be in compliance with, and conform to, the Comprehensive Plan. The Comprehensive Plan provides policy direction and guides the development of these other plans.

The Hazard Mitigation Plan will augment the County Comprehensive Plan in a number of ways. The Comprehensive Plan addresses the County's accelerated erosion by high winds and high tides, overland flow, and identifies strategies to reduce erosion along Kent County's 268 miles of tidal shoreline. Both plans also emphasize the maintenance, enforcement, and strengthening of floodplain regulations and participation in the Community Rating System. All county projects will be evaluated for consistency with both the Comprehensive Plan and the Hazard Mitigation Plan.

Public comment and input will be sought as the Hazard Mitigation Plan is implemented over the five-year planning cycle.

SECTION 2

SECTION 2 TOPICS

- FLOOD HAZARD
- HISTORY & FUTURE RISK
- VULNERABILITY
- CAPABILITIES
- MITIGATION STRATEGIES

PLAN UPDATE HIGHLIGHTS

The hurricane hazard has been continued from the 2014 Plan into the 2020 Hazard Mitigation Plan.

This section focused on 1% annual chance flood event for riverine and coastal hazards.

A new table was added to provide descriptions for the SFHAs and new mapping to depict each flood zone's location within the northern and southern portions of Kent County.

Hazard Risk Assessment Data tables were updated using data from the 2016 State of Maryland Hazard Mitigation Plan and the National Centers for Environmental Information (NCEI) – Storm Events Database.

Vulnerability analysis for 1% annual chance flood event risk assessment and loss estimations were completed using FEMA Flood Zones – Effective Date: 2014 data. New maps were generated for the northern and southern parts of County, municipalities, and structures at risk to the inundation area. New At-Risk Structures to 1% Annual Chance Floodplain and Loss Estimations Per Community tables were developed and included.

Critical & Public Facilities at risk to the 1% annual chance flood event were analyzed. Facilities at risk were provide in table and mapping formats.

Updated flood insurance policy information obtained from FEMA was provided. Information the Kent County Nuisance Flood Plan was integrated as well as the dam inventory for Kent County.

New capabilities provided by stakeholders were discussed.

New goals and objectives were developed for this plan section. New 2020-2025 Mitigation Action Items provided by stakeholders were included. Action items ranked "High" were further detailed to include discussion, potential funding sources, and a timeline for implementation.

Flood Hazard

Hazard

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. The probability of a flood is based on a statistical chance of a particular size flood (expressed as cubic feet per second of water flow) occurring in any given year. The annual flood is usually considered the single greatest event expected to occur in any given year. Flood studies use historical records to determine the probability of occurrence for different extents of flooding.

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. Table 2.1 provides a description for each flood zone, while Maps 2.1 and 2.2 depict each flood zone's location within the northern and southern portions of Kent County.

Table 2-1: FEMA Special Flood Hazard Areas

Flood Zone	Description
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.
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.
AO	River or stream flood hazard area, and areas with a **1% or greater chance** of swallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1-3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage.
X Shaded	An area of moderate flood hazard that is determined to be outside the Special Flood Hazard Area between the limits of the base flood and the **0.2% annual chance** (or 500-year) flood.

Most of the SFHA is designated as "AE" zone; the National Flood Insurance Program (NFIP) uses this label for riverine/inland areas of the SFHA where base flood elevations (BFEs), the elevations of the 1% annual chance floodplain (100-year floodplain), are determined. In Kent County, within much of this AE zone, floodwater levels are controlled by tidal influences and storm surge levels. Kent County also has areas in the western part of the County designated as VE zones, or Coastal High Hazard Areas. VE zones are parts of the SFHA that are prone to velocity/wave action at least 3 feet in height during a 1% annual chance flood event. The wave action that occurs during flooding in these zones generally causes more severe damage to structures, as well as erosion, than what is experienced in nearby AE zones and riverine flooding areas.

The County's Flood Insurance Rate Maps (FIRMs) show that the majority of the County's land mass in the northern, western, and the southeastern rim lie within the 1% annual chance flood (100-year floodplain) or Special Flood Hazard Area (SFHA). The National Flood Insurance Program (NFIP) uses these general labels to mark areas subject to riverine and inland flooding (AE zones) and coastal flooding (VE zones) where flood hazards include velocity flows, wave action, and erosion. While the BFE has been identified in much of the County, the northeastern rim of the County has holes in its BFE documentation. Several of the county's streams are also regulated floodways in which the channel and adjacent land areas must be reserved in order to discharge the base flow without increasing the base flood elevation by more than one foot.

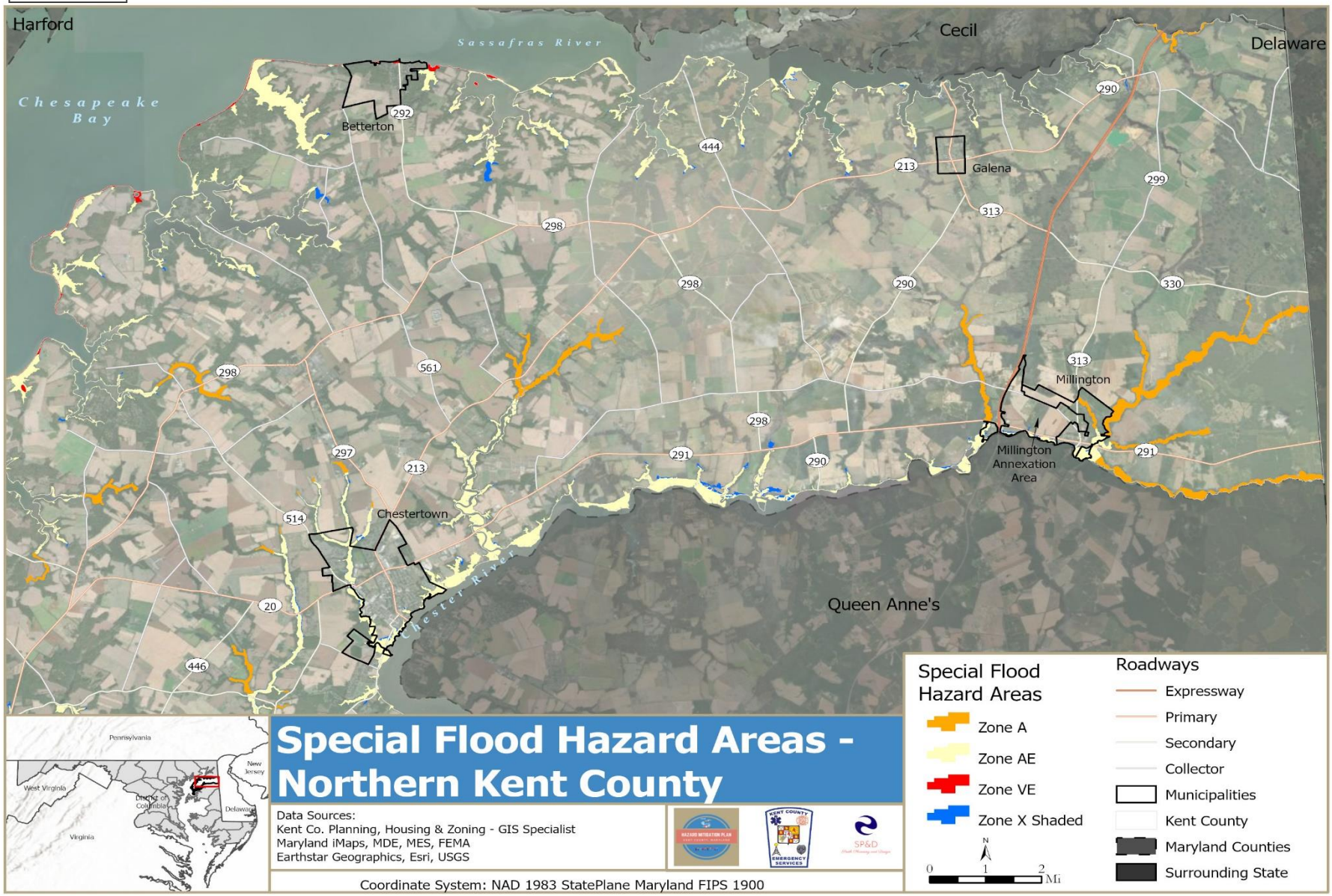
The floodplain map below for the County indicates floodplains intersecting urban areas in Chestertown, Millington, Rock Hall, and the Chesapeake Bay in general. The low lying, relatively undisturbed topography, high seasonal water tables, poor drainage and high runoff characteristics of the soils combine to expose Kent County with a high potential to be flooded. When heavy rainfall and a high river discharge combine with storm tides, low lying areas adjacent to rivers and estuaries become inundated with saltwater.

The areas within the County that are not within the 1% annual chance floodplain (100-year floodplain) have a relatively smaller risk of being flooded. However, flood risks could also arise from one or more of the following: drainage areas of less than one square mile; sewer backup; drainage system backup; dam breaches; and storm water runoff problems.

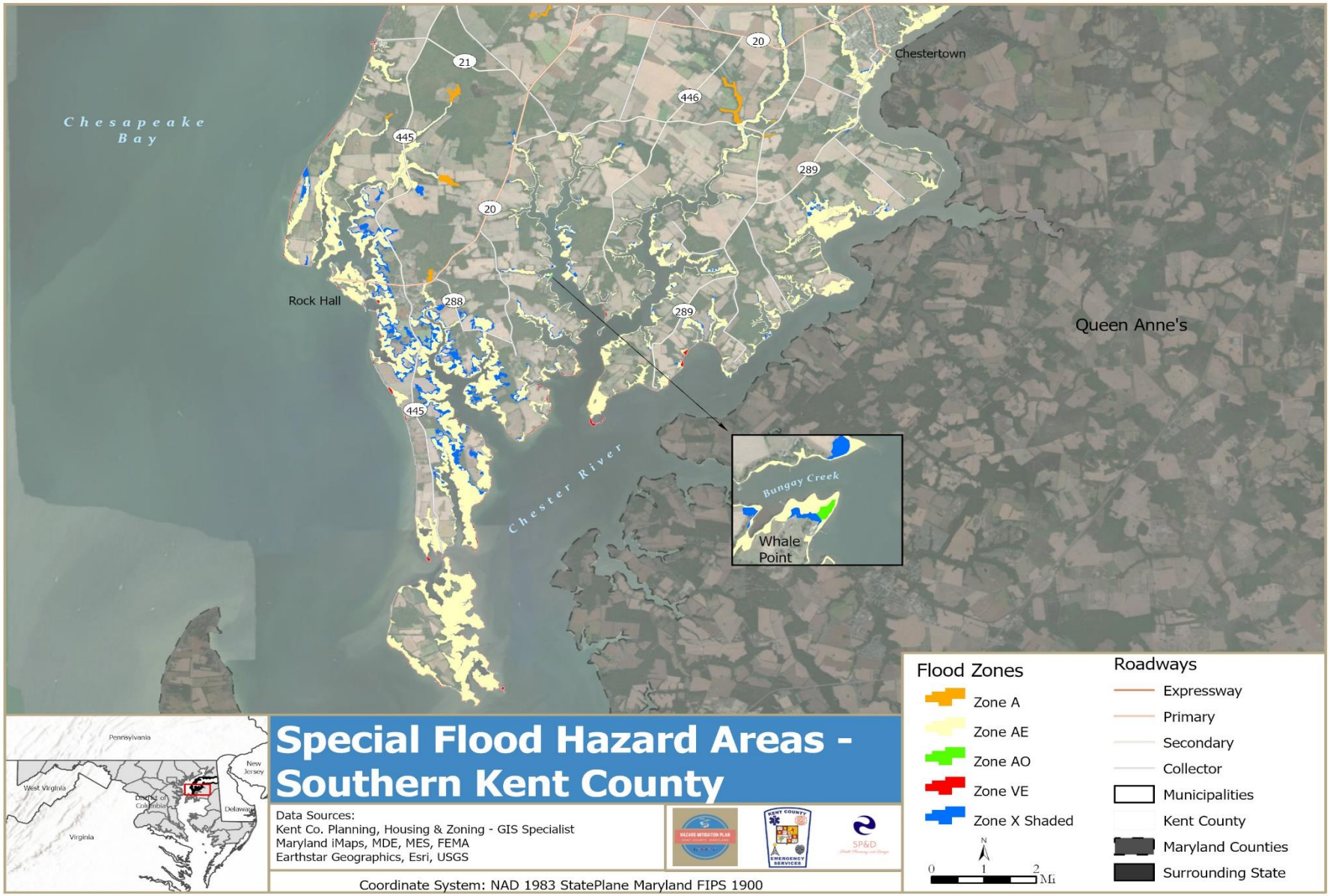
While not all riverine flooding events are hurricane-related, most coastal flooding events are related to hurricane events. Three of the documented coastal flooding events were declared federal disasters. Along with the tidal surges associated with hurricane events, direct results of coastal flooding events include power outages, wind damage to structures, downed trees, and interruption of services.

Hardest hit by coastal flooding events are residents of the Town of Rock Hall and residents of all low-lying areas around Rock Hall and the following creeks: Grays Inn, Church, Herrington, and Langford's East and West Forks.

Map 2-1


Harford
Cecil
Delaware
Sassafras River
Chesapeake Bay
Betterton
Galena
Millington
Millington Annexation Area
Chestertown
Queen Anne's
Chester River
292
444
213
290
299
313
298
330
561
297
291
514
20
446
Special Flood Hazard Areas - Northern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, MDE, MES, FEMA
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Special Flood Hazard Areas
Zone A
Zone AE
Zone VE
Zone X Shaded
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
Surrounding State
0 1 2 Mi
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia

Map 2-2


Chesapeake Bay
Chester River
Rock Hall
Chestertown
Queen Anne's
Bungay Creek
Whale Point
21
20
446
445
289
288
Special Flood Hazard Areas - Southern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, MDE, MES, FEMA
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Flood Zones
Zone A
Zone AE
Zone AO
Zone VE
Zone X Shaded
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
Surrounding State
0 1 2 Mi
Pennsylvania
New Jersey
West Virginia
Virginia
Delaware

Riverine and Flash Flooding

Riverine floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. Flooding is exacerbated by low lying, relatively undisturbed topography, high water tables, poor drainage, constrictions from filling or other obstructions and certain soil characteristics. Flood studies use historical records to determine the probability of occurrence for different extents of flooding. The probability of occurrence is expressed as the percentage chance that a flood of a specific extent will occur in any given year.

On the other hand, flash floods cannot be predicted accurately and happen whenever there are heavy storms. Flash floods are more likely to occur in places with steep slopes and narrow stream valleys, and along small tributary streams. In urban areas, parking lots and other impervious surfaces that shed water rapidly contribute to flash floods. In rugged, hilly, and steep terrain, the high-velocity flows and short warning time make these floods hazardous and very destructive. Flash floods can also be a result of improper drainage.

Flash floods, as the name suggests, occur suddenly after a brief but intense downpour. They move fast and terminate quickly. Although the duration of these events is usually brief, the damages can be quite severe. Flash floods also result as a secondary effect from other types of disasters including large wildfires and dam breaks. Wildfires remove vegetative cover and alter soil characteristics, increasing the quantity and velocity of stormwater runoff and dam breaks release large quantities of water into receiving drainageways in a very short timeframe. Flash floods are the number one weather-related killer. For the period of 1988-2012, there was an average of 80 deaths each year due to the direct results of flash flooding and flood events across the United States.

Coastal Flooding

Coastal flooding is 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, tidal inlets, or other bodies of water. When this inundation occurs, the surrounding landmass is flooded. Ocean storms can unload significant amounts of water on a coast, raising the sea level in that area. These are known as storm surges and cause coastal flooding.

Coastal flooding usually occurs as a result of severe storms, either tropical or winter storms. Ocean waves intensify on the open ocean, and these storms make surface water more severe than normal. Raging winds can create huge waves that crash on unprotected beaches.

Coastal flooding can result from a combination of tide and surge levels that exceed the height of sea walls but is more commonly due to wave action in combination with high water levels. Close to the shore the maximum wave height is closely related to the water depth and the amount of wave run-up and overtopping is a function of the nature and configuration of the shoreline.

History & Future Risk

Kent County is prone to various forms of flooding, which include riverine, flash, and coastal flooding. They have caused extensive damage in the past to parts of Kent County. Most of the damage has occurred near a body of water. Erosion and its impact on shorelines and roads are the most significant problem associated with flooding in the County.

The flood hazard was continued from the 2014 planning cycle and was given a ranking of "Medium High" during the 2020 planning cycle. In order to assess the hazard risk identified, a composite score method was undertaken. The composite score method was based on a blend of quantitative and qualitative factors extracted from the National Centers for Environmental Information (NCEI), stakeholder survey, and other available data sources. These included:

- Historical impacts, in terms of human lives and property;
- Geographic extent;
- Historical occurrence;
- Future probability; and
- Local community perspective.

Detailed information is available within *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, and Hazard Data Tables.*

Information obtained for Kent County using both the *2016 State of Maryland Hazard Mitigation Plan* and the National Centers for Environmental Information (NCEI) – Storm Events Database between January 1950 and December 31, 2019 for Flood Hazard include: Flood, Flash Flood, Heavy Rain, Coastal Storm, and Storm Surge/Tide. There has been a total of seventy-nine Flood Events between 1996-2020, with an annualized rate of 3.16. These storms have produced $2,260,000 million in property damage and a geographic extent of 13.33%.

Total Flood Hazard Risk Assessment Data Table
Hazards included within this table from NCEI Data:
Flood, Flash Flood, Heavy Rain, Coastal Storm, and Storm Surge/Tide.

Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	2.260M	0	% in 100-yr Flood Zone (A, AE, AO & VE) = 13.33%	Total = 79 Annualized = 3.16

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Flood Data Table

Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2001-2020
0	0	1.150M	0	% in 100-yr Flood Zone (A, AE, AO & VE) = 13.33%	Total = 3 Annualized =0.15

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Flood (C). *Any high flow, overflow, or inundation by water which causes damage. In general, this would mean the inundation of a normally dry area caused by an increased water level in an established watercourse, or ponding of water, that poses a threat to life or property. If the event is considered significant, it should be entered into Storm Data, even if it only*

affected a small area. Refer to the Flash Flood event (Section 14) for guidelines for differentiating between Flood and Flash Flood events.

Flash Flood Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1999-2020
0	0	1.010M	0	% in 100-yr Flood Zone (A, AE, AO & VE) = 13.33%	Total = 18 Annualized = 0.82

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Flash Flood (C). *A life-threatening, rapid rise of water into a normally dry area beginning within minutes to multiple hours of the causative event (e.g., intense rainfall, dam failure, ice jam). Ongoing flooding can intensify to the shorter-term flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters. Flash flooding, such as dangerous small stream or urban flooding and dam or levee failures, requires immediate action to protect life and property. Conversely, flash flooding can transition into flooding as rapidly rising waters abate. The Storm Data preparer uses professional judgment in determining when the event is no longer characteristic of a Flash Flood and becomes a Flood.*

Heavy Rain Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	0	0	% in 100-yr Flood Zone (A, AE, AO & VE) = 13.33%	Total = 52 Annualized = 2.08

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Heavy Rain (C). *Unusually large amount of rain which does not cause a Flash Flood or Flood event, but causes damage, e.g., roof collapse or other human/economic impact. Heavy Rain will no longer be acceptable as a means to record low-impact or isolated flood events.*

Coastal Flood Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	100K	0	% County in risk area= 87.00%	Total = 6 Annualized = 0.24

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Coastal Flood (Z). *Flooding of coastal areas due to the vertical rise above normal water level caused by strong, persistent onshore wind, high astronomical tide, and/or low atmospheric pressure, resulting in damage, erosion, flooding, fatalities, or injuries. Coastal areas are defined as those portions of coastal land zones (coastal county/parish) adjacent to the waters, bays, and estuaries of the oceans. Farther inland, the Storm Data preparer determines the boundary between coastal and inland areas, where flood events will be encoded as Flash Flood or Flood rather than Coastal Flood. Terrain (elevation) features will determine how far inland the coastal flooding extends.*

Future Risk

Future probability was factored into the hazard risk vulnerability and ranking for each identified hazard, as detailed *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, & Data Tables*. Results for the flood hazard indicate a future probability ranking of “highly likely”.

Vulnerability

Vulnerability

Vulnerability to flood events is difficult to determine because local terrain, soil conditions, and construction play a role in how much storm water is able to run off, percolate into the soil, or cause flash flooding. Flood vulnerability is described in terms of the community assets that lay in the path of flood waters. The flood hazard vulnerability assessment for Kent County focuses on the 1% annual chance flood event, though floods of both greater and lesser flood depths are possible.

The probability of occurrence is expressed as the percentage chance that a flood of a specific extent will occur in any given year. The extent of flooding associated with a 1% annual probability of occurrence, the base flood, which is used as the regulatory boundary by various agencies. Also referred to as the Special Flood Hazard Area (SFHA), this boundary is a convenient tool for assessing vulnerability and risk in flood prone communities since many communities have maps available that show the extent of the base flood and likely depths that will be experienced. The base flood is often referred to as the "100-year flood." Experiencing a 100-year flood does not mean a similar flood cannot happen for the next 99 years; rather, it reflects the probability that over a long period of time, a flood of that magnitude should occur in only 1% of all years. Smaller floods occur more often than larger and more widespread ones. Table 2-2 shows a range of flood recurrence intervals and their probabilities of occurrence. So, every year, a 10-year flood has a greater likelihood of occurring (10% chance) than a 100-year flood (1% chance). Flood Insurance Rate Maps (FIRMs) show that 29.4 square miles (9.5%) of the County's land mass lies within the 100-year floodplain, or 1% annual chance floodplain.

Table 2-2: Flood Probability Terms

Flood Recurrence Intervals	Chance of occurrence in any given year
10-year	10%
50-year	2%
100-year	1%
500-year	0.2%

Risk Assessment & Loss Estimations

The vulnerability analysis for at-risk structures, including critical and public facilities, in Kent County was completed utilizing the following GIS data layers:

- Kent County Addressable Building Layer
  - The dataset contains addressable buildings for Kent County, MD.
- Maryland Department of Planning's MdProperty View – Kent County 2017
  - The Maryland Department of Planning developed the MdProperty View products to assist users in accessing parcel data. For each parcel, numerous attributes are provided such as account identification, improvement value, year built, etc.
- Maryland Six Inch Imagery - Imagery flown in 2019 for the Eastern Shore
  - The six-inch resolution aerial imagery for the State of Maryland is composed of imagery flown in 2019 (Eastern Shore) and 2017 (Western Shore).
- FEMA Flood Zones – Effective Date: 2014
  - Flood mapping is an important part of the National Flood Insurance Program (NFIP), as it is the basis of the NFIP regulations and flood insurance requirements.
- Flood Depth Grids for 1% annual chance Special Flood Hazard Areas (SFHAs) – Risk MAP Product – 2014

- Depth grids were created for all mapped 1-percent-annual-chance floodplains in the county, whereby flood depth is a function of the difference between the calculated water surface elevation (including overland wave propagation for coastal areas) and the ground.

Structure replacement values are useful for loss estimation. Replacement value is a necessary component in estimating the dollar amount of losses in a flood and, when combined with a range of flood probabilities from the 1% annual chance flood event, can help in describing the costs and benefits of mitigation actions in monetary terms. To determine loss estimations for at-risk structures, improvement values provided within the MdProperty View parcel database where used. At-risk structures are structures located within the 1% annual chance floodplain. The floodplain was overlaid on the addressable buildings and MdProperty View parcels to determine which structures were at-risk. The Maryland imagery was used to validate. For the critical and public facilities risk assessment, the flood depth grids were used to determine the depth of flood for those facilities at-risk to the 1% annual chance flood event.

At-Risk Structures

A total of 614 structures are located in the 1% annual chance floodplain. The 1% annual chance floodplain is not located within the Town of Galena, therefore there are no at-risk structures within the town limits.

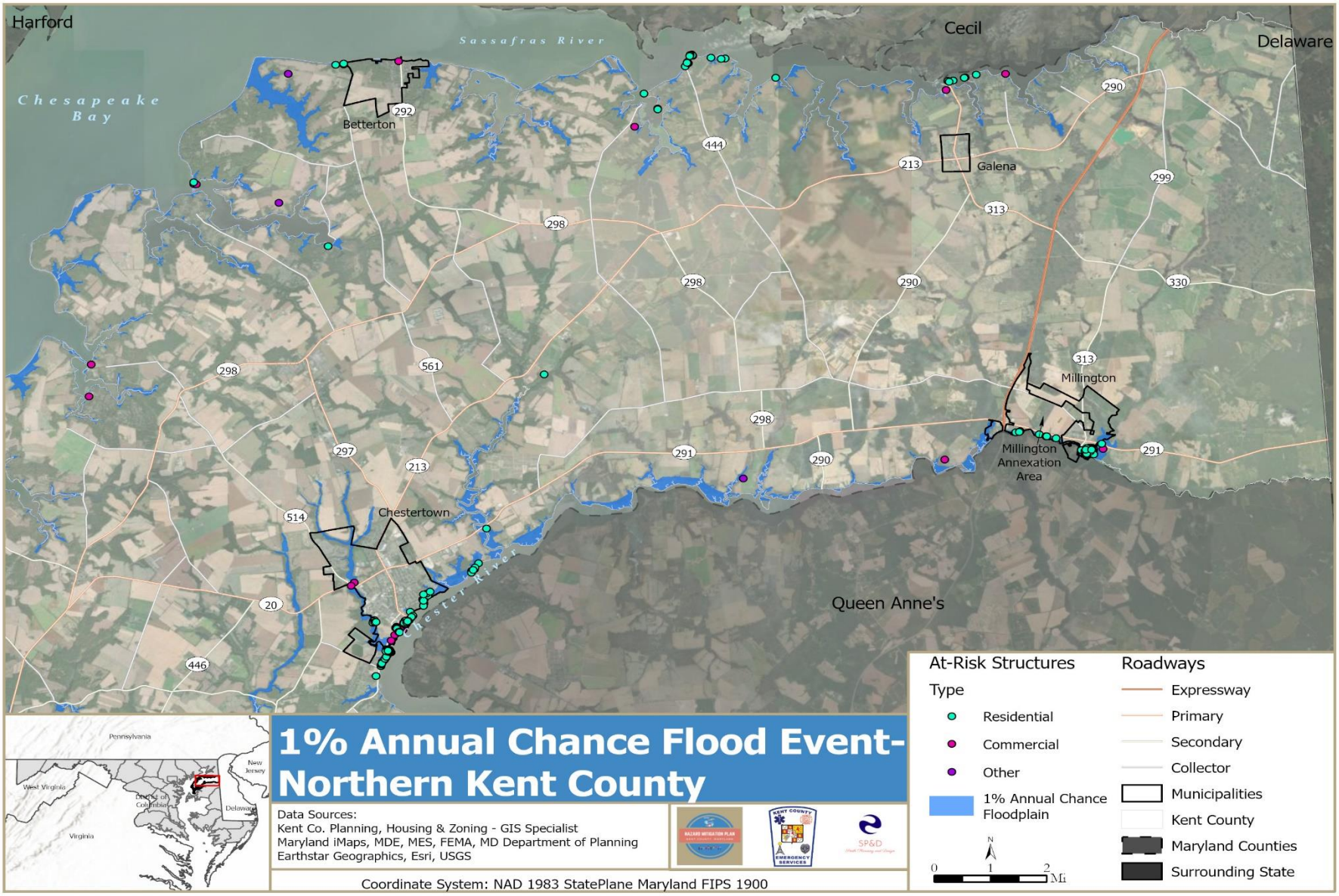
Table 2-3: At Risk Structures to 1% Annual Chance Floodplain

Location	Structure Type						At-Risk Structures Total	Building Value Total
	Residential		Commercial		Other			
	# of Structures	Building Values	# of Structures	Building Values	# of Structures	Building Values		
Unincorporated Kent County	204	$29,938,800	19	$12,859,700	17	$5,070,600	204	$47,869,100
Betterton	0	0	1	$161,300	0	0	1	$161,300
Chestertown	111	$25,174,900	9	$5,123,700	0	0	120	$30,298,600
Millington	29	$2,230,400	0	0	0	0	29	$2,230,400
Rock Hall	231	$30,050,700	29	$8,451,600	0	0	260	$38,502,300
Total	**575**	**$87,394,800**	**58**	**$26,596,300**	**17**	**$5,070,600**	**614**	**$119,061,700**

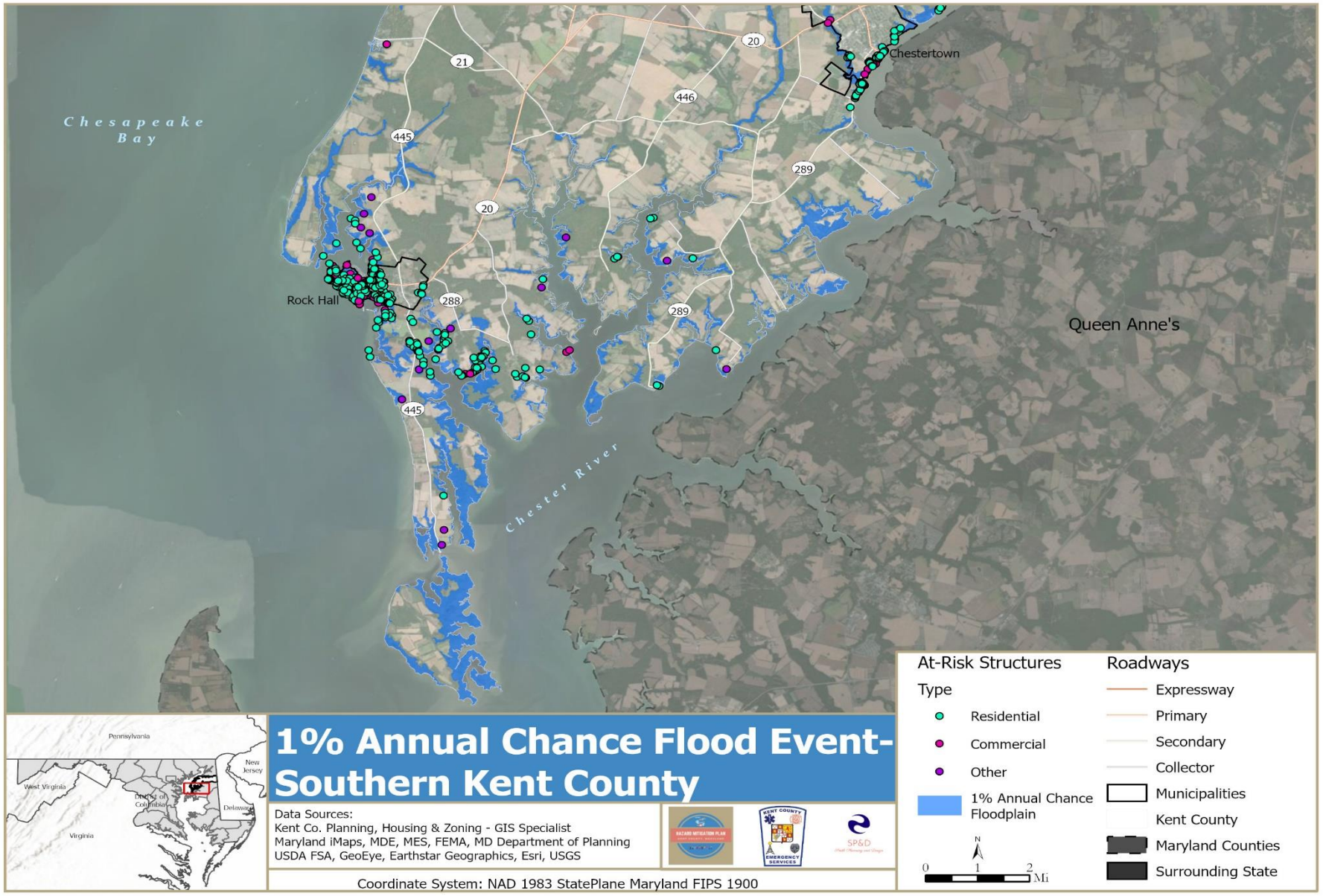
Source: Smith Planning & Design, FEMA Flood Zones - Effective Date: 2014, Kent County Address Layer, MdProperty View
NOTE: Residential includes: Residential, Commercial Condominium, Commercial/Residential, Residential Condominium, and Apartments
Commercial includes: Commercial, Exempt Commercial
Other includes: Agricultural

The Town of Rock Hall contains the majority of at-risk structures with a total of 260. Rock Hall is a waterfront town surrounded in the by The Haven, the west by Swan Creek, and the southern portion by Rock Harbor. Floods have been and will continue to be a significant threat to the economic and social well-being of selected areas of Kent County. In particular, the towns have more population and economic assets that are vulnerable to flood damages. Exacerbating the effects of flooding in the County are areas with steep slopes or obstructions in the floodplain.

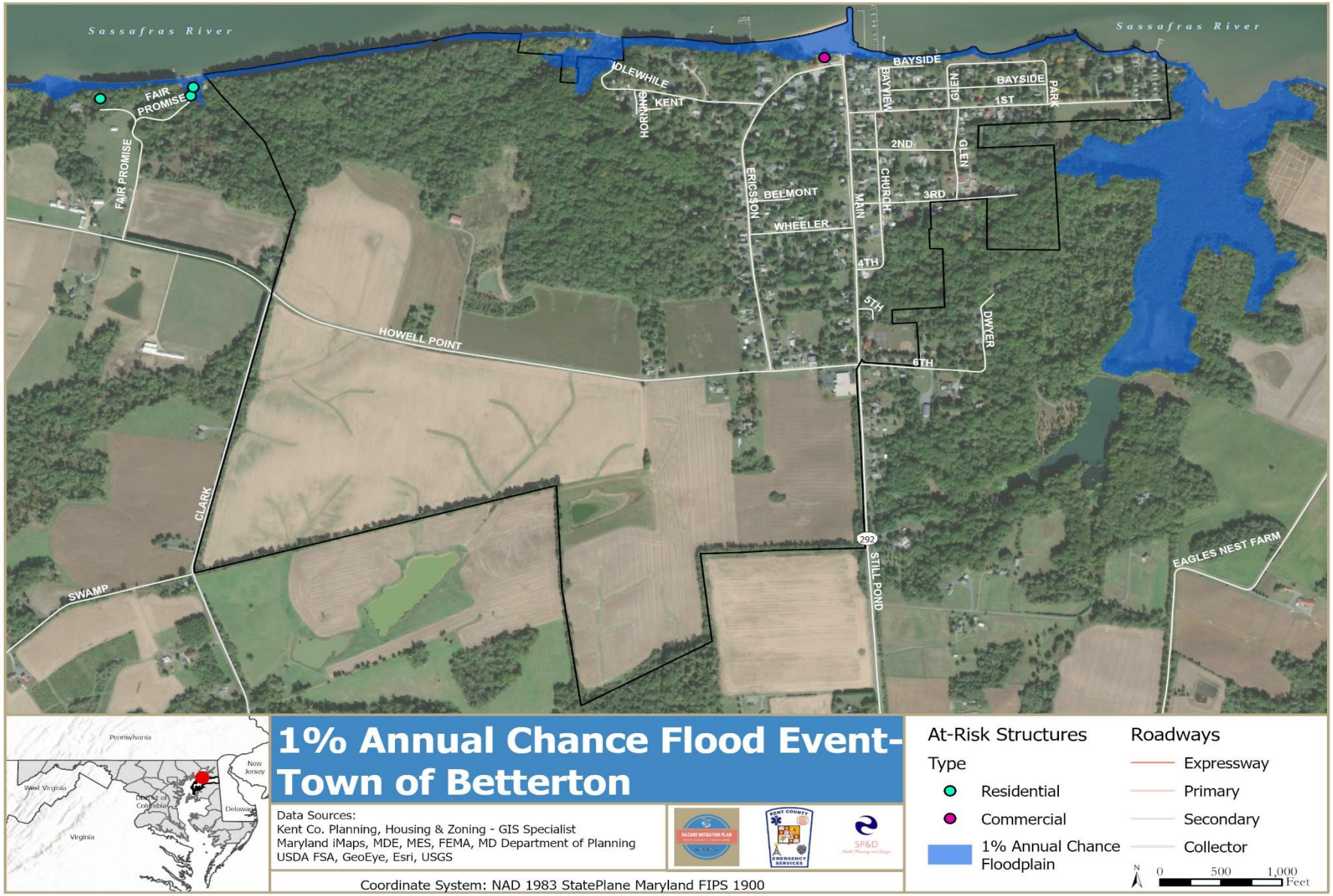
Map 2-3


Harford
Cecil
Delaware
Queen Anne's
Sassafras River
Chesapeake Bay
Chester River
Betterton
Galena
Millington
Millington Annexation Area
Chestertown
292
444
213
290
299
313
298
330
561
297
291
514
20
446
At-Risk Structures
Type
Residential
Commercial
Other
1% Annual Chance Floodplain
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
Surrounding State
0 1 2 Mi
Pennsylvania
New Jersey
West Virginia
Virginia
Delaware
1% Annual Chance Flood Event-Northern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, MDE, MES, FEMA, MD Department of Planning
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900

Map 2-4


Chesapeake Bay
Chester River
Rock Hall
Chestertown
Queen Anne's
21
20
446
445
289
288
At-Risk Structures
Type
Residential
Commercial
Other
1% Annual Chance Floodplain
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
Surrounding State
0
1
2
Mi
Pennsylvania
New Jersey
West Virginia
Virginia
Delaware
1% Annual Chance Flood Event-Southern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, MDE, MES, FEMA, MD Department of Planning
USDA FSA, GeoEye, Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900

Map 2-5


Sassafras River
Sassafras River
FAIR PROMISE
FAIR PROMISE
IDLEWHILE
HORNING
KENT
BAYSIDE
BAYVIEW
GLEN
BAYSIDE
1ST
PARK
2ND
GLEN
ERICSSON
BELMONT
MAIN
CHURCH
3RD
WHEELER
4TH
5TH
DWYER
6TH
HOWELL POINT
CLARK
292
STILL POND
EAGLES NEST FARM
SWAMP
Pennsylvania
New Jersey
West Virginia
Maryland
District of Columbia
Delaware
Virginia
1% Annual Chance Flood Event- Town of Betterton
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, MDE, MES, FEMA, MD Department of Planning
USDA FSA, GeoEye, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
At-Risk Structures
Type
Residential
Commercial
1% Annual Chance Floodplain
Roadways
Expressway
Primary
Secondary
Collector
N
0
500
1,000
Feet

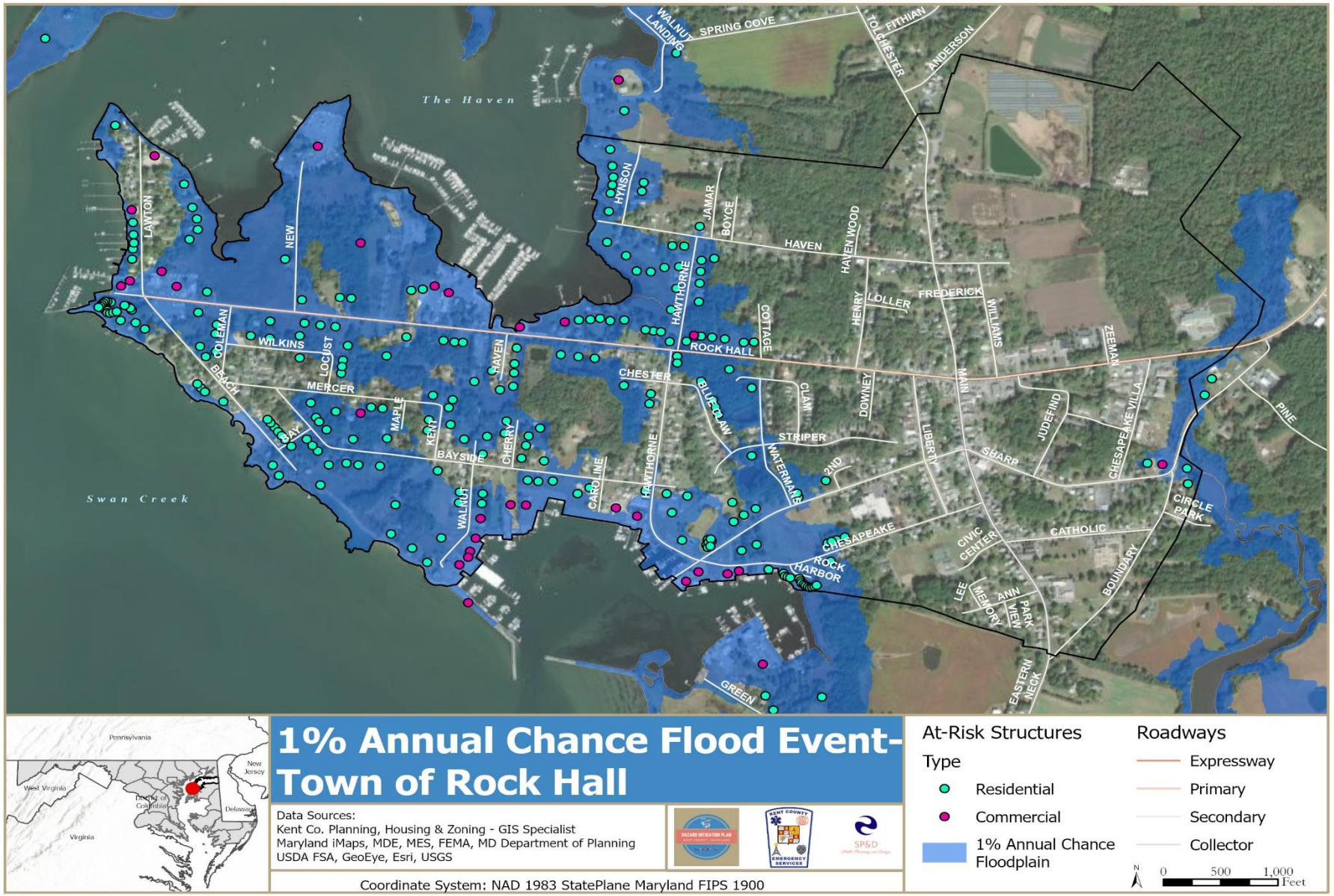
Map 2-6


1% Annual Chance Flood Event-
Town of Chestertown
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, MDE, MES, FEMA, MD Department of Planning
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
At-Risk Structures
Type
Residential
Commercial
1% Annual Chance Floodplain
Roadways
Expressway
Primary
Secondary
Collector
Maryland Counties
0 1,250 2,500 Feet
Chester River
Queen Anne's
Queen Anne's
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
STOCKTON START
CROMWELL CLARK
FLATLAND
CAMELOT
TRAFFORD
DEVON
ADELA
MAYFAIR
LEEDS
KENNEDY
LINCOLN
VICKERS
HILLTOP
ORCHARD
MEADOWVIEW
GATEWAY
SOUTHGATE
CRESTVIEW
FOXVIEW
WASHINGTON
MANOR
MALONE
HAACKE
WARNER
ISLAND
LARK
SILVER
HEEL
JIMSTOWN
SCHEELER
ACORN
CONLEY
WASHINGTON
HADAWAY
HOLLY
CEDAR
BELL
PINE
ELM
GREENWOOD
VALLEY
SCHOOL
ROLLING
REED
GIBSON
TALBOT
SPEER
HIGH
PROSPECT
COLLEGE
MOUNT VERNON
CAMPUS
BROWN
RIVERSIDE
SASSAFRAS
GUILFORD
CLIPPER
SCHAUBER
BROOKYARD
MORGNEC
MALLARD
BOHEMIA
CREEK
AMERICAN LEGION
MAIDEN LOT FARM
BIRCH
RUN
CEDAR
CHASE
DAVID
BARROW
WALDO
BYFORD
RICHARD
KENT
HORSEY
RIVERSIDE
MAPLE
CHURCH
QUEEN
WATER
CROSS
PHILOSOPHERS
LINCHBURG
CALVERT
CANNON
MILL
PARK
DIXON
RADCLIFFE
ALDAN
QUAKER NECK
LANDING
JOHN HANSON
AIRY HILL
BRICES MILL
FOXCHASE
BEAVER
GARFIELD
BROAD NECK
PIPPIN HILL
CHESTERTOWN
20
514

Map 2-7


CHESTERVILLE BRIDGE MEMORIAL
BLUE STAR MEMORIAL
CARROLL CLARK
313
SPEER
GALENA
MILLINGTON
KENT MILL
EDGE
HOWARD JOHNSON
RAMP - to NB 301
RAMP from NB 301
CHESTER
RIVER PARK
RIVER BEND
RIVER
SASSAFRAS
EMBERT
SCHOOL
CARVILLE
HURTT
COMEGYS
BACK
RAILROAD
CRANE
CYPRESS
HAZEL
Chester River
Queen Anne's
WEST
MIDDLE
RACE
SUNFLOWER
DAISY
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
1% Annual Chance Flood Event- Town of Millington
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, MDE, MES, FEMA, MD Department of Planning
USDA FSA, GeoEye, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
At-Risk Structures
Type
Residential
Commercial
1% Annual Chance Floodplain
Roadways
Expressway
Primary
Secondary
Collector
Maryland Counties
N
0
500
1,000
Feet

Map 2-8


The Haven
Swan Creek
WALNUT LANDING
SPRING COVE
TOLCHESTER
FITHIAN
ANDERSON
HYNSON
JAMAR
BOYCE
HAVEN
HAVEN WOOD
HENRY
LOLLER
FREDERICK
WILLIAMS
ZEEMAN
PINE
LAWTON
NEW
COLEMAN
WILKINS
LOCUST
BEACH
MERCER
MAPLE
KENT
CHERRY
BAYSIDE
OTIS BAY
HAVEN
HAWTHORNE
COTTAGE
ROCK HALL
CHESTER
BLUE CLAW
CLAM
DOWNEY
MAIN
STRIPER
WATERMANS
2ND
LIBERTY
SHARP
JUDEFIND
CHESAPEAKE VILLA
CIRCLE PARK
CAROLINE
HAWTHORNE
WALNUT
CHESAPEAKE
ROCK HARBOR
CIVIC CENTER
CATHOLIC
BOUNDARY
LEE MEMORY
ANN
PARK VIEW
EASTERN NECK
GREEN
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
1% Annual Chance Flood Event-Town of Rock Hall
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, MDE, MES, FEMA, MD Department of Planning
USDA FSA, GeoEye, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
At-Risk Structures
Type
Residential
Commercial
1% Annual Chance Floodplain
Roadways
Expressway
Primary
Secondary
Collector
N
0
500
1,000
Feet

Critical & Public Facilities

Critical and public facilities are vulnerable to flooding, but their vulnerability is dependent on their specific terrain and soil type and the amount of excess runoff from neighboring areas. Since flash floods frequently occur outside of established floodplains, one cannot say with absolute certainty that future development in a specific location in the county will be subjected to flash floods.

Critical (or essential) facilities as defined and identified within the State of Maryland Hazard Mitigation Plan include five (5) facility types: Emergency Operation Centers (EOC), fire/EMS stations, hospital and medical clinics, police stations, and schools (K-12, colleges). Public facilities include county owned, state owned, water treatment plants (WTP), and wastewater treatment plants (WWTP).

A vulnerability assessment was conducted to determine which critical and public facilities were at-risk to the 1% annual chance flood event. The results indicated seven (7) public facilities are at-risk and have a potential loss estimation of $1,131,700.00.

Table 2-4: Critical & Public Facilities – At Risk to 1% Annual Chance Flood Event

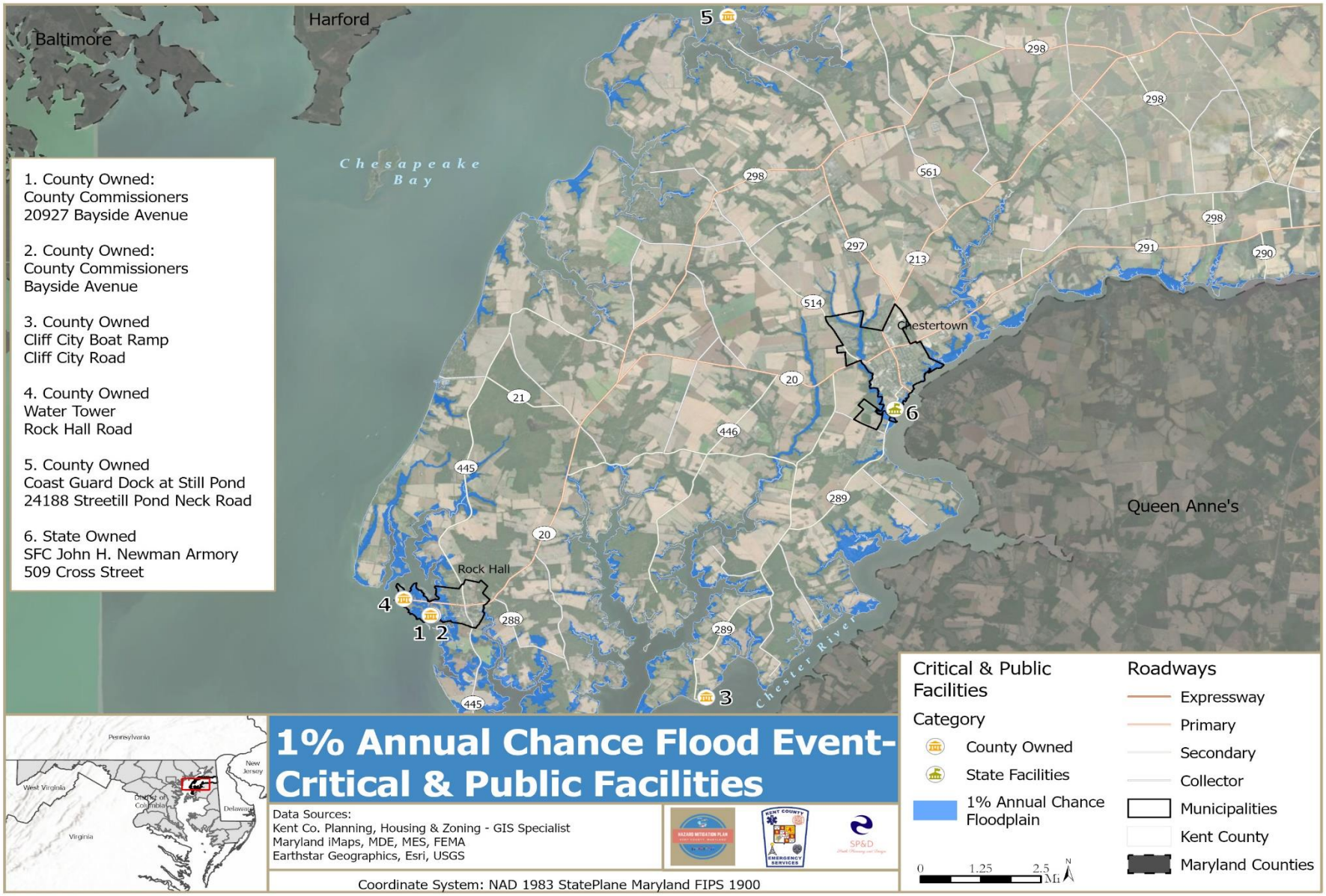
Category	Name	Address	City	Zip Code	Year Built	Building Value	Flood Zone	Coastal Flood Depth
County Owned	Bayside Landing Park	20927 Bayside Avenue	Rock Hall	21661	Not Available	$259,100	AE	0.90’
County Owned	Marina	Bayside Avenue	Rock Hall	21661	Not Available	$45,200	AE	0.50’
County Owned	Cliff City Boat Ramp	Cliff City Road	Chestertown	21620	Not Available	Not Available	AE	3.40’
County Owned	Water Tower	Rock Hall Road	Rock Hall	21661	Not Available	$89,500	AE	0.90’
County Owned	Coast Guard Dock at Still Pond	24188 Still Pond Neck Road	Worton	21678	1970	$161,900	AE	2.90’
Washington College Owned	Chestertown Armory	509 Cross Street	Chestertown	21620	1930	$576,000	AE	1.10’
WWTP	Millington WWTP	227 Sassafras Street	Millington	21651	Not Available	Not Available	AE	6.10’

Source: Smith Planning & Design, FEMA Flood Zones - Effective Date: 2014, Kent County Database, MdProperty View

Utilizing the 1% annual chance flood depth grid, flood depths at the lowest adjacent grade of the structures were provided for each facility. The Millington Wastewater Treatment Plant has the highest flood depth at 6.1 feet. The Millington WWTP is located in Queen Anne’s County and identified in the *2018 Queen Anne’s County Hazard Mitigation Plan*. Map 2.1 depicts the location of the six (6) critical & public facilities impacted by the 1% annual chance flood event.

Source: Town of Millington- WWTP Flooded

Map 2-9


1. County Owned:
County Commissioners
20927 Bayside Avenue
2. County Owned:
County Commissioners
Bayside Avenue
3. County Owned
Cliff City Boat Ramp
Cliff City Road
4. County Owned
Water Tower
Rock Hall Road
5. County Owned
Coast Guard Dock at Still Pond
24188 Streetill Pond Neck Road
6. State Owned
SFC John H. Newman Armory
509 Cross Street
Baltimore
Harford
Chesapeake Bay
Chestertown
Queen Anne's
Rock Hall
Chester River
1% Annual Chance Flood Event-
Critical & Public Facilities
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, MDE, MES, FEMA
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Critical & Public Facilities
Category
County Owned
State Facilities
1% Annual Chance Floodplain
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
0 1.25 2.5 Mi
N

NFIP Policies

Flood insurance policy information was obtained from Joshua Norris, FEMA shown on Table 2-5. Data indicates that as of September 28, 2020, there were no policies filed in the Town of Betterton, which is no different than that reported in the 2014 Plan. The Flood insurance policies for Chestertown increased since the last Plan, however policies decreased in Rock Hall and in the unincorporated areas of the County.

Table 2-5: Total Structures within the Floodplain & Flood Insurance Policies as of September 28, 2020

Table 2-5: Total Structures within the Floodplain & Flood Insurance Policies as of September 28, 2020			
Community Name (Number)	Total Policy Count	Total Coverage	Total Net Dollars Paid
Betterton, Town Of (240095)	-	$0	$303,618
Chestertown, Town Of (240046)	95	$27,954,700	$934,492
Kent County * (240045)	218	$63,451,500	$3,430,281
Millington, Town Of (240058)	-	$0	$104,824
Queen Anne's County* (240054)	2	$500,000	$118,779
Rock Hall, Town Of (240048)	229	$60,009,800	$3,213,265
Unknown (Unknown)	26	$6,580,500	-
Grand Total	570	$158,496,500	$8,105,259

Source: FEMA, Joshua Norris, provided to MEMA and Kent County on October 27, 2020

Note: Flood insurance is available to anyone in the County and even those structures outside of the mapped floodplain area. Therefore, in some cases, the number of policies includes polices for structures that are outside the mapped floodplain. Likewise, not all structures located within the mapped floodplain areas have flood insurance policies.

Nuisance Flood Locations

The *Kent County Nuisance Flood Plan* was developed in response to Maryland Senate Bill (SB) 1006. The amended Bill states that "on or before October 1, 2020, a local jurisdiction that experiences nuisance flooding shall develop a plan to address nuisance flooding." The legislation further specifies that the plan must be submitted to the Maryland Department of Planning, published on the local jurisdiction's website, and updated at least every five years. Kent County completed this planning effort in March of 2019.

In Kent County, nuisance flooding occurs most predominately in locations near or adjacent to major bodies of water. Along the Chester River, nuisance flooding is common on residential and commercial properties. The Town of Chestertown has made major investments in flood mitigation at the municipal marina, park, and walkways along the riverbank. Elsewhere in the County, nuisance flooding is experienced as debris from farm fields washes into ditches and eventually settles on roadways as ditches overflow. Culverts in low-lying areas may have difficulty conveying water adequately, causing ponding on low-lying roadways throughout the County. Both roads and bridges subject to nuisance flood conditions are identified in various tables and maps within the Nuisance Flood Plan.

Thresholds are maintained for Kent County which direct a set of actions based on a particular inundation level or frequency of flooding. These thresholds are meant to supplement actions directed by the *Kent County Emergency Operations Plan*. When flooding reaches such a severity that life safety, critical infrastructure, and key resources are threatened, "nuisance" flooding levels have been exceeded. Below are response concepts consistent with the Kent County Emergency Operations Plan which may become necessary as flood waters rise beyond nuisance levels.

Table 2-6: Flood Response Thresholds

Threshold	Response Level	Required Action
Forecast data from the NWS or NOAA tide gauge indicates likely nuisance flooding impacts	Level I – Public Warning	Make the public aware of nuisance flooding threat via mass notification emails, social media, etc.
Flood waters are present below nuisance levels and are rising	Level II – Monitor Inundation	Deploy DPW and SHA personnel to monitor flood levels as needed and place high water signs at impacted locations.
Flood waters are high enough to warrant temporary road closures	Level III – Flood Response	Place additional DPW and SHA personnel on standby; close roads and reroute traffic as flooding reaches hazardous levels

Source: Kent County Emergency Operations Plan

In terms of future considerations, the areas impacted by nuisance flooding will increase gradually in the coming years as changing climate elevates water levels and drives precipitation patterns to new extremes. This shift, however, is likely to accelerate gradually over time. New areas will also become impacted, leading to an increased number of businesses, residents, and critical infrastructure at risk. Public services will also be more frequently impaired as flooding increases. Kent County will maintain a level of awareness of data made available by NOAA, the State of Maryland, the University of Maryland Center for Environmental Science, and other scientific institutions as it pertains to the community and local flood risks. These risks of increased nuisance flooding will be communicated appropriately to residents and decision makers and direct them to take appropriate action in the areas of emergency response and hazard mitigation. Elected officials and County staff will utilize venues such as County Commissioners' meetings and Planning Commission meetings to communicate information on long-term flood risks. Future projections of sea level change and nuisance flooding should also be integrated into land use planning, floodplain management, comprehensive planning, and capital investment planning.

Dam Inventory

According to the USACE National Inventory of Dams, seventeen (17) dams are located in Kent County, three (3) of which have Emergency Action Plans. There are no High Hazard Potential Dams (HHPD) located in Kent County. Hazard classifications related to dams throughout Maryland are available through MDE's Dam Safety Division.

Table 2-7: USACE National Inventory of Dams - Kent County, MD				
Name	Owner Type	Purpose	River	Emergency Action Plan (EAP)
Big Meadows Farm Dam	Private	Irrigation	Mill Creek-Trib.	Not Required
Carpenter Farm Pond	Private	Irrigation	Swan Creek	Not Required
Chestertown Stabilization Pond No. 1	Local Government	Lagoon	Offstream-Radcliffe Creek	Not Required
Chestertown Stabilization Pond No. 2	Local Government	Lagoon	Offstream-Radcliffe Creek	Not Required
Eaton-Raimond Pond	Private	Recreation	Stillpond Creek-Trib.	Not Required
Elgin Farm Pond	Private	Recreation	Morgan Creek-Trib.	Not Required
Fairlee Lake	Private	Recreation	Fairlee Creek-Trib.	Not Required
Richard Smith Dam	Private	Recreation	Herring Branch	Not Required
Riley Mill Dam - Lower Pond	Private	Recreation	Mill Creek	Not Required
Riley Mill Pond	Private	Recreation	Mill Creek	Not Required
Sassafras Mill Dam	Private	Recreation	Herring Branch	Yes
Shellman Farm Dam	Private	Recreation	Chester River-Trib.	Not Required
St. Pauls Millpond	Private	Recreation	West Fork, Langford Creek	Yes
Stillpond Creek Dam	Private	Recreation	Stillpond Creek	Yes
Teels Lake Dam	Private	Recreation	Swantown Creek	Not Required
Urieville Dam (Augustine Herman Hwy)	State	Recreation	Morgan Creek-Trib.	Not Required
Watts Farm Pond	Private	Recreation	Mill Creek	Not Required

Source: USACE National Inventory of Dams - http://nid.usace.army.mil/cm_apex/f?p=838:7:0::NO

Capabilities

Capabilities

During the 2014-2020 planning cycle several notable projects were completed.

In 2014, the Town of Betterton was awarded $91,045 through the *Maryland Sea Grant - Green Streets-Green Jobs.* Funding was awarded for the Greener Wheeler Avenue Project. Grant funds from this program were used for the design and initial implementation of the project. The project included stormwater infiltration benefits, basically slowing stormwater flow and filtering permeated rainwater.

2018 panorama photo of the Chestertown Marina during high tide, which was prior to the completion of renovations that raised the grade by about two feet. *Photo Source:* Kees de Mooy

The Town of Chestertown continuously experienced nuisance flooding during rain events, extreme high tide events, and both full and new moon time periods. In a recent effort to mitigate, the Chestertown Marina was recently renovated. This renovation included raising the grade by two feet, the installation of new bulkheads along the entire shoreline, and the installation of pervious paved plazas to help with stormwater runoff. Given the frequent occurrence of extreme tide events in this area, the new floating docks have enhanced the resiliency of this marina.

Photo Source: Sam Shoge

Through grant funding the Town of Galena has received Cares Funding approval for a mobile electronic board to be placed on the corner of MD313 and MD290. According to the *2019 Kent County Nuisance Flood Plan,* MD 313 was identified as having flooding at the Chester River bridge during Hurricane type storms. MD 290, north of Chestertown has documented flooding issues during heavy rain events.

Appendix D: Capability Assessment of this document contains more extensive information.

Mitigation Strategies

Mitigation goals, objectives, and action items were identified throughout the plan development process for the unincorporated areas of the county and each of the five (5) towns. Following the review and discussion of risk and vulnerability, stakeholders identified and prioritized new action items for this plan update. Action items identified and designated as "all-hazards" and "flood" related are listed below. Those flood mitigation action items listed as a "High" priority have been further detailed table below and include discussion, potential funding sources, and a timeline for implementation.

Section 2 Goal: Minimize the loss of life, property, and adverse environmental impacts due to Flooding in Kent County.

Objective 1: Increase the sustainability of public and private property as it relates to the effect of flooding.
Objective 2: Continue to promote public awareness to the dangers of flooding
Objective 3: Educate property owners and the public about risk and about mitigation measures to protect homes and businesses.

Action Items	Hazard(s)	Category	Responsible Entity(s)	Priority Ranking
Promote awareness of assets and resources located within the 0.2% chance ("500-year") floodplain that may become increasingly at risk due to sea level rise. Currently, properties located within the 0.2% chance floodplain are neither required to meet floodplain requirements nor carry flood insurance. A disclosure regarding such properties should be developed to better-inform residents of their vulnerability and protection options.	**Flood & Climate Adaptation**	Prevention & Natural Resource Protection	Kent County Dept. of Planning, Housing & Zoning	Low
Host and conduct Regional Incident Command Training courses including multi-disciplines. Encourage cross-training among various hazard response and mitigation disciplines. Consider the 0305 All-Hazard Incident Management Course for a group training multi-day event.	**All-Hazards**	Emergency Services	Kent County Office of Emergency Services	Low
Create a prioritized list of properties for land acquisition for flood mitigation and conservation	**Flood & Climate Adaptation**	Prevention & Natural Resource Protection	Kent County Dept. of Planning, Housing & Zoning	Medium

Design with additional elevation when repairing or upgrading county bulkheads, retaining walls, jetties, riprap, and docks to preserve function with rising water levels.	**Flood & Climate Adaptation**	Prevention & Natural Resource Protection	Kent County Dept. of Public Works	Medium
Review county owned critical & public facilities within the FEMA regulated 1% annual-chance flood event area listed on Table 2-4. Five (5) properties were identified and are located within Rock Hall, Chestertown, and Worton.	**Flood**	Property Protection	Kent County Office of Emergency Services, Dept. of Public Works	Medium
Renovate and include flood protection for the Kent County **Detention Center.** Relocate the **Emergency Operations Center**, as appropriate**.** This facility is particularly vulnerable because it has a groundwater spring located nearby. A set of pumps keeps the water table at least 12 feet below the building's foundation. However, during wet or rainy periods the pumps cannot keep up and the basement floors get wet. This is a problem because the **Emergency Operations Center and communications equipment** is housed in the basement.	**Flood & Climate Adaptation**	Prevention	Kent County Office of Emergency Services, Kent County Detention Center, Dept. of Public Works, Kent County Dept. of Planning, Housing & Zoning	High
Pursue funding and conceptual design for stream restoration project(s) along the Chester River at Little Chester Bridge. Both sides display bridge abutment scour issues.	**Flood & Climate Adaptation**	Property & Natural Resource Protection	Town of Millington	Medium
Determine potential flood impacts to the WWTP located within the FEMA regulated 1% annual-chance flood event area listed on Table 2-4.	**Flood**	Property Protection	Town of Millington	Medium
Install back-up generators at public utility facilities, Town Hall, and VFD.	**All-Hazards**	Property Protection	Town of Millington	Medium
Place fixed high-water signage on vulnerable bridges & roads.	**Flood**	Prevention & Natural Resource Protection	Kent County Office of Emergency Services, Dept. of Public Works	High

Discussion: Repetitive flood locations, both bridges and roads, identified in the Kent County Nuisance Flood Plan should be further reviewed and prioritized for high water signage. Priority consideration should be given to these roadways, considering, they are evacuation routes. Also, during a flood hazard event, certain essential facilities might become inaccessible.

Barricades are often deployed to these locations, however, new signage that includes water level data collection would enable staff to monitor and quickly response to these areas, as needed.

Flood Detection Systems & Warning Systems with Gate Closure

Possible Funding Sources: FEMA - Building Resilient Infrastructure and Communities (BRIC), Local Government Infrastructure Financing Program

Timeline for Implementation: 1-3 yrs.

Investigate Ericsson Avenue storm water management issues. Potential Streetscape Project- project is multi-faceted.	**Flood**	Property Protection	Town of Betterton	**High**

Discussion: Revitalization projects may include streetscapes including lighting, sidewalks, facade enhancements, and other physical upgrades. These upgrades will include stormwater design enhancements to improve water conveyance and mitigate roadway flooding.

Possible Funding Source: Maryland Department of Transportation- State Highway Administration and Community Legacy

Timeline for Implementation: 3-5 yrs.

Provide flood insurance and flood related regulations training area contractors, real estate agents and insurance providers.	**Flood**	Prevention	Kent County Dept. of Planning, Housing & Zoning, Town of Millington	**High**

Discussion: Hosting flood insurance workshop(s) insurance and real estate agents become more informed, which will encourage them to share more about the need to purchase flood insurance, regardless of where the home or business is located with the public. Workshops will focus discussion on modernization of flood maps and the differences between policy coverage. Continuing Education Credits (CEU's) should be offered to attendees. For additional training, promote *FEMA's NFIP Key Fundamentals of Flood Insurance for Agents*, two-day webinar.

Training Resources:

FloodSmart Website
FloodSmart Resources for Agents
NFIP Agent Field Guide

National Flood Insurance Program Website
NFIP Flood Insurance Manual
NFIP Community Status Book
Helping Clients Understand the Newly Mapped Procedure
FEMA Elevation Certificate
NFIP Summary of Coverage
How to Print a FIRMette and Download a FIRM Panel
FEMA Map Service Center

Elevation Certificates: Who Needs Them and Why
NFIP Claims Handbook
NFIP Increased Cost of Compliance Overview
How to File a Flood Insurance Claim
Insurance Outreach Publications and Resources
Map Changes and Flood Insurance
Office of the Flood Insurance Advocate
Hurricane Season Campaign
Disasters and Assistance
Risk Rating 2.0
Answers to Questions about the NFIP
WYO Companies Actively Writing Flood Insurance
Understanding Mudflow and the NFIP
Flood Insurance: It's Worth It

Possible Funding Source: Free FEMA/MDE Instructor/Technical Advisors

Timeline for Implementation: 1 yr.

Expand public information capabilities by hosting regional training and workshops. Continue Joint Information Center initiative.	**All-Hazards**	Public Education & Awareness	Kent County Office of Emergency Services	**High**

Discussion: Hazards impacting Kent County, specifically flood-related hazards, oftentimes are also impacting the surrounding jurisdictions. Forming a Joint Information Center (JIC), in this case a virtual center, provides an opportunity for Public Information Officers (PIOs) to come together to coordinate and disseminate accurate, consistent and timely messages during an emergency. Coordinating prior to an incident through workshops, exercise, and drills will enable regional PIOs to get to know one another prior to a real-life incident. In addition, having PIO contacts in other jurisdictions, opens the opportunity to request assistance, as available, from contacts that are known and work in the Region.

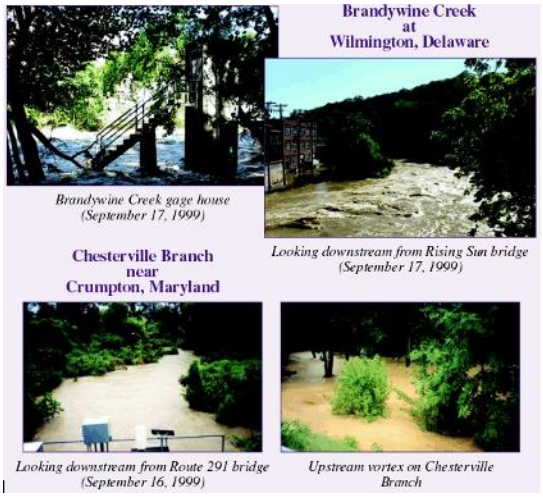
Possible Funding Sources: Staff Time

Timeline for Implementation: 1-2 yrs.

Consider pursuing FEMA's Community Rating System to lower flood insurance costs for property owners and provide outreach to at-risk properties. Review Map 2-3 thru 2-8 for at-risk structures.	**Flood**	Public Education & Awareness	Town of Chestertown	**N/A**
			Town of Rock Hall	**High**
			Town of Millington	**Medium**
			Town of Betterton	**Medium**
			Kent County Dept. of Planning, Housing & Zoning	**Medium**
Discussion: The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. According to the FEMA flood Insurance policy data provided on Table 2-5, there are 570 policies in-force county-wide, of which 229 are within the Town of Rock Hall. Total net losses for the Town of Rock Hall is $3,213,265. Participation in CRS and the completion of activities by Rock Hall will result in credit points awarded. Based on awarded points and CRS rating, flood insurance discounts will be provided to all flood insurance policy holders. A 10% discount based on the total premiums for Rock Hall would result in a total cost savings of $20,900.00 using the data found in Table 2-5. **Possible Funding Sources:** Staff Time **Timeline for Implementation:** 2-3 yrs.				
Obtain and strategically deploy mobile message sign boards throughout the county.	**All-Hazards**	Emergency Services	Kent County Office of Emergency Services, Washington College	**High**
Discussion: Mobile or variable message sign boards are easily deployable and highly effective for public safety warning and notification. Due to the land area size of the county and potential for various hazard impacts, particularly widespread flooding, multiple sign boards are needed. Approximately $12K per board. **Possible Funding Sources:** FEMA - Building Resilient Infrastructure and Communities (BRIC) and Local Government Infrastructure Financing Program **Timeline for Implementation:** 2-3 yrs.  InstAlert 24 on ATS 5 Trailer				

Establish a working group to complete a field visit to identify potential stream restoration project locations.	**Flood & Climate Adaptation**	Natural Resource Protection	Town of Rock Hall, University of MD	**High**
			Town of Millington	**Medium**

Discussion: Maryland Sea Grant Extension is a partnership between Maryland Sea Grant and University of Maryland Extension. Maryland Sea Grant's Extension specialists and agents are experts in a wide variety of fields. Those include aquaculture, business, food safety, and watershed restoration. We facilitate workshops and training seminars, produce publications, and conduct applied research that can help solve practical problems.



Watershed Restoration: Managing Stormwater, Restoring Natural Habitats

- Our staff of five watershed restoration specialists help Marylanders install green design projects – like stream restoration projects and rain gardens – that are based on sound practices.
- These measures can manage the flow of stormwater locally by soaking up water (to limit flooding) and treating it (to remove pollutants).
- We also work to help groups and communities restore natural habitats that can help to improve water quality Bay-wide. Those include wetlands, streams, and forest buffers, which are trees planted along a waterway.
- Our specialists assist five Watershed Stewards Academies around Maryland to train volunteers to lead and find funding for community-based watershed restoration projects.
- We help communities and individuals find technical assistance and funding to support their watershed restoration activities. For more information on sources of funding for water quality improvement projects, check out our Maryland Watershed Restoration Assistance Directory.

Possible Funding Sources: Maryland Sea Grant and University of Maryland Extension

Timeline for Implementation: 1-2 yrs.

Explore (10) tideflex valve installation.	**Flood**	Property Protection	Town of Rock Hall	**High**

Discussion: Tideflex valves for drains and sewers provide end-of-pipe backflow prevention and flooding protection. Tideflex valves are unibody, rubber check valves which means they do not rust and are resistant to most chemicals found in wastewater.


Tideflex Check Valve
municipalvalve.com


Tideflex Check Valves | Red Valve
redvalve.com

They do not block easily and are self-clearing, so they have a long-life span and require no maintenance, unlike traditional flap valves.

Possible Funding Sources: FEMA - Building Resilient Infrastructure and Communities (BRIC), Emergency Advance Measures for Flood Prevention, Watershed and Flood Prevention Operations Program

Timeline for Implementation: 2-3 yrs.

Develop a Flood Mitigation Plan.	**Flood**	Property Protection	Kent County Office of Emergency Services, Kent County Dept. of Planning, Housing & Zoning	**High**

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. 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.

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.

CRS information – The Kent County 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 hazard mitigation plans, and floodplain management plans prepared for the U.S. Army Corps of Engineers.

Possible Funding Sources: FEMA - Building Resilient Infrastructure and Communities (BRIC) and FEMA - Hazard Mitigation Grant Program (HGMP)

The Flood Mitigation Assistance Program is a competitive grant program that provides funding to states, local communities, federally recognized tribes and territories. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program. Planning grants are available using FMA grant funding.

Timeline for Implementation: 2-3 yrs.

Add link to MDE's Flood Risk application on the Kent County's Mapping Tools homepage.	**Flood**	Property Protection	Kent County Dept. of Planning, Housing & Zoning	**High**

Discussion: The simple activity of including links on the county's website that assist the public with accessing additional flood information could earn the County CRS points. After review of the County's website, there was no link to the Maryland Department of Environment's Flood Risk Application: MD Floodmaps, https://mdfloodmaps.net/map/. By providing this link, citizens could learn about their property's flood risk and will earn the County CRS points under 300 Public Information Activities: 320 Map Information Services. A max of 90 points could be earned activities such as this.

Possible Funding Sources: Staff Time

Timeline for Implementation: 2 months

SECTION 3

SECTION 3 TOPICS

- HURRICANE HAZARD
- HISTORY & FUTURE RISK
- VULNERABILITY
- CAPABILITIES
- MITIGATION STRATEGIES

PLAN UPDATE HIGHLIGHTS

The hurricane hazard has been continued from the 2014 Plan into the 2020 Hazard Mitigation Plan.

The hurricane hazard includes tropical storms. There are no hurricanes and tropical depressions recorded in the NCEI Database for Kent County.

The Saffir-Simpson Hurricane Wind Scale and NOAA Historical Hurricane Tract were updated with the most current information.

New maps and figures were included to display hurricane tracks and storm surge explanations. Velocity Pressure as a Function of Wind Speed data was included to the plan update.

Hazard Risk Assessment Data tables were updated using data from the 2016 State of Maryland Hazard Mitigation Plan and the National Centers for Environmental Information (NCEI) - Storm Events Database.

Vulnerability analysis for storm surge risk assessment and loss estimations were completed using updated data, 2016 Hurricane Storm Surge GIS data. New maps were generated for the northern and southern parts of County, municipalities, and structures at risk to the inundation area. New Hurricane Storm Surge Rise At-Risk Structures and Loss Estimations Per Community tables were developed and included.

Critical & Public Facilities at risk to hurricane storm surge were analyzed. Facilities at risk were provide in table and mapping formats.

New capabilities provided by stakeholders were discussed.

New goals and objectives were developed for this plan section. New 2020-2025 Mitigation Action Items provided by stakeholders were included. Action items ranked “High” were further detailed to include discussion, potential funding sources, and a timeline for implementation.

Hurricane Hazard

Hazard

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 39 mph.

A hurricane is a type of tropical cyclone, which is a very low-pressure, gyrating weather system that forms over tropical waters. Tropical cyclones that occur in the Atlantic Ocean are known as hurricanes. When such systems begin, they are called tropical depressions. Once winds reach a sustained force of 39 miles per hour, a tropical depression becomes a tropical storm. If the winds reach a sustained force of 74 miles per hour, the tropical storm becomes a hurricane. Their further classification depends on the speed of the winds and storm surge. Damage is not, however, a direct function of windspeed. Usually a combination of hazards within a storm causes the most extensive damage. Hurricane Katrina demonstrated this as it was only a category 3 hurricane, but the storm surge, the extensive rainfall, and the failed levees together resulted in unprecedented damage.

Table 3-1: Saffir-Simpson Hurricane Wind Scale

Category Wind Speed Storm Surge	Effects
Category 1-Weak 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-Moderate 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.

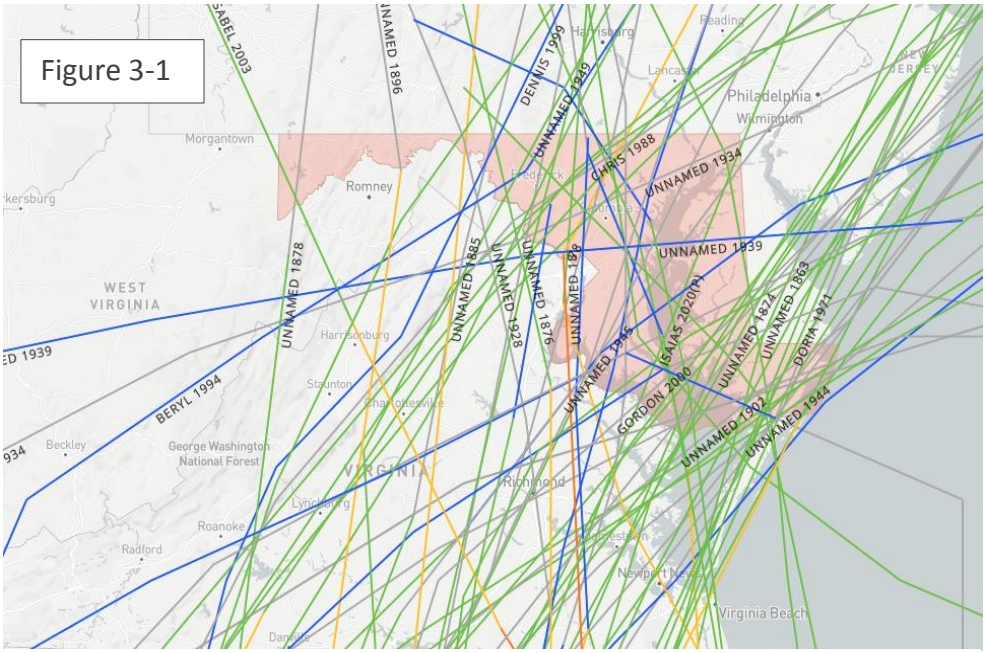
Source: National Hurricane Center, 2012

Hurricanes are classified by the Saffir-Simpson scale which distinguishes hurricanes based on their intensity and damage level; Table 3-1. The categories from 1 to 5 indicate increasing intensity based on the degree of sustained winds, atmospheric pressure, storm surge and anticipated extent of damage.

A hurricane may include one or more of the following effects: storm surge, high winds and heavy rain. The cumulative impact of these can be life threatening and cause catastrophic damage. Several hurricanes or tropical storms travel up the Atlantic Coast each season threatening large areas of the eastern United States and millions of people. Figure 3-1 depicts hurricane tracks across the State of Maryland. Green lines indicate tropical storm, blue are tropical depressions, while yellow are category 1 hurricanes.

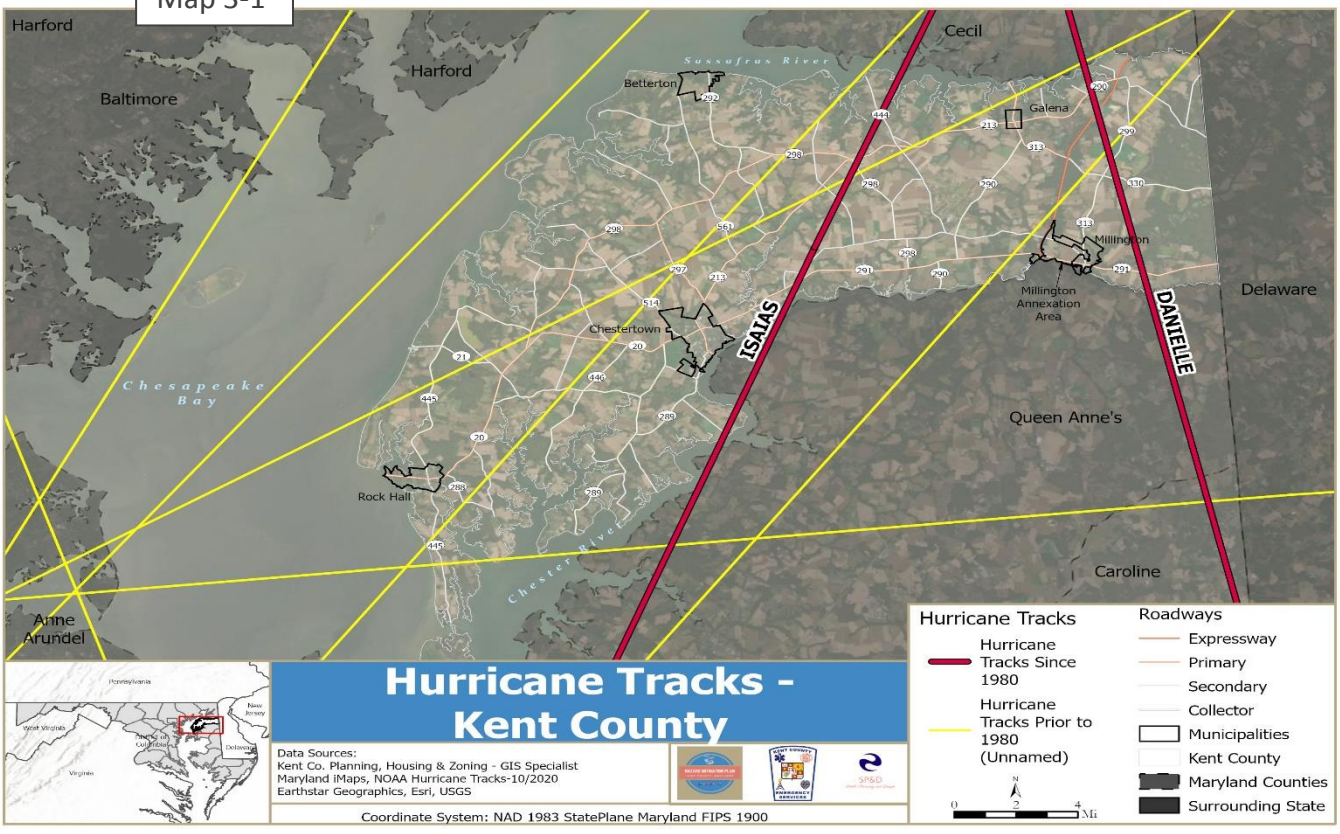
A total of six (6) hurricanes have directly traversed Kent County and one (1) tracked along the western coastline. Since 1980, two (2) hurricanes have passed through the County; Danielle in 1993 and most recently, Isaias in 2020. Map 3-1 shows the hurricane tracks going through or around Kent County.

Figure 3-1



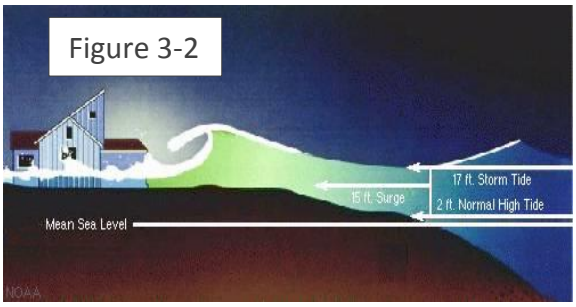
Source: NOAA Historical Hurricane Tracks: https://oceanservice.noaa.gov/news/historical-hurricanes/

Map 3-1



The most destructive of the hurricane's effects is storm surge, an abnormal local rise in sea level. When a hurricane forms and as it moves landward, low barometric pressure and high, gyrating winds create a dome of ocean water that moves under the hurricane's eye. When over open ocean, the volume of this dome of water is absorbed by the great volume of water characteristic of substantial bottom depths.

Storm surge occurs when the hurricane approaches the coast and the depth decreases, the resulting dome of water floods ashore. Storm surge causes nine out of ten hurricane deaths. Storm surge results in a temporary sea level increase. Any wave action is in addition to the storm surge.



The stronger the hurricane and the closer it is perpendicular to its track, in relation to the coastline, the higher the storm surge and resulting destruction will be. The depth of the water along the coastline and the slope of the bottom are other determining factors of storm surge height. "…When surging waters come into contact with the gradually sloping shallow bottom, the speed of the surge decreases, and wave heights increase because of the kinetic energy that is forced upward by the bottom." Because the local continental shelf slopes gradually, storm surge heights will generally be greater than in areas where the slope is more abrupt. Figure 3-2 shows storm surge inundation areas.

The heavy rain that accompanies hurricanes can also be destructive and has a greater area of impact than storm surge. Hurricanes can bring ten (10) to fifteen (15) inches or more of rainfall. This causes flooding and has many secondary impacts. Heavy rain can severely impede the flow of traffic and thus impair evacuation and emergency services. Rainfall, as a symptom of a hurricane can affect inland areas far from the coast.

High winds can also cause a great deal of damage and injuries. The high winds of hurricanes are a threat to the stability of structures including tall buildings, towers, and mobile homes. The destructive wind forces of hurricanes can be divided into several categories:

- Direct pressure and uplift;
- Internal pressurization; and
- Wind-borne debris.

Direct pressure and uplift result from sustained winds against a structure. The speed of the wind has a direct and exponential relationship with the amount of pressure exerted; Table 3-2.

Table 3-2: Velocity Pressure as a Function of Wind Speed

Wind Speed (mph)	75	95	110	130	155	180	200
Velocity Pressure (psf)	19	30.6	41	57.2	81.3	109.7	135

Source: ASCE, 1990

The level of structural damage is a function of its shape and construction. The most common form of damage to structures from wind is uplift that damages or completely separates the roof from the structure. This type of damage is much more likely with gable style roofs.

Source: This Photo by Unknown Author is licensed under CC BY-SA.

Internal pressurization or depressurization results from the entry of wind forces into the structure through openings. If the opening is on the leeward side of the structure, suction is created resulting in depressurization which can cause the roof or its structural components to cave inward. When the opening is on the windward side, the result is an internal pressurization of the structure that can blow windows, doors, and walls outward.

Hurricane winds fling debris at high speeds. Debris can consist of roofing materials, glass from windows, doors, tree branches, lawn furniture, fencing materials, accessory structures, etc. This debris damages anything in its path and, when it hits a structure hard enough, can result in an opening that can cause internal pressurization or depressurization.

Typically, wind speeds are thought to be slowed by land. However, wind speed is not a function of distance inland, rather it is a function of time spent over land. A building that is five (5) miles inland is therefore not exempt from a wind hazard. A weaker storm that is moving 25 mph could wreak as much wind damage inland as a stronger storm that is moving slowly.

Storm Surge

Storm Surge is an abnormal rise of water generated by a storm, over and above the astronomical tide.

Storm Tide is the water level rise during a storm due to the combination of storm surge and the astronomical tide.

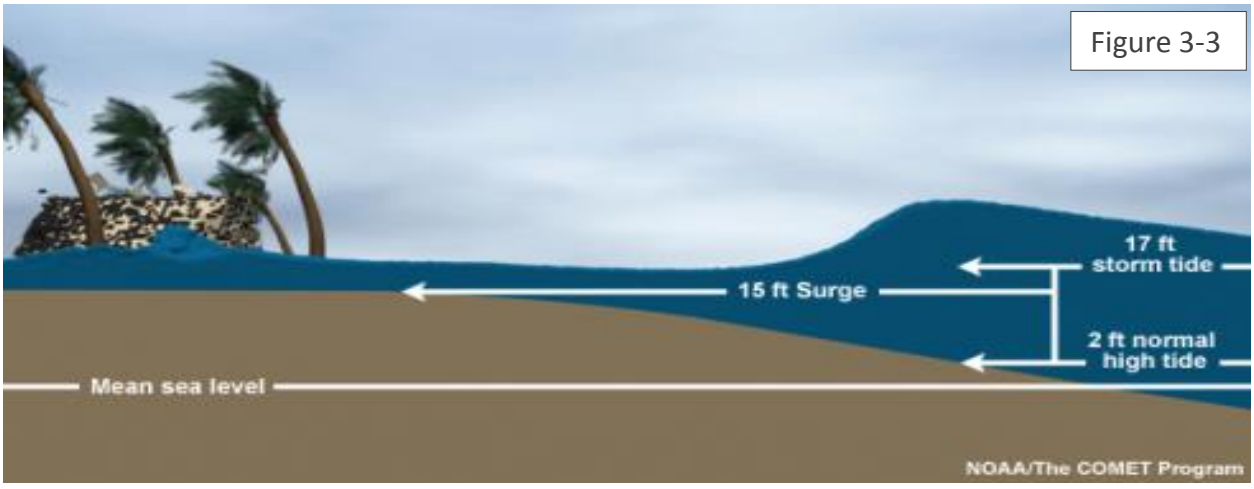


Figure 3-3

Source: nhc.noaa.gov/surge/surge_into.pdf

History & Future Risk

History

As shown on Figure 3-1, tropical depressions, tropical storms, and category 1 hurricanes have tracked in and/or around Kent County. Effects from these storms have impacted all of Kent County, considering the disruptions in power and inundation of roadways, they can and do wreak havoc on the entire community.

In terms of hazard risk, the hurricane hazard was continued from the 2014 planning cycle and was given a ranking of "Medium High" during the 2020 planning cycle. In order to assess the hazard risk identified, a composite score method was undertaken. The composite score method was based on a blend of quantitative and qualitative factors extracted from the National Centers for Environmental Information (NCEI), stakeholder survey, and other available data sources. These included:

- Historical impacts, in terms of human lives and property;
- Geographic extent;
- Historical occurrence;
- Future probability; and
- Local community perspective.

Detailed information is available within *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, and Hazard Data Tables.*

Specific to the hurricane hazard, information obtained for Kent County using both the *2016 State of Maryland Hazard Mitigation Plan* and the National Centers for Environmental Information (NCEI) - Storm Events Database between January 1950 and December 31, 2019 for Hurricane Hazard include: Tropical Storm. There are no Hurricanes and Tropical Depressions in the database for Kent County. There has been a total of three (3) Tropical Storm Events between 2003-2020, with an annualized rate of 0.17. These storms have produced $550,000 in property damage and 87% of the county is in a risk area.

Total Hurricane Hazard Risk Assessment Data Table

Hazards included within this table from NCEI Data: Tropical Storm. There are no Hurricanes and Tropical Depressions recorded in the NCEI Database for this county.

Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2003-2020
0	0	550K	0	% County in risk area= 87.00%	Total = 3 Annualized = 0.17

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Tropical Storm Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2003-2020
0	0	550K	0	% County in risk area= 87.00%	Total = 3 Annualized = 0.17

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Tropical Storm (Z). *A tropical cyclone in which the 1-minute sustained surface wind ranges from 34 to 63 knots (39 to 73 mph). A Tropical Storm should be included as an entry when these conditions are experienced in the WFO's (Weather Forecast Office) CWA (County Warning Area).*

Federally declared Hurricanes impacting Kent County include Hurricane Isabel in 2003, Hurricane Katrina in 2005, Hurricane Irene in 2011, and Hurricane Sandy in 2012. In 1972, Tropical Storm Agnes impacted Kent County, as a result a Maryland State of Emergency was declared.

According to the National Center for Environmental Information (NCEI), the following hurricanes/tropical storms impacted Kent County:

- **September 18-19, 2003 – Hurricane Isabel** - This storm caused a record-breaking tide and storm surge up the Chesapeake Bay, heavy rain and strong power outage producing winds. A record-breaking high tide of 7.91 feet above mean lower low water was observed at Tolchester Beach (Kent County). The surge was 6.88 feet. Tidal flooding problems began after Midnight EDT on the 19th and continued throughout the day on the 19th. The surge was so strong that it negated the normal tide cycle in the bay. Evacuations occurred near the bay. For example, in Kent County emergency management officials evacuated residents along Eastern Neck Road (State Route 455) from Rock Hall to the Eastern Neck Island. Tidal flooding occurred in and around Rock Hall, Chestertown, Skinners Neck, Piney Neck and Cliffs City. Tidal flooding carried inland on the Chester River to Chestertown. Over 100 homes, vehicles and boats were damaged and/or ruined. In addition, eleven marinas, three restaurants, two hotels, two Bed and Breakfast facilities, one boat building business and one marine railway reported major damage.
- **September 6, 2008 – Tropical Storm Hanna** – This storm brought heavy rain, strong winds and some tidal flooding to the Eastern Shore. Peak wind gusts were 42 mph in Tolchester and a precipitation total of 1.76 inches in Millington. The evening high tide at Tolchester Beach crested at 3.1 feet above mean lower low water and failed to reach minor tidal flooding levels (3.5 feet above mean lower low water).
- **August 27-28, 2011 – Hurricane Irene** – This storm produced heavy flooding rain, tropical storm force wind gusts and caused one wind related death across the Eastern Shore. Multiple parts of Maryland State Routes 20 and 445 were closed. Approximately 30-40% of the Town of Millington was under water and one (1) shelter was opened for one (1) night. Eleven (11) homes sustained major or minor damage which left them uninhabitable, and five (5) homes were affected (some damage but useable without repairs). In addition, there were 42 separate road closures due to downed trees or powerlines, encroaching water, and complete washouts. Gusts of 60 mph were recorded in Tolchester Beach.

Future Risk

Future probability was factored into the hazard risk vulnerability and ranking for each identified hazard, as detailed *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, & Data Tables.* Results for the hurricane hazard indicate a future probability ranking of "occasional" while potential impacts could be significant, indicating a future risk rating of "'medium-high."

Vulnerability

Vulnerability

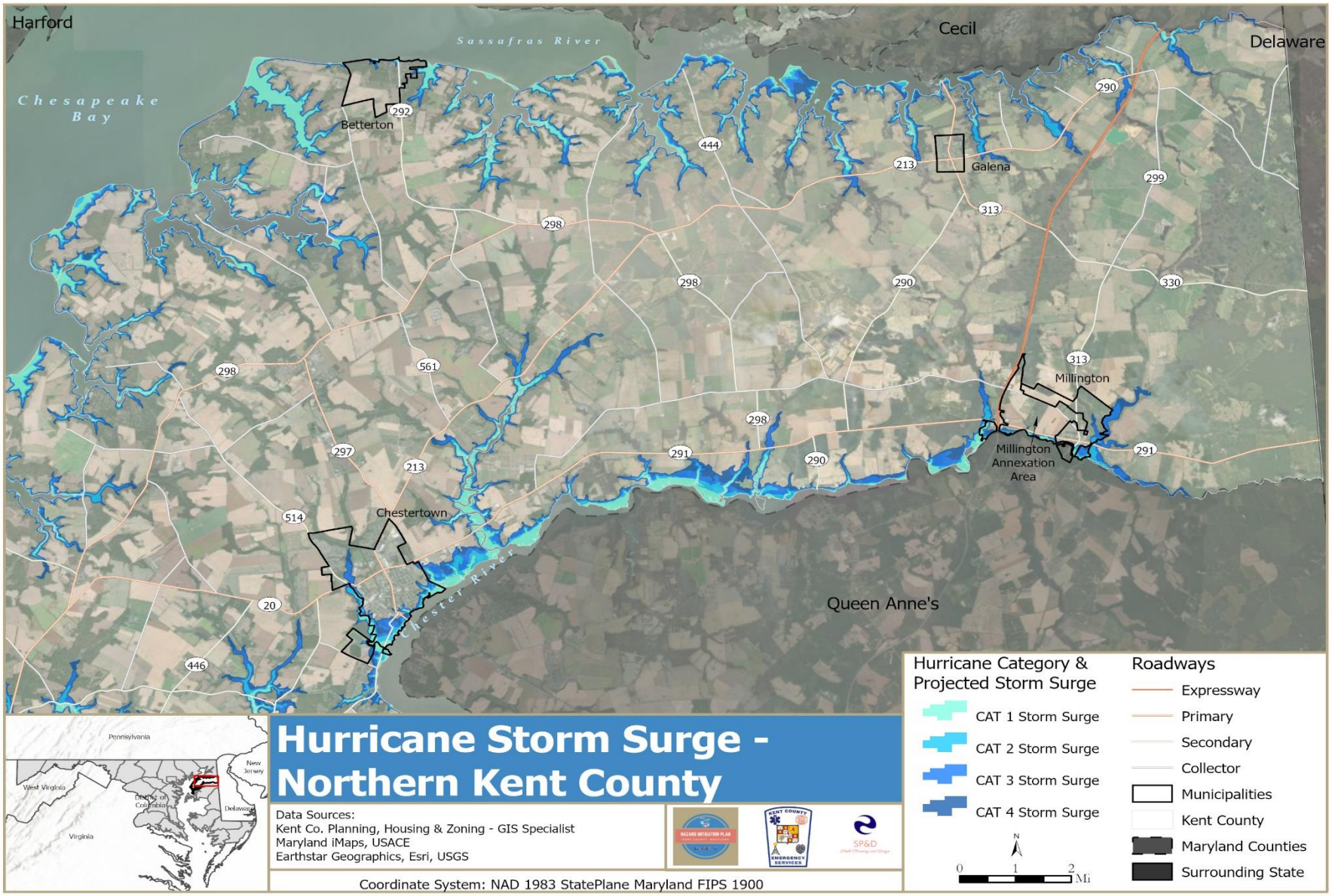
The Chester and Sassafras Rivers run through developed areas with considerable potential for flooding. Communities also sit on the Chesapeake Bay and are susceptible to tidal surge and accretion. Kent County is surrounded by water bodies, most of them tidal. Nearly all the County's municipalities, villages, and communities have been affected by storm affects. However, the Town of Galena is least susceptible to hurricane storm surge, while the Town of Rock Hall and Southern Kent County is most susceptible, refer to Maps 3-2 and 3-3.

Storm Surge Zones (Inundation Areas)

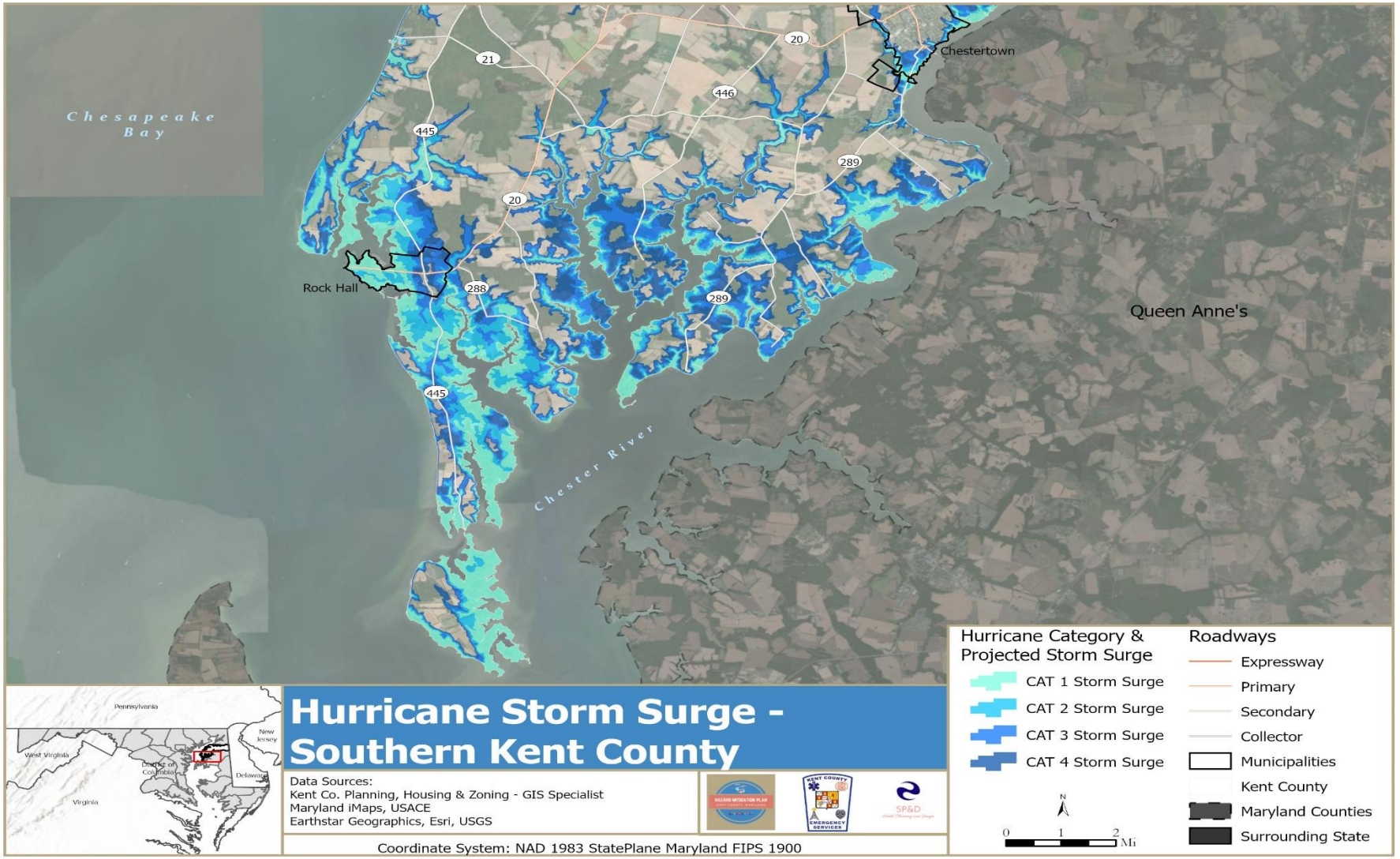
The higher the Saffir-Simpson rating for the hurricane, the farther inland the storm surge zones. The storm surge zones data was generated using the **Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model.** SLOSH is a computerized model run by the National Weather Service to estimate storm surge heights resulting from historical, hypothetical, or predicted hurricanes. The model creates its storm surge zones by analyzing the pressure, size, forward speed, track, and wind data from a hurricane. The method used for this data was a "worst case scenario" for the entire SLOSH basin. Based on the SLOSH Model, the elevation of inundation ("worst case scenario") for Category One, Two, Three, and Four hurricanes were calculated for Kent County. Maps 3-2 and 3-3 depict the hurricane storm surge inundation areas within Kent County. Category 1, the most likely scenario for Maryland and Kent County.

As depicted in Maps 3-2 and 3-3, it may be concluded that the AE and VE zones would be inundated during a Category 1 storm. As the category of the storm increases, more land area will become inundated. Storm surge is a major component of nor'easter storms along the East Coast of the U.S. Because winds are moving from a north and/or eastward position, winds move across the ocean towards shore and form large waves.

Map 3-2


Harford
Cecil
Delaware
Sassafras River
Chesapeake Bay
Betterton
Galena
Millington
Millington Annexation Area
Chestertown
Chester River
Queen Anne's
292
444
213
290
299
313
298
330
561
297
291
514
20
446
Hurricane Storm Surge - Northern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, USACE
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Hurricane Category & Projected Storm Surge
CAT 1 Storm Surge
CAT 2 Storm Surge
CAT 3 Storm Surge
CAT 4 Storm Surge
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
Surrounding State
0 1 2 Mi
Pennsylvania
New Jersey
West Virginia
Virginia
Delaware

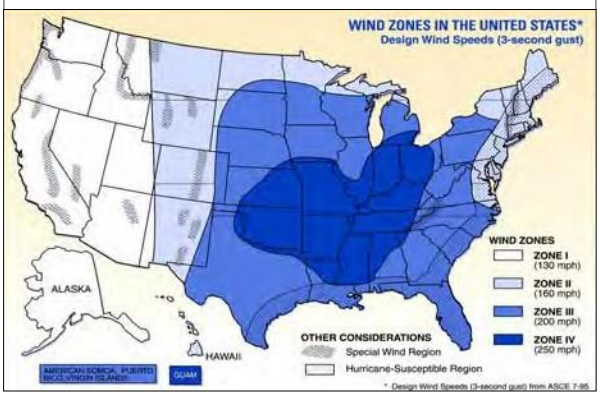
Map 3-3


Chesapeake Bay
Chestertown
Rock Hall
Queen Anne's
Chester River
21
20
446
445
289
288
Hurricane Storm Surge - Southern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, USACE
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Hurricane Category & Projected Storm Surge
CAT 1 Storm Surge
CAT 2 Storm Surge
CAT 3 Storm Surge
CAT 4 Storm Surge
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
Surrounding State
0 1 2 Mi
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia

In addition to flooding, the other significant impact from hurricanes is wind damage. High winds lead to the transport of debris, which can cause casualties and property loss. Another significant hazard caused by winds is the toppling of trees (namely trees with extensive root structures located in highly erodible soils along shorelines). A less probable hazard involves the dislodging of mobile homes from their foundations or displacing vehicles. High winds may also cause damage to poles and lines carrying electric, telephone, and cable television service.

Since high wind events may affect the entire County, it is important to identify specific critical and public facilities and other structures that are most vulnerable to the hazard. Evaluation criteria include age of the building (and what building codes may have been in effect at the time of construction), and type of construction. Data for individual structures was available through Maryland Department of Planning's MDProperty View data. For the plan update, the number and types of structures in Kent County that have a vulnerability to storm surge were determined. These structures could also be considered for having a heightened vulnerability to wind as well.

Figure 3-4: Wind Speed Zones



FEMA's publication, Taking Shelter from the Storm, October 1998, presents a map of four wind zones in the U.S. (Figure 3-4) and provides design wind speeds for shelters and other critical facilities. Zone IV shows the areas of highest wind activity which are situated in the Midwest and Tornado Alley, while Zone I show the areas of lowest activity which are in the western U.S. All of Kent County is mapped in Zone II. For shelters and critical facilities in this zone, a design wind speed of 160 mph is recommended.

Kent County's coastal location lends itself to being somewhat vulnerable to hurricanes originating in the Atlantic and working their way up to the mid-Atlantic region. These hurricanes, although rare in occurrence, bring not only the threat of flooding, but also damage from wind. The American Society of Civil Engineers (ASCE) publication, *Minimum Design Loads for Buildings and Structures*, 1998 (also referred to as ASCE 7-98) shows that for Kent County the design wind speed (3-second gust) for structures ranges from 90 to 100 mph. While most of the continental U.S. is mapped as having a design wind speed of 90 mph, the Atlantic and Gulf Coast areas have design wind speeds ranging from 100 mph to 150 mph (along the tip of the Florida peninsula and a portion of the Gulf Coast).

Risk Assessment & Loss Estimations

The vulnerability analysis for at-risk structures, including critical and public facilities, in Kent County was completed utilizing the following GIS data layers:

- Hurricane Storm Surge Layer – US Army Corps of Engineers (USACE) 2016
  - The data reflects areas with a risk of storm tide 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.
- Kent County Addressable Building Layer
  - The dataset contains addressable buildings for Kent County, MD.

- Maryland Department of Planning's MdProperty View – Kent County 2017
  - The Maryland Department of Planning developed the MdProperty View products to assist users in accessing parcel data. For each parcel, numerous attributes are provided such as account identification, improvement value, year built, etc.
- Maryland Six Inch Imagery - Imagery flown in 2019 for the Eastern Shore
  - The six-inch resolution aerial imagery for the State of Maryland is composed of imagery flown in 2019 (Eastern Shore) and 2017 (Western Shore).

Building data provided by the Department of Planning, Housing & Zoning – GIS Specialist and MdProperty View parcel data were utilized to analyze the storm surge vulnerability. At-risk structures are structures located within the each of the hurricane storm surge inundation areas; Categories 1-4. The storm surge layer was overlaid on the addressable buildings and MdProperty View parcels to determine which structures were at-risk. The Maryland imagery was used to validate structures in Category 1 storm surge inundation areas, since this is the storm event to historically impacted Kent County. To determine loss estimations for at-risk structures, improvement values provided within the MdProperty View parcel database where used. The storm surge inundation area does not intersect with the Town of Galena, therefore there are no at-risk structures within town limits. The following table provides the number of structures at-risk to hurricane storm surge.

Table 3-3: Hurricane Storm Surge At-Risk Structures per Community

Storm Surge Categories	Category 1			Category 2			Category 3			Category 4		
	Residential	Commercial	Other	Residential	Commercial	Other	Residential	Commercial	Other	Residential	Commercial	Other
Kent County Unincorporated	185	14	15	301	8	45	314	14	46	426	9	66
Betterton	0	0	0	2	1	0	2	0	0	16	1	0
Chestertown	70	8	0	88	8	1	106	51	0	81	67	2
Millington	0	0	0	10	0	0	38	0	0	27	0	0
Rock Hall	308	36	0	218	6	0	82	9	0	156	28	0
TOTAL	563	58	15	619	23	46	542	74	46	706	105	68

Source: Smith Planning & Design, NOAA Hurricane Storm Surge - 2016, Kent County Database, MdProperty View
NOTE: Residential includes: Residential, Commercial Condominium, Commercial/Residential, Residential Condominium, and Apartments
Commercial includes: Commercial, Exempt Commercial
Other includes: Agricultural, Church

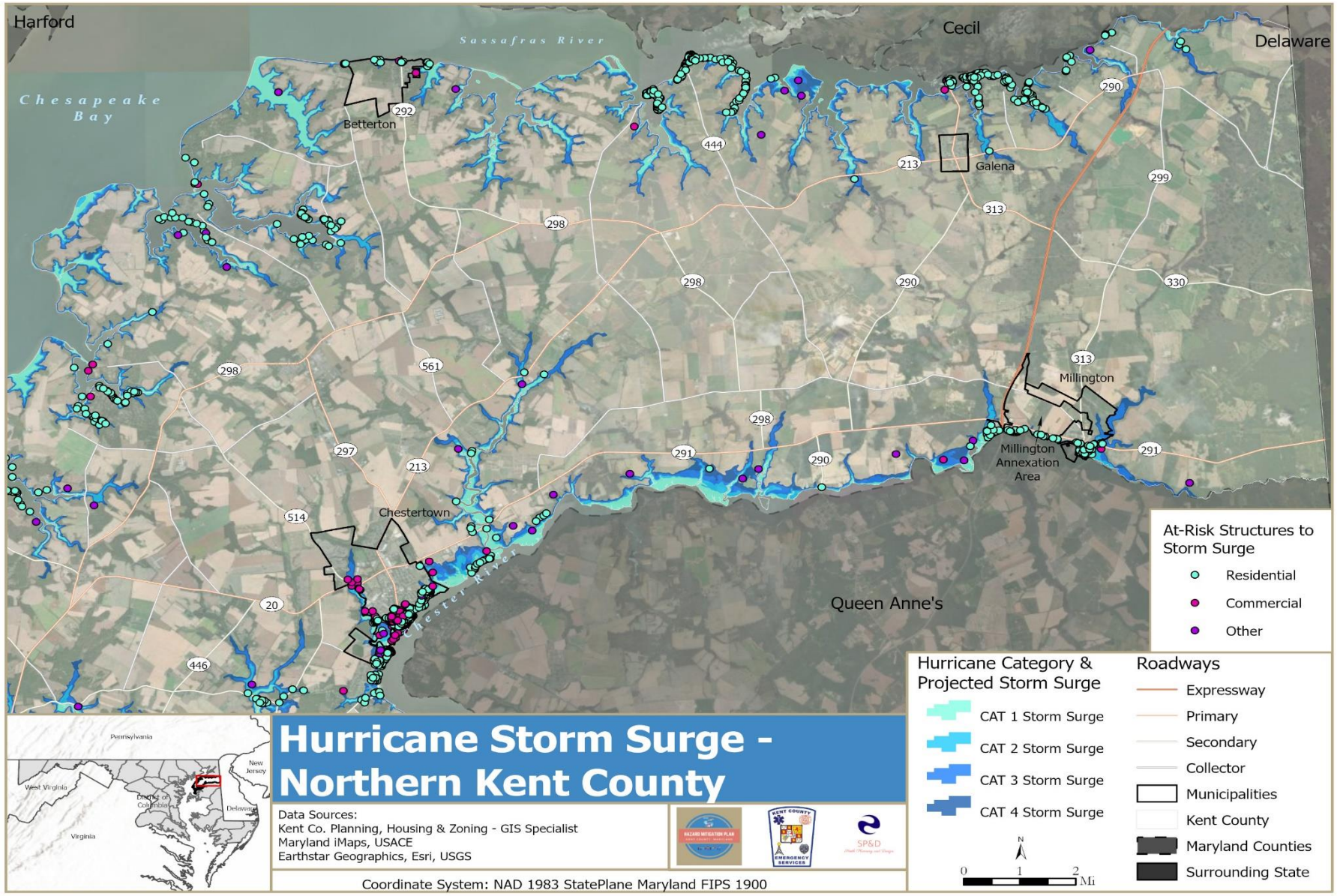
Table 3-4: Hurricane Storm Surge Loss Estimations per Community				
Storm Surge Categories	Category 1 Loss Estimations	Category 2 Loss Estimations	Category 3 Loss Estimations	Category 4 Loss Estimations
Kent County Unincorporated	$47,120,600	$75,669,900	$77,419,600	$102,364,200
Betterton	$0	$240,200	$208,900	$1,844,400
Chestertown	$21,526,900	$48,417,200	$27,306,900	$58,190,500
Millington	$0	$904,100	$3,257,600	$2,661,000
Rock Hall	$51,174,900	$23,164,800	$11,681,200	$19,943,200
TOTAL	$119,822,400	$148,396,200	$119,874,200	$185,003,300

Source: Smith Planning & Design, NOAA Hurricane Storm Surge - 2016, Kent County Database, MdProperty View
NOTE: Residential includes: Residential, Commercial Condominium, Commercial/Residential, Residential Condominium, and Apartments
Commercial includes: Commercial, Exempt Commercial
Other includes: Agricultural, Church

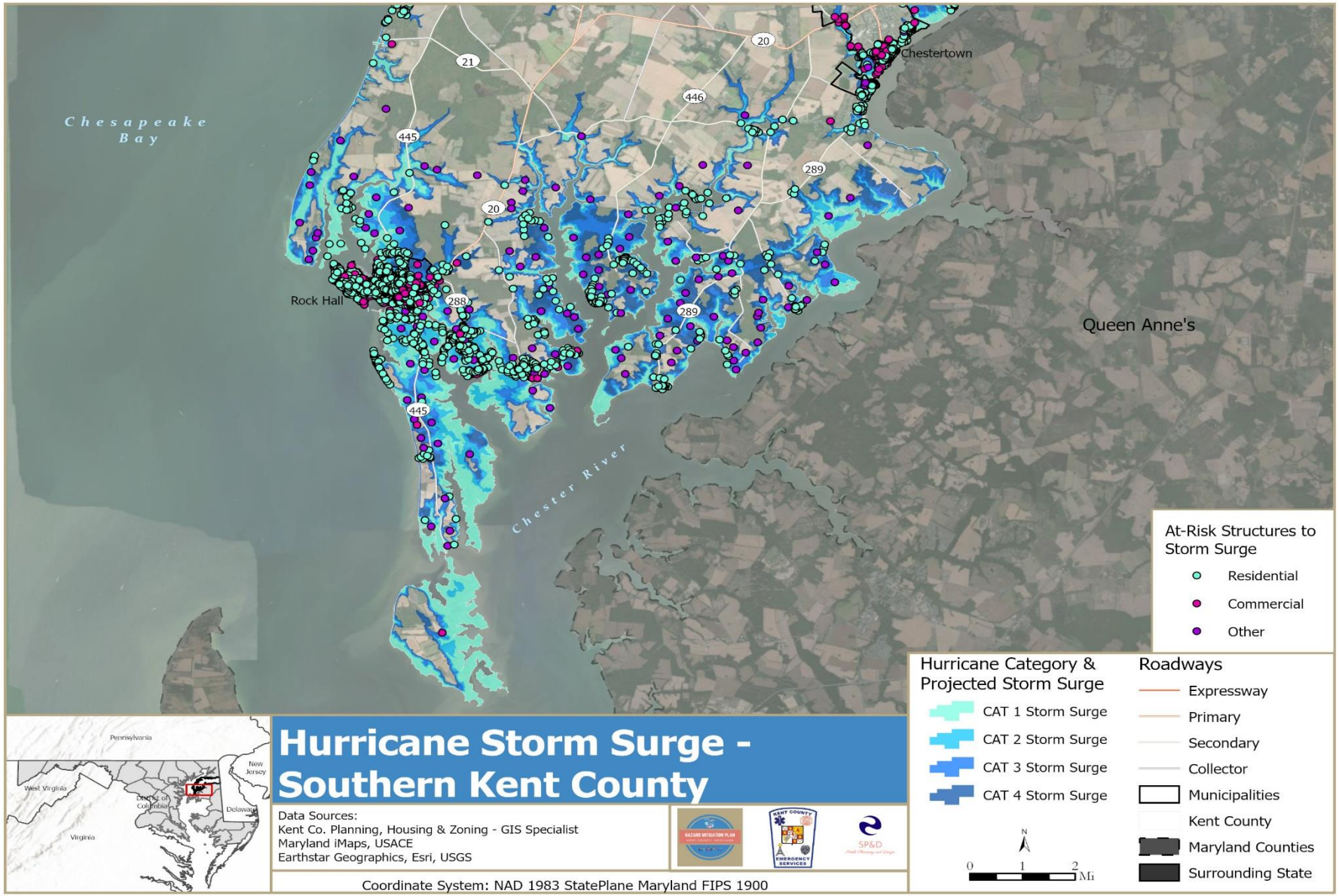
Results from the analysis indicate most structures at-risk to hurricanes scenarios are located in the Town of Rock Hall and throughout the unincorporated areas of Kent County. The Town of Rock Hall and Southern Kent County contain the majority of at-risk structures for hurricane storm surge category 1, the most likely scenario to affect Kent County.

Pictures provided by the Town of Millington show flooding that occurred for Hurricane Irene in August 2011.

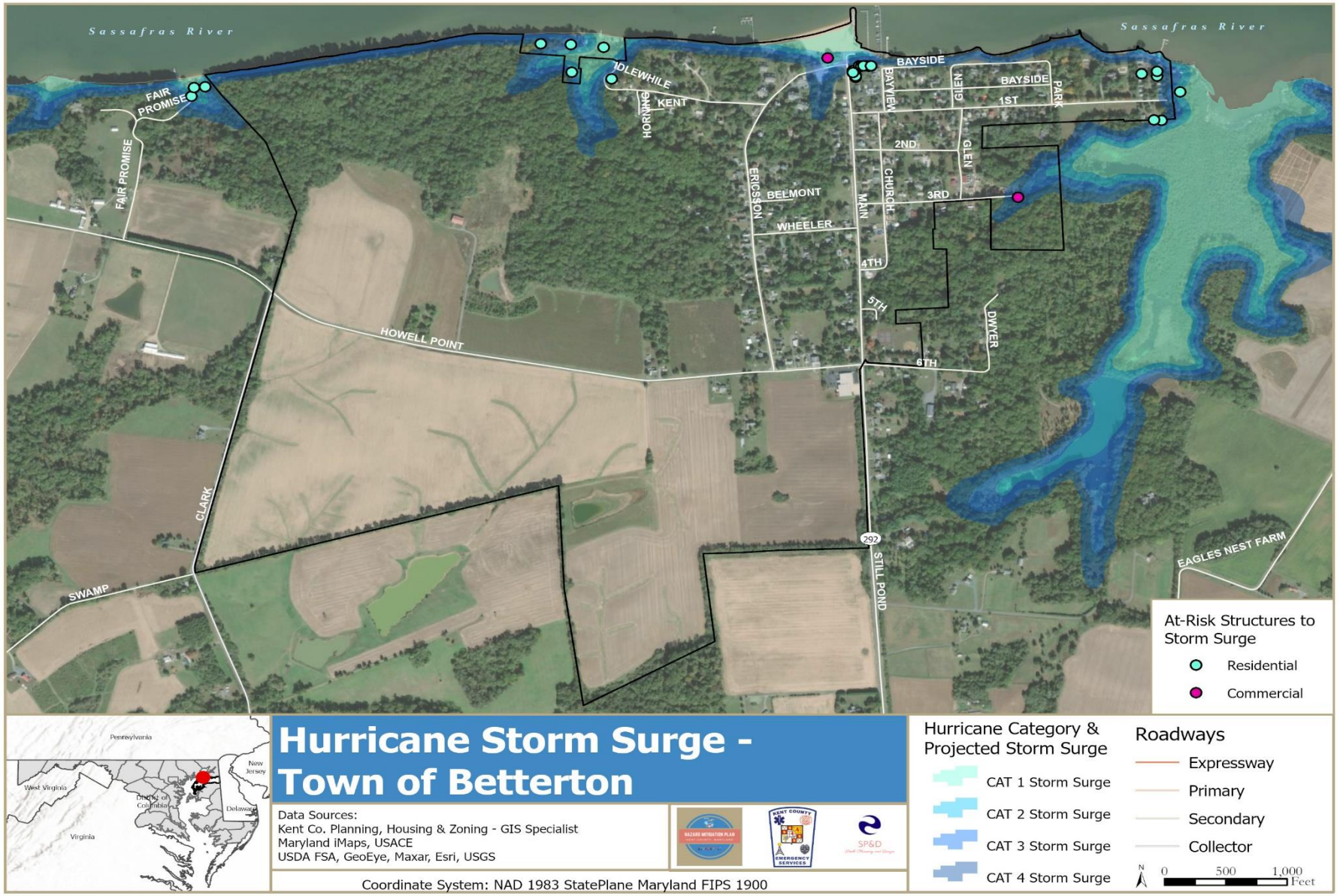
Map 3-4


Harford
Cecil
Delaware
Queen Anne's
Sassafras River
Chesapeake Bay
Chester River
Betterton
Galena
Millington
Millington Annexation Area
Chestertown
292
444
213
290
299
313
298
330
561
297
291
514
20
446
At-Risk Structures to Storm Surge
Residential
Commercial
Other
Hurricane Category & Projected Storm Surge
CAT 1 Storm Surge
CAT 2 Storm Surge
CAT 3 Storm Surge
CAT 4 Storm Surge
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
Surrounding State
0 1 2 Mi
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
Hurricane Storm Surge - Northern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, USACE
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900

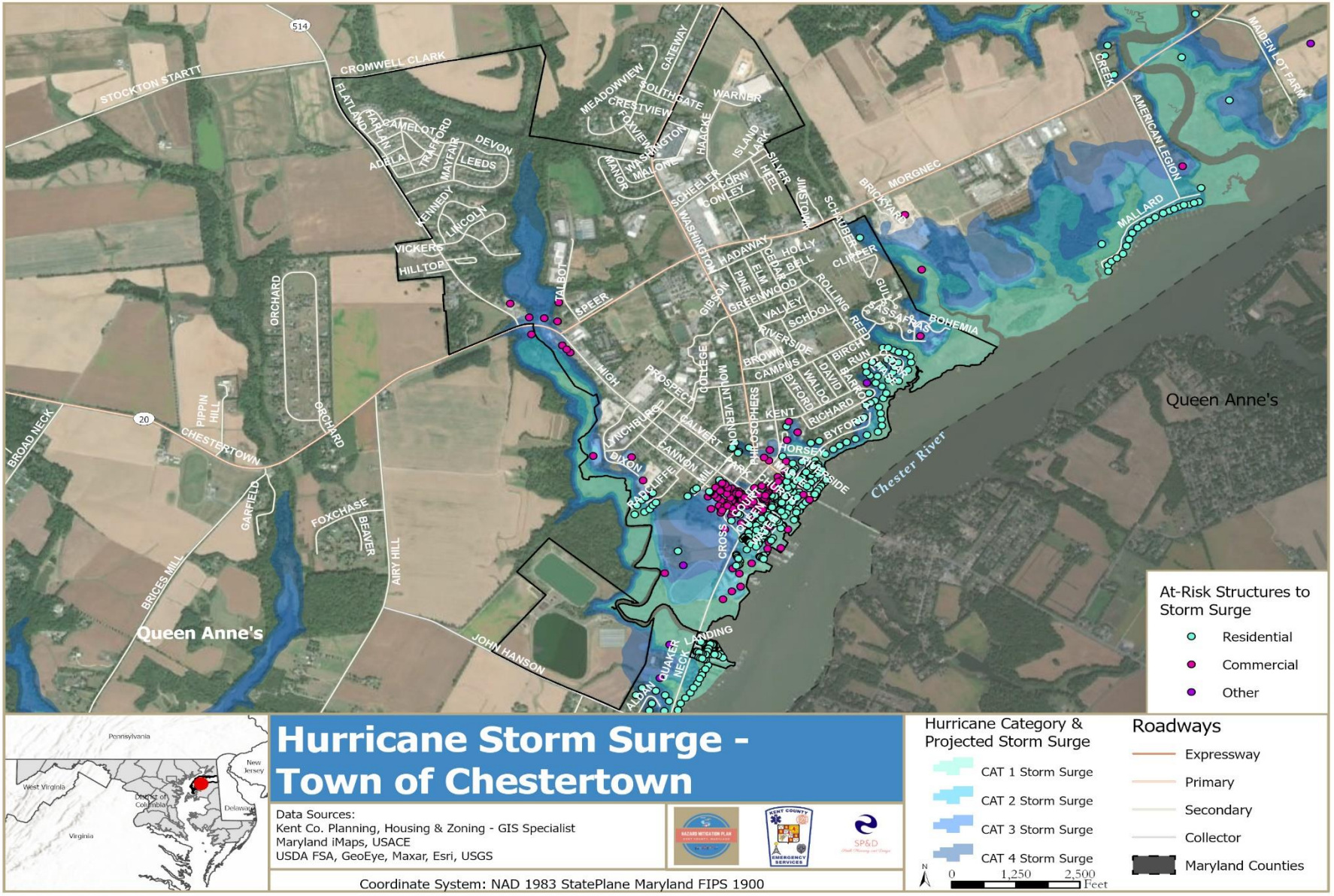
Map 3-5


Chesapeake Bay
Chester River
Chestertown
Rock Hall
Queen Anne's
21
20
446
445
289
288
At-Risk Structures to Storm Surge
Residential
Commercial
Other
Hurricane Category & Projected Storm Surge
CAT 1 Storm Surge
CAT 2 Storm Surge
CAT 3 Storm Surge
CAT 4 Storm Surge
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
Surrounding State
0 1 2 Mi
Pennsylvania
New Jersey
West Virginia
Delaware
Virginia
Hurricane Storm Surge - Southern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, USACE
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900

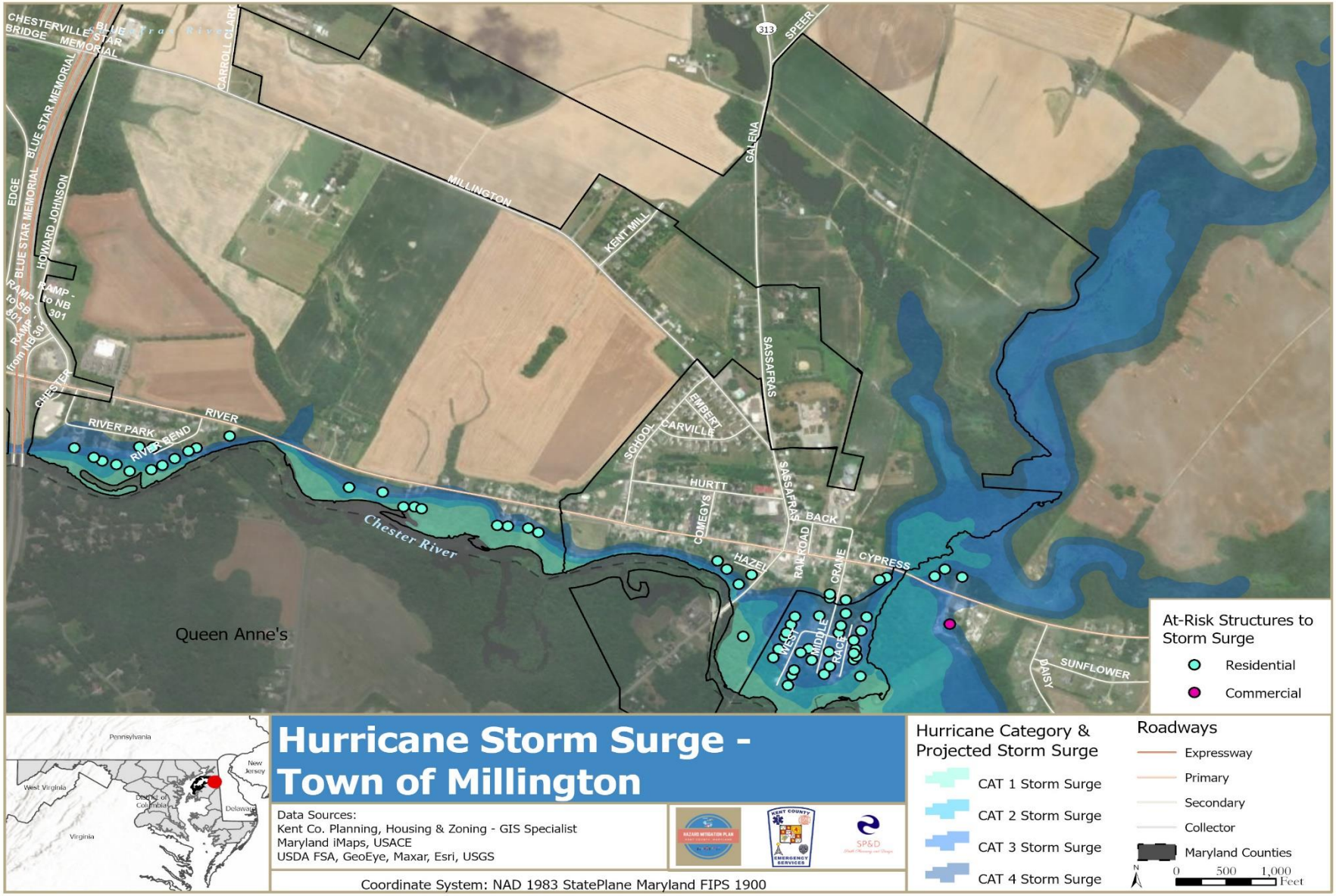
Map 3-6


Sassafras River
Sassafras River
FAIR PROMISE
FAIR PROMISE
IDLEWHILE
HORNING
KENT
BAYSIDE
BAYVIEW
GLEN
BAYSIDE
1ST
PARK
2ND
GLEN
ERICSSON
BELMONT
MAIN
CHURCH
3RD
WHEELER
4TH
5TH
DWYER
6TH
HOWELL POINT
CLARK
SWAMP
292
STILL POND
EAGLES NEST FARM
At-Risk Structures to Storm Surge
Residential
Commercial
Hurricane Storm Surge - Town of Betterton
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, USACE
USDA FSA, GeoEye, Maxar, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Hurricane Category & Projected Storm Surge
CAT 1 Storm Surge
CAT 2 Storm Surge
CAT 3 Storm Surge
CAT 4 Storm Surge
Roadways
Expressway
Primary
Secondary
Collector
N
0
500
1,000
Feet

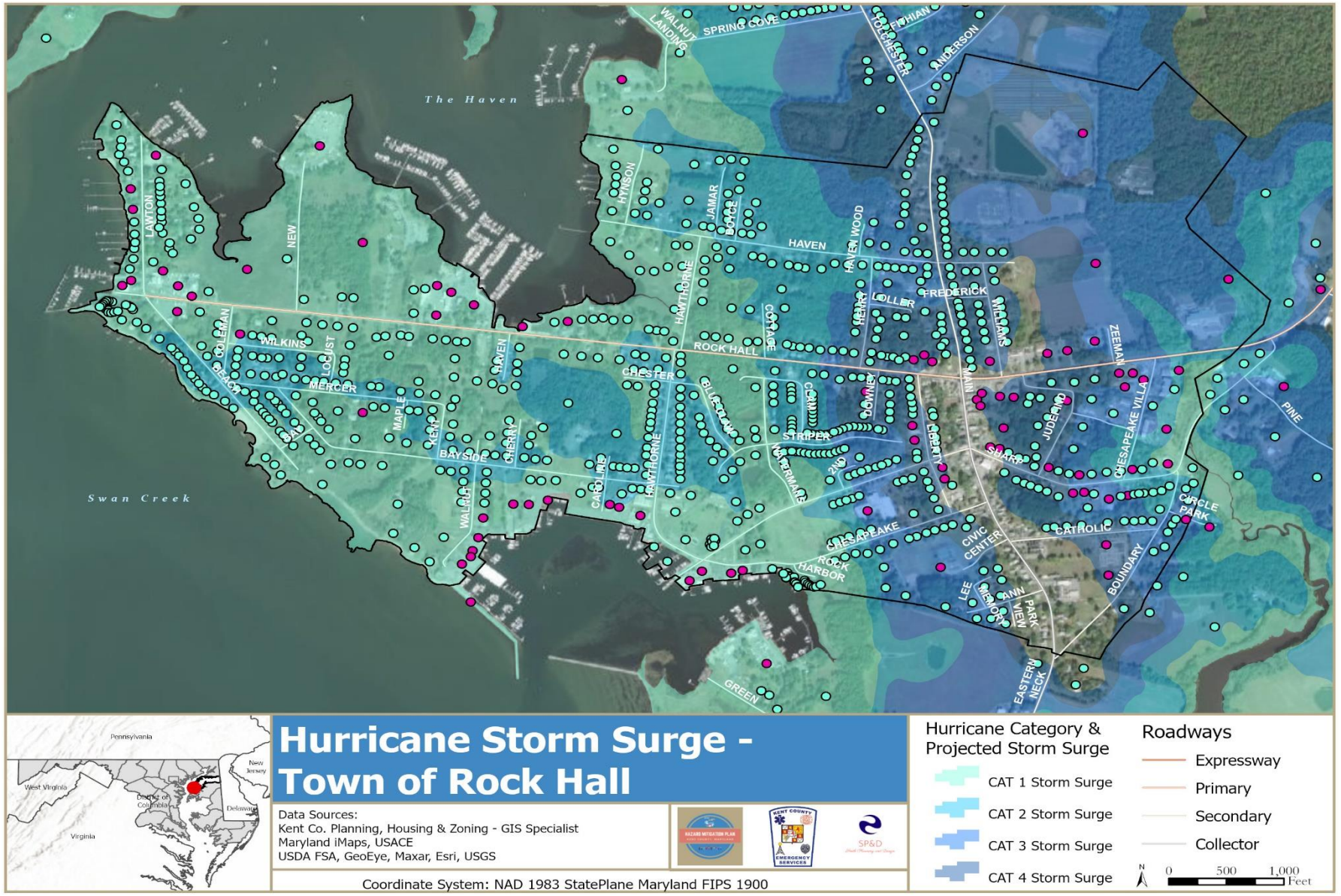
Map 3-7


Hurricane Storm Surge - Town of Chestertown
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, USACE
USDA FSA, GeoEye, Maxar, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
At-Risk Structures to Storm Surge
Residential
Commercial
Other
Hurricane Category & Projected Storm Surge
CAT 1 Storm Surge
CAT 2 Storm Surge
CAT 3 Storm Surge
CAT 4 Storm Surge
Roadways
Expressway
Primary
Secondary
Collector
Maryland Counties
0 1,250 2,500 Feet
Queen Anne's
Chester River
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia

Map 3-8


CHESTERVILLE BRIDGE
BLUE STAR MEMORIAL
CARROLL CLARK
313
SPEER
GALENA
MILLINGTON
KENT MILL
BLUE STAR MEMORIAL
HOWARD JOHNSON
EDGE
RAMP - to NB 301
RAMP - from NB 301
CHESTER
RIVER PARK
RIVER BEND
RIVER
SASSAFRAS
EMBERT
CARVILLE
SCHOOL
HURTT
COMEGYS
BACK
RAILROAD
CRANE
HAZEL
CYPRESS
Chester River
Queen Anne's
WEST
MIDDLE
RACE
SUNFLOWER
DAISY
At-Risk Structures to Storm Surge
Residential
Commercial
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
Hurricane Storm Surge - Town of Millington
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, USACE
USDA FSA, GeoEye, Maxar, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Hurricane Category & Projected Storm Surge
CAT 1 Storm Surge
CAT 2 Storm Surge
CAT 3 Storm Surge
CAT 4 Storm Surge
Roadways
Expressway
Primary
Secondary
Collector
Maryland Counties
0 500 1,000 Feet

Map 3-9


The Haven
Swan Creek
WALNUT LANDING
SPRING COVE
COLCHESTER
FRIHAN
ANDERSON
HYNSON
JAMAR
BOYCE
HAVEN
HAVEN WOOD
HAWTHORNE
COTTAGE
HENRY
LOLLER
FREDERICK
WILLIAMS
ZEEMAN
ROCK HALL
COLEMAN
WILKINS
LOCUST
MERCER
CHESTER
BILLINGSLEY
CRANE
DOWNEY
STRIPER
MAPLE
CHERRY
BAYSIDE
WALNUT
CAROLINE
WATERMARK
DOCK
MAIN
JUDEFIND
CHESAPEAKE VILLA
PINE
SHARP
CIRCLE PARK
CHESAPEAKE
ROCK HARBOR
CIVIC CENTER
CATHOLIC
BOUNDARY
LEE
ANN
PARK VIEW
MANOR
EASTERN NECK
GREEN
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
Hurricane Storm Surge - Town of Rock Hall
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, USACE
USDA FSA, GeoEye, Maxar, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Hurricane Category & Projected Storm Surge
CAT 1 Storm Surge
CAT 2 Storm Surge
CAT 3 Storm Surge
CAT 4 Storm Surge
Roadways
Expressway
Primary
Secondary
Collector
N
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Feet

Critical & Public Facilities

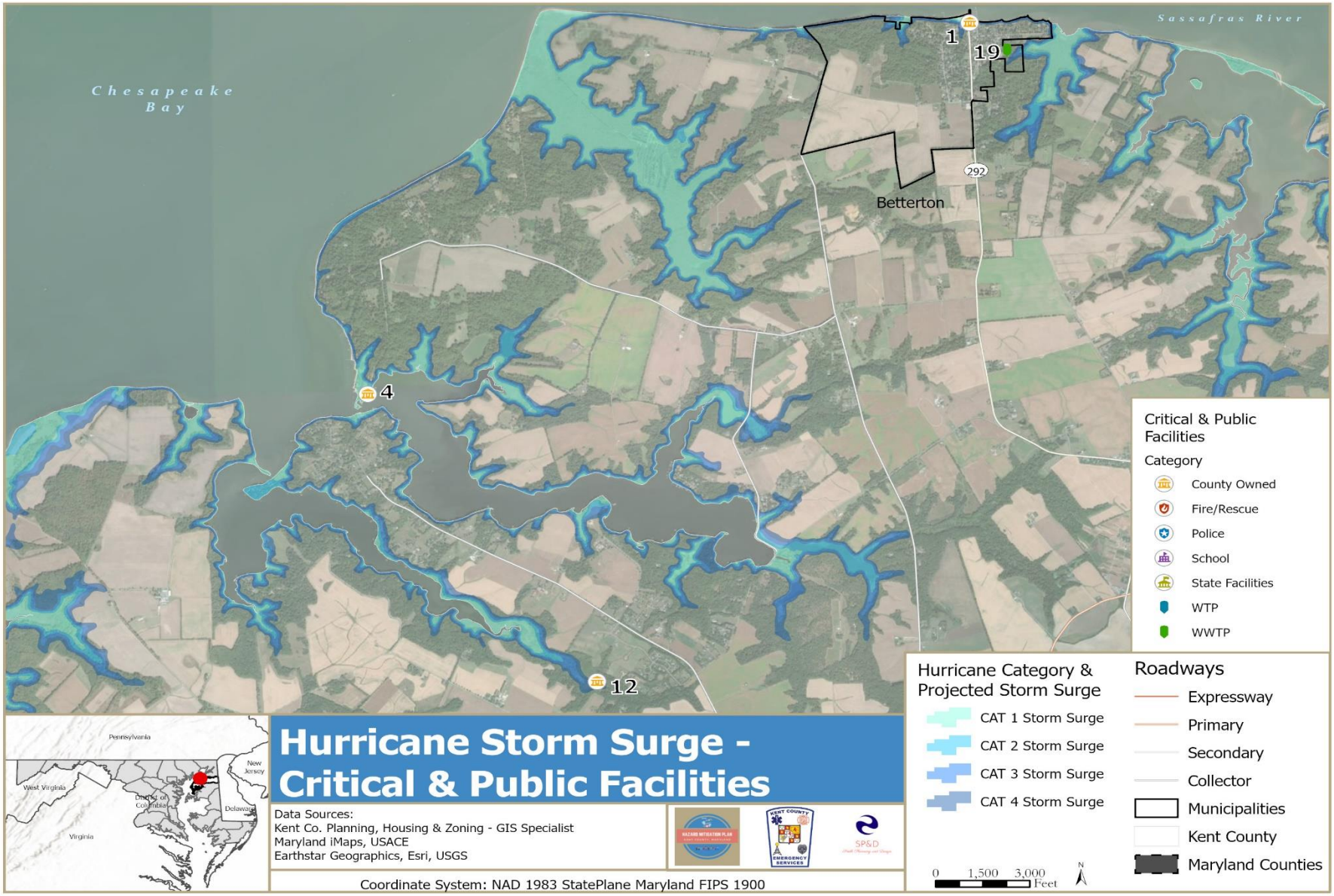
Critical and public facilities are typically vulnerable to wind damage due to the age of construction and possible poor condition, especially in the more rural and isolated areas of the County. No specific critical facilities were identified as vulnerable to strong winds; however, the County's emergency communications capabilities may be vulnerable to disruption. The County has uninterrupted power source (UPS) and generator back-up. There are nineteen (19) critical and public facilities located in the hurricane storm surge inundation areas with a potential loss estimation of $9,898,500.00

Table 3-5: Critical & Public Facilities – At Risk to Hurricane Storm Surge

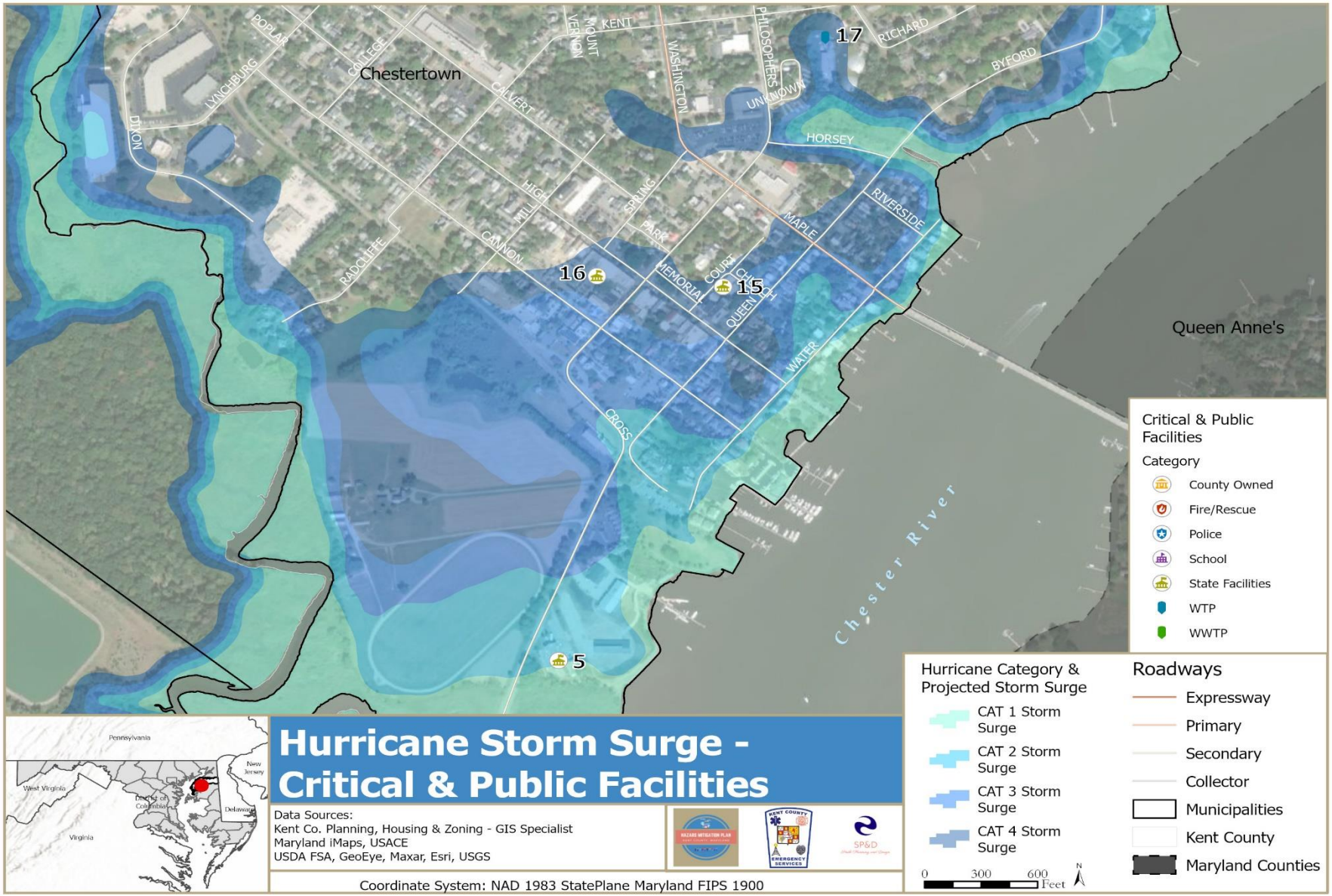
Map ID	Category	Name	Address	City	Year Built	Building Value	# of Stories	CAT 1	CAT 2	CAT 3	CAT 4
1	County Owned	Marina	Bayside Avenue	Rock Hall	Not Available	$45,200	1	Yes	No	No	No
2	County Owned	Cliff City Boat Ramp	Cliff City Road	Chestertown	Not Available	Not Available	1	Yes	No	No	No
3	County Owned	Water Tower	Rock Hall Road	Rock Hall	Not Available	$89,500	1	Yes	No	No	No
4	County Owned	Coast Guard Dock at Still Pond	24188 Still Pond Neck Road	Worton	1970	$161,900	1	Yes	No	No	No
5	Washington College Owned	Chestertown Armory	509 Cross Street	Chestertown	1930	$576,000	2	No	Yes	No	No
6	County Owned	Betterton Beach	Main Street	Betterton	1986	$193,800	1	No	No	Yes	No
7	Fire/Rescue	Rock Hall VFC Station 7	21500 Rock Hall Avenue	Rock Hall	2005	$2,149,700	1	No	No	Yes	No
8	School	Rock Hall Elementary School	21203 W. Sharp Street	Rock Hall	1949	$1,847,200	1	No	No	Yes	No
9	WWTP	Rock Hall	6015 N. Main Street	Rock Hall	2000	$719,100	1	No	No	Yes	No
10	County Owned	Board of Education	5608 Boundary Avenue	Rock Hall	Not Available	$0	1	No	No	No	Yes
11	County Owned	Board of Education	5608 Boundary Avenue	Rock Hall	1975	$2,311,800	1	No	No	No	Yes
12	County Owned	County Commissioners	24938 Montabello Lake Road	Worton	1900	$8,100	1	No	No	No	Yes
13	County Owned	Storage Sheds	Crosby Road	Rock Hall	Not Available	$16,600	1	No	No	No	Yes
14	County Owned	Communications Tower	Sharptown Road	Chestertown	Not Available	$1,100	1	No	No	No	Yes
15	State Facilities	The Public Defender System	115 Court Street	Chestertown	1860	$58,400	1	No	No	No	Yes
16	State Facilities	Department of Juvenile Services - Chestertown Office	315 High Street	Chestertown	1997	$1,062,100	2	No	No	No	Yes
17	WTP	Chestertown	405 N. Kent Street	Chestertown	Not Available	$0	1	No	No	No	Yes
18	WTP	Rock Hall	405 N. Kent Street	Rock Hall	1984	$643,300	1	No	No	No	Yes
19	WWTP	Betterton	28 3rd Avenue	Betterton	Not Available	$14,700	1	No	No	No	Yes

Source: Smith Planning & Design, NOAA Hurricane Storm Surge - 2016, Kent County Database, MdProperty View

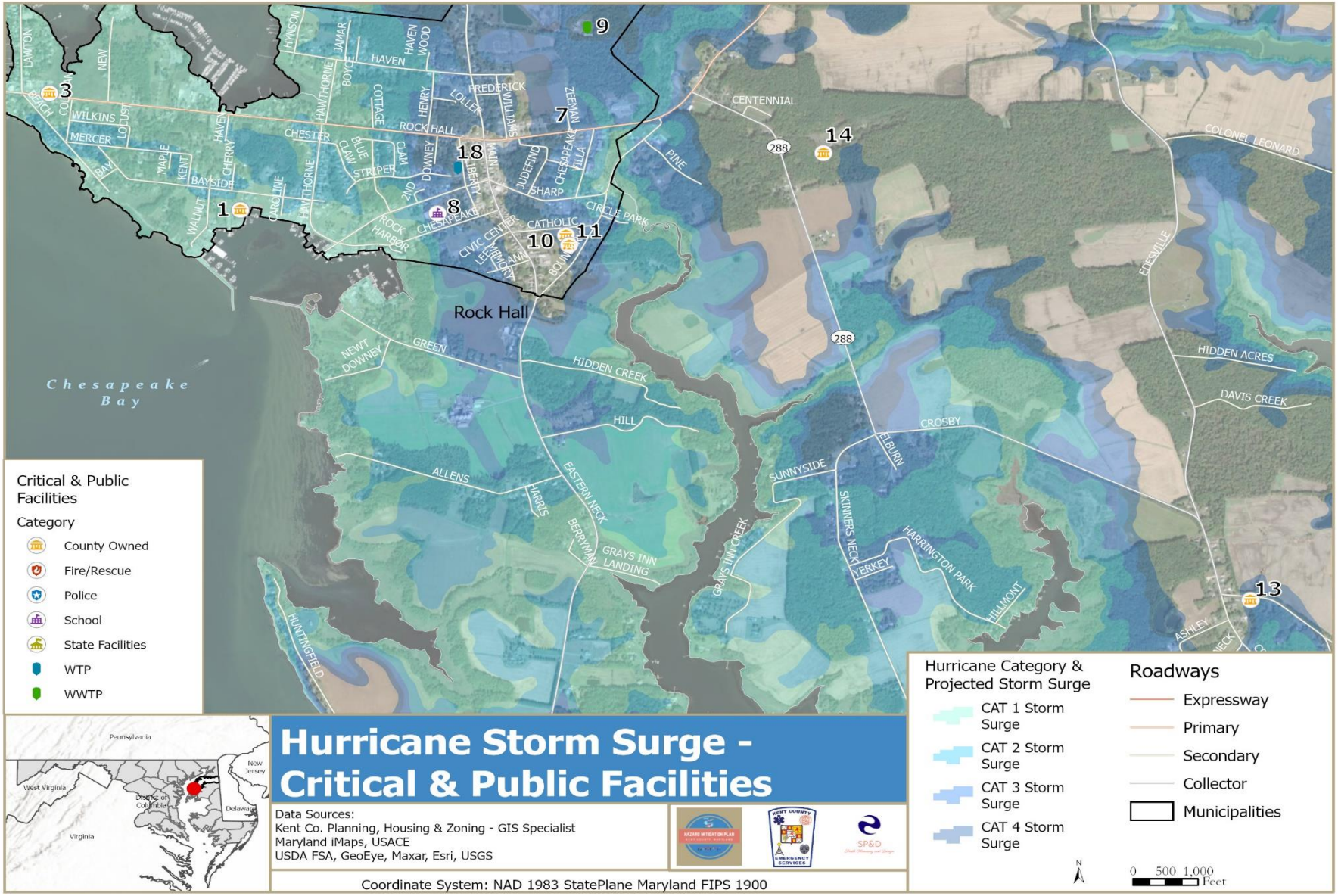
Map 3-10


Chesapeake Bay
Sassafras River
Betterton
292
1
19
4
12
Critical & Public Facilities
Category
County Owned
Fire/Rescue
Police
School
State Facilities
WTP
WWTP
Hurricane Category & Projected Storm Surge
CAT 1 Storm Surge
CAT 2 Storm Surge
CAT 3 Storm Surge
CAT 4 Storm Surge
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
0 1,500 3,000 Feet
N
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
Hurricane Storm Surge - Critical & Public Facilities
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, USACE
Earthstar Geographics, Esri, USGS
SP&D
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900

Map 3-11


Chestertown
Queen Anne's
Chester River
17
16
15
5
POPLAR
COLLEGE
LYNCHBURG
DIXON
CALVERT
KENT
MOUNT VERNON
WASHINGTON
PHILOSOPHERS
UNKNOWN
RICHARD
BYFORD
HORSEY
HIGH
MILL
SPRING
PARK
MAPLE
RIVERSIDE
CANNON
RADCLIFFE
MEMORIAL
COURT
CHURCH
QUEEN
WATER
CROSS
Critical & Public Facilities
Category
County Owned
Fire/Rescue
Police
School
State Facilities
WTP
WWTP
Hurricane Category & Projected Storm Surge
CAT 1 Storm Surge
CAT 2 Storm Surge
CAT 3 Storm Surge
CAT 4 Storm Surge
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
0 300 600 Feet
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
Hurricane Storm Surge - Critical & Public Facilities
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, USACE
USDA FSA, GeoEye, Maxar, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900

Map 3-12


Rock Hall
Chesapeake Bay
Critical & Public Facilities
Category
County Owned
Fire/Rescue
Police
School
State Facilities
WTP
WWTP
Hurricane Storm Surge - Critical & Public Facilities
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, USACE
USDA FSA, GeoEye, Maxar, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Hurricane Category & Projected Storm Surge
CAT 1 Storm Surge
CAT 2 Storm Surge
CAT 3 Storm Surge
CAT 4 Storm Surge
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
0 500 1,000 Feet
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia

Capabilities

Capabilities

All county departments have developed a *Continuity of Operations Plan*. These plans strive for continued government operations before, during, and after a disaster event, as feasible. In addition, the County and all five (5) Towns have adopted the 2018 International Building and Residential Codes, which includes current wind design speeds for the region. Finally, the countywide emergency warning and notification system has the capability to reach all landlines within the County, and those phone numbers that have been added to the system using the citizen signup located on the County website. *Appendix D: Capability Assessment* of this document contains more extensive information.

Mitigation Strategy

Mitigation goals, objectives, and action items were identified throughout the plan development process for the unincorporated areas of the county and each of the five (5) towns. Following the review and discussion of risk and vulnerability, stakeholders identified and prioritized new action items for this plan update. One (1) action item has been identified and designated as "hurricane" hazard and one (1) "all-hazards" action item applicable to the "hurricane" hazard has been included in the table below. The mitigation action item listed as a "High" priority has been further detailed in the table below and includes discussion, potential funding sources, and a timeline for implementation.

Section 3 Goal: Minimize loss of life and property due to hurricane events in Kent County. Objective 1: Provide public awareness information on the impact of hurricanes to life, property, and business disruption.				
Action Items	**Hazard(s)**	**Category**	**Responsible Entity(s)**	**Priority Ranking**
Conduct public awareness campaign on severe wind through various outreach activities. Improve public awareness of severe wind through outreach activities such as: • Educating homeowners on the benefits of wind retrofits such as shutters, hurricane clips, etc. • Instructing property owners on how to properly install temporary window coverings before a storm. • Educating design professionals to include wind mitigation during building design. Include multiple agencies and organizations in public awareness	Tornado, High Wind, **Hurricane,** Severe Storms	Public Education & Awareness	Kent County Dept. of Planning, Housing & Zoning, Dept. of Economic Development, Historic Society, Towns	Medium

campaign, such as the Historic Society, Kent County Government - Planning, Housing, and Zoning, Municipalities, and the Department of Economic Development.				
Identify and solicit low/no cost partners to create awareness and promote outreach and conduct a business continuity planning workshop to promote disaster resistance, mitigation, and preparedness to help businesses develop contingency plans to minimize loss during disasters.	**All-Hazards**	Public Education & Awareness	Kent County Office of Emergency Services, Dept. of Public Works, Dept. of Economic Development, Historical Society, Heron Point, Towns, Chamber of Commerce	**High**
Discussion: FEMA National Continuity Programs has developed a toolkit to provide partners at all levels of government, private and nonprofit sectors with tools, templates and resources to help implement concepts found in the Continuity Guidance Circular (CGC). In addition, FEMA offers many resources including brochures: https://www.fema.gov/emergency-managers/national-preparedness/continuity/toolkit/brochures, as well as toolkits and user guides at: https://www.fema.gov/emergency-managers/national-preparedness/continuity/toolkit/documents. Distribution of this information and a facilitated discussion to promote continuity of operations planning would ideally work at during an in-person workshop of webinar. **Possible Funding Sources:** Staff Time- FEMA resources are free and available for download. **Timeline for Implementation:** 1-2 years				

SECTION 4

EXTREME TEMPERATURES
HAZARD MITIGATION PLAN

SECTION 4 TOPICS

- EXTREME TEMPERATURES HAZARD
- HISTORY & FUTURE RISK
- VULNERABILITY
- MITIGATION STRATEGIES

PLAN UPDATE HIGHLIGHTS

Modified from Extreme Heat to Extreme Temperatures Hazard as noted on the *2020 Review of Hazards Profiled* in Chapter 1.

Extreme Temperatures hazard now includes Excessive Heat, Excessive Cold, and Wind Chill.

The National Weather Service Forecast Office' s *Heat Disorders* table was included to explain possible effects of heat on these higher risk groups.

Hazard Risk Assessment Data tables were updated using data from the 2016 State of Maryland Hazard Mitigation Plan and the National Centers for Environmental Information (NCEI) – Storm Events Database.

An Observed U.S. Temperature Change map was included to illustrate the trend in rising temperatures and future projections.

Vulnerability analysis updated to reflect 65 and older population estimations. This population subgroup is more susceptible to effects of extreme temperatures. Agriculture land were also discussed as being vulnerability to extreme heat events.

Loss estimations were focused on structures and the impacts associated with extreme temperatures.

New capabilities provided by stakeholders were discussed.

New goals and objectives were developed for this plan section.

New 2020-2025 Mitigation Action Items provided by stakeholders were included. Action items ranked "High" were further detailed to include discussion, potential funding sources, and a timeline for implementation.

Extreme Temperatures Hazard

Excessive Heat

Excessive Heat is defined as a combination of high heat and humidity that can lead to heat related illness, including heat cramps, heat exhaustion, and heat stroke. Heat-related illness can occur when the ability of the body to cool itself is challenged, or when there are insufficient levels of fluid or salt in the body due to sweating or dehydration. Heat-related illnesses increase as the combination of temperature and relative humidity increase, but there are other factors involved as well. Kent County typically enjoys variably moderate temperatures throughout the summer months with occasional peaks of high temperatures and humidity.

Extreme Cold/Wind Chill

Extreme Cold/Wind Chill is defined in the Northeastern part of the United States as temperatures well below zero and with the rate of heat loss on the human body resulting from the combined effect of low temperature and wind. Exposure to cold can cause frostbite or hypothermia and become life-threatening. Infants and elderly people are most susceptible. Kent County is not susceptible to extreme cold/wind chill events.

History & Future Risk

History

In addition to being hazardous to people, livestock and crops, extreme heat can cause water shortages, fire hazards, excessive energy demands, and damage to infrastructure. When the air temperature is above 90°F and the relative humidity is high, the body is under great stress to maintain its normal temperature; heat exhaustion can result, followed by heat stroke.

The National Weather Service headlines the heat index in its forecasts when the index is expected to reach 100°F. At index temperatures of 105°F and greater, a heat advisory is in effect and heat disorders such as cramps, heat exhaustion, and heat stroke are possible. Excessive heat warnings are issued by the National Weather Service or Maryland Department of Health when the heat index reaches 115°F, a stage considered dangerous for a large portion of the population.

The two age groups most vulnerable to extreme temperatures are the elderly (65 and older) and younger (under age 5) populations. An additional high-risk group includes the homeless population. Table 4-1 is from the National Weather Service Forecast Office and shows the possible effects of heat on these higher risk groups.

Table 4-1: Heat Disorders

Classification	Heat Index	Possible heat disorders for people in higher risk groups
Extreme Danger	125 or higher	Heatstroke/sunstroke highly likely
Danger	103-124	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity.
Extreme Caution	90-103	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Caution	80-90	Fatigue possible with prolonged exposure and/or physical activity

Source: NOAA, NWS

According to the data found within the National Centers for Environmental Information (NCEI), Kent County has only experienced one (1) Extreme Cold/Wind Chill event. Although the county does not experience many extreme cold/wind chill events, according to the U.S. Climate Data, and the National Oceanic and Atmospheric Administration (1981-2010 normals), Kent County's extreme low temperatures are in the months of December, January, and February.

The Extreme Temperatures hazard was continued from the 2014 planning cycle and was given a ranking of "Medium High" during the 2020 planning cycle. In order to assess the hazard risk identified, a composite score method was undertaken. The composite score method was based on a blend of quantitative and qualitative factors extracted from the National Centers for Environmental Information (NCEI), stakeholder survey, and other available data sources. These included:

- Historical impacts, in terms of human lives and property;
- Geographic extent;
- Historical occurrence;
- Future probability; and
- Local community perspective.

Detailed information is available within *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, and Hazard Data Tables.*

Information obtained for Kent County using both the *2016 State of Maryland Hazard Mitigation Plan* and the National Centers for Environmental Information (NCEI) – Storm Events Database between January 1950 and December 31, 2019 for Extreme Temperatures Hazard include: Excessive Heat, Heat, and Excessive Cold/Wind Chill. There has been a total of seventy-six (26) events between 1996-2020, with an annualized rate of 3.04. These storms have produced three (3) injuries and a geographic extent of 81.3%.

Total Extreme Temperatures Hazard Risk Assessment Data Table
Hazards included within this table from NCEI Data: Excessive Heat, Heat, and Excessive Cold/Wind Chill.

Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
3	0	0	0	% Total Cropland from 2017 Agriculture Census = 83.1%	Total = 76 Annualized = 3.04

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan, 2017 Census of Agriculture

Excessive Heat Data Table

Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2000-2020
0	0	0	0	% Total Cropland from 2017 Agriculture Census = 83.1%	Total = 16 Annualized = 0.76

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan, 2017 Census of Agriculture

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.
Based on NCEI definitions/criteria: Excessive Heat (Z). *Excessive Heat results from a combination of high temperatures (well above normal) and high humidity. An Excessive Heat event occurs and is reported in Storm Data whenever heat index values meet*

or exceed locally/regionally established excessive heat warning thresholds. Fatalities (directly related) or major impacts to human health that occur during excessive heat warning conditions are reported using this event category. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data.

Heat Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
3	0	0	0	% Total Cropland from 2017 Agriculture Census = 83.1%	Total = 59 Annualized = 2.36

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan, 2017 Census of Agriculture

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Heat (Z). *A period of heat resulting from the combination of high temperatures (above normal) and relative humidity. A Heat event occurs and is reported in Storm Data whenever heat index values meet or exceed locally/regionally established advisory thresholds. Fatalities or major impacts on human health occurring when ambient weather conditions meet heat advisory criteria are reported using the Heat event. If the ambient weather conditions are below heat advisory criteria, a Heat event entry is permissible only if a directly related fatality occurred due to unseasonably warm weather, and not man-made environments.*

Excessive Cold/Wind Chill Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2014-2020
0	0	0	0	Countywide	Total = 1 Annualized = 0.14

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

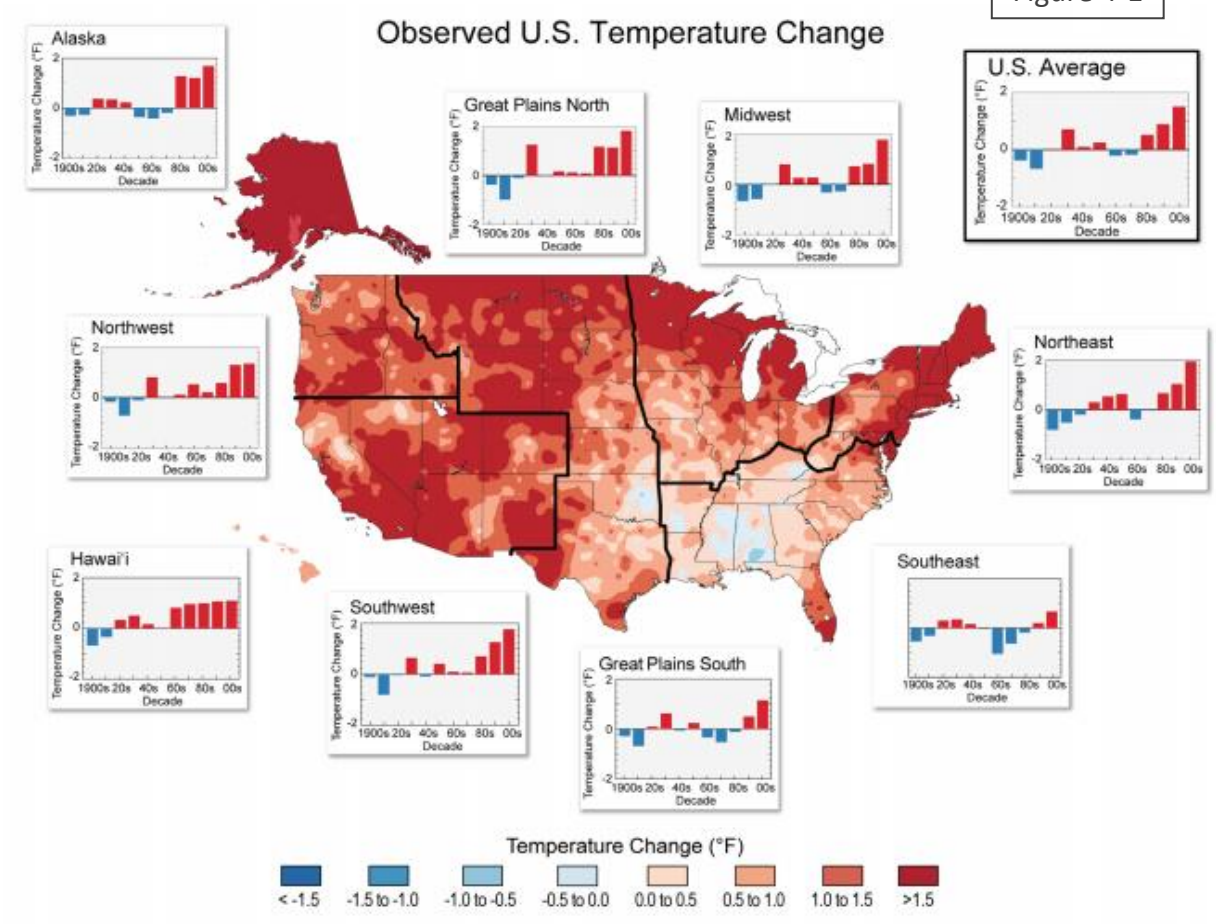
Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Extreme Cold/Wind Chill (Z). *A period of extremely low temperatures or wind chill temperatures reaching or exceedingly locally/regionally defined warning criteria (typical value around -350F or colder). If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data. Normally these conditions should cause significant human and/or economic impact. However, if fatalities occur with cold temperatures/wind chills but extreme cold/wind chill criteria are not met, the event should also be included in Storm Data as a Cold/Wind Chill event and the fatalities are direct. Use this event only if a fatality/injury does not occur during a winter precipitation event.*

Future Risk

Future probability was factored into the hazard risk vulnerability and ranking for each identified hazard, as detailed *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, & Data Tables*. Results for the Extreme Temperatures hazard indicate a future probability ranking of "highly likely" while impacts are minimal, indicating a future risk rating of "'medium-high".

Figure 4-1



The map shows temperature changes from 1991-2012, compared to the 1901-1960 average (in Alaska and Hawaii, the changes are compared to the 1951-1980 average). The bars on the graph show the average temperature changes by decade for 1901-2012 (relative to the 1901-1960 average) for each region. The far right bar (2000s decade) includes 2011 and 2012. The period from 2001 to 2012 was warmer than any previous decade in every region.

Source: NOAA NCDC / CICS-NC

Considering temperature changes form 1991-2012 compared to the 1901-1960 average, the rise in temperature trend indicated that future average temperatures will be higher for in the Northeast Region.

Vulnerability

Vulnerability

Extreme heat events tend to be regional in occurrence; therefore, there is no hazard or impact zone within the County, aside from agricultural land. There are certain population subgroups which may be more susceptible to the effects of extreme heat and may require relocation in extreme cases. These populations include the elderly and younger people, as well as households that lack air conditioning. According to the 2018 U.S. Population Estimates, 26.7 percent of the County's total population is 65 or over (5,177 people). The county's youth

population (3,897 people 19 and under) makes up 20.1 percent of the total population. A total of 9,074 people in Kent County (or 46.58 percent) are at risk in an extreme heat event.

Based on the 2017 US Census on Agriculture, 81.3 percent of the county's land area was in cropland (109,188 acres). Most of the county falls into the cropland category. Small patches of pastoral land are found in the northern parts of the county. Approximately 81.3 percent of the County's land mass is at risk during an extreme heat event.

Loss Estimations

Loss estimation typically refers to damage to property and/or infrastructure, suspension of utility services, or harm to humans, such as injuries and fatalities. Certain urban systems or building types are overly sensitive to the impacts associated with extreme temperatures. For instance, infrastructure systems are quite sensitive to extreme heat. Energy systems affected by extreme temperatures, typically have additional impacts on other systems and structures. Understanding this, certain facilities including hospitals, emergency shelters, and schools are likely to endure increased financial burdens as normal operation conditions must be maintain operations under more demanding circumstances. Additionally, impacts on critical facilities may be exacerbated by damage to transportation systems, that may occur from shrinking and swelling conditions due to temperature changes.

Capabilities

Capabilities

The **frost line** is the depth at which the ground freezes. It is important to know the **frost line** depth for construction purposes. It is also important that the footings for a **building** or a deck be well below the **frost line,** so the posts don't shift as the ground freezes and thaws. *Appendix D: Capability Assessment* of this document contains more extensive information.

Mitigation Strategies

Mitigation goals, objectives, and action items were identified throughout the plan development process for the unincorporated areas of the county and each of the five (5) towns. Following the review and discussion of risk and vulnerability, stakeholders identified and prioritized new action items for this plan update. Action items identified and designated "extreme temperatures" are listed below. In addition, one (1) "all-hazards" action item applicable to the "extreme temperatures" hazard has been included in the table below. The mitigation action items listed as a "High" priority have been further detailed in the table below and includes discussion, potential funding sources, and a timeline for implementation.

Section 4 Goal: Minimize loss of life and property due to Extreme Temperatures in Kent County. Objective 1: Conduct public outreach campaign specific to extreme temperatures and mitigation action and adaptive measures. Identify points of distribution and delivery method best practices for public outreach.				
Action Items	**Hazard(s)**	**Category**	**Responsible Entity(s)**	**Priority Ranking**
Encourage agricultural community to plant shade trees and/or erect tarp systems for livestock to congregate under extreme heat events.	**Extreme Temperatures**	Natural Resource Protection	Soil Conservation District	Medium
Encourage the planting of shade trees to relieve extreme heat reflected off of concrete services. Consider cool roofing products when replacing existing roof. Target both public and private property.	**Extreme Temperatures**	Natural Resource Protection	Kent County & Area Businesses	Medium
Expand number and locations of cooling and warming centers within the County. Currently, public libraries are used.	**Extreme Temperatures**	Natural Resource Protection	Kent County & Area Businesses	Medium
Establish Vulnerable Population Committee that meets periodically. Maintain updated Committee listing with primary and secondary contacts.	All-Hazards	Emergency Services	Kent County Office of Emergency Services, Health Dept., Dept. of Social Services, Samaritan Group, Kent County Commission on Aging	Medium
Complete application process for the Resilient Maryland Grant Program. Note: projects include distributed energy resource (DER) systems such as, micro grids, advance Combined Heat and Power (CHP) systems, and community resiliency hubs.	**Extreme Temperatures & Climate Adaptation**	Property Protection & Natural Resource Protection	Town of Galena	High
			Town of Chestertown	N/A
			Town of Betterton	N/A
			Town of Millington	Medium
			Town of Rock Hall	Medium
Discussion: Resilient Maryland is a competitive program that provides grants to help offset the costs of analyzing, planning, and designing distributed energy resource (DER) systems including microgrids, advanced Combined Heat and Power (CHP) systems, and community resiliency hubs. This highly successful program was launched as a pilot in Fiscal Year 2020 and awarded 14 unique project proposals from nearly every sector of Maryland's economy. Grant funds are provided to assist entities in the crucial planning and design phases of DER projects and will help bring projects closer to "shovel-ready." The Town of Betterton is currently updating their Comprehensive Plan, Sustainable Communities Plan,				

and Critical Area Ordinance so that they are up to date and include Best Practices.

Possible Funding Sources: Staff Time

Timeline for Implementation: 1-2 years

SECTION 5

SECTION 5 TOPICS

- TORNADO HAZARD
- HISTORY & FUTURE RISK
- VULNERABILITY
- CAPABILITIES
- MITIGATION STRATEGIES

PLAN UPDATE HIGHLIGHTS

The tornado hazard has been continued from the 2014 Plan into the 2020 Hazard Mitigation Plan.

The Enhanced Fujita Scale was included and explained.

Detailed history of tornado events that have impacted Kent County were provided.

Hazard Risk Assessment Data tables were updated using data from the 2016 State of Maryland Hazard Mitigation Plan and the National Centers for Environmental Information (NCEI) – Storm Events Database.

Included a new map illustrating tornado paths that have traversed Kent County and surrounding areas.

The vulnerability analysis reviewed the wind zone for Kent County and how structures are subjected to wind loads that exceed their design. A new figure depicted wind zones was included.

Loss estimations focused on building stock constructed prior to 1939 and agriculture structures.

New capabilities provided by stakeholders were discussed.

New goals and objectives were developed for this plan section.

New 2020-2025 Mitigation Action Items provided by stakeholders were included. Action items ranked “High” were further detailed to include discussion, potential funding sources, and a timeline for implementation.

Tornado Hazard

Hazard

The National Weather Service defines a tornado as a violently rotating column of air, usually pendant to a thunderstorm, with circulation reaching the ground. Tornadoes are generally considered the most destructive of all atmospheric-generated phenomena, with an average of 1,200 being reported annually in the United States. In the southern states, peak tornado season is March through May; peak months in the northern states are during the summer. Additionally, over 30 percent of recorded tornado activity has occurred between the hours of 3:00 pm and 6:00 pm, and an additional estimated 25 percent have occurred between 6:00 pm and 9:00 pm.

History & Future Risk

History

Tornadoes can be ranked by intensity by using the Fujita Scale devised by Dr. Theodore Fujita at the University of Chicago in 1971. The Fujita Damage Scale (F-Scale) is used to determine the tornado strength based on observed damage. The Fujita Tornado Scale assigns a category to tornadoes based on their wind speed and relates this to the general type of damage that is expected. The damage scale increases in intensity from a weak F0 (40 to 70 mph wind) to a F5 (over 260 mph wind). The Fujita scale of tornado intensity indicates that tornadoes at the F0 classification cause light damage to chimneys, tree branches, and signboards. Tornadoes of F1 magnitude can cause moderate damage to road surfaces, automobiles, and mobile homes. The impact of tornadoes primarily depends upon their occurrence in developed areas-tornadoes in undeveloped areas can cause damage only to a few trees and even go unreported.

According to National Oceanic Atmospheric Administration (NOAA), the Enhanced Fujita (EF) Scale has replaced the original Fujita (F) Scale used to rate tornadoes by the NWS. The EF Scale improves upon the limitations of the original F-Scale, which has been used since 1971. The tornado rating categories of the EF Scale range from zero to five, with EF0 as having the lowest wind speed and EF5 as having the highest wind speed. A correlation between the two scales has been developed and this makes it possible to express ratings in term of one scale to the other, thus preserving the historical database. The major improvements of the EF Scale are the more accurate wind speed ranges in each category and an increase in the amount of detail that goes into determining a tornado rating. These improvements will allow for more consistent and accurate tornado ratings by the National Weather Service (NWS).

Table 5-1: Enhanced Fujita (EF) Scale

Fujita Scale			Wind Speed		Typical Damage	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	**0**	**65-85**
1	73-112	79-117	1	86-109	**1**	**86-110**
2	113-157	118-161	2	110-137	**2**	**111-135**
3	158-207	162-209	3	138-167	**3**	**136-165**
4	208-260	210-261	4	168-199	**4**	**166-200**
5	261-318	262-317	5	200-234	**5**	**Over 200**

Source: http://www.spc.noaa.gov/faq/tornado/ef-scale.html

The tornado hazard was continued from the 2014 planning cycle and was given a ranking of "Medium Low" during the 2020 planning cycle. In order to assess the hazard risk identified, a composite score method was undertaken. The composite score method was based on a blend of quantitative and qualitative factors extracted from the National Centers for Environmental Information (NCEI), stakeholder survey, and other available data sources. These included:

- Historical impacts, in terms of human lives and property;
- Geographic extent;
- Historical occurrence;
- Future probability; and,
- Local community perspective.

Detailed information is available within *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, and Hazard Data Tables.*

Kent County has experienced tornadoes and tornado-like storm events throughout its history. Many tornado events are unreported and result in the loss of agricultural buildings or residential damage. Several notable events have been documented by Kent County Office of Emergency Management.

In June 1980, several residences and a business in the Fairlee and Tolchester areas suffered approximately $121,500 in damage caused by a severe storm with tornado-like winds. Downed trees and high winds damaged homes and a local marina. The marina suffered damage to buildings and piers.

In Millington, a tornado touched down on November 16, 1989, resulting in $250,000 in damages. No injuries were reported; however, both a church and a mobile home were destroyed. In addition, hundreds of Millington residents lost electricity.

Tolchester was hit by tornado-like conditions again in October 1990 from a storm bringing heavy rain and damaging winds.

Tornadoes touched down in several areas on July 27,1994. Civil defense sirens were sounded in Chestertown as citizens were warned to take shelter. The tornado made landfall in the Chestertown area, damaging 12 homes and multiple outbuildings, as well as, crops and trees on Smithville Road. Extensive damage to homes, outbuildings, automobiles, and trees was also reported on Flatland Road. The path of the tornado proceeded on a northwesterly course through forested areas and cropland toward Coopers Lane and Still Pond. Twisted trees, downed barns, fences, and roofs were reported in this area. In these and other locations throughout the county, fallen trees damaged automobiles, as well as dwellings. Damage to the agricultural community was extensive in the form of destruction to crops, agricultural buildings and machinery. Further, the roof of the airplane hangar at Scheeler Field located on Route 213 collapsed damaging at least one airplane. No injuries were reported.

Additional information obtained for Kent County from the National Centers for Environmental Information (NCEI) – Storm Events Database between January 1950 and December 31, 2019 for Tornado Hazard include: Tornado and Funnel Cloud. According to this data source, there has been a total of seven (7) recorded Tornado Events between 1950-2020, with an annualized rate of 0.10. These storms have produced $502,500 in property damage and a SVRGIS (intensity & frequency) of 1.

Total Tornado Hazard Risk Assessment Data Table
Hazards included within this table from NCEI Data: Tornado and Funnel Cloud.

Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1950-2020
0	0	502.50K	0	SVRGIS (intensity & frequency) = 1	Total = 7 Annualized = 0.10

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Tornado Data Table

Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1950-2020
0	0	502.50K	0	SVRGIS (intensity & frequency) = 1	Total = 4 Annualized = 0.06

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.
Based on NCEI definitions/criteria: Tornado (C). *A violently rotating column of air, extending to or from a cumuliform cloud or underneath a cumuliform cloud, to the ground, and often (but not always) visible as a condensation funnel. For a vortex to be classified as a tornado, it must be in contact with the ground and extend to/from the cloud base, and there should be some semblance of ground-based visual effects such as dust/dirt rotational markings/swirls, or structural or vegetative damage or disturbance.*

Funnel Cloud Data Table

Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2006-2020
0	0	0	0	SVRGIS (intensity & frequency) = 1	Total = 3 Annualized = 0.2

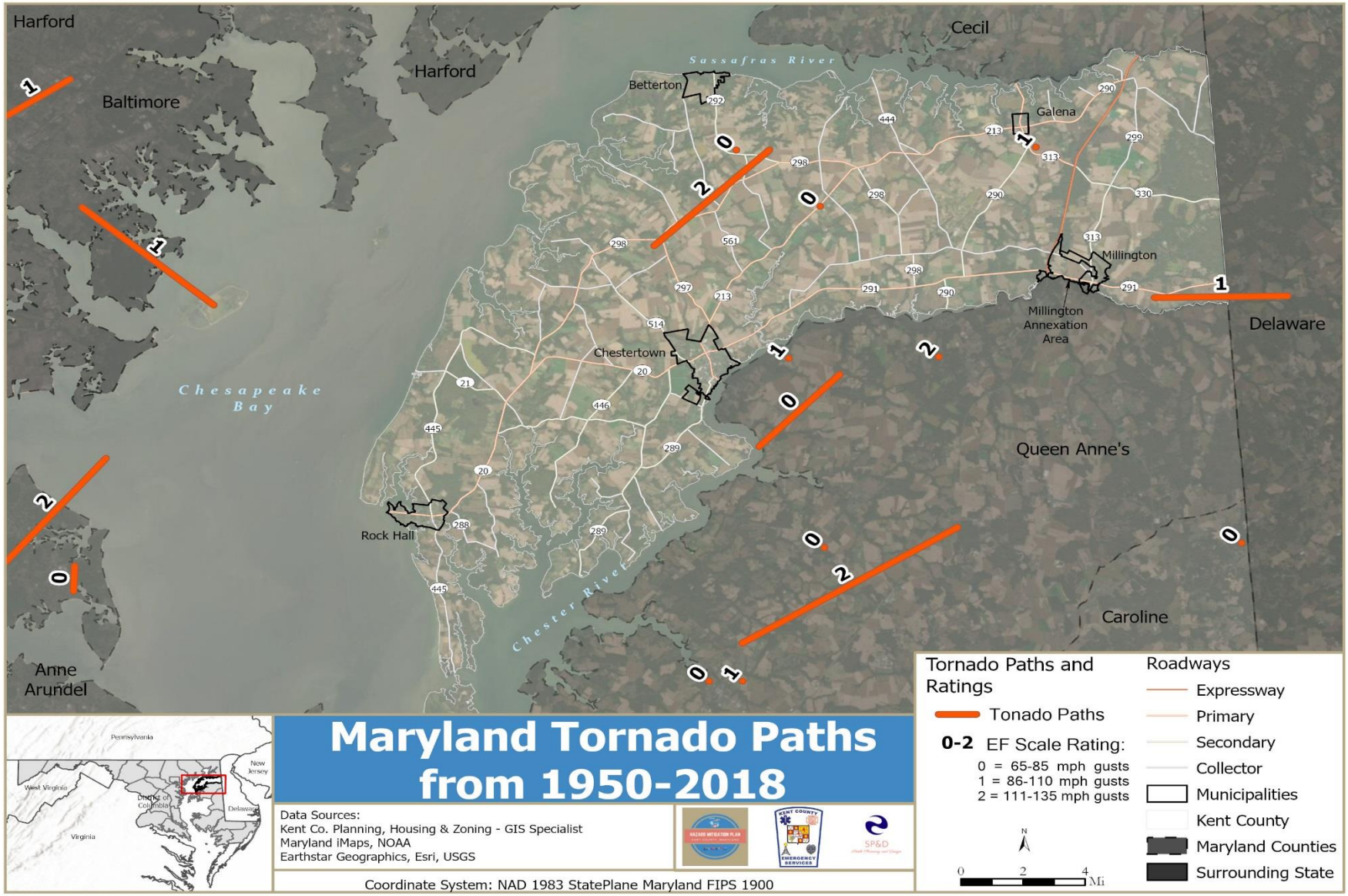
Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.
Based on NCEI definitions/criteria: Funnel Cloud (C). *A rotating, visible extension of a cloud pendant from a convective cloud with circulation not reaching the ground. The funnel cloud should be large, noteworthy, or create strong public or media interest to be entered.*

Unlike some other hazards, mapping tornado risk is not as important because it is unlikely that a community has variable tornado risks within its jurisdiction and tornadoes are not likely to touchdown in the same place each time. In most cases, communities need only to determine if they have a tornado risk and then proceed to determine their design wind speed.

To provide additional reference to location of past tornado events, Map 5-1 below depicts tornado pathways in and around Kent County, Maryland. These paths were obtained from NOAA's Severe Weather Data (SVRGIS).

Map 5-1


Harford
Baltimore
Harford
Cecil
Sassafras River
Betterton
Galena
Millington
Millington Annexation Area
Delaware
Chesapeake Bay
Chestertown
Queen Anne's
Rock Hall
Chester River
Caroline
Anne Arundel
Maryland Tornado Paths from 1950-2018
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, NOAA
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Tornado Paths and Ratings
Tonado Paths
0-2 EF Scale Rating:
0 = 65-85 mph gusts
1 = 86-110 mph gusts
2 = 111-135 mph gusts
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
Surrounding State
0 2 4 Mi

Future Risk

Future probability was factored into the hazard risk vulnerability and ranking for each identified hazard, as detailed *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, & Data Tables*. Results for the tornado hazard indicate a future probability ranking of "occasional". While the magnitude and location of tornadoes are unpredictable, most of those occurring in the County over the last 60 years have been classified as low intensity (F0 and F1). These tornadoes have had no history of fatalities although they have resulted in road blocks and delays, and increased workload from clearing fallen trees and debris.

Vulnerability

Vulnerability

Kent County is located in Wind Zone II (wind speed of 160 miles per hour).

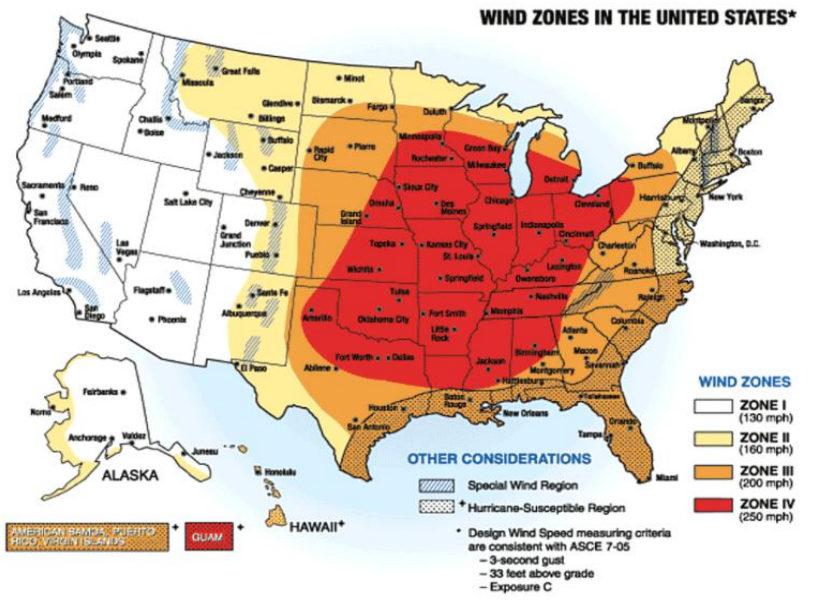


Figure 1A – Safe room wind speed map 2015 (courtesy of the ICC).

Figure 5-1

Source: FEMA- Safe Rooms for Tornadoes and Hurricanes Guidance for Community and Residential Safe Rooms FEMA P-361, Third Edition / March 2015

In assessing vulnerability, the most important factor is how likely structures are to fail when they are subjected to wind loads that exceed their design or to flying debris that penetrates the building. In general, building damages can range from cosmetic to complete structural failure, depending on wind speed and location of the building with respect to the tornado path and can be analyzed by a structural engineer.

Loss Estimations

Approximately one quarter of the County's housing units were built prior to 1939. These older structures may be in poor condition and not be able to weather high winds due to poor building quality, plumbing, etc. and are thus more prone to damage by winds. Approximately 81 percent of the County's total land area is in agricultural use. Crops, farm buildings, and farm equipment are susceptible to tornadoes and strong wind damage due to their exposure to tornadoes and wind conditions.

Since there are not any standard loss estimation models and tables for tornadoes currently, it is difficult to calculate actual losses. In terms of calculating human losses, shelters throughout the community have been assessed by Kent County for their location, capacity,

and strength in order to ensure they are able to house residents and withstand the design wind speed.

Capabilities

Capabilities

Kent County as well as all five (5) Towns have adopted the most recent, 2018 International Building Code (IBC). The International Code Council (ICC) publishes building codes that promote safety and fire prevention in commercial, government and residential structures. These codes are used throughout the US, including enforcement by several federal agencies. While evidenced in this section, the tornado hazard has resulted in approximately $500K in damages historically and is considered a "medium-low" risk hazard both now and into the future. *Appendix D: Capability Assessment* of this document contains more extensive information.

Mitigation Strategies

Mitigation goals, objectives, and action items were identified throughout the plan development process for the unincorporated areas of the county and each of the five (5) towns. Following the review and discussion of risk and vulnerability, stakeholders identified and prioritized new action items for this plan update. Several action items have been identified and designated "Tornado, High Wind, Hurricane, Severe Storms" in which "Tornado" related event impacts result. The mitigation action items listed as "High" priority have been further detailed in the table below.

Section 5 Goal: Minimize the losses of life and property due to Tornado in Kent County. Consider wind mitigation measures countywide.

Objective 1: Assess all fire and rescue Stations to determine if large garage doors meet design standards that protect against building envelope penetration which leads to building failure during a high wind event.

Objective 2: Target mobile communities, which are highly susceptible to high wind hazards.

Objective 3: Minimize the impact of power loss form damaging high wind events. Enforce tie down requirements in the mobile home communities of Rock Hall, Chestertown, and Worton. Identify homes that lack proper tiedowns to reduce their vulnerability to high wind damages.

Action Items	Hazard(s)	Category	Responsible Entity(s)	Priority Ranking
Enforce tie down requirements in the mobile home community in Worton. Identify homes that lack proper tie downs in the (1) mobile home community within the County to reduce vulnerability to high wind damages.	**Tornado, High Wind, Hurricane, Severe Storms**	Prevention	Kent County Dept. of Planning, Housing & Zoning	**Medium**

Enforce tie down requirements in the mobile homes in the Town of Rock Hall. Identify homes that lack proper tie downs in the (2) mobile home communities within the Town to reduce vulnerability to high wind damages.	**Tornado, High Wind, Hurricane, Severe Storms**	Prevention	Town of Rock Hall	**High**
Discussion: High winds can originate from several events: tropical cyclones, other coastal storms, and tornadoes, which generate the most significant wind hazards. High winds are capable of imposing large lateral (horizontal) and uplift (vertical) forces on buildings. Residential buildings including mobile homes can suffer extensive wind damage when they are improperly designed and constructed and when wind speeds exceed design levels. The effects of high winds on a building will depend on several factors: wind speed and duration of high winds, height of building above ground, exposure or shielding of the building relative to wind direction, strength of the structural frame, connections, and envelope (walls and roof), shape of building and building components, number, size and location of openings, and type, quantity and velocity of windborne debris. Based on the ASCE Standard of Minimum Design Loads for Building sand Other Structures, Kent County, Maryland, lies in a 90 mile per hour (mph) wind speed zone and should design and construct all new buildings that will stand up to winds of 90 mph (3 second gust) to resist damage from strong winds. Tie-downs are systems of heavy-duty straps and anchors designed to stabilize manufactured homes (also known as mobile homes) during high winds. Failure to properly install and maintain tie-downs results in reduced capacity to resist sliding and overturning.  **Possible Funding Sources:** Assessment- Staff Time; Wind Retrofit Community Project- FEMA BRIC **Timeline for Implementation:** Grant Application and Project Implementation 2-3 years				
Enforce tie down requirements in the mobile homes in the Town of Chestertown. Identify homes that lack proper tie downs in the (4) mobile home communities within the Town to reduce vulnerability to high wind damages.	**Tornado, High Wind, Hurricane, Severe Storms**	Prevention	Town of Chestertown	**High**
Refer to discussion above for previous mitigation action item.				
Complete a fire and rescue station garage door assessment to determine high wind risk and mitigation needs, if any. Note: Of the (8) stations, (3) were built in or before 1975. Also, evaluate fire and rescue stations to determine the need for protective glass.	**Tornado, High Wind, Hurricane, Severe Storms**	Property Protection	Volunteer Fire & Rescue Stations	**High**
Discussion: Several of the County's fire stations also serve as housing for County emergency service workers. These facilities have been built at different times and to different building performance standards. As a result, some of them can withstand significant flood and wind events while others require building fortification measures. As with most structures, integrity of the building envelope during a wind event is a major concern. Given the size of building openings for most fire stations (doors to truck and vehicle storage areas), they are of concern for fire stations.				

There are seven fire and one rescue stations in Kent County. Consider the age of each fire station, as specified on the table below. While all stations may be assessed, prioritize those stations in or before 1975.

Station	Year Built	Department	Address	City
1	1987	Kent County EMS	104 Vickers Drive	Chestertown
2	1975	Millington Community Vol Fire Co	185 Sassafras ST	Millington
3	1992	Galena Vol Fire Co	90 East Cross ST	Galena
4	1957	Kennedyville Vol Fire Co	11993 Kennedyville RD	Kennedyville
5	1999	Betterton Vol Fire Co	2 Howell Point RD	Betterton
6	1979	Chestertown Vol Fire Co	211 Maple AVE	Chestertown
7	2005	Rock Hall Vol Fire Co	21500 Rock Hall AVE	Rock Hall
8	1971	Kent - Queen Anne's Rescue Squad	140 Morgnec RD	Chestertown

Source: Marylandfirefighters.com/ken

Glass in the fire departments is tempered glass. Replace the existing glass with 1" laminated bullet – impact resistant glass. Protective glass mitigates high wind damage from tornadoes, hurricanes, and other severe storm events. FEMA tornadoes windows:

- FEMA 361-2008 & Hurricane Certified
- Minimum of 6" Aluminum Framing
- 2 ½" x 6" Mullion and Intermediate Horizontal Members Available
- Codes and standards use the term glazing to address all windows and openings containing glass. Specifically, ASCE 7-05 (which is incorporated by reference into both the IBC and IRC).

Possible Funding Sources: Assessment- Staff Time; Wind Retrofit Project- FEMA BRIC, State Homeland Security Grant Program, Pre-Disaster Mitigation Grant Program

Timeline for Implementation: Grant Application and Project Implementation 1-3 years

Provide tornado warning sirens or additional warning sirens for the following Fire Stations: Chestertown, Galena, and Millington,	**Tornado, High Wind, Hurricane, Severe Storms**	Emergency Services	Kent County Office of Emergency Services, Volunteer Fire & Rescue Stations	**Medium**

SECTION 6

SECTION 6 TOPICS

- SNOW & ICE STORMS HAZARD
- HISTORY & FUTURE RISK
- VULNERABILITY
- CAPABILITIES
- MITIGATION STRATEGIES

PLAN UPDATE HIGHLIGHTS

The winter storm/winter weather hazard from the 2014 Plan was carried over into the 2020 Hazard Mitigation Plan and renamed to Snow & Ice Storms.

The following were identified and integrated into the Snow & Ice Storms Section: Winter Storm, Winter Weather, Blizzard, Cold/Wind Chill, Frost/Freeze, Heavy Snow and Sleet

A Maryland Average Annual Snowfall figure was added to illustrate the average snowfall for Kent County.

FEMA Winter Storm Disaster Declarations were updated to include all winter weather events.

Hazard Risk Assessment Data tables were updated using data from the 2016 State of Maryland Hazard Mitigation Plan and the National Centers for Environmental Information (NCEI) – Storm Events Database.

The vulnerability analysis elaborated on the effects winter storms has on buildings, specifically disruptions of emergency and other essential services and critical facilities.

New capabilities provided by stakeholders were discussed. Various Kent County departments and organizations provided their capabilities for dealing with winter weather.

New goals and objectives were developed for this plan section.

New 2020-2025 Mitigation Action Items provided by stakeholders were included. Action items ranked “High” were further detailed to include discussion, potential funding sources, and a timeline for implementation.

Snow & Ice Storms Hazard

Hazard

Winter storms are defined by cold temperatures and heavy snow or ice and include heavy snowstorms, sleet storms, ice storms, blizzards, and severe blizzards. Winter storms may contain one or more types of hazardous weather events, the definitions of which are included below.

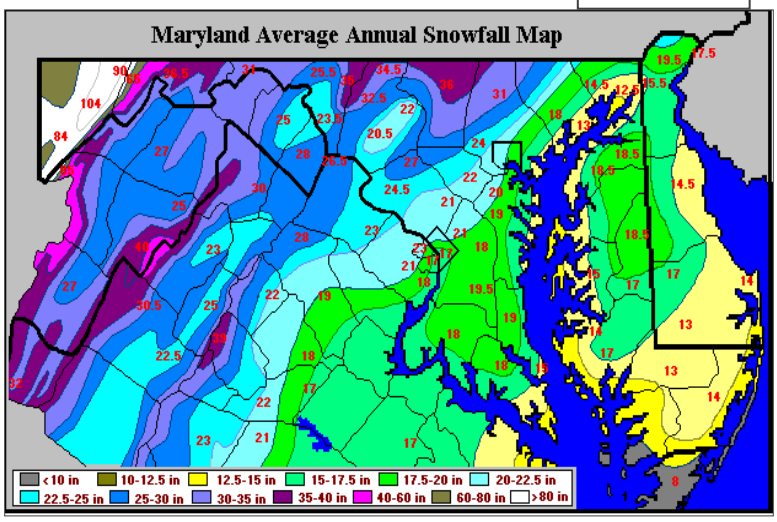
- Heavy snowstorm: Accumulations of four inches or more in a six-hour period; or six inches or more in a 12-hour period. The most common impacts are traffic accidents, interruptions in power supply and communications; and the failure of inadequately designed and/or maintained roofing systems.
- Sleet storm: Significant accumulations of solid pellets that form from the freezing of raindrops or partially melted snowflakes, resulting in slippery surfaces and posing hazards to pedestrians and motorists.
- Ice storm: Significant accumulations of rain or drizzle freezing on objects such as trees, power lines and roadways, causing slippery surfaces and damage from the sheer weight of ice accumulation.
- Blizzard: Wind velocity of 35 miles per hour or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile, prevailing over an extended period of time.
- Severe Blizzard: Wind velocity of 45 miles per hour or more, temperatures of 10 degrees or. lower, a high density of blowing snow with visibility frequently measured in inches, prevailing over an extended period of time.

History & Future Risk

History

Snow and winter storms are not uncommon in Kent County. Since the County is subjected to extreme cold weather conditions periodically, there have occasionally been instances of severe winter storms.

Figure 6-1



As illustrated in Figure 6-1, Kent County's annual snowfall is approximately 16.4 inches. Some incidents over the past five decades have been detailed in Table 6-1. Since 2000, five major winter storms have occurred in the County which yielded Declarations of Disaster by FEMA.

Table 6-1: FEMA Disaster Declarations		
Event	**Description**	**Year**
Ice Conditions	Major disaster declaration	January 1977
Severe Snowfall and Winter Storm	Emergency declaration	March 1993
Blizzard of 96	Major disaster declaration: County applied for public assistance	January 1996
Severe Winter Storm	Major disaster declaration: County applied for public assistance	January 2000
Snow	Emergency declaration: MD National Guard and FEMA assisted residents; 30.5 inches of snow in 3-day period	February 2003
Severe Winter Storm and Snowstorm	Major disaster declaration: County applied for public assistance	December 2009
Severe Winter Storms and Snowstorms	Major disaster declaration: County applied for public assistance	February 2010
Severe Winter Storm and Snowstorm	Major disaster declaration: County applied for public assistance	January 2016

Source: FEMA

ALL RECORDS BROKEN

BY BLIZZARD OF 1905

Snow Piled 20 Feet High on Railroad—Seven Engines and 300 Men Battle With Same—Six Days Without Mail—Ice Six Inches on River and Bay—All Night on Train at Lynch's Station — Mercury Reaches Six Degrees Below Zero—All Roads Blocked.

Source: Blizzard February 1905 provided by the Kent County Historical Society- Barbara Jorgenson

Maryland's greatest winter storms are the Nor'easters. The strong northeast winds that rack the coast and inland areas give the storm its name. For Nor'easters to occur in Maryland, an arctic air mass should be in place. While high pressure builds over New England, cold arctic air flows south from the high-pressure area. The dense cold air is unable to move west over the Appalachian Mountains and so it funnels south down the valleys and along the Coastal Plain. Winds around the Nor'easter's center can become intense. The wind builds large waves that batter the coastline and sometimes pile water inland causing major coastal flooding and severe beach erosion. Unlike hurricanes, which usually come and go within one tide cycle, the Nor'easter can linger through several tides, each one piling more and more water on shore and into the bays and dragging more sand away from the beaches.

The snow & ice storms hazard was continued from the 2014 planning cycle and was given a ranking of "Medium" during the 2020 planning cycle. In order to assess the hazard risk identified, a composite score method was undertaken. The composite score method was based on a blend of quantitative and qualitative factors extracted from the National Centers for Environmental Information (NCEI), stakeholder survey, and other available data sources. These included:

- Historical impacts, in terms of human lives and property;
- Geographic extent;
- Historical occurrence;
- Future probability; and
- Local community perspective.

Detailed information is available within *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, and Hazard Data Tables.*

Information obtained for Kent County using both the *2016 State of Maryland Hazard Mitigation Plan* and the National Centers for Environmental Information (NCEI) – Storm Events Database between January 1950 and December 31, 2019 for the Snow and Ice Storms Hazard include: Winter Storm, Winter Weather, Blizzard, Cold/Wind Chill, Frost/Freeze, Heavy Snow and Sleet. There has been a total of 155 Snow & Ice Storm Events between 1996-2020, with an annualized rate of 6.2. These storms have produced $125,000 in property damage and an average snowfall total of 2 inches.

Total Snow & Ice Storms Hazard Risk Assessment Data Table

Hazards included within this table from NCEI Data: Winter Storm, Winter Weather, Blizzard, Cold/Wind Chill, Frost/Freeze, Heavy Snow and Sleet. There are no Ice Storms recorded in the NCEI Database for this county.

Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	125K	0	Average Snowfall Total = 2	Total = 155 Annualized = 6.2

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Winter Storm Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	125K	0	Average Snowfall Total = 2	Total = 22 Annualized = 0.88

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Winter Storm (Z). *A winter weather event that has more than one significant hazard (i.e., heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet and ice) and meets or exceeds locally/regionally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data. Normally, a Winter Storm would pose a threat to life or property.*

Winter Weather Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	0	0	Average Snowfall Total = 2	Total = 76 Annualized = 3.04

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Winter Weather (Z). *A winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation, but does not meet locally/regionally defined warning criteria. A Winter Weather event could result from one or more winter precipitation types (snow, or blowing/drifting snow, or freezing rain/drizzle). The Winter Weather event can also be used to document out-of-season and other unusual or rare occurrences of snow, or blowing/drifting snow, or freezing rain/drizzle. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data.*

Blizzard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2010-2020
0	0	0	0	Average Snowfall Total = 2	Total = 1 Annualized = 0.09

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Blizzard (Z). *A winter storm which produces the following conditions for 3 consecutive hours or longer: (1) sustained winds or frequent gusts 30 knots (35 mph) or greater, and (2) falling and/or blowing snow reducing visibility frequently to less than 1/4 mile. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data.*

Cold/Wind Chill Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	0	0	Countywide	Total = 24 Annualized = 0.96

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Cold/Wind Chill (Z). *Period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory (typical value is -180F or colder) conditions. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data. There can be situations where advisory criteria are not met, but the combination of seasonably cold temperatures and low wind chill values (roughly 150F below normal)*

may result in a fatality. In these situations, a cold/wind chill event may be documented if the weather conditions were the primary cause of death as determined by a medical examiner or coroner. Normally, cold/wind chill conditions should cause human and/or economic impact. Use this event only if a fatality/injury does not occur during a winter precipitation event.

Frost/Freeze Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2007-2020
0	0	0	0	Countywide	Total = 1 Annualized = 0.07

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.
Based on NCEI definitions/criteria: Frost/Freeze (Z). *A surface air temperature of 32 degrees Fahrenheit (F) or lower, or the formation of ice crystals on the ground or other surfaces, for a period of time long enough to cause human or economic impact, during the locally defined growing season. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data.*

Heavy Snow Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	0	0	Average Snowfall Total = 2	Total = 27 Annualized = 1.08

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.
Based on NCEI definitions/criteria: Heavy Snow (Z). *Snow accumulation meeting or exceeding locally/regionally defined 12 and/or 24-hour warning criteria. This could mean values such as 4, 6, or 8 inches or more in 12 hours or less; or 6, 8, or 10 inches in 24 hours or less. If the event that occurred is considered significant, even if it affected a small area, it should be entered into Storm Data. In some heavy snow events, structural damage, due to the excessive weight of snow accumulations, may occur in the few days following the meteorological end of the event. The preparer should include this damage as part of the original event and give details in the narrative. Normally, strong winds or other precipitation types are not present in a Heavy Snow event. If they were, then the Winter Storm event should be used.*

Sleet Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1997-2020
0	0	0	0	Countywide	Total = 4 Annualized = 0.17

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.
Based on NCEI definitions/criteria: Sleet (Z). *Sleet accumulations meeting or exceeding locally/regionally defined warning criteria (typical value is ½ inch or more). The Storm Data preparer should include in the narrative the times that sleet accumulation began, met criteria, and ended.*

Future Risk

Future probability was factored into the hazard risk vulnerability and ranking for each identified hazard, as detailed *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, & Data Tables*. Results for the snow and ice storms hazard indicate a future probability ranking of "occasional".

Vulnerability

Vulnerability

All areas of Kent County are subject to the effects of winter storms. They are considered hazards when:

- local capabilities to handle disruptions to emergency services, traffic, communications, and electric power are overwhelmed;
- residents in isolated communities run out of basic supplies, including food and fuel;
- livestock suffer from severe cold and lack of feed; and
- building structural systems fail.

Vulnerability to the effects of winter storms on buildings depends on the age of the building (and the building codes in effect at the time it was built), type of construction, and condition of the structure (how well it has been maintained).

The entire county would be affected by snow, ice and extreme cold. Kent County has a total area of 278.34 square miles and 343 miles of shoreline. Severe winter storms could result in the loss of utilities, expected increase in traffic accidents, impassable roads, and lost income since normal commuting may be hindered.

Snow and ice can be extremely hazardous. It can reduce visibility and when it accumulates on surfaces, it reduces traction and puts strain on power lines, roofs, and other structures. Severe winter storms have been and will continue to be a significant threat to the economic and social well-being of Kent County. Disruptions of emergency and other essential services and critical facilities are the main threats to people and property. Inadequate snow removal equipment could exacerbate the effects of snow events in the County, although it is not an issue at the present time.

Severe storm activity poses a significant threat to unprotected or exposed lifeline systems. Generally, commercial power networks are very susceptible to interruption from lightning strikes, high winds, ice conditions, and hail. Other utilities, including underground pipelines, may be impacted if not protected from exposure.

All critical and public facilities in the County are vulnerable to the effects of severe winter storms, due to the potential disruption of services and transportation systems as well as possible structural failure due to heavy snow loads. The County's critical and public owned facilities are detailed on maps and within the database found in *Appendix F: Critical and Public Owned Facilities*.

Capabilities

Capabilities

Kent County's Building Construction Code provide mechanisms to protect properties against frost damage. Chapter 73-15 Building Construction below states:

§ 73-15Frost protection. [1]

Except when erected upon solid rock or otherwise protected from frost, foundation walls, piers and other permanent supports of all buildings and structures larger than two hundred (200) square feet in area or ten (10) feet in height shall extend below the frost line of the locality, and spread footings of adequate size shall be provided when necessary to properly distribute the load within the allowable bearing value of the soil. Such structures shall be supported on piles or ranging timbers when solid earth or rock is not available. Footings shall not be founded on frozen soils unless such frozen condition is of a permanent character.[2]

[1]*Editor's Note: Former § 73-15, Swimming pools, as amended, was repealed 6-3-2008 by Bill No. 3-2008. This bill also redesignated former §§ 73-16 through 73-20 as §§ 73-15 through 73-19, respectively.*

[2]*Editor's Note: See also Ch. 192, Part 4, Footings.*

Kent County has a winter shelter for homeless residents. It runs January 1st to March 31st and is hosted by local churches and is managed by a nonprofit in conjunction with Social Services. There is a paid manager and volunteers round out the nightly staff and volunteers provide a hot meal each night. The Office of Emergency Services (OES) assists winter shelter operations by ensuring that the sheltering group has current and accurate notifications, are aware of plans for snow emergencies, and any warming center openings.

In addition, to prevent frozen and snow laden tree limbs from affecting utility lines tree trimming is encouraged. Within the Chesapeake Bay Critical Area utility companies apply for Critical Area Utility Line Maintenance Plans and trees are replanted in locations that are better suited.

The Department of Public Works, County Roads, is responsible for snow removal. They re-stock winter storm materials at the end of each season. Finally, dump trucks equipped with plows, loaders, pickup trucks with plows and graders with v-plows. Under extreme conditions, the County has contracted local contractors with loaders. Snow drifts are normally seen in all areas with high back slopes.

In terms of public outreach, there is a plethora of public warning information coming out from Office of Emergency Service (OES) prior to a known storm. At the start of each winter season, OES holds a conversation on WCTR (Kent and Queen Anne's County's Hometown Radio Station) to advise residents of ways to prepare and mitigate winter storm damage. Additional media outlets include radio spots, email, twitter, Facebook and news media.

Currently, the Office of Emergency Service provides "Winter Safety Tips" on their website.

Winter Storm Safety Tips

If you are caught in a winter storm, do the following:

- If you are outside, find a shelter and stay dry. Cover all exposed parts of the body.

- If there is no shelter, prepare a lean-to, windbreak or snow cave for protection from the wind. Build a fire for heat and to attract attention. Place rocks around the fire to absorb and reflect heat.
- Do not eat snow. It will lower your body temperature. Melt it first.
- If you are in a car or truck, stay there. Run the motor about ten minutes each hour for heat. Open the window a little for fresh air to avoid carbon monoxide poisoning and make sure the exhaust pipe is not blocked. Make yourself visible to rescuers by turning on the dome light at night when running the engine. Tie a colored cloth (preferably red) to your antenna or door. Raise the hood indicating trouble after snow stops falling. Exercise from time to time by vigorously moving arms, legs, fingers, and toes to keep blood circulating and to keep warm.
- If you are at home or in a building, stay inside. When using alternative heat from a fireplace, wood, stove, space heater, etc., use fire safeguards and properly ventilate. If there is no heat, close off unneeded rooms, stuff towels or rags in cracks under doors, and cover windows at night. Eat and drink food and wear layers of loose-fitting, lightweight, warm clothing.

Mitigation Strategies

Mitigation goals, objectives, and action items were identified throughout the plan development process for the unincorporated areas of the county and each of the five (5) towns. Following the review and discussion of risk and vulnerability, stakeholders identified and prioritized new action items for this plan update. The action item identified and designated “snow and ice storm” specific is listed below along with two (2) “all-hazards” action items.

Section 6 Goal: Ensure residents are forewarned and prepare County with supplies to face winter storms.

Objective 1: Provide public education (concerning safe driving and driving only if it is required, and also stock up on food, water, batteries, and other supplies) to prepare people for the storm.

Action Items	Hazard(s)	Category	Responsible Entity(s)	Priority Ranking
Develop and use updated delivery methods for winter storm public outreach activities. Topics to include: warming center locations, driving conditions, and other preparedness items.	**Snow & Ice Storms**	Public Education & Awareness	Kent County Office of Emergency Services, Faith Centers & Towns	Medium
Increase citizen participation in the County's hazard warning and notification system - Code Red.	All-Hazards	Public Education & Awareness	Kent County Office of Emergency Services	High

<table>
<tr><td colspan="5">Discussion: This action item is applicable to all hazards identified in the Plan Update. While the Code Red hazard warning and notification system is capable of calling all land lines within a designated geo-referenced area, citizen sign-up is key to enhancing the outreach capacities of the system. Citizen sign-up allows users to identify the scope of hazard messaging received and the number of devices that would like to receive those messages on by inputting their own contact information.

Possible Funding Sources: N/A

Timeline for Implementation: Ongoing</td></tr>
<tr><td rowspan="7">Forward and repost Kent County Office of Emergency Services' hazard related Facebook posts and other social media content.</td><td rowspan="7">All-Hazards</td><td rowspan="7">Public Education & Awareness</td><td>Town of Chestertown</td><td>N/A</td></tr>
<tr><td>Town of Rock Hall,</td><td>High</td></tr>
<tr><td>Town of Millington</td><td>Medium</td></tr>
<tr><td>Town of Betterton</td><td>High</td></tr>
<tr><td>Town of Galena</td><td>High</td></tr>
<tr><td>Historical Society, American Red Cross, Economic Development, Chamber of Commerce, Partnered Media Outlets</td><td>High</td></tr>
<tr><td colspan="5">Discussion: This action item is applicable to all hazards identified in the Plan Update. During the plan update process, discussion on public outreach and awareness highlighted opportunities for further collaboration between the County, Towns, and related organizations.

Possible Funding Sources: N/A

Timeline for Implementation: Ongoing</td></tr>
</table>

SECTION 7

SECTION 7 TOPICS

- SEVERE STORMS HAZARD
- HISTORY & FUTURE RISK
- VULNERABILITY
- CAPABILITIES
- MITIGATION STRATEGIES

PLAN UPDATE HIGHLIGHTS

Other Severe Storms was changed to Severe Storms as noted on the *2020 Review of Hazards Profiled* table in *Section 1: Introduction*.

The Severe Storms Section reviews and discusses the following hazards: Thunderstorm Wind, Lightning, and Hail.

The "Thunderstorm Life Cycle" figure was included to further explain the stages of thunderstorms.

Hazard Risk Assessment Data tables were updated using data from the 2016 State of Maryland Hazard Mitigation Plan and the National Centers for Environmental Information (NCEI) – Storm Events Database.

The vulnerability analysis discussed the effects severe storms have on agricultural lands, buildings, lifeline systems and critical and public facilities.

New capabilities provided by stakeholders were discussed. Detailed information about the lightning rod/protection systems installed throughout the county was provided.

New goals and objectives were developed for this plan section.

New 2020-2025 Mitigation Action Items provided by stakeholders were included. Action items ranked "High" were further detailed to include discussion, potential funding sources, and a timeline for implementation.

Severe Storms Hazard

Hazard

The Severe Storms Hazard includes: **Thunderstorm Wind, Lightning**, and **Hail.** Severe storms impacts include the transport of debris, which could cause casualties and property loss, as well as damages to the poles and lines carrying electric, telephone, and cable television service. Disruption of utilities, injuries to people, and damages to property resulting from severe storms affect Kent County and are a cause for concern.

Thunderstorm Wind

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.

Strong winds that can develop from thunderstorms are known as downbursts. Downbursts occur when rapidly descending air beneath a thunderstorm reaches the ground and begins to move horizontally. These winds have been observed in excess of 100 mph and can occur before, during, and after a thunderstorm.

Lightning

Lightning is defined as a sudden and violent discharge of electricity from within a thunderstorm due to a difference in electrical charges and represents a flow of electrical current from cloud-to-cloud or cloud-to-ground. Nationally, lightning causes extensive damage to buildings and structures, kills, or injures people and livestock, starts untold numbers of forest fires and wildfires, and disrupts electromagnetic transmissions. Lightning is extremely dangerous during dry lightning storms because people remain outside due to the lack of precipitation; however, lightning is still present during the storm. Lightning usually occurs because of thunderstorms that move through an area during the summer months. Peak lightning occurs between June and August.

Hail

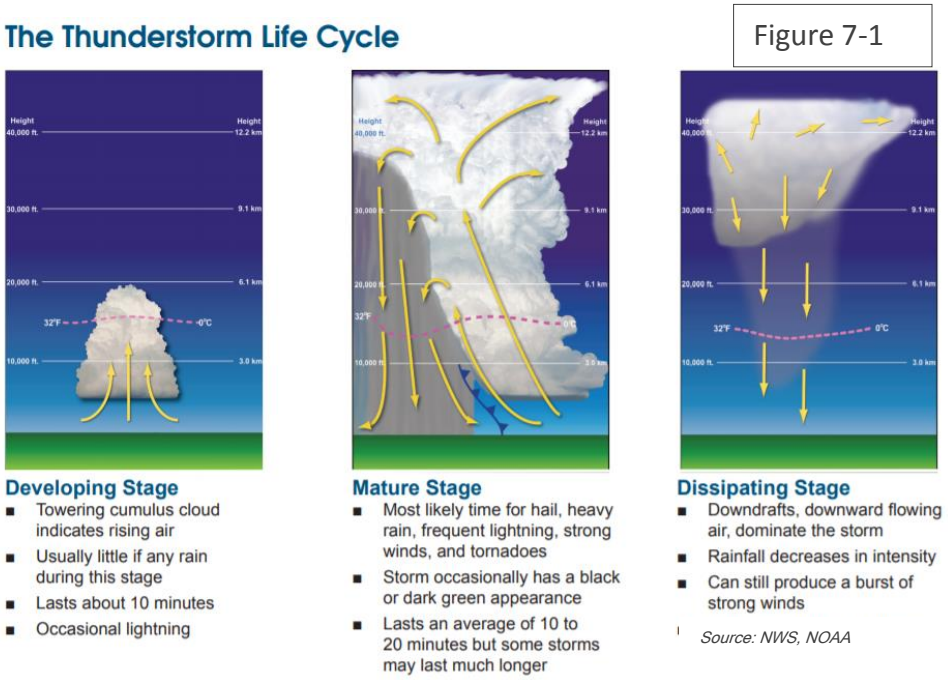
Hailstorms are violent and spectacular phenomena of atmospheric convection, always associated with heavy rain, gusty winds, thunder, and lightning. Hail is a product of strong convection and occurs only in connection with a thunderstorm where the high velocity updrafts carry large raindrops into the upper atmosphere (where the temperature is well below the freezing point of water). Hail stones grow when the frozen droplet is repeatedly blown into the higher elevations. The hailstone ascends if the updraft velocity is high enough to hold the hailstone. As soon the size and weight of the hailstone overcomes the lifting capacity of the updraft, it begins to fall freely under the influence of gravity. The falling of hail stones, under thunderstorm conditions, is accompanied with a cold downdraft of air.

History & Future Risk

History

Thunderstorms, lightning, and hail are common occurrences in Kent County. Thunderstorms have winds ranging from 0 to 69 knots (kts) in magnitude. Thunderstorms can sometimes produce strong winds, dangerous electric storms, prolific hail accumulations, life-threatening flash floods, and occasional tornadoes.

Figure 7-1



Lightning is the most common culprit during power outages either directly by striking transformers or indirectly by striking trees causing limbs to fall into power lines.

Damaging or severe hail (0.75 to 2.00 inches) is most common between the months of June and August, although a significant number of hail reports also occur between April and June. The most extensive damage caused by hail occurs on the County's agricultural lands.

The severe storms hazard was continued from the 2014 planning cycle and was given a risk ranking of "High" during the 2020 planning cycle. In order to assess the hazard risk identified, a composite score method was undertaken. The composite score method was based on a blend of quantitative and qualitative factors extracted from the National Centers for Environmental Information (NCEI), stakeholder survey, and other available data sources. These included:

- Historical impacts, in terms of human lives and property;
- Geographic extent;
- Historical occurrence;
- Future probability; and
- Local community perspective.

Detailed information is available within *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, and Hazard Data Tables.*

Information obtained for Kent County using both the *2016 State of Maryland Hazard Mitigation Plan* and the National Centers for Environmental Information (NCEI) – Storm Events Database between January 1950 and December 31, 2019 for Severe Storms Hazard include: Thunderstorm Wind, Lightning, and Hail. There has been a total of 112 Events between 1996-2020, with an

annualized rate of 4.48. These storms have produced $630,980 in property damage. $1,000 in crop damage, and an ASCE wind design speed of 90.

Total Severe Storms Hazard Risk Assessment Data Table *Hazards included within this table from NCEI Data: Thunderstorm Wind, Lightning, and Hail.*					
Injuries & Deaths		**Property & Crop Damage**		**Geographic Extent**	**Events 1968-2020**
10	0	116.50K	5K	ASCE Wind Design Speed = 90 2"> hail and lightning events with Injuries/Deaths = 2	Total = 173 Annualized = 3.26
Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan					

Thunderstorm Wind Data Table					
Injuries & Deaths		**Property & Crop Damage**		**Geographic Extent**	**Events 1968-2020**
2	0	70.50K	0	ASCE Wind Design Speed = 90	Total = 139 Annualized = 2.62
Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan					

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.
Based on NCEI definitions/criteria: Thunderstorm Wind (C). *Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 50 knots (58 mph), or winds of any speed (non-severe thunderstorm winds below 50 knots) producing a fatality, injury, or damage. Maximum sustained winds or wind gusts (measured or estimated) equal to or greater than 50 knots (58 mph) will always be entered. Events with maximum sustained winds or wind gusts less than 50 knots (58 mph) should be entered as a Storm Data event only if the result in fatalities, injuries, or serious property damage. Storm Data software permits only one event name for encoding severe and non-severe thunderstorm winds. The Storm Data software program requires the preparer to indicate whether the sustained wind or wind gust value was measured or estimated.*

Lightning Data Table					
Injuries & Deaths		**Property & Crop Damage**		**Geographic Extent**	**Events 1997-2020**
8	0	26K	5K	2"> hail and lightning events with Injuries/Deaths = 2	Total = 15 Annualized = 0.63
Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan					

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.
Based on NCEI definitions/criteria: Lightning (C). *A sudden electrical discharge from a thunderstorm, resulting in a fatality, injury, and/or damage.*

Hail Data Table					
Injuries & Deaths		**Property & Crop Damage**		**Geographic Extent**	**Events 1975-2020**
0	0	0	0	2"> hail and lightning events with Injuries/Deaths = 2	Total = 18 Annualized = 0.39
Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan					

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.
Based on NCEI definitions/criteria: Hail (C). *Frozen precipitation in the form of balls or irregular lumps of ice. Hail 3/4 of an inch or larger in diameter will be entered. Hail accumulations of smaller size, which cause property and/or crop damage or casualties, should be entered. Maximum hail size will be encoded for all hail reports entered.*

Future Risk

Future probability was factored into the hazard risk vulnerability and ranking for each identified hazard, as detailed *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, & Data Tables*. Results for the severe storms hazard indicate a future probability ranking of "highly likely". These storms have produced 20 fatalities, with 2 of those fatalities occurring during storms with hail greater than 2". In addition, there have been $212,500 in property damage and $10,000 in crop damage over the past 50 years.

Vulnerability

Vulnerability

Vulnerability to the effects of severe storms on buildings depends on the age of the building (and the building codes in effect at the time it was built), type of construction, and condition of the structure (how well it has been maintained).

The entire county may be affected by thunderstorms, lightning, and hail. Agricultural land suffers the most damage from hailstorms. Kent County has a total area of 278.34 square miles and 343 miles of shoreline. Severe lightning and thunderstorms may result in the loss of utilities, an increase in traffic accidents, impassable roads, lost income since normal commuting may be hindered, and loss to crops.

Thunderstorms, lightning, and hail can all be extremely hazardous. They may reduce visibility and put strain on power lines, roofs, and other structures. Severe storms have been and will continue to be a significant threat to the economic and social well-being of Kent County. Disruptions of emergency and other essential services and critical facilities are the main threats to people and property. Particularly at risk are County crops which fall victim to hailstorms.

Severe storm activity poses a significant threat to unprotected or exposed lifeline systems. Generally, commercial power networks are very susceptible to interruption from lightning strikes, high winds, and hail. Other utilities, including underground pipelines, may be impacted if not protected from exposure.

All critical and public facilities in the County are vulnerable to the effects of severe storms, due to the potential disruption of services and transportation systems as well as possible structure exposure to lightning strikes (directly or by tree limbs). The County's critical and public facilities are mapped and detailed within *Appendix F: Critical & Public Facilities*.

Capabilities

Capabilities

Lightning rod/protection systems are installed at the following locations throughout Kent County:

- Office of Emergency Services, 9-1-1 Communications, Sheriff's Office, and the Detention Center (collocated) – 104 Vickers Drive, Chestertown, Maryland.
- Chestertown Town Hall – 118 N. Cross Street
- Wastewater Treatment Plan – 25792 John Hanson Road
- Water Treatment Plant – 405 N. Kent Street

In addition, lightning rods are installed on water towers throughout Kent County. These rod protect structures from lightning strikes, where it could start a fire, cause electrocution, or result in power outage. *Appendix D: Capability Assessment* of this document contains more extensive information.

Mitigation Strategies

Mitigation goals, objectives, and action items were identified throughout the plan development process for the unincorporated areas of the county and each of the five (5) towns. Following the review and discussion of risk and vulnerability, stakeholders identified and prioritized new action items for this plan update. One (1) action item has been identified and designated "severe storms" and is listed below. In addition, one (1) "all-hazards" action item applicable to the "severe storms" included in the table below. The mitigation action item listed as a "High" priority has been further detailed in the table below and includes discussion, potential funding sources, and a timeline for implementation.

Section 7 Goal: Assess buildings, specifically critical facilities, that may benefit from lightning protection due to hazard risk and probability.

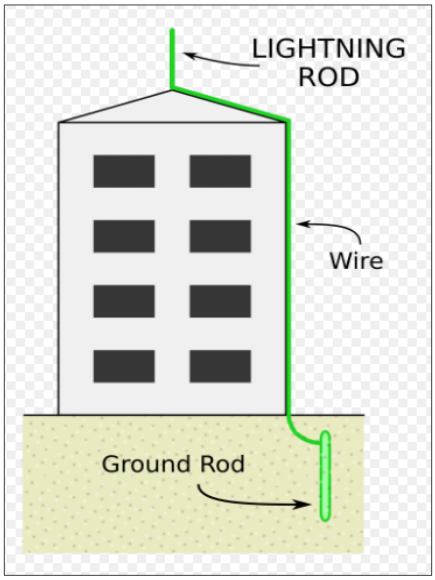
Objective 1: List and prioritize critical facilities for lightning protection using past damages, and potential damages. Upgrade and maintain existing lightning protection systems to prevent roof cover damage and/or install new lightning protection systems at critical facilities.

Action Items	Hazard(s)	Category	Responsible Entity(s)	Priority Ranking
Pursue Storm Ready Certification through the National Weather Service.	All-Weather Related Hazards	Emergency Services	Kent County Office of Emergency Services	Medium
Install lightning rod(s) at Shore Regional Health and Washington College.	Severe Storms	Property Protection	Shore Regional Health, Washington College	High

Discussion: A **lightning rod** is a metal rod mounted on a structure and intended to protect the structure from a lightning strike. If lightning hits the structure, it will preferentially strike the rod and be conducted to ground through a wire, instead of passing through the structure, where it could start a fire or cause electrocution.

In a **lightning protection system**, a lightning rod is a single component of the system. The lightning rod requires a connection to earth to perform its protective function. Lightning rods come in many different forms, including hollow, solid, pointed, rounded, flat strips, or even bristle brush-like. The main attribute common to all lightning rods is that they are all made of conductive materials, such as copper and aluminum.

Lightning rods (and the accompanying protection system) are designed to protect a house or building from a direct lightning strike and, in particular, a lightning-initiated fire. Note that lightning protection systems do not prevent lightning from striking the structure, but rather intercept a lightning strike, provide a conductive path for the harmful electrical discharge to follow (the appropriate UL-listed copper or aluminum cable), and disperse the energy safely into the ground (grounding network). It's very important that these components be properly connected (bonded) to minimize the chances for any sparks or side flashes.



While lightning rods help protect a structure from a direct lightning strike, a complete lightning protection system is needed to help prevent harmful electrical surges and possible fires caused by lightning entering a structure via wires and pipes. A complete system also includes electrical surge protection devices for incoming power, data, and communication lines, and surge protection devices for vulnerable appliances. Lightning protection may also be needed for gas piping.

Any lightning protection system should follow the national safety standards and requirements of the Lightning Protection Institute, National Fire Protection Association, and Underwriters Laboratories.

Possible Funding Sources: FEMA Hazard Mitigation Grant Program (HGMP), FEMA Building Resilient Infrastructure and Communities (BRIC).

Timeline for Implementation: Grant Application and Project Implementation 1-3 years

SECTION 8

SECTION 8 TOPICS

- HIGH WIND HAZARD
- HISTORY & FUTURE RISK
- VULNERABILITY
- CAPABILITIES
- MITIGATION STRATEGIES

PLAN UPDATE HIGHLIGHTS

High wind is a “new” hazard identified during the hazard identification process for the plan update.

The high wind hazard section includes Derecho & Straight-line Winds, High Winds, and Strong Winds.

Hazard Risk Assessment Data tables were developed using data from the 2016 State of Maryland Hazard Mitigation Plan and the National Centers for Environmental Information (NCEI) – Storm Events Database.

A figure illustrating the ASCE design wind speed zones was included and shows the design wind speeds for Kent County.

The vulnerability analysis discusses potential impacts from wind related hazard events, including debris generation.

Loss estimations were provided using data collected by the National Center for Environmental Information.

New capabilities provided by stakeholders were discussed. Kent County along with all five (5) municipalities have adopted the 2018 International Building Code. Wind loads criteria for coastal high hazards areas was provided.

This is a new section, therefore new goals and objectives were developed.

New 2020-2025 Mitigation Action Items provided by stakeholders were included. Action items ranked “High” were further detailed to include discussion, potential funding sources, and a timeline for implementation.

High Wind Hazard

Hazard

The High Wind Hazard for this section includes derecho & straight-line winds, high winds, and strong winds.

Derecho & Straight-Line Winds

These winds are widespread, long-lived windstorms that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous microbursts, downbursts, and downburst clusters. Wind damage swath extends more than 240 miles (about 400 kilometers) and includes wind gusts of at least 58 mph (93 km/h) or greater along most of its length.

High Wind

There are three basic types of damaging high wind events that affect Maryland: synoptic-scale winds, tropical storm winds and thunderstorm winds. Synoptic-scale or large-scale winds are high winds that occur typically with cold frontal passages or Nor'easters and are uncommon in Maryland. The National Weather Service considers a thunderstorm to be severe only if it produces wind gusts of 58 mph or higher.

"Downbursts" cause the high winds in a thunderstorm. Downburst winds result from the sudden descent of cool or cold air toward the ground. As the air hits the ground, it spreads outward, creating high winds. Unlike tornadoes, downburst winds move in a straight line, without rotation. Most wind events in Maryland occur in June and July. High winds generated from coastal storm events cause a significant amount of damage on Maryland's Eastern Shore.

Strong Winds

Strong winds are defined as non-convective winds gusting less than 58 mph, or sustained winds less than 40 mph.

History & Future Risk

History

Information obtained for Kent County using both the *2016 State of Maryland Hazard Mitigation Plan* and the National Centers for Environmental Information (NCEI) – Storm Events Database between January 1950 and December 31, 2019 for High Wind Hazard include: Derecho & Straight-Line Winds, High Winds, and Strong Winds.

There has been a total of 112 High Wind Events between 1996-2020, with an annualized rate of 4.48. These storms have produced $630,980 in property damage, $1,000 in crop damage, and had a SVRGIS (intensity & frequency) of 1.

Total High Wind Hazard Risk Assessment Data Table *Hazards included within this table from NCEI Data: Derecho, High Wind and Strong Wind.*					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	630.98K	1K	ASCE Wind Design Speed = 90	Total = 112 Annualized = 4.48

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

High Wind Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	396.50K	0	ASCE Wind Design Speed = 90	Total = 28 Annualized = 1.12

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.
Based on NCEI definitions/criteria: High Wind (Z). *Sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer, or gusts of 50 knots (58 mph) or greater for any duration (or otherwise locally/regionally defined). In some mountainous areas, the above numerical values are 43 knots (50 mph) and 65 knots (75 mph), respectively. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data.*

Strong Wind Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1997-2020
0	0	214.48K	1K	ASCE Wind Design Speed = 90	Total = 83 Annualized = 3.46

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.
Based on NCEI definitions/criteria: Strong Wind (Z). *Non-convective winds gusting less than 50 knots (58 mph), or sustained winds less than 35 knots (40 mph), resulting in a fatality, injury, or damage. Consistent with regional guidelines, mountain states may have higher criteria. A peak wind gust (estimated or measured) or maximum sustained wind will be entered.*

Derecho Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2012-2020
0	0	20K	0	ASCE Wind Design Speed = 90	Total = 1 Annualized = 0.11

Source: - National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan.

Based on NCEI definitions/criteria: Derecho. *A widespread, long-lived windstorm associated with a band of rapidly moving showers or thunderstorms variously known as a squall line, bow echo, or quasi-linear convective system. Although a derecho can produce destruction similar to that of a tornado, the damage typically occurs in one direction along a relatively straight swath. As a result, the term "straight-line wind damage" sometimes is used to describe derecho damage. By definition, a derecho must include wind gusts of at least 58 mph (50 knots or 93 km/h) or greater along most of its length. A derecho wind damage swath must extend more than 240 miles (about 400 kilometers).*

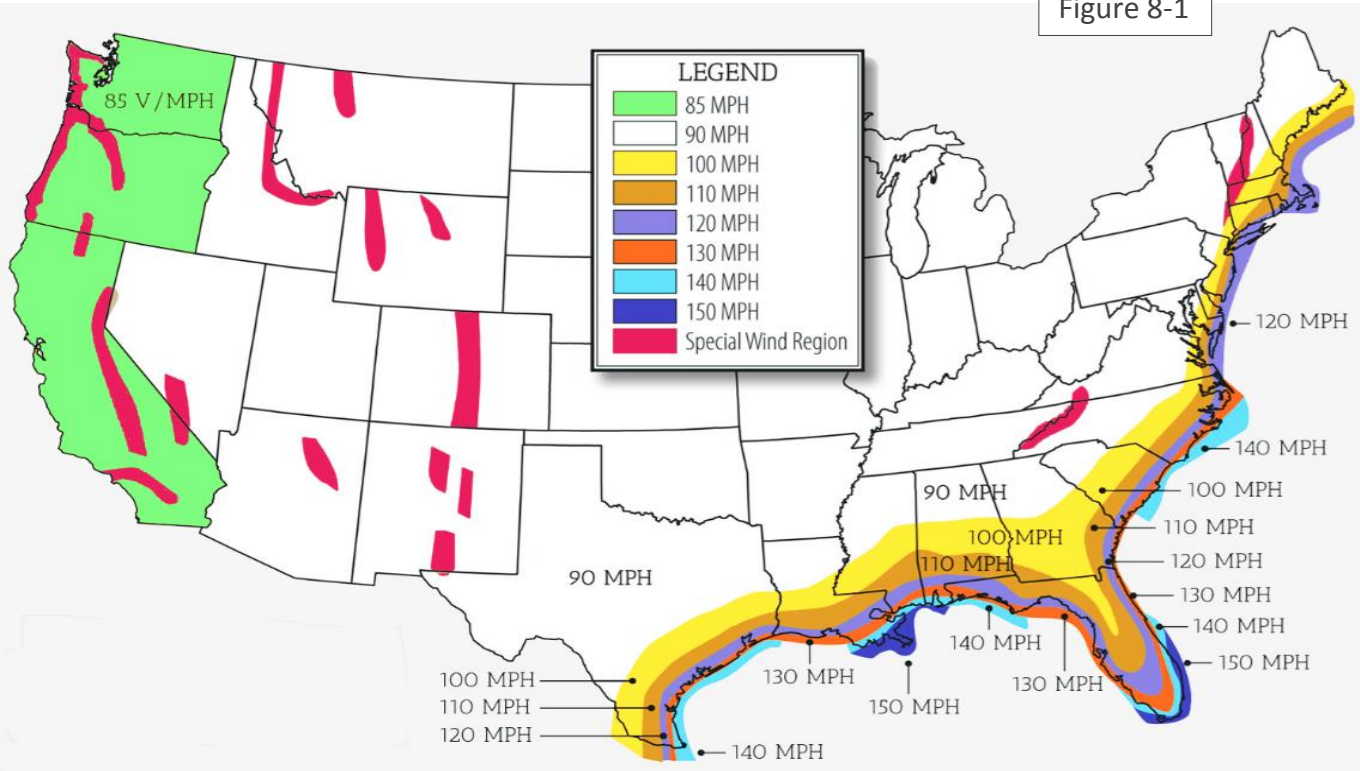
The high wind hazard was identified as a new hazard during the 2020 planning cycle and was given a ranking of "Medium High". In order to assess the hazard risk identified, a composite score method was undertaken. The composite score method was based on a blend of quantitative and qualitative factors extracted from the National Centers for Environmental Information (NCEI), stakeholder survey, and other available data sources. These included:

- Historical impacts, in terms of human lives and property;
- Geographic extent;
- Historical occurrence;
- Future probability; and
- Local community perspective.

Detailed information is available within *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, and Hazard Data Tables.*

According to the ASCE design wind speed zones, the wind design speed zones for Kent County is 90-100 mph, shown below on Figure 8-1.

Figure 8-1



Source: ALP, http://alppoles.com/wind-speed.php Note: 2009 AASHTO LTS-5 specification 3-second gust basic wind speeds mph) with gust effect factor (G) of 1.14- and 25-year design life wind map (ASCE 7-05) is shown above. This wind map should be used to determine wind velocity for your specific location. If you are located between two different velocity isotach lines, the higher velocity should be used.

Future Risk

Future probability was factored into the hazard risk vulnerability and ranking for each identified hazard, as detailed *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, & Data Tables*. Results for the High Wind hazard indicate a future probability ranking of "highly likely".

Vulnerability

Vulnerability

The entire county and five (5) towns have the potential to be impacted by high wind events. Hazard event data indicate that 4 to 5 high winds events occur within the County annually. Both loss of power at critical facilities and potential debris generation are potential impacts from wind related hazard events.

Loss Estimations

Losses totaled to date for all high wind hazards are in excess of $1.2 million dollars according to data collected by the National Center for Environmental Information. The date range for property and crop damage for high wind hazards is 1996 to 2020. Using loss estimations reported during this date range annual projected losses for high wind hazards are $50K.

Capabilities

Capabilities

According to the Capability Assessment (see *Appendix D: Capability Assessment*) completed for this plan update, Kent County along with all five (5) municipalities have adopted the *2018 International Building Code*.

In Coastal High Hazard Areas (V-Zones), the following applies to wind loads:

B. New and substantially improved structures.

(1) All new or substantially improved structures shall be elevated on adequately anchored pilings or columns to resist flotation, collapse and lateral movement due to the effect of the one-hundred-year water loads and **wind loads** acting simultaneously on all building components. Water-loading values shall be those associated with the base flood and **wind-loading values** shall be those required by local building standards. The bottom of the lowest horizontal structural member supporting the lowest floor shall be elevated one (1) foot above the base flood elevation. Building designs and elevations must be certified by a registered professional engineer or architect that the building has been designed to **withstand the water and wind loads and to be anchored properly**. The use of slabs or other at-grade foundation systems shall be prohibited.

(2) The space below the flood protection elevation shall be free of obstruction or may be enclosed with open wood lattice, insert screening or breakaway walls.

(3) Breakaway walls shall be designed to collapse under a **wind and water load** less than would occur during the one-hundred-year flood and have a design safe loading resistance of not less than ten (10) pounds and not more than twenty (20) pounds per square foot. Glass walls shall not be considered breakaway walls. Enclosed areas below the flood protection elevation shall be used solely for the parking of vehicles,

limited storage and building access. If such areas are enclosed, a non-conversion agreement shall be signed.

C. **Manufactured homes** and recreational vehicles. Manufactured homes **shall not be permitted in the coastal high hazard area**.

Damages from high wind events often result in debris, specifically woody debris. The Town of Betterton has free yard waste pick-up March through November, typically during the months when high wind events are most likely to occur.

Mitigation Strategies

Mitigation goals, objectives, and action items were identified throughout the plan development process for the unincorporated areas of the county and each of the five (5) towns. Following the review and discussion of risk and vulnerability, stakeholders identified and prioritized new action items for this plan update. Several action items have been identified and designated "All Weather-Related Hazards" in which "High Wind" related event impacts result. The mitigation action items listed as "High" priority have been further detailed in the table below.

Section 8 Goal: Minimize the losses of life and property due to High Winds in Kent County.

Objective 1: Establish and coordinate the development of the debris management plan with various stakeholders includes representatives from each of the Towns.

Objective 2: Use FEMA guidance documents to review draft plan.

Objective 3: Minimize the impact of power loss form damaging high wind events.

Action Items	Hazard(s)	Category	Responsible Entity(s)	Priority Ranking
Install generator at Washington College campus: Johnson Fitness Center, Hudson Hall & gym. These locations would be where students congregate during a hazard event. Johnson Fitness Center is also used as shelter for several elementary schools. Dining Hall needs a generator to be able to continue to provide meals to students and first responders when necessary.	All-Weather Related Hazards	Emergency Services	Washington College	Medium
Install back-up generators at public utility facilities, Town Hall, and VFD.	All-Weather Related Hazards	Property Protection	Town of Millington	Medium
Install back-up generators at (5) pump stations.	All-Weather Related Hazards	Property Protection	Town of Betterton	High

Discussion: The effects of wind events can last longer than the actual storm itself when it comes to power. With power lines being knocked down and underground lines getting flooded, trees to get out of the way before restoration, it can take days or even weeks before power is fully restored. That much downtime can heavily affect critical utility functions without a backup power supply.

Possible Funding Sources: FEMA BRIC

Timeline for Implementation: Grant Application and Project Implementation 1-3 years

Continue work on the development of the County Debris Management Plan. Coordinate the development of the plan with various stakeholders, specifically the Towns of Betterton, Galena, Rock Hall, Chestertown, and Millington.	**Tornado, High Wind, Hurricane, Severe Storms**	Prevention	Kent County Office of Emergency Services, Dept. of Public Works, Towns	**High**

Discussion: A debris management plan is a written document that establishes procedures and guidelines for managing disaster debris in a coordinated, environmentally responsible, and cost-effective manner. The human, financial, environmental, and political costs associated with insufficient debris management planning can be devastating.

Disaster debris can complicate and delay disaster response activities such as medical care, transportation of victims or relief teams, firefighting, and provision of shelter, food, and water to disaster survivors. Facilitates the quick return of a community to normalcy.
Disaster debris can complicate and delay the short and long-term recovery of the community and its return to normalcy.

In some disaster events, the amount of debris generated can be equivalent to years, if not decades, of normal solid waste production in the affected jurisdictions. Landfill capacities may be overwhelmed, roads may be damaged by debris hauling, debris may be disposed of without adequate controls, and the debris may present a general public health and safety hazard.

An effective debris management plan:

- Facilitates response and recovery activities;
- Facilitates the quick return of a community to normalcy;
- Reduces impacts to humans and the environment;
- Ensures effective use of resources;
- Helps to control and minimize costs; and,
- Aids in complying with applicable local, state/tribal/territorial, and Federal regulations.

Possible Funding Sources: Staff Time

Timeline for Implementation: Project has been started by the Office of Emergency Services- 1 year for collaboration with project partners and plan completion.

SECTION 9

SECTION 9 TOPICS

- EARTHQUAKE HAZARD
- HISTORY & FUTURE RISK
- VULNERABILITY
- CAPABILITIES
- MITIGATION STRATEGIES

PLAN UPDATE HIGHLIGHTS

Earthquake was identified as a new hazard for the 2020 Plan Update and therefore the new Section 9 was developed.

Mercalli magnitude and intensity measures are discussed as well as the history of earthquakes in Maryland.

The vulnerability analysis focused on the U.S Geological Survey's seismic hazard forecast. The 2017 USGS Forecast for Damage from Natural and Induced Earthquakes was added.

Identified and integrated new data sources obtained from the United States Geological Survey, 2014 U.S. Geological Survey (USGS) National Seismic Hazard Maps.

Earthquake Shaking Intensity was discussed and Shaking Intensity figure included.

New capabilities provided by stakeholders were discussed. Kent County adopted the current 2018 International Building Code.

New goals and objectives were developed for this section.

New 2020-2025 Mitigation Action Items provided by stakeholders were included. Action items ranked "High" were further detailed to include discussion, potential funding sources, and a timeline for implementation.

Earthquake Hazard

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. While earthquakes have been felt in and around Kent County, no impacts have been reported.

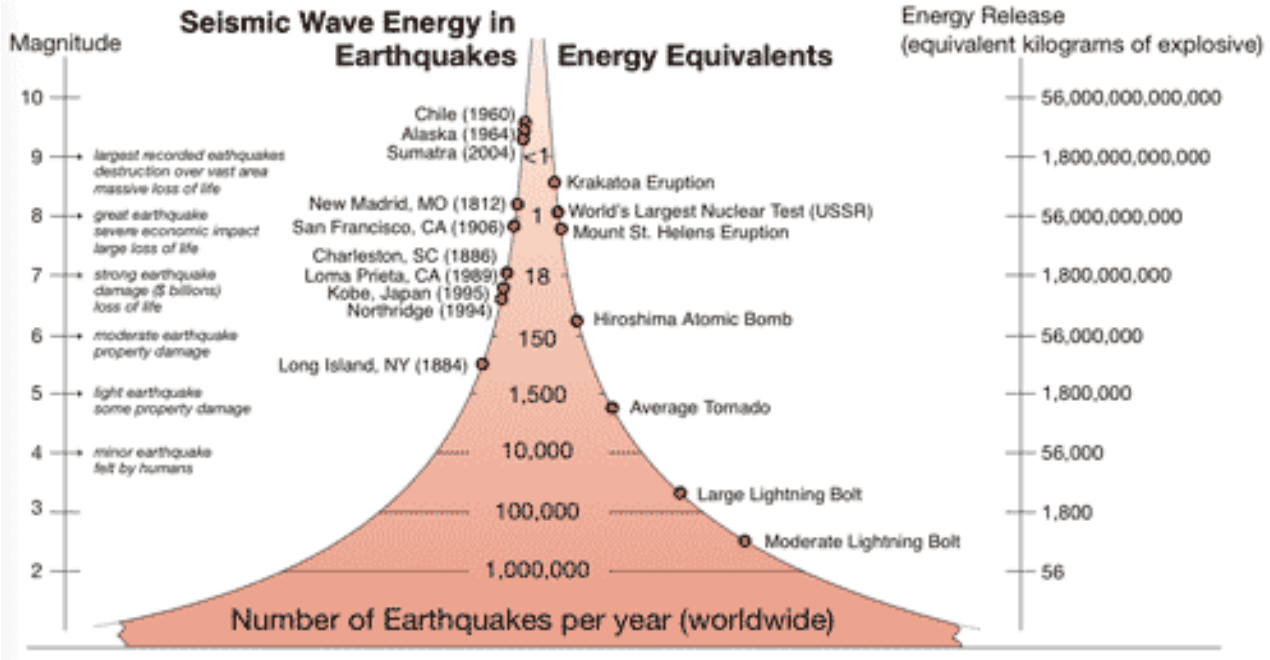
History & Future Risk

History

In general, earthquakes with an epicenter in Maryland are a rare occurrence, especially events with high intensity and/or magnitude. In most cases, earthquakes that are felt in Maryland occur in adjacent states, such as Virginia or Pennsylvania. Earthquakes are measured by their Mercalli magnitude and their intensity. The following table describes both measurements.

Magnitude and **Intensity** measure different characteristics of earthquakes. Magnitude measures the energy released at the source of the earthquake. Magnitude is determined from measurements on seismographs. Intensity measures the strength of shaking produced by the earthquake at a certain location

Figure 9-1



Source: https://www.usgs.gov/natural-hazards/earthquake-hazards/science/earthquake

The table below details earthquake events within and around Maryland that have occurred in the past 24 years.

Table 9-1: Earthquake Events in Maryland			
Date	General Location	Intensity	Magnitude
1996/08/02	Perryville	II-III	2.2
1996/10/17	Rising Sun (epicenter may be in Pennsylvania)	III	2.2, 2.3
1996/12/06	Columbia - Allview Estates	II	<1.5 (est.)
1996/12/14	Columbia - Allview Estates	II	<1.5 (est.)
1996/12/16	Ilchester - Ellicott City	I	about 1 (est.)
1996/12/22	Columbia - Allview Estates	III	2.0, 2.3
2001/12/18	Columbia near US29-MD32	II	1.5-2.0 (est)
2002/03/22	Columbia near US29-MD32	I	1-2 (est.)
2003/12/09	28 miles west of the Richmond in rural Powhatan County, VA	VI	4.5
2005/02/23	Southeastern Baltimore near Fort McHenry, Dundalk, Glen Burnie, Pasadena, Gambrills	II-III	2.0-2.1
2008/12/27	6 miles west of Lancaster, PA.	IV	3.4
2009/07/01	Southwestern New Jersey	III	2.8
2009/09/29	4 miles NNE (15°) from Bel Air North, MD	II	1.6
2010/07/16	Potomac-Shenandoah Region, MD	V	3.4
2011/08/23	5 miles SSW (195°) from Mineral, VA	V-VI	5.8
2017/10/30	Glenelg, Maryland	I	1.52
2017/11/11	0.8 km (0.5 mi) ESE of Roxbury, Maryland	I	1.5

Source: Maryland Geological Survey

The highest intensity and/or magnitude earthquake felt in Maryland was on August 23, 2011, an earthquake struck Mineral, Virginia with a magnitude of 5.8. The earthquake was approximately 164 miles southwest of Chestertown in Kent County and was felt throughout the County; however, no damage was reported.

Future Risk

Future probability was factored into the hazard risk vulnerability and ranking for each identified hazard, as detailed *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, & Data Tables.* Results for the earthquake hazard indicate a future probability ranking of "occasional" while impacts are minimal, indicating a future risk rating of "'low."

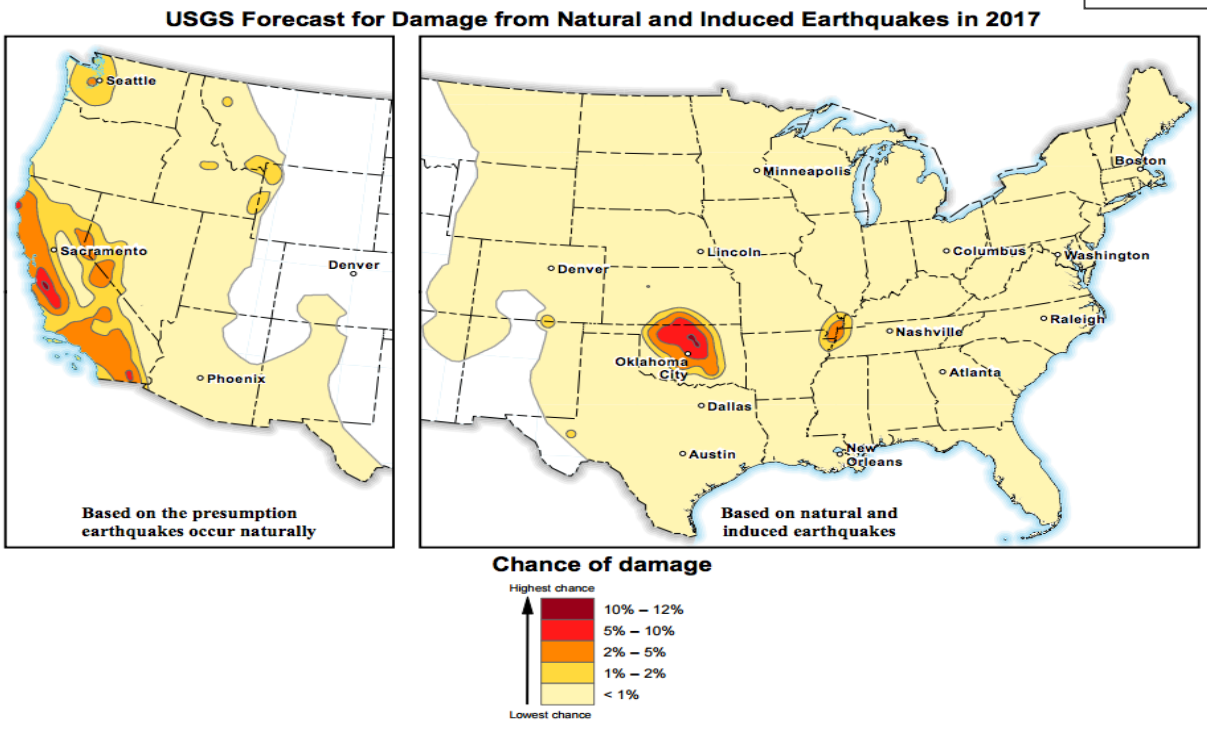
Vulnerability

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 figure below, the eastern Unites States, Maryland specifically, has less than a 1-percent chance of earthquake damage.

Figure 9-2



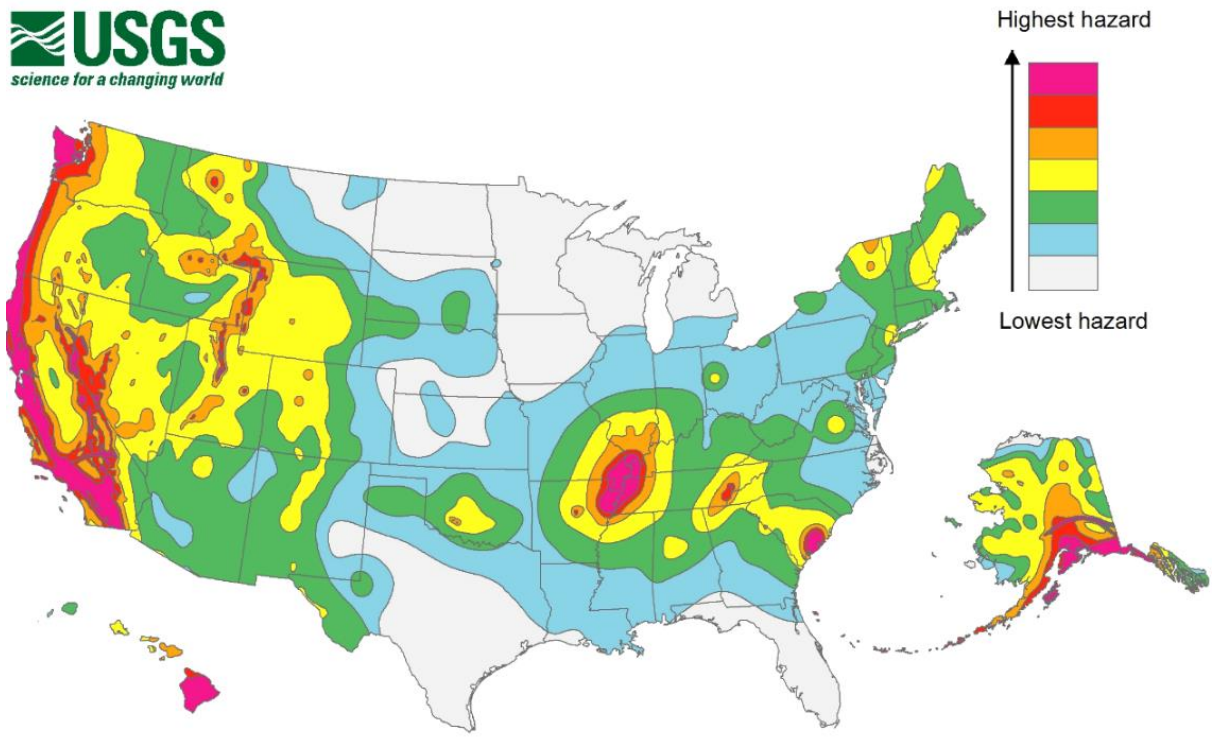
USGS map displaying potential to experience damage from natural or human-induced earthquakes in 2017. Chances range from less than 1 percent to 12 percent.

The following excerpt contains USGS Long-Term 2014 Model information and figure indicates that Kent County is within an 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).

Figure 9-3

U.S. Earthquake Seismic Hazard Map



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 9-4

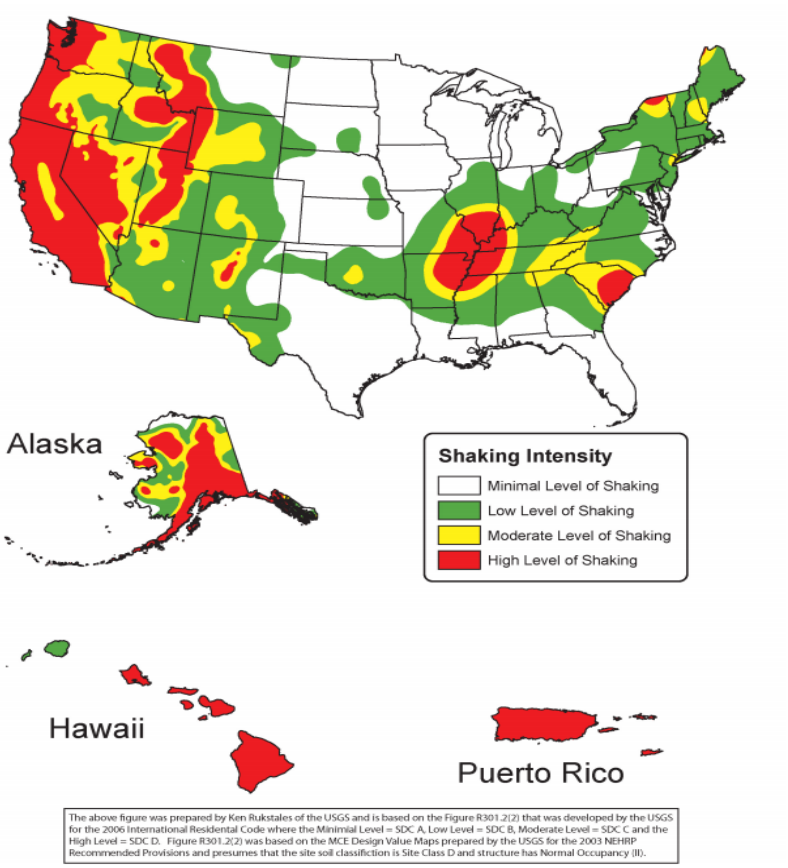


Figure 3.2.1-1 Map of probable shaking intensity in the United States.

Capabilities

Capabilities

Kent County has adopted the most recent, 2018 International Building Code (IBC). The International Code Council (ICC) publishes building codes that promote safety and fire prevention in commercial, government and residential structures. These codes are used throughout the US, including enforcement by several federal agencies. While evidenced in this section, the earthquake hazard has resulted in no damages historically and is considered a “low” risk hazard both now and into the future. Therefore, additional, or higher thresholds for building codes locally have not been deemed warranted. *Appendix D: Capability Assessment* of this document contains more extensive information.

Mitigation Strategies

Mitigation goals, objectives, and action items were identified throughout the plan development process for the unincorporated areas of the county and each of the five (5) towns. Following the review and discussion of risk and vulnerability, stakeholders identified and prioritized new action items for this plan update. Action items identified and designated "earthquake" specific are listed below.

Section 9 Goal: Assess earthquake damage susceptibility.

Objective 1: Determine what facilities, if any, specifically critical facilities, have nonstructural components that need bracing or anchoring.

Action Items	Hazard(s)	Category	Responsible Entity(s)	Priority Ranking
Following the review of FEMA E-74 Practical Guide, examine critical and public facilities for proper anchorage and bracing of non-structural components.	Earthquake	Property Protection	Kent County Office of Emergency Services, Dept. of Public Works, Towns	Low
Continue to participation in The Great Shake Out Drill - Drop.	Earthquake	Property Protection	Kent County Office of Emergency Services, Health Dept.	Medium

SECTION 10

SECTION 10 TOPICS

- CLIMATE ADAPTATION HAZARD
- HISTORY & FUTURE RISK
- VULNERABILITY
- CAPABILITIES
- MITIGATION STRATEGIES

PLAN UPDATE HIGHLIGHTS

Climate Adaptation was added as a "new" hazard for the 2020 Plan Update. The Climate Adaptation section includes shoreline erosion and projected sea level rise.

Recent information from the State of Maryland Climate Change website was included.

Information from the *2019 The Greenhouse Gas Emissions Reduction Act* and *2016 Climate Change and Sea Level Rise Adaptation Report Kent County, Maryland* was reviewed and integrated.

Kent County solar panel permit data obtained from the Department of Planning and Zoning was added.

Sea level rise projections were reviewed and updated in the *2018 Sea Level Rise Projections for Maryland*. Vulnerability analysis for projected sea level rise risk assessment and loss estimations were completed using new data developed by NOAA's Office for Coastal Management. New maps were generated for the northern and southern parts of County, municipalities, and structures at risk to projected sea level rise of 1 to 3 feet. New Project Sea Level Rise At-Risk Structures and Loss Estimations Per Community tables were developed and included.

Critical & Public Facilities at risk to projected sea level rise of 1 to 3 feet were analyzed. Facilities at risk were provide in table and mapping formats.

New capabilities provided by stakeholders were discussed. Several climate change and adaptation reports have been completed for Kent County.

New goals and objectives were developed for this section. New 2020-2025 Mitigation Action Items provided by stakeholders were included. Action items ranked "High" were further detailed to include discussion, potential funding sources, and a timeline for implementation.

Climate Adaptation Hazard

Hazard

According to the State of Maryland's Climate Change website (http://climatechange.maryland.gov/science/), climate change is defined as changes in weather patterns on a global, continental, regional, or local scale. On a global scale, temperatures and sea levels are rising, rainfall patterns are shifting, and wildlife habitats are changing. In addition, there is an increasing number and severity of hurricanes, winter storms, droughts, and other extreme weather events. The effects are already apparent in rising seas, summer heat waves, and more frequent and violent thunderstorms. Climate Change directly affects Marylanders and the state's economy.

Shoreline Erosion

Erosion and accretion are long term, dynamic processes that occur along shorelines. Major erosion/accretion events are usually associated with coastal storms because floodwater forces have the ability to cause significant acts of erosion/accretion in a short time period. Erosion is considered a serious hazard in coastal areas because it can threaten coastal development by eroding beach areas including the flat berm portion and protective dunes. In general, shoreline erosion poses a significant threat to property owners, the public and natural resources, both terrestrial and aquatic.

Sea Level Rise

Sea level rise is an increase in the level of the world's oceans due to the effects of global warming. Burning fossil fuels is one of the causes of global warming because it releases carbon dioxide and other heat-trapping gasses into the atmosphere. The oceans then absorb the majority of this heat. As water becomes warmer, it expands. This results in ocean levels rising worldwide.

Land-based ice, such as glaciers and ice sheets, is greatly affected by global warming, as well. These reserves of ice are located in places like Greenland and Antarctica. Typically, they experience melt during the warmer months of the year and the ice is replenished in colder months. With the average year-round global temperatures rising, however, ice caps and glaciers are experiencing a disproportionate amount of melting at an accelerated rate.

What's the difference between global and local sea level?

Global sea level trends and relative sea level trends are different measurements. Just as the surface of the Earth is not flat, the surface of the ocean is also not flat—in other words, the sea surface is not changing at the same rate globally. Sea level rise at specific locations may be more or less than the global average due to many local factors: subsidence, upstream flood control, erosion, regional ocean currents, variations in land height, and whether the land is still rebounding from the compressive weight of Ice Age glaciers.

Sea level is primarily measured using tide stations and satellite laser altimeters. Tide stations around the globe tell us what is happening at a local level —the height of the water as measured along the coast relative to a specific point on land. Satellite measurements provide us with the average height of the entire ocean. Taken together, these tools tell us how our ocean sea levels are changing over time.

Sea level rise poses a serious threat to coastal life around the world. Consequences include increased intensity of storm surges, flooding, and damage to coastal areas. In many cases, this is where large population centers are located, in addition to fragile wildlife habitats. Therefore, people may become displaced and will need to seek safer homes. Even life farther inland is threatened because rising seas can contaminate soil and groundwater with salt.

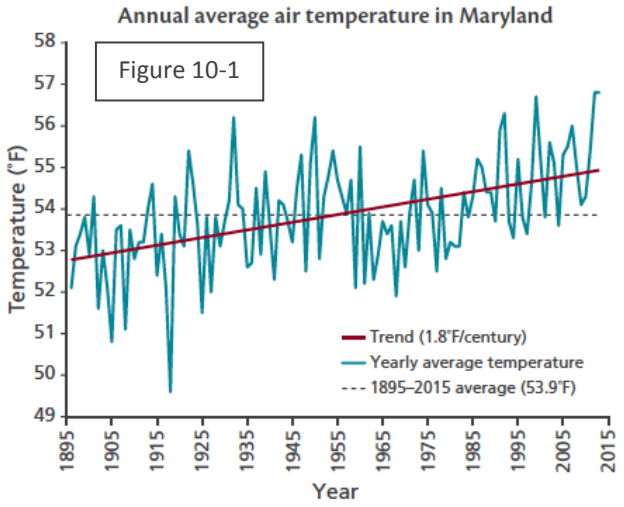
History & Future Risk

History

According to the State of Maryland Climate Change website, within Maryland, temperatures and coastal sea levels are rising, and extreme events are more frequent. The increases in temperatures are related to increases in greenhouse gas emissions over the last 50 years. Long-term temperature data shows that average temperatures in Maryland have risen in the last century and will continue to rise in the future.

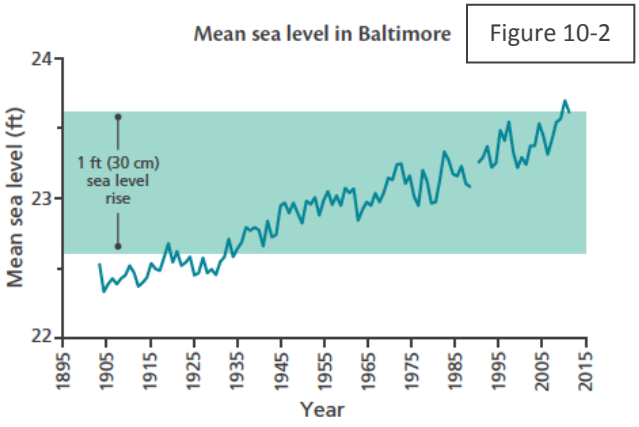
The State of Maryland is experiencing warmer winter days, more intense heat and humidity in the summer, and more damage due to storms. Figure 10-1, annual average air temperature in Maryland shows that the temperature has increased 1.8°F per century since 1895.

Figure 10-1



Source http://climatechange.maryland.gov/science/

Figure 10-2



Source http://climatechange.maryland.gov/science/

Historic tide gauge records demonstrate that sea levels are rising along Maryland's coast. Due to a combination of global sea level rise and land subsidence, sea levels have risen about one foot within Maryland's waters during the last 100 years. As our climate changes, sea levels are expected to continue to rise, potentially twice as fast as during the 1900s. Maryland is at risk of experiencing another one-foot rise in sea level by 2050 and as much as a three-foot rise by 2100, contributing to higher storm wave heights, greater flooding in low-lying coastal areas, exacerbated shoreline erosion, and damage to property and infrastructure. The long-term tide gauge in Baltimore Harbor shows a steady rise in sea level since the early 1900s.

Maryland is experiencing more frequent extreme rain and storm events and more flooding as a result of sea level rise and coastal storms. Increasing temperatures, which allow air to trap more moisture, will make these storm events more common. Extreme events affect human health both directly and indirectly. Warmer temperatures and poor air quality increase respiratory illness and other health problems in our vulnerable populations. Extreme events can directly damage infrastructure such as water treatment and supply, transportation, and electricity systems.

Shoreline Erosion

A large percentage of Kent County's shorelines incur erosion accelerated by high winds, high tides, overland flow, and shoreline cliff sluffing. The greatest numbers of incidences occur during the fall and winter months. A small number of damaging wind events coupled with abnormally high tides, causing shoreline erosion to occur each year.

Much of the County's soils are highly erodible and susceptible to storm damage. With shoreline cliffs and steep banks along the Sassafras and the Chesapeake Bay, overland flow meets storm surge events halfway and causes unique erosion problems for landowners. Highly erodible soils along the Sassafras River and county creeks also cause unique challenges for property owners.

All shorelines in the County are subject to the effects of erosion. The most severe impacts occur along those shorelines with the longest fetch or exposed distance over water in front of the shore. Although erosion is a natural process, it can create significant problems for property owners, businesses, and the public, especially when inappropriate planning and design activities either increase natural erosion rates or compound the impact of natural erosion processes. The Maryland Geological Survey (MGS) began to quantify the problem in 1914, documenting major reductions of various islands throughout the State such as Sharp, James and Tilghman Islands.

Sea Level Rise

According to the Maryland Department of the Environment, *2019 The Greenhouse Gas Emissions Reduction Act*, in the Northeast, the rate of sea level rise already observed is greater than the global average, having increased about one-foot since 1990 (average is 8 inches), likely due to both increased ice loss as well as changes in regional currents and land subsidence. Maryland has experienced an increase in annual average temperature of 1.5°F since the beginning of the 20th century. Also, a winter warming trend reflected in the average of less than one day per year of nights below 0°F since the mid 1990's, as compared to an average of two nights per year between 1950 and 1994. Annual precipitation, though more variable, increased by approximately 0.39 inches per decade in the Northeast during this same time, with Maryland's annual mean precipitation having been above average for the past two decades. The climate in this region is generally expected to continue trending warmer and wetter over the next century, accompanied by an increase in extreme heat waves and precipitation events.

According to the *2016 Climate Change and Sea Level Rise Adaptation Report Kent County, Maryland,* the average annual temperature in Kent County has increased by 1.5°F compared to the first half of the 20th century. The Chesapeake region, which is expected to warm faster than the global average, could be up to 8°F warmer by the end of this century.

According to FEMA's *Guide to Expanding Mitigation: Making the Connection to Electric Power,* experts predict that extreme weather will continue to jeopardize electric power systems. Therefore, the need to transition to renewable power sources, including solar power, should be considered. Solar power not only assists in mitigating future hazard impacts, but it also provides redundancy during a disaster if it has battery backup, and reduces the emissions from the electric power sector, which contributes to climate change impacts.

Permit data was obtained from the Kent County Department of Planning and Zoning. Data was gathered from January 1, 2015 to October 19, 2020. Within the data, permits for solar panel was extrapolated. Solar panel data on Table 10-1 below, indicates that an average of 32.5 solar panel permits per year for this date range.

Table 10-1: Kent County Permit Data	
Year	# of Solar Panel Permits
2015	49
2016	51
2017	30
2018	30
2019	24
2020	11

Source: Kent County Permit Data, as of October 19, 2020

Future Risk

Climate change is exacerbating environmental conditions in Kent County and increasing the risk of certain natural hazards. Climate change is altering the likelihood of extreme conditions (heat, precipitation, and flooding) in Kent County today and in the future. The climate adaptation hazard is new for the 2020 planning cycle and was given a ranking of "Medium". Community perspective survey results indicate that respondents are "concerned". Future probability was factored into the hazard risk vulnerability and ranking for each identified hazard, as detailed *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, & Data Tables*. Results for the climate adaptation hazard indicate a future probability ranking of "highly likely."

Vulnerability

Vulnerability

Erosion historically occurs along the County's 268 miles of tidal shoreline. Soils found in the northern shorelines along the Sassafras River and its creeks and tributaries are dominated by moderately sloping to steep, well-drained soils formed from loamy materials. The western and southern shorelines located along the Chesapeake Bay and its many creeks and tributaries are dominated by nearly level to moderately sloping, moderately well-drained and poorly drained soils formed from clayey and silty materials. This clay layer often acts as a conduit to stop infiltration and to cause erosion in the form of sluffing along shoreline cliffs. The south-eastern shorelines located along the Chester River and its creeks and tributaries are dominated by level, poorly drained marsh soils formed from organic and mineral materials. Shorelines in this area are also nearly level to moderately sloping with well and poorly drained clayey and silty soils.

According to the Environmental Protection Agency, the climate for the northeast has changed with an average temperature rise of 2 degrees Fahrenheit and an increase of 4 degrees Fahrenheit in winter temperatures. Precipitation events have also increased in magnitude and frequency. Rain events now exceed snow events for the northeast region of the United States. With an increase in rain events, influences to sea level rise are likely to

increase as well. Sea level rise, storm surge, erosion, and the destruction of important coastal ecosystems will likely contribute to an increase in coastal flooding events, including the frequency of the current one-percent annual chance flood event (100-year flood) levels.

Maryland has been at the forefront of states taking action to address the consequences of climate change beginning in 2000 with the development of the *Sea Level Rise Response Strategy*. The state went on to pass the Healthy Air and Clean Cars Acts (2006, 2007, and 2019), join the Regional Greenhouse Gas Initiative (2007), and pass the 2009 and 2016 Greenhouse Gas Emissions Reduction Acts (GGRA). The Maryland Commission on Climate Change (MCCC) was established by Executive Order (01.01.2007.07) in 2007 and charged with developing an action plan and timetable for mitigation and adaptation to the likely consequences and impacts of climate change in Maryland.

According to the *July 2020 Center for Disease Control (CDC) Climate and Health Program*, the health impacts from climate change in the North Eastern United States include:

- Temperature-Related Death and Illness
- Extreme Events
- Water-Related Illness
- Food Safety, Nutrition and Distribution
- Mental Health and Well-Being
- Populations of Concern

The Maryland Department of Health is a CDC funded jurisdiction since 2012 and is a Climate-Ready States and Cities Initiative (CRSCI) recipient.

Maryland Department of Health, CRSCI Recipient, funded by CDC since 2012

The Maryland Climate Change Health Adaptation Program is the lead for integration of health adaptation into the state's response to a changing climate. Located in the Maryland Department of Health, the program provides a health focus to climate response efforts across the state, through technical assistance, development of epidemiologic tools and data products, and education and outreach. The program primarily addresses extreme heat, air quality and respiratory illness, water-borne diseases, and extreme weather events, such as hurricanes and tornadoes. The program, which is closely integrated with the Maryland Commission on Climate Change, includes education and outreach for school age youth (K-12), minority groups, community health workers, and informal healthcare networks. Among the products of the program is a climate change training curriculum for community health workers and extension workers. The training increases competency among informal healthcare networks in order to advise patients and community members on how to understand climate impact on themselves and their health. The program's Climate Ambassador program, which is a program targeted at school age youth in Maryland, provides students with tools and information to educate and empower themselves and their communities to respond to the impacts of a changing climate.

According to the *2016 Climate Change and Sea Level Rise Adaptation Report for Kent County*, the County is naturally vulnerable to elevated water levels and heavy rainstorms. Surrounded on three sides by water, the county has low-lying areas that are exposed to flooding during times of high water in the Chesapeake Bay and two of its tributaries, the Chester and Sassafras Rivers. Poor drainage due to flat terrain and clay soils make the county naturally susceptible to precipitation-driven flooding. Recommendations from the 2016 Climate Change and Sea Level Rise Adaptation Report have been reviewed and integrated into this plan update.

Risk Assessment & Loss Estimations

Current standard loss estimation models and tables for erosion damages are not available. Structural damage to buildings could be simplified as either undamaged or severely damaged due to erosion. Although slight or moderate damage could occur due to erosion, the likelihood of this level of damage is considered small. The estimated structure loss from erosion is based on factors such as: past experience, location of the structure within the hazard area, rate of erosion, and the structure replacement value. The same applies to content damage as well. Relevant data should be collected to complete the vulnerability analysis for this hazard.

Sea level rise projections were reviewed and updated in 2018 for the State of Maryland. According to the *2018 Sea Level Rise Projections for Maryland*, the Likely range (66% probability) of the relative rise of mean sea level expected in Maryland between 2000 and 2050 is 0.8 to 1.6 feet, with about a one-in-twenty chance it could exceed 2.0 feet and about a one-in one hundred chance it could exceed 2.3 feet.

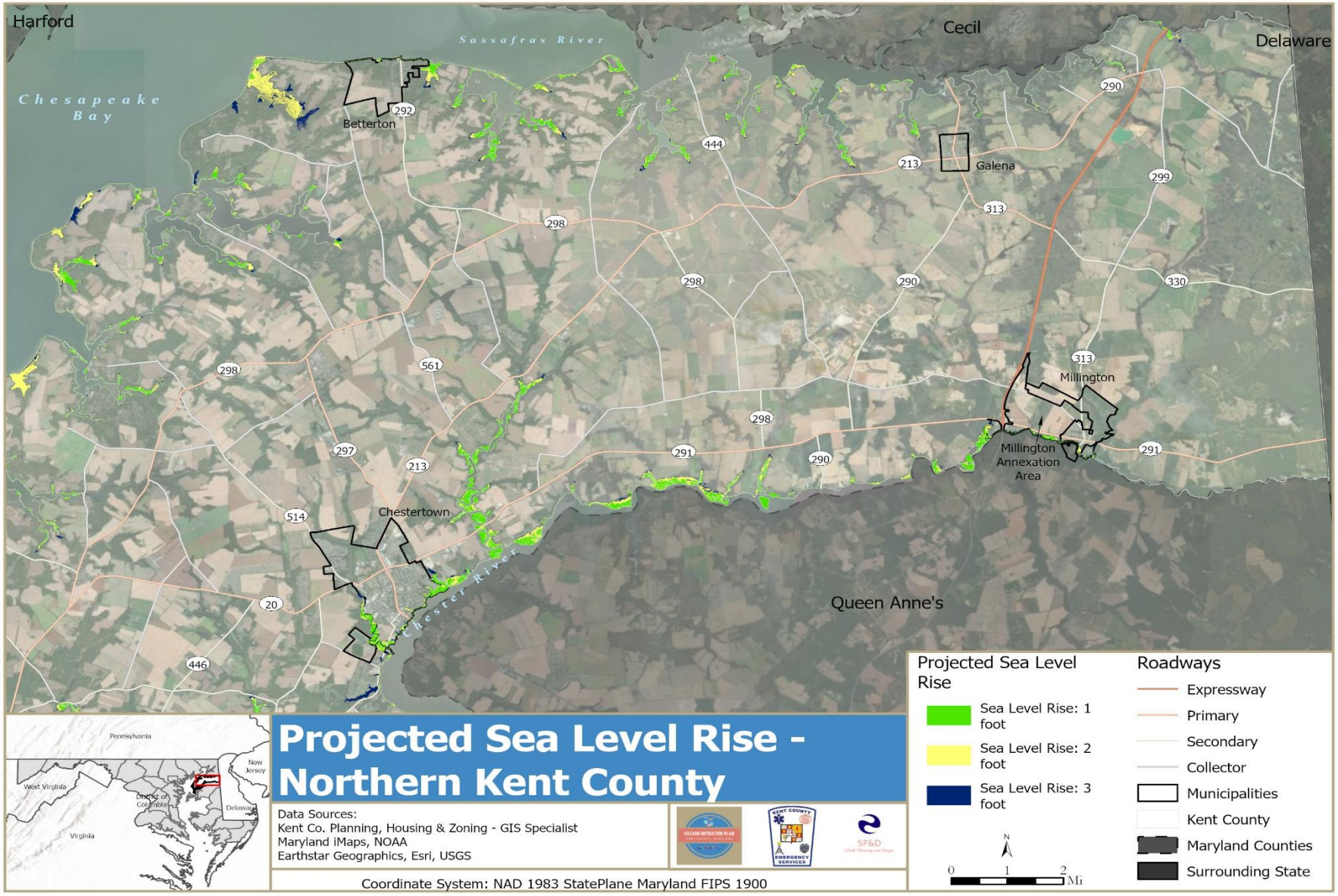
In March 2019, NOAA's Office for Coastal Management released new Sea Level Rise data. The sea level rise layers show inland extent and relative depth of inundation above mean higher high water (MHHW). Mean higher high water is the average height of the highest tide recorded at a tide station each day during the recording period. The sea level rise inundation areas are illustrated during the highest high tides (excludes wind-driven tides) with the sea level rise amount. These layers are projections and do not consider natural processes such as erosion, subsidence, or future construction. *(NOAA Digital Coast Sea Level Rise Viewer, January 2017: Frequent Questions)*

The *2016 Climate Change and Sea Level Rise Adaptation Report* states that Kent County experiences a semidiurnal tide; two high tides and two low tides every day. The two high tides differ from each other by 3-6 inches depending upon location in the county. The low tides also differ from each other in a similar manner. The 19-year average height of the higher of the two high tides is the Mean Higher High Water (MHHW) for Kent County.

For the vulnerability assessment, sea level rise projections for from 1 to 3 feet were utilized considering the Likely range of the relative mean sea level rise expected by 2050. Maps 10-1 and 10-2 illustrate the geographic extent for sea level rise projections, 1 to 3 feet, within Kent County.

According to the study completed for the *2016 GIS Data Products to Support Climate Change Adaption Planning,* Kent County is moderately impacted by sea-level change through 2050. However, by 2100, rising levels of the Bay and subsidence of the land surface will create some local negative impacts. Specifically, the area north of Worton, Chestertown, Millington and most significantly, Rock Hall and Eastern Neck National Wildlife Refuge will see the most significant negative impacts, particularly during spring tides.

Map 10-1


Harford
Cecil
Delaware
Sassafras River
Chesapeake Bay
Betterton
Galena
Millington
Millington Annexation Area
Chestertown
Chester River
Queen Anne's
292
444
213
290
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313
298
330
561
297
291
514
20
446
Projected Sea Level Rise - Northern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, NOAA
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
Projected Sea Level Rise
Sea Level Rise: 1 foot
Sea Level Rise: 2 foot
Sea Level Rise: 3 foot
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
Surrounding State
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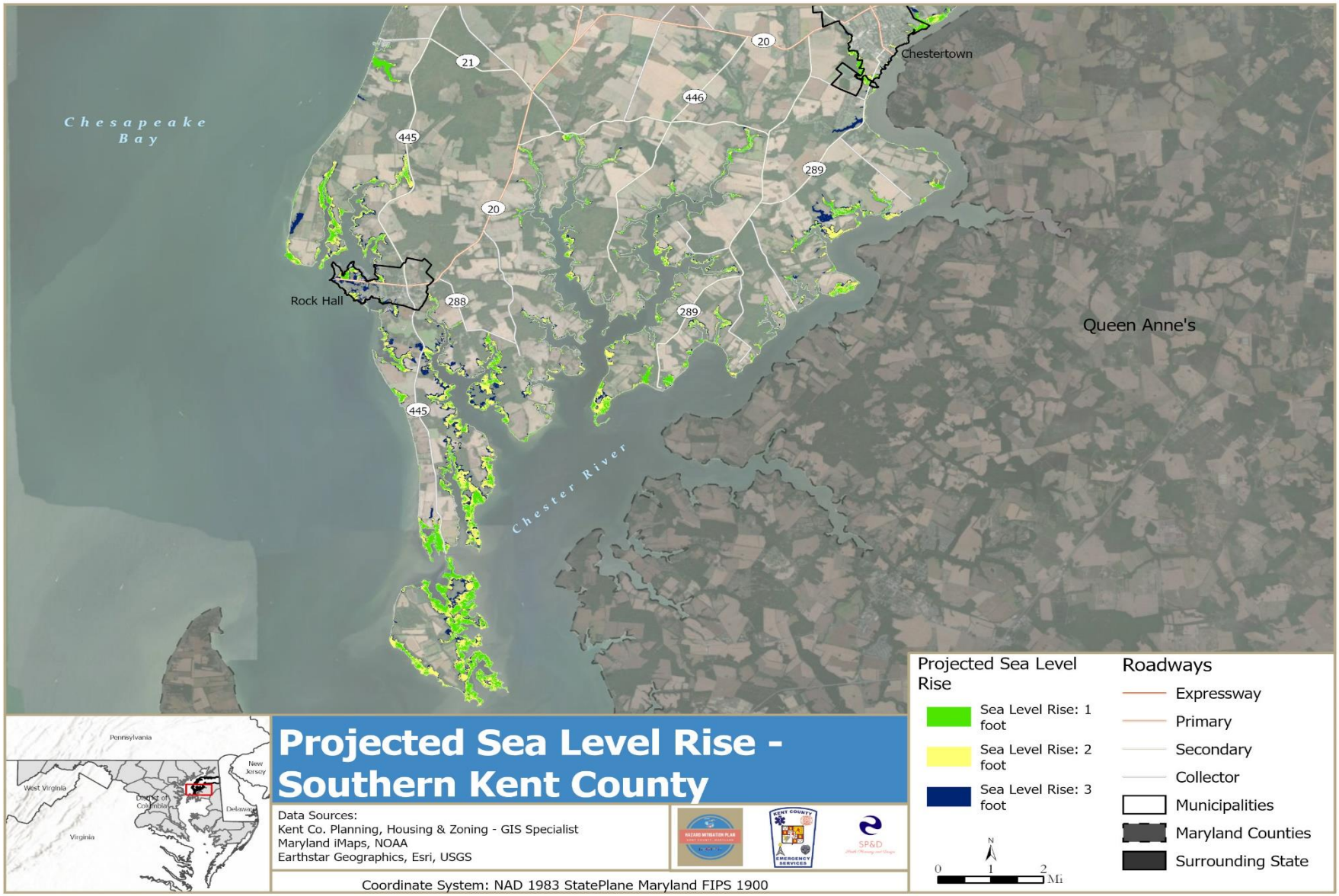
Map 10-2


Chesapeake Bay
Chester River
Rock Hall
Chestertown
Queen Anne's
21
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446
445
289
288
Projected Sea Level Rise - Southern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, NOAA
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Projected Sea Level Rise
Sea Level Rise: 1 foot
Sea Level Rise: 2 foot
Sea Level Rise: 3 foot
Roadways
Expressway
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Municipalities
Maryland Counties
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West Virginia
Virginia
Delaware

The vulnerability analysis for at-risk structures, including critical and public facilities, in Kent County was completed utilizing the following GIS data layers:

- Maryland North Sea Level Rise Data – NOAA's Office for Coastal Management 2019
  - The sea level rise layers show inland extent and relative depth of inundation above mean higher high water (MHHW).
- Kent County Addressable Building Layer
  - The dataset contains addressable buildings for Kent County, MD.
- Maryland Department of Planning's MdProperty View – Kent County 2017
  - The Maryland Department of Planning developed the MdProperty View products to assist users in accessing parcel data. For each parcel, numerous attributes are provided such as account identification, improvement value, year built, etc.
- Maryland Six Inch Imagery - Imagery flown in 2019 for the Eastern Shore
  - The six-inch resolution aerial imagery for the State of Maryland is composed of imagery flown in 2019 (Eastern Shore) and 2017 (Western Shore).

The Maryland North Sea Level Rise data set was to analyze at-risk structures located within the projected sea level rise inundation areas; 1-3 feet. The sea level rise layer was overlaid on the addressable buildings and MdProperty View parcels to determine which structures were at-risk. Loss estimations for at-risk structures were determined using the total improvement values provided within the MdProperty View parcel database. The projected sea level rise does not intersect with the Town of Galena, therefore there are no at-risk structures within town limits. The projected sea level rise does enter town limits for Betterton and Millington; however, no structures were impacted. The following table provides the number of structures at-risk to the projected sea level rise.

Table 10-2: Projected Sea Level Rise At-Risk Structures per Community

Projected Sea Level Rise	Sea Leve Rise – 1 foot			Sea Leve Rise – 2 feet			Sea Leve Rise – 3 feet		
	Residential	Commercial	Other	Residential	Commercial	Other	Residential	Commercial	Other
Kent County Unincorporated	4	7	1	18	3	0	49	3	2
Chestertown	1	2	0	4	0	0	28	5	0
Rock Hall	6	7	0	12	6	0	66	10	0
TOTAL	11	16	1	34	9	0	143	18	2

Source: Smith Planning & Design, 2019 Maryland North Sea Level Rise, Kent County Address Layer, MdProperty View
NOTE: Residential includes: Residential, Commercial Condominium, Commercial/Residential, Residential Condominium, and Apartments
Commercial includes: Commercial, Exempt Commercial
Other includes: Agricultural, Church

Table 10-3 provides the loss estimations for each community affected by sea level rise and the unincorporated areas of the County. The unincorporated areas of the county have the greatest loss estimates from one (1) foot of sea level rise with a total of $6,285,300.00. the Town of Rock Hall is expected to have a greater impact from 2 feet of sea level rise with a loss estimation of $6,188,800.00.

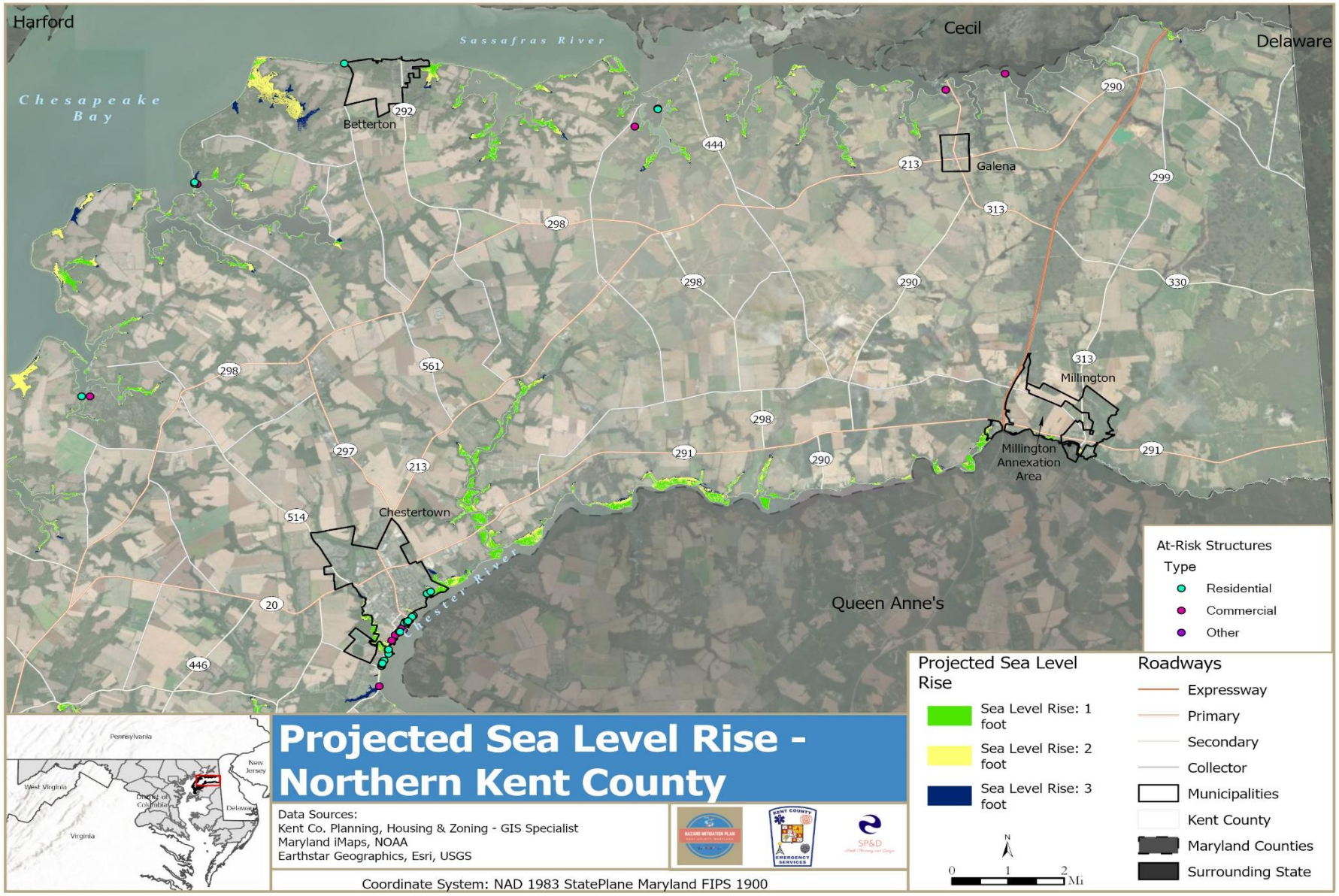
Table 10-3: Projected Sea Level Rise Loss Estimations per Community

Projected Sea Level Rise	Sea Leve Rise - 1 foot	Sea Leve Rise - 2 feet	Sea Leve Rise - 3 feet
Kent County Unincorporated	$6,285,300	$3,527,400	$10,048,300
Chestertown	$1,241,000	$1,307,600	$10,236,400
Rock Hall	$3,419,800	$6,188,800	$10,125,800
TOTAL	$10,946,100	$11,023,800	$30,410,500

Source: Smith Planning & Design, 2019 Maryland North Sea Level Rise, MdProperty View

The following maps depict the projected sea level rise inundation areas for 1-3 feet and the at-risk structures.

Map 10-3


Harford
Cecil
Delaware
Queen Anne's
Sassafras River
Chesapeake Bay
Chester River
Betterton
Galena
Millington
Millington Annexation Area
Chestertown
292
444
213
290
299
313
298
330
561
297
291
514
20
446
At-Risk Structures
Type
Residential
Commercial
Other
Projected Sea Level Rise
Sea Level Rise: 1 foot
Sea Level Rise: 2 foot
Sea Level Rise: 3 foot
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Kent County
Maryland Counties
Surrounding State
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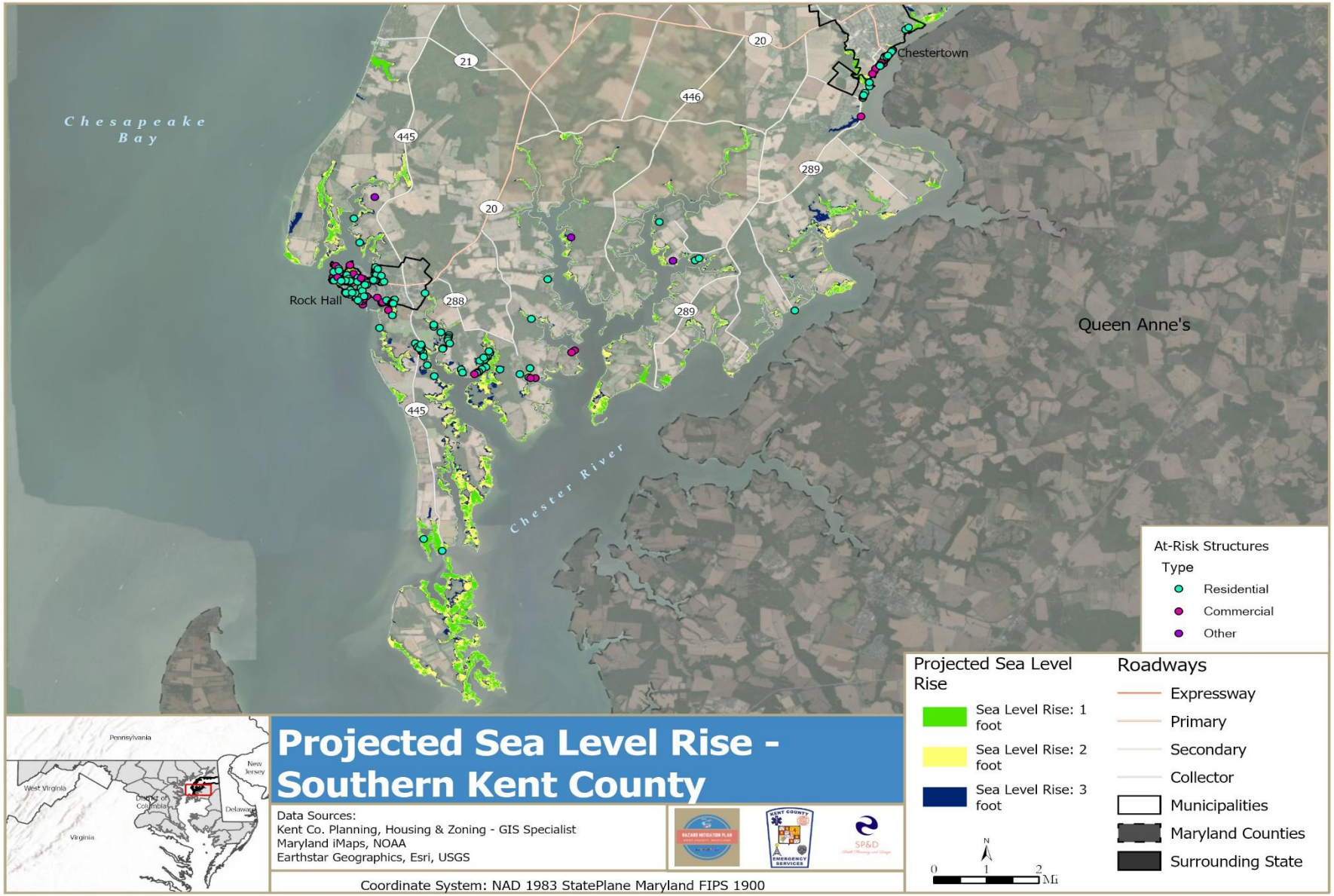
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
Projected Sea Level Rise - Northern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, NOAA
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900

Map 10-4


Chesapeake Bay
Chester River
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At-Risk Structures
Type
Residential
Commercial
Other
Projected Sea Level Rise
Sea Level Rise: 1 foot
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Sea Level Rise: 3 foot
Roadways
Expressway
Primary
Secondary
Collector
Municipalities
Maryland Counties
Surrounding State
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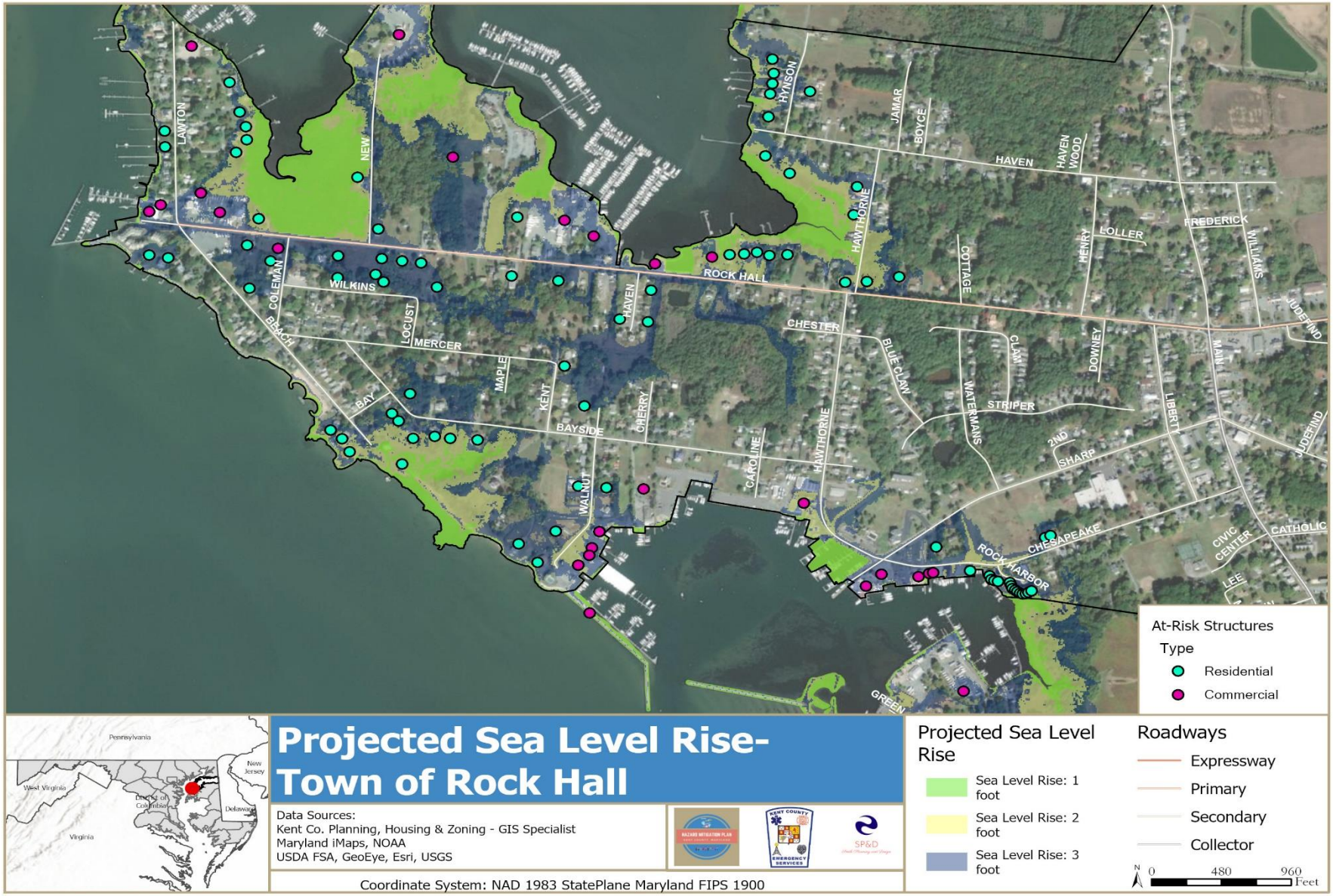
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
Projected Sea Level Rise - Southern Kent County
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, NOAA
Earthstar Geographics, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900

Map 10-5


HIGH
RIVERSIDE
CEDAR
SASSAFRAS
BROWN
CAMPUS
ROBERTS
BIRCH RUN
CEDAR CHASE
BARROLL
DAVID
WALDO
BYFORD
COLLEGE
WASHINGTON
MOUNT VERNON
PROSPECT
ELMER HAWKINS
HAWKINS
HIGH
KENT
RICHARD
BYFORD
DIXON
CALVERT
PHILOSOPHERS
HORSEY
SPRING
RIVERSIDE
MILL
PARK
COURT
MAPLE
QUEEN
WATER
CANNON
RADCLIFFE
CROSS
Queen Anne's
Chester River
LANDING
LITTLE HARBOR
JOHN HANSON
QUAKER NECK
RADCLIFFE
PEARCE
CARRIAGE
ALDAN
At-Risk Structures
Type
Residential
Commercial
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
Projected Sea Level Rise - Town of Chestertown
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, NOAA
USDA FSA, GeoEye, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Projected Sea Level Rise
Sea Level Rise: 1 foot
Sea Level Rise: 2 foot
Sea Level Rise: 3 foot
0 500 1,000 Feet
Roadways
Expressway
Primary
Secondary
Collector
Maryland Counties

Map 10-6


LAWTON
NEW
HYNSON
JAMAR
BOYCE
HAVEN
HAVEN WOOD
HAWTHORNE
COTTAGE
HENRY
LOLLER
FREDERICK
WILLIAMS
JUDEFIND
ROCK HALL
COLEMAN
WILKINS
BEACH
LOCUST
MERCER
HAVEN
CHESTER
BLUE CLAW
CLAM
DOWNEY
MAIN
LIBERTY
MAPLE
KENT
BAY
BAYSIDE
CHERRY
CAROLINE
HAWTHORNE
WATERMANS
STRIPER
2ND
SHARP
WALNUT
CHESAPEAKE
ROCK HARBOR
CIVIC CENTER
CATHOLIC
LEE
GREEN
At-Risk Structures
Type
Residential
Commercial
Pennsylvania
New Jersey
West Virginia
District of Columbia
Delaware
Virginia
Projected Sea Level Rise-
Town of Rock Hall
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, NOAA
USDA FSA, GeoEye, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Projected Sea Level Rise
Sea Level Rise: 1 foot
Sea Level Rise: 2 foot
Sea Level Rise: 3 foot
Roadways
Expressway
Primary
Secondary
Collector
N
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480
960
Feet

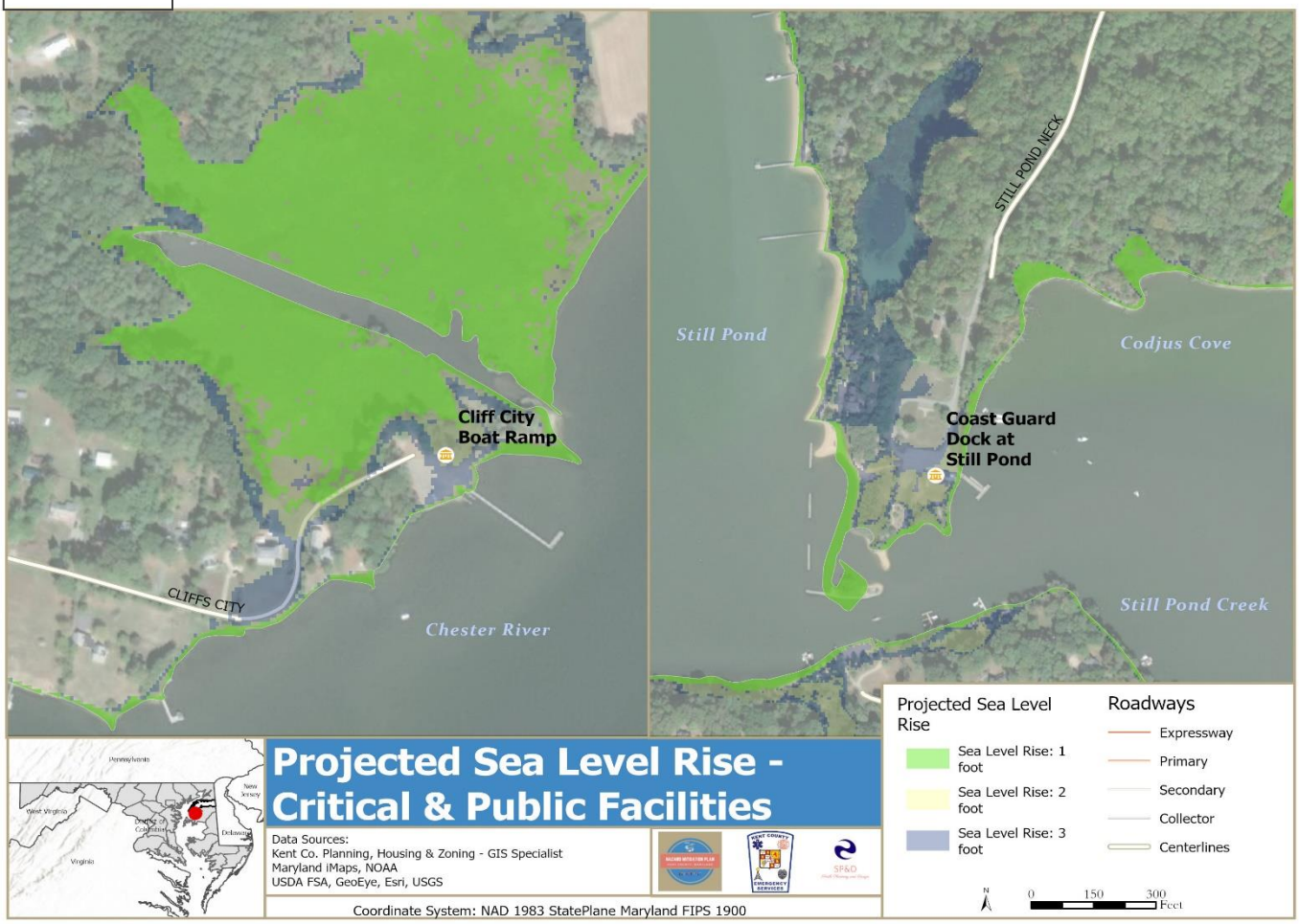
Critical & Public Facilities

Results from the Sea Level Rise (SLR) vulnerability assessment indicated that two (2) public facilities will be affected. The Cliff City Boat Ramp and Coast Guard Dock at Still Pond will be impacted based on sea level rise projections. Cliff City Boat Ramp will be impacted by the projected sea level rise of two (2) feet; and the Coast Guard Dock at Still Pond will be impacted three (3) feet or more of sea level rise. Both facilities are also impacted by coastal flooding and hurricane storm surge inundation, as well.

Table 10-4: Critical & Public Facilities - At Risk to Projected Sea Level Rise

Category	Name	Address	City	Year Built	Building Value	SLR-1 ft	SLR-2 ft	SLR-3 ft
County Owned	Cliff City Boat Ramp	Cliff City Road	Chestertown	Not Available	Not Available	No	Yes	Yes
County Owned	Coast Guard Dock at Still Pond	24188 Still Pond Neck Road	Worton	1970	$161,900	No	No	Yes

Map 10-7



In addition, the *2016 Climate Change and Sea Level Rise Adaptation Report for Kent County* prepared by the Eastern Shore Land Conservancy included the following vulnerability information: The Kent County Detention Center is particularly vulnerable because it has a groundwater spring located nearby. A set of pumps keeps the water table at least 12 feet below the building's foundation. However, during wet or rainy periods the pumps cannot keep up and the basement floors get wet. This is a problem because the Emergency Operations Center and communications equipment is housed in the basement. The public works building at 709 Morgnec Road had groundwater come up through the floors due to the heavy rain during tropical storm Isabel in 2003, indicating that it too is vulnerable to extreme rain events. Kent County relies on 17 major pump stations and nearly a thousand smaller, residential grinder pumps to move water through the stormwater system. These pumps will need the capacity to accommodate increasing flows during wetter wet seasons and heavier downpours.

Capabilities

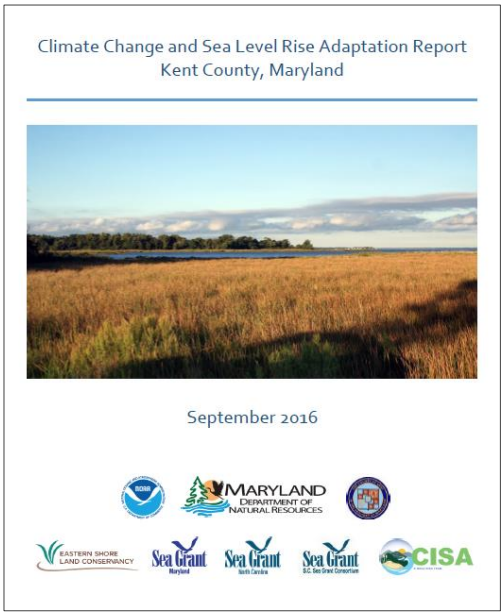
Capabilities

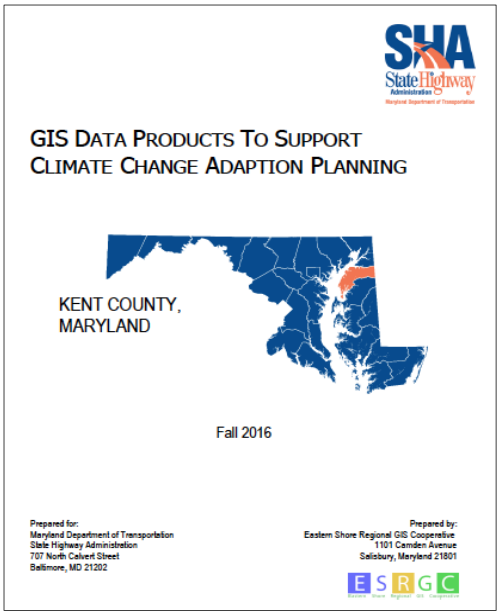
Maryland's *Climate Action Plan* includes two climate change adaptation strategies that are currently being used to guide state-level adaptation planning efforts. The first strategy (Phase 1) addresses the impacts associated with sea level rise and coastal storms. The second strategy (Phase II), released as a complement to the Climate Action Plan, addresses changes in precipitation patterns and increased temperature, and the likely impacts to human health, agriculture, forest and terrestrial ecosystems, bay and aquatic environments, water resources, and nonprofit, and private sectors participated in a series of meetings from the purpose of interpreting the most recent climate change literature, evaluating adaptation options, and recommending strategies to reduce Maryland's overall climate change vulnerability.

The strategies provide the basis for guiding and prioritizing State-level activities with respect to both climate science and adaptation policy over the near and loner terms. A variety of projects designed to implement components of the strategies is well underway and additional efforts have been identified as high priorities for early action.

In addition, several climate change and adaptation reports have been completed specifically for Kent County including:

- ***2016 GIS Data Products to Support Climate Change Adaption Planning***; Kent County, MD prepared by Maryland Department of Transportation, State Highway Administration and the Eastern Shore Regional GIS Cooperative; and,
- ***2016 Climate Change and Sea Level Rise Adaptation Report for Kent County*** prepared by the Eastern Shore Land Conservancy.





On October 5, 2020, The Town of Betterton registered to become Sustainable Maryland Certified. In addition, the Town of Chestertown was awarded The Sustainable Maryland Certification in 2012 and 2015.

Over 10 years ago, the National Oceanic Atmospheric Administration (NOAA) Living Shoreline Project funded the Town of Chestertown with $15,000 to remove a section of bulkhead in their town park and replace it with the living shoreline, reestablishing about 0.40 acres of tidal wetlands along the 276 feet of waterfront.

The Town of Betterton has approximately 400 year-round citizens. As demonstrated by the projects discussed on the following page, it is committed to making both the town and county a Sustainable place to live and visit. The town is a model to other municipalities, proving even small towns with limited resources can succeed.

The town has just completed at $10.1 million-dollar WWTP upgrade. Betterton received the 2019 Wastewater System of the Year award by Maryland Rural water for exceeding standards and their ongoing commitment to significantly reduce Nitrogen and Phosphorus to the Bay. This project also resulted in a reduction of impervious surface within the service area.

In addition, the town also completed the Greener Wheeler Avenue Project. This $1.1 million dollar project was fully funded by US Department of Agriculture and the Community Development Block Grant (CDBG). The design narrowed the road, added permeable sidewalks, a rain garden, plunge pool, and other Best Management Practices (BMP's) to reduce stormwater runoff in and around Wheeler Avenue.

The town has also received a grant from FEMA for erosion control on the steep bank located on Bayside Boulevard. The engineering is complete. This is planned to be a multi-phase project with the first phase of work slated to begin in late 2020. Additional phases will be developed as the project begins.

In addition to erosion control, the town has received a Watershed Assistance Grant to design additional stormwater BMPs on Wheeler Avenue and Bayside Alley. The engineering designs are currently in progress.

Finally, the town has collaborated with Kent County on the removal of invasive species along the shoreline. The most recent project includes the removal of invasive species along bank area by Rigbie steps, regrading the bank, and replanting native species.

Appendix D: Capability Assessment of this document contains more extensive information.

Mitigation Strategies

Mitigation goals, objectives, and action items were identified throughout the plan development process for the unincorporated areas of the county and each of the five (5) towns. Following the review and discussion of risk and vulnerability, stakeholders identified and prioritized new action items for this plan update. Action items identified and designated "climate adaptation" are listed below. The mitigation action items listed as a "High" priority have been further detailed in the table below and includes discussion, potential funding sources, and a timeline for implementation.

Section 10 Goal: Minimize the potential losses of life and property due to Climate Adaptation in Kent County.

Objective 1: To educate the citizens of Kent County on methods to reduce the effects of climate change.

Objective 2: Coordinate and partner with various agencies, department, and organizations to mitigate the effects of climate change and develop adaptation strategies.

Action Items	Hazard(s)	Category	Responsible Entity(s)	Priority Ranking
Consider adopting an expanded floodplain (i.e. including the 0.2% chance "500-year" floodplain) or a "coastal resilience overlay zone" for greater protection from sea level rise and an increased margin of safety against errors in FEMA flood risk maps.	**Climate Adaptation**	Prevention & Natural Resource Protection	Kent County Dept. of Planning, Housing & Zoning	Medium
Consider adopting an expanded floodplain (i.e. including the 0.2% chance "500-year" floodplain) or a "coastal resilience overlay zone" for greater protection from sea level rise and an increased margin of safety against errors in FEMA flood risk maps.	**Climate Adaptation**	Prevention & Natural Resource Protection	Town of Betterton	Medium
			Town of Chestertown	Medium
			Town of Rock Hall	High
			Town of Millington	Medium
Develop a 5-year maintenance and upgrade plan (modeled after the county's water infrastructure maintenance plan) for major building systems (e.g. HVAC, groundwater elevation control) with additional capacity for higher outdoor temperatures, higher cooling loads from electronics, and increased precipitation rates.	**Climate Adaptation**	Prevention & Natural Resource Protection	Kent County Dept. of Public Works	Medium
Complete Sustainable Maryland certification and/or recertification.	**Climate Adaptation**	Natural Resource Protection	Town of Galena	High
			Town of Chestertown	High
			Town of Betterton	Medium

			Town of Millington	Medium

Discussion: Municipalities in Maryland can currently work toward one level of certification. Certification means a municipality has made a commitment to sustainability and succeeded in implementing significant first steps, and municipalities are encouraged to exceed the minimum requirements and make ongoing progress in additional sustainability categories to become a state-wide and national leader. There are a variety of actions municipalities within Kent County can take to become more green and sustainable to earn certification with Sustainable Maryland.

As indicated, priority actions must be completed, and can be chosen from the following actions:

- Community Gardens
- Municipal Energy Audits
- Municipal Carbon Footprint
- Evaluate Current Purchasing Practices
- Green Purchasing Policy
- Vendor Preference Statement
- Stormwater Management Program
- Create a Watershed Plan

Sustainable Maryland registered towns get special priority access and notification of incentives and grants. On October 5, 2020, The Town of Betterton registered to become Sustainable Maryland Certified. In addition, the Town of Chestertown was awarded The Sustainable Maryland Certification in 2012 and 2015.

Possible Funding Sources: Building Blocks for Sustainable Communities, Comprehensive Flood Management Grant Program (FMG), FEMA-Flood Mitigation Assistance Program (FMA), FEMA - Building Resilient Infrastructure and Communities (BRIC), Emergency Coastal Resilience Fund, Five Star and Urban Waters Restoration Grant Program, Local Government Infrastructure Financing Program, Maryland Energy Administration (MEA) -Resilient Maryland, Maryland Energy Administran (MEA) - Combined Heat and Power (CHP) Grant Program, Maryland Sea Grant (NOAA), Watershed and Flood Prevention Operations Program, Capacity Building Grant Coordination & Collaboration Grant, Climate Change Strategy Grant, Innovative Nutrient and Sediment Reduction Grants, Small Watershed Grants, Watershed Assistance Program. These Program can be used specifically to the eight priority items listed above.

Timeline for Implementation: 1-2 years

Strictly enforce sediment erosion control regulations. Pursue grants for planting projects to stabilize soil and mitigate erosion.	**Climate Adaptation**	Prevention & Natural Resource Protection	Town of Rock Hall	**High**

Discussion: There are many potential opportunities for erosion control/planting projects in and around the Town of Rock Hall. These projects could be a part of a larger Green Infrastructure Initiative. Green infrastructure is an important component of many types of local plans at the neighborhood and town levels, including those for water resource management, hazard mitigation, climate adaptation and resilience, sustainability, environmental justice, and economic development. Identifying specific locations for planting projects and mapping these locations is a logical next step. Hold a community meeting to review locations and discuss ideas and options.

Possible Funding Sources: U.S. Department of Housing and Urban Development's Community Development Block Grant (CDBG) Program- Eligible to fund stormwater and green infrastructure; Urban Waters Small Grants Program The Program can be used specifically for innovative or new green

<table>
<tr><td colspan="5">infrastructure practices that improve water quality; state, local, and tribal governments, as well as universities and nonprofit organizations, are eligible to apply.

Timeline for Implementation: 1-2 years</td></tr>
<tr><td>Install Rain Garden into landscaping plan around Cerino Center.</td><td>Climate Adaptation</td><td>Natural Resource Protection</td><td>Town of Chestertown</td><td>High</td></tr>
<tr><td colspan="5">Discussion: Rain gardens are an easy way to capture rainwater that otherwise may lead to flooding and increased pollution. This is because as rainwater flows across our yards, patios, parking lots, and other hard surfaces, the water picks up oil, pet waste, fertilizer, sediments, and other pollutants. This polluted stormwater runoff courses into storm drains and eventually dumps into our stream, rivers and other waterways.

Possible Funding Sources: Outreach & Restoration Grant Program and the Watershed Assistance Program

Timeline for Implementation: 1-2 years</td></tr>
<tr><td>Bayside erosion issues identified by the Town. Note: Partial funding has been obtained for erosion mitigation project by FEMA 2021; project includes revetment and riparian planting.</td><td>Climate Adaptation</td><td>Natural Resource Protection</td><td>Town of Betterton</td><td>High</td></tr>
<tr><td colspan="5">Discussion: The town has received a grant from FEMA for erosion control on the steep bank located on Bayside Boulevard. The engineering is complete. This is planned to be a multi-phase project with the first phase of work slated to begin in late 2020. Additional phases will be developed as the project begins.

Possible Funding Sources: FEMA BRIC, Watershed and Flood Prevention Operations Program

Timeline for Implementation: Multi-Year Project</td></tr>
</table>

SECTION 11

SECTION 11 TOPICS

- EMERGING INFECTION DISEASE HAZARD
- HISTORY & FUTURE RISK
- VULNERABILITY
- CAPABILITIES
- MITIGATION STRATEGIES

PLAN UPDATE HIGHLIGHTS

Emerging Infectious Disease is a new hazard identified during the 2020 Plan Update.

Emerging infectious disease section focused on the following: **Pandemics** (Novel Covid-19 Virus, Novel Influenza A (H1N1), and Severe Acute Respiratory Syndrome (SARS)) and **Epidemics** (Zika Virus and Ebola Virus).

The difference between Epidemic and Pandemic was discussed.

The history for pandemics and epidemics identified were provided. New data obtained from public health stakeholders was integrated.

The vulnerability analysis discussed the risk of contracting an infectious disease and how to reduce this risk.

New capabilities provided by stakeholders were discussed. The Health Department provided information on Kent County's participate in mosquito control for reducing the spread of the Zika Virus. The Health Department also conducts ICS training and maintains the *Kent County Emerging Infectious Disease Plan.*

This is a new section, therefore new goals and objectives were developed.

New 2020-2025 Mitigation Action Items provided by stakeholders were included. Action items ranked "High" were further detailed to include discussion, potential funding sources, and a timeline for implementation.

Emerging Infectious Disease Hazard

Hazard

The *Maryland Department of Health's Emerging Infectious Plan* defines Emerging Infectious Diseases as follows:

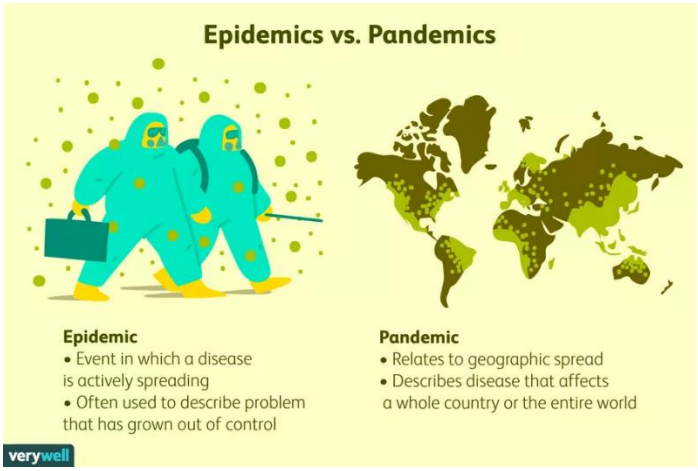
a) an infectious disease that is novel or new to a geographic area;
b) an existing infectious disease that is causing a marked increase in cases or geographic spread; or
c) a biological agent used to cause harm or death in a population (bioterrorism).

Pandemic

The World Health Organization (WHO) defines a pandemic as the worldwide spread of a new disease. A pandemic happens when a new strain of a virus appears for which people have little or no immunity. As a result, it spreads easily from person to person around the world, causing widespread illness and death. Individuals, families, caregivers, healthcare workers and teachers can all take steps to get ready for a pandemic before it happens.

Epidemic

The World Health Organization (WHO) defines an epidemic as the occurrence in a community or region of cases of an illness, specific health-related behavior, or other health-related events clearly more than normal expectancy. The community or region and the period in which the cases occur are specified precisely. The number of cases indicating the presence of an epidemic varies according to the agent, size, and type of population exposed, previous experience or lack of exposure to the disease, and time and place of occurrence.



Source: www.verywellhealth.com

Within emerging infectious disease section, we will be focusing on the following:

- Pandemics
  - Novel Covid-19 Virus,
  - Novel Influenza A (H1N1), and
  - Severe Acute Respiratory Syndrome (SARS),
- Epidemics
  - Zika Virus, and
  - Ebola Virus

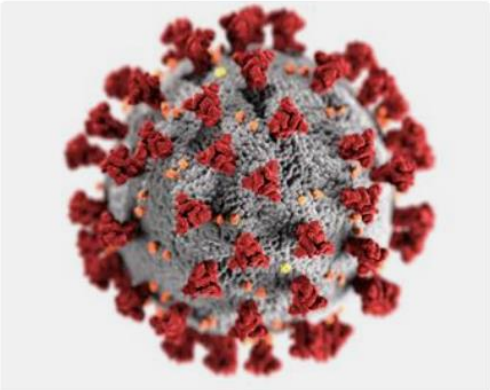
History & Future Risk

History

Novel COVID-19 Pandemic

The Novel COVID-19 pandemic has exploded since cases were first reported in Wuhan, Hubei Province, China in December 2019. As of October 2020, more than 43 million cases of COVID-19–caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection–have been reported globally, including >1,156,212 deaths. Cases have been reported in more than 189 countries, including all 50 states of the United States.

Individuals of all ages are at risk for infection and severe disease. However, the probability of fatal disease is highest in people aged ≥65 years and those living in a nursing home or long-term care facility. Others at highest risk for COVID-19 are people of any age with certain underlying conditions, especially when not well-controlled. In addition, COVID-19 can spread between people who are in close contact with one another (within about 6 feet), through respiratory droplets produced when an infected person coughs, sneezes or talks, and by persons who are asymptomatic. Symptoms, or a combination of symptoms, can appear 2-14 day after exposure. *Note: COVID-19 is an evolving pandemic. Symptoms are being updated as experts learn more about this virus.*



Source: World Health Organization (WHO)

2009 Novel Influenza A (H1N1) Pandemic

According to the Center for Disease Control, 2009 H1N1 (sometimes called "swine flu") is a new influenza virus causing illness in people. This new virus was first detected in people in the United States in April 2009. This virus was spreading from person-to-person worldwide, probably in much the same way that regular seasonal influenza viruses spread. On June 11, 2009, the World Health Organization (WHO) declared that a pandemic of 2009 H1N1 flu was underway.

Severe Respiratory Acute Syndrome (SARS) Pandemic

According to the World Health Organization (WHO), severe acute respiratory syndrome (SARS) is a viral respiratory disease caused by a SARS-associated coronavirus. It was first identified at the end of February 2003 during an outbreak that emerged in China and spread to 4 other countries. SARS is an airborne virus and can spread through small droplets of saliva in a similar way to the cold and influenza. It was the first severe and readily transmissible new disease to emerge in the 21st century and showed a clear capacity to spread along the routes of international air travel. In addition, it can be spread indirectly via surfaces that have been touched by someone who is infected with the virus.

Most patients identified with SARS were previously healthy adults aged 25-70 years. A few suspected cases of SARS have been reported among children under 15 years. Symptions of SARS usually begins with a high fever (temperature greater than 100.4°F), while some have mild respiratory symptoms at the onset. Others include headache, an overall feeling of discomfort, and body aches. About 10 percent to 20 percent of patients have diarrhea. After 2 to 7 days, SARS patients may develop a dry cough, with most patients developing pneumonia.

Zika Virus Epidemic

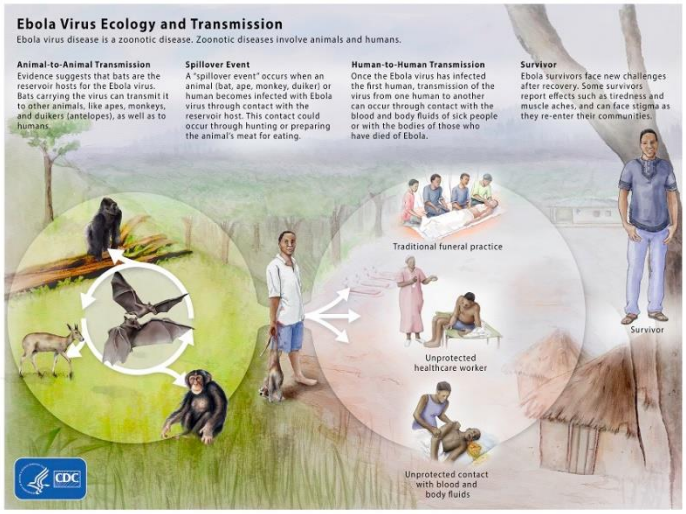
According to the Maryland Department of Health, the Zika virus is an arboviral infection that is spread primarily through the bite of certain species of infected *Aedes* mosquitoes, sexually transmitted, or through blood transfusion (likely but not confirmed). Zika virus has been identified as an illness that causes multiple birth defects including microcephaly, which is defined as abnormal smallness of the head, a congenital condition associated with incomplete brain development. There is no identified vaccine or medication that can be taken to prevent Zika infection. The Eastern Shore has been affected by the Zika virus in the recent past, particularly from 2015-2016 with nine cases reported. As of June 2017, one Zika cases has been reported on the Eastern Shore, a decrease from the year prior.

Ebola Virus Epidemic

According to the Center for Disease Control, Ebola Virus Disease (EVD) is a rare and deadly disease in people and nonhuman primates. The viruses that cause EVD are located mainly in sub-Saharan Africa. People can get EVD through direct contact with an infected animal (bat or nonhuman primate) or a sick or dead person infected with Ebola virus. It is caused by an infection with a group of viruses within the genus *Ebolavirus*:

- Ebola virus (species *Zaire ebolavirus*)
- Sudan virus (species *Sudan ebolavirus*)
- Taï Forest virus (species *Taï Forest ebolavirus*, formerly *Côte d'Ivoire ebolavirus*)
- Bundibugyo virus (species *Bundibugyo ebolavirus*)
- Reston virus (species *Reston ebolavirus*)
- Bombali virus (species *Bombali ebolavirus)*

Of these, only four (Ebola, Sudan, Taï Forest, and Bundibugyo viruses) are known to cause disease in people. Reston virus is known to cause disease in nonhuman primates and pigs, but not in people. It is unknown if Bombali virus, which was recently identified in bats, causes disease in either animals or people.



Ebola symptoms usually include:

- Fever,
- headache,
- diarrhea,
- vomiting,
- weakness,
- joint and muscle aches,
- stomach pain,
- lack of appetite, and
- bleeding.

The symptoms can be similar to other, more common, infections. Symptoms appear 2-21 days after exposure to the virus, but most commonly occur 8-10 days after exposure. Individuals who do not have a fever are not contagious and cannot transmit the disease to another person. The Ebola virus is transmitted through direct contact with the blood or body fluids of an infected person with symptoms or through exposure to objects (such as needles) contaminated by infected body fluids. Transmission can also occur from directly handling bats, rodents, or primates in areas where Ebola occurs. To date, there have been no cases of the disease acquired in Maryland.

Future Risk

Future probability was factored into the hazard risk vulnerability and ranking for each identified hazard, as detailed *Appendix A: Hazard Risk Methodology, Hazard Ranking Results, & Data Tables*. Results for the emerging Infectious diseases hazard indicate a future probability ranking of "highly likely".

Vulnerability

Vulnerability

Traveling abroad can put you at risk for infectious diseases that are not widespread in the United States. Travelers who become ill in a country where treatment for these diseases may be somewhat limited are even more at risk. All people planning travel should become informed about the potential hazards of the countries they are traveling to. Further information to reduce their risk of getting these diseases (https://www.hopkinsmedicine.org/health/conditions-and-diseases/emerging-infectious-diseases).

Loss Estimations

Data collected on as of October 13, 2020 for COVID-19 indicates that 132,343 cases have been confirmed within the State of Maryland, of those confirmed cases, 325 are Kent County residents. Total confirmed deaths reported for the State of Maryland to date is at 3,868, of those, 22 were residents of Kent County.

Capabilities

On June 10, 2020, the Federal Emergency Management Agency (FEMA) released *The Mass Care/Emergency Assistance Pandemic Planning Considerations* to assist state, tribal, and territorial governments in planning mass care delivery. The guide provides information on sheltering, feeding, evacuation and the federal resource request process. It was developed using health and safety planning information and requirements outlined by the Department of Health and Human Services (DHHS) and the Centers for Disease Control and Prevention (CDC).

This document provided planning considerations for jurisdictions that are responding to a pandemic or responding to a pandemic occurring concurrently with a natural, technological and/or human caused disaster. For planning purposes, the document includes only mass care and emergency assistance functions and planning considerations in the context of a pandemic. The delivery of mass care and emergency assistance may vary due to the health and safety planning requirements put forth by DHHS and the CDC.

Concept of operations is based on two types of events: a pandemic without a disaster event and a pandemic during a disaster event.

Response to Concurrent Pandemic and Disaster Event(s)

A natural, technological, or human-caused disaster has occurred in an area disproportionately affected by a pandemic outbreak or a pandemic event emerges during disaster response.

As a direct result of the natural or human-caused disaster, it is necessary to provide mass care and emergency assistance services to affected individuals and emergency responders. In addition, evacuations may be necessary to a neighboring jurisdiction(s) as well as the provision of public health and medical services to individuals affected by the pandemic. This could place an additional burden on neighboring states or tribes providing mass care to the affected populations. Some jurisdictions may not be willing to accept survivors who have, or potentially have been, infected by illness.

NOTE: Depending on the magnitude of the disaster event, a Stafford Act declaration for major disaster may be issued to provide federal financial assistance to the state or tribe and affected survivors in accordance with existing regulations.

Source: The Mass Care/Emergency Assistance Pandemic Planning Considerations

Response to a Pandemic Event Only

Viruses may cause moderate to severe illness and spread easily from person to person. Due to the pandemic outbreak, a range of actions have been established to prevent further spread of the disease, including social distancing, shelter-in-place, travel restrictions and cancellation of large gatherings.

A jurisdiction may experience an outbreak of disease that is beyond the capacity of the state, tribe, territory or affected local government. The affected jurisdiction should initially seek state or tribal assistance. If a state or tribe is unable to provide adequate resources, the state or tribe should request federal assistance.

Homeless populations residing in congregate shelters across the country are at risk, due to lack of space for social distancing and increased risk of cross contamination

FEMA recognizes that non-congregate sheltering will be necessary during a pandemic in an effort to save lives, to protect property and public health and to ensure public safety, as well as to lessen or avert the threat of a catastrophe. In accordance with section 502 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, eligible emergency protective measures taken to respond to a pandemic emergency at the direction or guidance of state, local, tribal and territorial public health officials may be reimbursed under Category B of FEMA's Public Assistance program.

Source: The Mass Care/Emergency Assistance Pandemic Planning Considerations

The following assistance components are included in the National Response Framework (NRF), 4th Edition Annex for ESF #6, Mass Care, Emergency Assistance, Temporary Housing and Human Assistance.

Mass Care

- Sheltering
- Feeding
- Distribution of Emergency Supplies
- Reunification

Emergency Assistance

- Assistance to People with Disabilities, and Others with Access and Functional Needs, Including those with disabilities
- Household Pets, Services and Support Animals
- Mass Evacuee Support

For details on each of these components, please refer to the Appendices in *The Mass Care/Emergency Assistance Pandemic Planning Considerations at: https://www.fema.gov/media-library/assets/documents/188597*.

In addition, funding from FEMA programs is an important resource to support COVID-19 response and recovery. Given that the Federal supplemental funding to address COVID-19 goes well beyond FEMA authorities, FEMA and other departments and agencies have worked together to create resource guides to help our partners better understand and maximize the available resources.

The interagency resource guides publshed in 2020 for state, local, territorial and tribal governments: COVID-19 Resource Summary Report; and COVID-19 Resource Roadmaps for Education and Food and Nutrition.

Zika Virus Epidemic

Multiple agencies collaborated to create the prevention strategies to limit the spread of Zika infection throughout all communities. The primary goal of the Maryland Department of Agriculture Mosquito Control Program is to prevent mosquito-borne diseases in humans, pets, and domestic livestock. Different mosquitoes can carry and transmit different diseases, and the methods for combating one species can differ from how the department combats another. Managing mosquito populations across the state generally requires the department to undertake several tasks:

- Monitor and test mosquitoes for diseases that pose a threat to public health. These efforts determine whether a threat exists and give a good idea of how big the threat is. This information helps staff decide how to combat a threat.
- Reduce mosquito breeding grounds.
- Larval mosquito control.

The following communities in Kent County participated in mosquito control services during 2020:

- Bayshore Campground, LLC
- Betterton
- Camp Tockwogh
- Carvill Road/Great Oak
- Chestertown
- Cliff Road/Great Oak Landing
- Easter Seals Camp Fairlee
- Forrest Lane/Great Oak
- Galena
- Great Oak Manor
- Kent County Parks & Recreation
- Kentmore Park
- Langford Bay Road
- Little Neck Farms
- Millington
- Pig Neck/Fox Point
- Rock Hall
- Skinner's Neck
- Wymont

The primary goal of Maryland Department of Health is reducing Zika transmission in humans through education on transmission precautions to include the following:

- Educate public on safe sexual practices as Zika is spread through sexual activity;
- Educate public on safe-travel practices to areas where Zika is endemic;
- Wear appropriate clothing that will prevent mosquito bites;
- Dump water from containers around home; and,
- Distribute Zika awareness kits that included condoms, educational flyers, insect repellent, screen repair kits.

In 2016, Governor Larry Hogan declared the week of April 24-30 as "Zika Virus Awareness Week" to urge people to stay informed. Emphasis was placed on information about how to avoid the Zika Virus.

Additional information about the Zika virus can be found at the Maryland Department of Agriculture's website, especially FAQs, at: http://mda.maryland.gov/plants-pests/Pages/Zika.aspx or contact the Somerset County Health Department.

Ebola Epidemic

Several actions protect Marylanders from Ebola:

- First, there are restrictions on travel for individuals in affected nations who are ill.
- Second, there are efforts to screen passengers upon arrival in the United States.
- Third, our health care system can identify potential cases, isolate the individuals, and perform testing.
- Fourth, if there is a case in Maryland, hospitals can isolate the ill person and provide supportive care that may be lifesaving. MDH will provide extra support to hospitals to protect the safety of our healthcare workers.
- Fifth, our public health system can track down contacts of cases and prevent further spread.
- Sixth, MDH is monitoring emergency departments and working closely with hospitals and the CDC.

Because of these steps -- while it is possible that additional cases might appear in the United States, including Maryland -- it is very unlikely that there will be a significant outbreak here. Strict adherence to infection control practices prevents the spread of the virus in health care settings. MDH will continue to work closely with leaders in infection control and CDC to support health care workers.

Local capabilities include Incident Command System (ICS) training for all Health Department Command Center Staff. The Health Department has made this a requirement and utilizes ICS during both large and small incidents. For example, ICS is used during flu vaccine clinics, thereby improving the efficiency and improved coordination of staff.

In addition, the University of Maryland Shore Medical Center at Chestertown has deployed a mobile field unit behind the hospital during the COVID-19 incident. The mobile field hospital increases the current capabilities of the hospital to treat patients.

Finally, the Health Department has developed and maintains the Kent County Emerging Infectious Disease Plan. The plan outlines the county's preparedness, response, and containment of emerging infectious diseases.

Appendix D: Capability Assessment of this document contains more extensive information.

Mitigation Strategies

Mitigation goals, objectives, and action items were identified throughout the plan development process for the unincorporated areas of the county and each of the five (5) towns. Following the review and discussion of risk and vulnerability, stakeholders identified and prioritized new action items for this plan update. Action items identified and designated "emerging infectious disease" are listed below. In addition, one (1) "all hazards" action item relevant to "emerging infectious disease" is listed below. The mitigation action items listed as a "High" priority have been further detailed in the table below and includes discussion, potential funding sources, and a timeline for implementation.

Section 2 Goal: Recognize and respond to new and reemerging infections.

Objective 1: Incorporate applied research to understand and combat emerging infectious disease threats into planning documents;

Objective 2: Provide training to staff for preparedness, response, and recovery from emerging infectious disease.

Action Items	Hazard(s)	Category	Responsible Entity(s)	Priority Ranking
Host and promote training courses such as DHS and FEMA certified courses, specifically related to pandemic/emerging infectious disease.	Emerging Infectious Diseases	Emergency Services	Kent County Health Dept., Office of Emergency Services, and Towns	Medium
Prepare an After Action Report and Improvement Plan (AAR/IP) for COVID-19 incident.	Emerging Infectious Diseases	Emergency Services	Health Department, Office of Emergency Services	Medium
Consider additional training such as Incident Command System (ICS), Incident Management Team (IMT), and Public Information for public health personnel.	All-Hazards	Emergency Services	Kent County Health Dept., Office of Emergency Services, and Towns	High
Discussion: While ICS is promoted within the County, oftentimes training above the introduction level is not undertaken by a large proportion of staff. For instance, the command level staff at the Health Department is required to take ICS training, including 300 and 400 level, however ICS training is not a				

requirement for all staff. Hosting additional training courses and reviewing current training credentials of all staff, will identify training gaps and provide information for a multi-year training plan.

In addition to the health department, personnel at the county and towns should be encouraged to take this training. This training will improve the ability of all staff to communicate and back-fill staff shortages, when necessary, as in the case of extended operational periods.
Finally, increase the number of staff within the county who have taken ICS Train-the-Trainer courses, to provide availability and flexibility for the training plan.

Possible Funding Sources: Many of these courses are offered on-line free of charge.
MEMA/FEMA/DEMA and the Maryland Fire and Rescue Institute offer higher level ICS training courses free of charge. Minimal cost is associated with this action item, aside from potential travel cost.

Timeline for Implementation: Ongoing

APPENDIX A:
HAZARD RISK METHODOLOGY & DATA TABLES

Methodology

Hazard risk for the ten (10) identified hazards was determined by using the composite score method. The composite score method was based on a blend of quantitative factors extracted from the National Centers for Environmental Information (NCEI) and other available data sources. These included:

- Historical impacts, in terms of human lives and property
- Geographic extent;
- Historical occurrence;
- Future probability, and;
- Community perspective.

The following eight (8) ranking parameters were used to develop the composite risk score, which provide the hazard rankings results for the ten (10) identified hazards. Each parameter was rated on a scale of one (1) through four (4).

Injuries & Death Ranking	
Death	4
N/A	3
Injury	2
None	1

Data Source: National Centers for Environmental Information, as of December 31, 2019

Crop Damage Ranking	
> 2M	4
501K	3
50K	2
0	1

Data Source: National Centers for Environmental Information, as of December 31, 2019

Probability & Future Ranking	
Highly Likely	4
Likely	3
Occasional	2
Unlikely	1

Data Source: National Centers for Environmental Information Data Tables: Annualized Events

Property Damage Ranking	
> 2M	4
501K	3
50K	2
0	1

Data Source: National Centers for Environmental Information, as of December 31, 2019

Annualized Events Ranking	
2.51	4
1.01	3
0.11	2
0	1

Data Source: National Centers for Environmental Information, as of December 31, 2019; Maryland Department of Health - Maryland's NEDSS And PRISM Databases, as 201-2018

Community Perspective Ranking	
Very Concerned	4
Concerned	3
Somewhat Concerned	2
Not Concerned	1

Data Source: Kent County Hazard Mitigation Plan Update: Public Survey, https://www.surveymonkey.com/r/HLV9L3F

Max Geographical Extent (Hazard Dependent) Ranking								
Ranking	Coastal & Climate Change	Drought	Flood	Thunderstorm	Tornado & Earthquake	Wildfire	Wind	Winter Storm
1	0.00	0	0.00	0-2 events	0-10 events	0	0.00	10”-19”
2	25.00	0.18	10.00	3-5 events	11-17 events	0.4674	60.00	20”-29”
3	50.00	0.3421	20.00	6-8 events	18-22 events	2.1545	74.00	30”-39”
4	75.00	0.49	30.00	>9 events	>23 event	3.9041	95.00	>40”
Source:	*COASTAL: Risk Area*	*DROUGHT: CDL MD*	*FLOOD: DFIRMS*	*THUNDERSTORM: NCDC*	*TORNADO: NCDC EARTHQUAKE: Maryland Geological Survey*	*WILDFIRE: MD DNR Forest Service Risk Assessment Layer*	*WIND: ASCE*	*WINTER STORM: National Weather Service*
Calculated Using:	*% of Coastal Land Area*	*% Crop Area*	*% Area in 100-yr Floodplain*	*Average number based on: Number of events, 2"> hail and lightning events with Injuries/Deaths*	*Sum of all tornados weighted by F-scale (F1*1.5, F2*2, F3*3, F4*4); Number of Earthquake Events*	*% Area in High and Med-High*	*ASCE Design Wind Speeds*	*Average Snowfall Total*

Source: 2016 State of Maryland Hazard Mitigation Plan

The following weighted risk factors were used in the equation below to determine the composite risk score for each identified hazard.

Weighted Risk Factors:

WEIGHTING		
Injuries	*IN*	1
Deaths	*DT*	1
Property Damage	*PD*	1
Crop Damage	*CD*	1
Geographic Extent (Hazard Dependent)	*GE*	1.5
Events (Annualized)	*EV*	1
Future Probability	*FP*	1
Community Perspective	*CP*	1.5

Equation:

Composite Score = IN + DT + PD + CD + (GE*1.5) + EV + FP + (CP*1.5)

Data Tables

The following data tables were developed and used populating five (5) of the eight (8) parameters: Injuries, Death, Property Damage, Crop Damage, and Annualized Events.

Total Flood Hazard Risk Assessment Data Table *Hazards included within this table from NCEI Data:* *Flood, Flash Flood, Heavy Rain, Coastal Storm, and Storm Surge/Tide.*					
Injuries & Deaths		**Property & Crop Damage**		**Geographic Extent**	**Events 1996-2020**
0	0	2.260M	0	% in 100-yr Flood Zone (A, AE, AO & VE) = 13.33%	Total = 79 Annualized = 3.16

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Flood Hazard Data Table					
Injuries & Deaths		**Property & Crop Damage**		**Geographic Extent**	**Events 2001-2020**
0	0	1.150M	0	% in 100-yr Flood Zone (A, AE, AO & VE) = 13.33%	Total = 3 Annualized =0.15

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Flood (C). *Any high flow, overflow, or inundation by water which causes damage. In general, this would mean the inundation of a normally dry area caused by an increased water level in an established watercourse, or ponding of water, that poses a threat to life or property. If the event is considered significant, it should be entered into Storm Data, even if it only affected a small area. Refer to the Flash Flood event (Section 14) for guidelines for differentiating between Flood and Flash Flood events.*

Flash Flood Data Table					
Injuries & Deaths		**Property & Crop Damage**		**Geographic Extent**	**Events 1999-2020**
0	0	1.010M	0	% in 100-yr Flood Zone (A, AE, AO & VE) = 13.33%	Total = 18 Annualized = 0.82

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Flash Flood (C). *A life-threatening, rapid rise of water into a normally dry area beginning within minutes to multiple hours of the causative event (e.g., intense rainfall, dam failure, ice jam). Ongoing flooding can intensify to the shorter-term flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters. Flash flooding, such as dangerous small stream or urban flooding and dam or levee failures, requires immediate action to protect life and property. Conversely, flash flooding can transition into flooding as rapidly rising waters abate. The Storm Data preparer uses professional judgment in determining when the event is no longer characteristic of a Flash Flood and becomes a Flood.*

Heavy Rain Data Table					
Injuries & Deaths		**Property & Crop Damage**		**Geographic Extent**	**Events 1996-2020**
0	0	0	0	% in 100-yr Flood Zone (A, AE, AO & VE) = 13.33%	Total = 52 Annualized = 2.08

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Heavy Rain (C). *Unusually large amount of rain which does not cause a Flash Flood or Flood event, but causes damage, e.g., roof collapse or other human/economic impact. Heavy Rain will no longer be acceptable as a means to record low-impact or isolated flood events.*

Coastal Flood Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	100K	0	% County in risk area= 87.00%	Total = 6 Annualized = 0.24

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Coastal Flood (Z). *Flooding of coastal areas due to the vertical rise above normal water level caused by strong, persistent onshore wind, high astronomical tide, and/or low atmospheric pressure, resulting in damage, erosion, flooding, fatalities, or injuries. Coastal areas are defined as those portions of coastal land zones (coastal county/parish) adjacent to the waters, bays, and estuaries of the oceans. Farther inland, the Storm Data preparer determines the boundary between coastal and inland areas, where flood events will be encoded as Flash Flood or Flood rather than Coastal Flood. Terrain (elevation) features will determine how far inland the coastal flooding extends.*

Total Hurricane Hazard Risk Assessment Data Table *Hazards included within this table from NCEI Data: Tropical Storm. There are no Hurricanes and Tropical Depressions recorded in the NCEI Database for this county.*					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2003-2020
0	0	550K	0	% County in risk area= 87.00%	Total = 3 Annualized = 0.17

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Tropical Storm Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2003-2020
0	0	550K	0	% County in risk area= 87.00%	Total = 3 Annualized = 0.17

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Tropical Storm (Z). *A tropical cyclone in which the 1-minute sustained surface wind ranges from 34 to 63 knots (39 to 73 mph). A Tropical Storm should be included as an entry when these conditions are experienced in the WFO's (Weather Forecast Office) CWA (County Warning Area).*

Total Extreme Temperatures Hazard Risk Assessment Data Table *Hazards included within this table from NCEI Data: Excessive Heat, Heat, and Excessive Cold/Wind Chill.*					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2000-2020
3	0	0	0	% Crop from 2012 Agriculture Census = 74.77%	Total = 76 Annualized = 3.62

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Excessive Heat Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2000-2020
0	0	0	0	% Crop from 2012 Agriculture Census = 74.77%	Total = 16 Annualized = 0.76

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Excessive Heat (Z). *Excessive Heat results from a combination of high temperatures (well above normal) and high humidity. An Excessive Heat event occurs and is reported in Storm Data whenever heat index values meet or exceed locally/regionally established excessive heat warning thresholds. Fatalities (directly related) or major impacts to human health that occur during excessive heat warning conditions are reported using this event category. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data.*

Heat Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
3	0	0	0	% Crop from 2012 Agriculture Census = 74.77%	Total = 59 Annualized = 2.36

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Heat (Z). *A period of heat resulting from the combination of high temperatures (above normal) and relative humidity. A Heat event occurs and is reported in Storm Data whenever heat index values meet or exceed locally/regionally established advisory thresholds. Fatalities or major impacts on human health occurring when ambient weather conditions meet heat advisory criteria are reported using the Heat event. If the ambient weather conditions are below heat advisory criteria, a Heat event entry is permissible only if a directly related fatality occurred due to unseasonably warm weather, and not man-made environments.*

Excessive Cold/Wind Chill Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2014-2020
0	0	0	0	Countywide	Total = 1 Annualized = 0.14

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Extreme Cold/Wind Chill (Z). *A period of extremely low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined warning criteria (typical value around -350F or colder). If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data. Normally these conditions should cause significant human and/or economic impact. However, if fatalities occur with cold temperatures/wind chills but extreme cold/wind chill criteria are not met, the event should also be included in Storm Data as a Cold/Wind Chill event and the fatalities are direct. Use this event only if a fatality/injury does not occur during a winter precipitation event.*

Total Tornado Hazard Risk Assessment Data Table *Hazards included within this table from NCEI Data: Tornado and Funnel Cloud.*					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1950-2020
0	0	502.50K	0	SVRGIS (intensity & frequency) = 1	Total = 7 Annualized = 0.10

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Tornado Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1950-2020
0	0	502.50K	0	SVRGIS (intensity & frequency) = 1	Total = 4 Annualized = 0.06

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Tornado (C). *A violently rotating column of air, extending to or from a cumuliform cloud or underneath a cumuliform cloud, to the ground, and often (but not always) visible as a condensation funnel. For a vortex to be classified as a tornado, it must be in contact with the ground and extend to/from the cloud base, and there should be some semblance of ground-based visual effects such as dust/dirt rotational markings/swirls, or structural or vegetative damage or disturbance.*

Funnel Cloud Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2006-2020
0	0	0	0	SVRGIS (intensity & frequency) = 1	Total = 3 Annualized = 0.2

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Funnel Cloud (C). *A rotating, visible extension of a cloud pendant from a convective cloud with circulation not reaching the ground. The funnel cloud should be large, noteworthy, or create strong public or media interest to be entered.*

Snow & Ice Storms Hazard Risk Assessment Data Table *Hazards included within this table from NCEI Data: Winter Storm, Winter Weather, Blizzard, Cold/Wind Chill, Frost/Freeze, Heavy Snow and Sleet. There are no Ice Storms recorded in the NCEI Database for this county.*					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	125K	0	Average Snowfall Total = 2	Total = 155 Annualized = 6.2

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Winter Storm Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	125K	0	Average Snowfall Total = 2	Total = 22 Annualized = 0.88

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Winter Storm (Z). *A winter weather event that has more than one significant hazard (i.e., heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet and ice) and meets or exceeds locally/regionally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data. Normally, a Winter Storm would pose a threat to life or property.*

Winter Weather Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	0	0	Average Snowfall Total = 2	Total = 76 Annualized = 3.04

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Winter Weather (Z). *A winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation, but does not meet locally/regionally defined warning criteria. A Winter Weather event could result from one or more winter precipitation types (snow, or blowing/drifting snow, or freezing rain/drizzle). The Winter Weather event can also be used to document out-of-season and other unusual or rare occurrences of snow, or blowing/drifting snow, or freezing rain/drizzle. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data.*

Blizzard Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2010-2020
0	0	0	0	Average Snowfall Total = 2	Total = 1 Annualized = 0.09

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Blizzard (Z). *A winter storm which produces the following conditions for 3 consecutive hours or longer: (1) sustained winds or frequent gusts 30 knots (35 mph) or greater, and (2) falling and/or blowing snow reducing visibility frequently to less than 1/4 mile. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data.*

Cold/Wind Chill Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	0	0	Countywide	Total = 24 Annualized = 0.96

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Cold/Wind Chill (Z). *Period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory (typical value is -180F or colder) conditions. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data. There can be situations where advisory criteria are not met, but the combination of seasonably cold temperatures and low wind chill values (roughly 150F below normal) may result in a fatality. In these situations, a cold/wind chill event may be documented if the weather conditions were the primary cause of death as determined by a medical examiner or coroner. Normally, cold/wind chill conditions should cause human and/or economic impact. Use this event only if a fatality/injury does not occur during a winter precipitation event.*

Frost/Freeze Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2007-2020
0	0	0	0	Countywide	Total = 1 Annualized = 0.07

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Frost/Freeze (Z). *A surface air temperature of 32 degrees Fahrenheit (F) or lower, or the formation of ice crystals on the ground or other surfaces, for a period of time long enough to cause human or economic impact, during the locally defined growing season. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data.*

Heavy Snow Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	0	0	Average Snowfall Total = 2	Total = 27 Annualized = 1.08

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Heavy Snow (Z). *Snow accumulation meeting or exceeding locally/regionally defined 12 and/or 24-hour warning criteria. This could mean values such as 4, 6, or 8 inches or more in 12 hours or less; or 6, 8, or 10 inches in 24 hours or less. If the event that occurred is considered significant, even if it affected a small area, it should be entered into Storm Data. In some heavy snow events, structural damage, due to the excessive weight of snow accumulations, may occur in the few days following the meteorological end of the event. The preparer should include this damage as part of the original event and give details in the narrative. Normally, strong winds or other precipitation types are not present in a Heavy Snow event. If they were, then the Winter Storm event should be used.*

Sleet Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1997-2020
0	0	0	0	Countywide	Total = 4 Annualized = 0.17

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Sleet (Z). *Sleet accumulations meeting or exceeding locally/regionally defined warning criteria (typical value is ½ inch or more). The Storm Data preparer should include in the narrative the times that sleet accumulation began, met criteria, and ended.*

Severe Storms Hazard Risk Assessment Data Table *Hazards included within this table from NCEI Data: Thunderstorm Wind, Lightning, and Hail.*					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1968-2020
10	0	116.50K	5K	ASCE Wind Design Speed = 90 2"> hail and lightning events with Injuries/Deaths = 2	Total = 173 Annualized = 3.26

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Thunderstorm Wind Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1968-2020
2	0	70.50K	0	ASCE Wind Design Speed = 90	Total = 139 Annualized = 2.62

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Thunderstorm Wind (C). *Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 50 knots (58 mph), or winds of any speed (non-severe thunderstorm winds below 50 knots) producing a fatality, injury, or damage. Maximum sustained winds or wind gusts (measured or estimated) equal to or greater than 50 knots (58 mph) will always be entered. Events with maximum sustained winds or wind gusts less than 50 knots (58 mph) should be entered as a Storm Data event only if the result in fatalities, injuries, or serious property damage. Storm Data software permits only one event name for encoding severe and non-severe thunderstorm winds. The Storm Data software program requires the preparer to indicate whether the sustained wind or wind gust value was measured or estimated.*

Lightning Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1997-2020
8	0	26K	5K	2"> hail and lightning events with Injuries/Deaths = 2	Total = 15 Annualized = 0.63

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Lightning (C). *A sudden electrical discharge from a thunderstorm, resulting in a fatality, injury, and/or damage.*

Hail Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1975-2020
0	0	0	0	2"> hail and lightning events with Injuries/Deaths = 2	Total = 18 Annualized = 0.39

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Hail (C). *Frozen precipitation in the form of balls or irregular lumps of ice. Hail 3/4 of an inch or larger in diameter will be entered. Hail accumulations of smaller size, which cause property and/or crop damage or casualties, should be entered. Maximum hail size will be encoded for all hail reports entered.*

Derecho (High Wind) Hazard Risk Assessment Data Table *Hazards included within this table from NCEI Data: Derecho, High Wind and Strong Wind.*					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	630.98K	1K	ASCE Wind Design Speed = 90	Total = 112 Annualized = 4.48

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

High Wind Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1996-2020
0	0	396.50K	0	ASCE Wind Design Speed = 90	Total = 28 Annualized = 1.12

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: High Wind (Z). *Sustained non-convective winds of 35 knots (40 mph) or greater lasting for 1 hour or longer, or gusts of 50 knots (58 mph) or greater for any duration (or otherwise locally/regionally defined). In some mountainous areas, the above numerical values are 43 knots (50 mph) and 65 knots (75 mph), respectively. If the event that occurred is considered significant, even though it affected a small area, it should be entered into Storm Data.*

Strong Wind Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 1997-2020
0	0	214.48K	1K	ASCE Wind Design Speed = 90	Total = 83 Annualized = 3.46

Source: National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine Zone.

Based on NCEI definitions/criteria: Strong Wind (Z). *Non-convective winds gusting less than 50 knots (58 mph), or sustained winds less than 35 knots (40 mph), resulting in a fatality, injury, or damage. Consistent with regional guidelines, mountain states may have higher criteria. A peak wind gust (estimated or measured) or maximum sustained wind will be entered.*

Derecho Hazard Data Table					
Injuries & Deaths		Property & Crop Damage		Geographic Extent	Events 2012-2020
0	0	20K	0	ASCE Wind Design Speed = 90	Total = 1 Annualized = 0.11

Source: - National Centers for Environmental Information, as of December 31, 2019 & 2016 State of Maryland Hazard Mitigation Plan.

Based on NCEI definitions/criteria: Derecho. *A widespread, long-lived windstorm associated with a band of rapidly moving showers or thunderstorms variously known as a squall line, bow echo, or quasi-linear convective system. Although a derecho can produce destruction similar to that of a tornado, the damage typically occurs in one direction along a relatively straight swath. As a result, the term "straight-line wind damage" sometimes is used to describe derecho damage. By definition, a derecho must include wind gusts of at least 58 mph (50 knots or 93 km/h) or greater along most of its length. A derecho wind damage swath must extend more than 240 miles (about 400 kilometers).*

Cases of Selected Notifiable Conditions Reported Kent County, Maryland 2014-2018					
Condition	2014	2015	2016	2017	2018
Animal Bites	81	65	58	53	64
Campylobacteriosis	0	4	4	8	1
Chlamydia	59	35	58	33	73
Creutzfeldt-Jakob Disease	0	0	N/A	N/A	0
Cryptosporidiosis	0	2	0	1	0
Cyclosporiasis	0	0	1	0	0
Ehrlichiosis	0	1	1	0	1
Giardiasis	2	0	1	1	1
Gonorrhea	5	10	0	16	7
H. Influenzae - Invasive Disease	0	0	14	0	0
Kawasaki Syndrome	0	0	0	1	0
Legionellosis	1	0	1	0	0
Lyme Disease	15	19	15	12	9
Meningitis, Aseptic	0	0	0	0	1
Mycobacteriosis, Other Than Tb & Leprosy	2	0	3	1	2
Pertussis	0	0	1	0	0
Rabies - Animal	0	5	5	1	2
Salmonellosis - Other Than Typhoid Fever	7	4	4	7	9
Shiga Toxin Producing E. Coli (STEC)	0	0	1	0	0
Shigellosis	0	0	1	0	0
Spotted Fever Rickettsiosis	0	0	0	2	2
Strep Group B - Invasive Disease	1	1	2	1	7
Strep Pneumoniae - Invasive Disease	2	1	1	3	2
Syphilis - Congenital	0	1	0	0	0
Syphilis - Primary and Secondary	0	0	1	1	0
Tuberculosis	0	0	0	0	1
Vibriosis (Non-Cholera)	0	0	1	0	1

Data Sources: Maryland Department of Health - Maryland's NEDSS And PRISM Databases. These are active databases and counts may vary slightly over time, as well as differ slightly from counts published by the Centers for Disease Control and Prevention (CDC). HIV/AIDS data are not included here but available at http://phpa.dhmh.maryland.gov/OIDEOR/CHSE/SitePages/statistics.aspx.
Data for 2014 is current as of July 10, 2015, Data for 2015 is current as of November 8, 2018, Data for 2016 is current as of January 9, 2018, Data for 2017 is current as of November 8, 2018, Data for 2018 is current as of June 19, 2019.

Hazard Ranking Results

Using the data tables above to populate the parameters, the composite score was determined for each identified hazard; below. Hazard Rankings were assigned accordingly using the Composite Score chart. The following table provides parameter information and scoring, composite score and hazard risk ranking for each hazard.

Composite Score

Score (>=)	*Hazard Ranking*
0	Medium-Low
15	Medium
20	Medium-High
25	High

Composite Score

Hazards	Injuries & Deaths		Property & Crop Damage	Geographic Extent	Total Events Annualized	Future Probability	Community Perspective	Composite Score	HAZARD RANINKG
Flood (Flood, Flash, Heavy Rain, Coastal Storm, Storm Surge/Tide)	0 = 1	0 = 1	2.260M = 4	0 = 1	13.33% = 2	3.16 = 4	Highly Likely = 4	Concerned = 3	22.5	Medium High
Hurricane (Tropical Storm, Hurricanes, Tropical Depression)	0 = 1	0 = 1	550K = 3	0 = 1	87.00% = 4	0.17 = 2	Occasional = 2	Concerned = 3	20.5	Medium High
Extreme Temperatures (Excessive Heat, Heat, Excessive Cold/Wind Chill)	3 = 2	0 = 1	0 = 1	0 = 1	74.77% = 4	3.62 = 4	Highly Likely = 4	Somewhat Concerned = 2	22	Medium High
Tornado (Tornado & Funnel Cloud)	0 = 1	0 = 1	502.50K = 3	0 = 1	1 = 1	0.10 = 1	Occasional = 2	Somewhat Concerned = 2	13.5	Medium Low
Snow & Ice Storms (Winter Storm, Winter Weather, Blizzard, Cold Wind/Chill, Frost/Freeze, Heavy Snow, Sleet)	0 = 1	0 = 1	125K = 2	0 = 1	2 = 1	6.2 = 4	Occasional = 2	Concerned = 3	17	Medium
Severe Storms (Thunderstorm Wind, Lightning, Hail)	10 = 2	0 = 1	116.50K = 2	5k = 1	90 = 3 2 = 1	3.26 = 4	Highly Likely = 4	Concerned = 3	25	High
High Wind (Derecho & Straight-line Winds, High Winds, Strong Wind)	0 = 1	0 = 1	630.98K = 2	1k = 1	90 = 3	4.48 = 4	Highly Likely = 4	Concerned = 3	22	Medium High
Earthquake	0 = 1	0 = 1	<50K = 1	0 = 1	17 = 2	0.77 = 2	Occasional = 2	Somewhat Concerned = 2	14	Medium Low
Climate Change (Erosion & Sea Level Rise)	0 = 1	0 = 1	0 = 1	0 = 1	87% = 4	*0.08 = 1	Highly Likely = 4	Concerned = 3	19	Medium
Pandemic & Emerging Infectious Diseases	** 204 = 2	** 22 = 4	0 = 1	0 = 1	*** 100% = 4	**** 1.64 = 3	Highly Likely = 4	Very Concerned = 4	27	High

*Climate Change Annualized Events: According to the *2016 Climate Change and Sea Level Rise Adaptation Report Kent County, Maryland,* Kent County, the observed increase in precipitation is between 5% and 10% over the past six decades. Therefore, eight percent was used for the "Total Events/Annualized" category.
**Injuries & Deaths were based on *Coronavirus Disease 2019 (COVID-19) Outbreak* data provided by Maryland Department of Health as of July 2020
***Pandemic & Emerging Infectious Diseases' geographic extent is countywide (100%).
**** Total Events/Annualized based on Cases of Selected Notifiable Conditions Reported Kent County, Maryland 2014-2018. *Source: Maryland Department of Health - Maryland's NEDSS And PRISM Databases*

APPENDIX B:
2014 – 2020 MITIGATION ACTIONS STATUS REPORT

Hurricane Mitigation	Hurricane Project	Responsible Organization
Ensure adequate protection of critical facilities and infrastructure throughout the County.	**#1 -** Install early warning devices.	Kent County Emergency Management, Municipalities
	Comments: **OES** - Code Red has been established as our early warning mechanism. There is an ever-present campaign to encourage residents & frequent visitors to sign up. Other options have been pursued, such as the use of warning sirens. All existing ones are privately owned, operated and managed and they are not interested in assisting in this campaign, due to an overwhelming number of complaints from residents of the loud noise generated from these sirens, so this is no longer being pursued. – Ongoing **MILLINGTON** - The Town of Millington does not have any early warning devices available. – Incomplete	
	High Priority #2 - Engineering services should provide specifications for backup generators and fuel tanks to provide the municipalities and County with a continuous source of electrical power.	Kent County Planning, Kent County Emergency Management, Municipalities
	Comments: **OES** - Backup generators are available in the KC Community Center & KC High School (our emergency animal shelter) so that these sites may be used as emergency shelter locations. Some fire houses have backup generators. There are generators in the 9-1-1 center & its backup location to ensure uninterrupted operations. There is an on-going quest for additional funding for generators in other locations, such as Washington College. - Partial **PLANNING** - DPHZ (Department of Planning, Housing, and Zoning) was of the understanding that this project has been completed and critical facilities and pump stations have backup generators. It was handled by the Departments of Public Works and Information Technology. – Complete **CHESTERTOWN** - Wastewater Treatment Plant, Water Plan and Police have emergency generators. – Complete **MILLINGTON** - The Town of Millington does not have any backup generators nor backup fuel tanks. – Incomplete	
Increase public understanding, support, and demand for hurricane mitigation.	**#3 -** Identify and solicit low/no cost partners to create awareness and promote outreach and conduct a business continuity planning workshop to promote disaster resistance, mitigation, and preparedness to help businesses develop contingency plans to minimize loss during disasters.	Kent County Emergency Management, Kent County Public Works, Municipalities
	Comments: **OES** - The importance of COOP planning has been brought to the attention of our local municipalities through luncheon meetings with mayors. COOP plans have also been presented to the leadership of the local Chamber of Commerce. Work is ongoing on all of these fronts. KC Government has re-done all COOP plans (2015) with an annual review for updates. – Ongoing **CHESTERTOWN** - Incomplete **MILLINGTON** – Incomplete **HISTORIC SOCIETY –** Historic Society could assist with promoting outreach, etc.	

Hurricane Mitigation cont.	Hurricane Project	Responsible Organization
Increase public understanding, support, and demand for hurricane mitigation. Continued	**#4 -** Provide the Delmarva Emergency Task Force guidance document for public review in the county libraries and at County offices.	Kent County Emergency Management, Kent County Public Works, Municipalities
	Comments: **CHESTERTOWN** - Incomplete **MILLINGTON** - Have no record of such document. - Incomplete	
Ensure County residents are aware of evacuation procedures.	**#5 -** Office of Emergency Services should have available all information needed for residents and visitors to make informed decisions regarding evacuating the County.	Kent County Emergency Management, Kent County Public Works, Municipalities
	Comments: **OES** - The entire state of MD re-evaluated our evacuation plans in 2018-19. This information was announced to the public in summer of 2019 via a WCTR recording as well as in press releases to local media. The Know Your Zone campaign has been in effect since 2018, and with it, we encourage all residents & visitors to know their evacuation zones and routes. This has become an on-going campaign, and stressed during June - November, to coincide with hurricane season. - Ongoing **CHESTERTOWN** - Not sure whether this has been done. - Incomplete **MILLINGTON** – Incomplete **HISTORIC SOCIETY –** We have a database of 200+ local families. We would be able to share emergency information with OES.	

Flooding Mitigation	Flood Project	Responsible Organization
Ensure that existing structures in the floodplain are resistant to flood related damage.	High Priority #6 - Conduct an assessment of all structures in the 100-year floodplain and obtain data to determine the best flood protection measure that will keep the character of the structure intact. Project costs and benefits will be considered when projects are prioritized.	Kent County Assessment Office, Kent County Planning, Kent County Emergency Management, Middle Dept. Inspection Agency, and the Towns of Betterton, Chestertown, Millington, and Rock Hall
	Comments: **PLANNING** - The Climate Change and Sea Level Rise Adaptation Report maps indicated structures in the FP, but no assessments have been completed to determine necessary mitigation projection measures - Partial **CHESTERTOWN** - All buildings in the Historic District have been surveyed, including those in the floodplain. Flood mitigation measures - Partial **MILLINGTON** - Incomplete	
	High Priority #7 - Identify older homes (built prior to 1940) and pre-FIRM residential structures in the flood plain that are in need of substantial improvement in order to bring them into compliance.	Kent County Assessment Office, Kent County Planning, Kent County Emergency Management, Middle Dept. Inspection Agency, and the Towns of Betterton, Chestertown, Millington, and Rock Hall
	Comments: **PLANNING** - Structures are identified and assessed when owners apply for building permits to alter their homes. - Ongoing **CHESTERTOWN** - Assume that this is being done on an individual basis by property owners in response to insurance requirements, especially post Hurricane Isabel. - Ongoing **MILLINGTON** - Incomplete **HISTORIC SOCIETY** - Our organization can assist in identifying these older homes. Our landmark book, Historical Houses of Kent County, identifies most structures from the 1700's to 1860. We can also survey our members to help identify such properties and structures.	
	#8 - Inform owners of the remaining 2 repetitive loss properties in the County when funding is available and explore mitigation options with them.	Kent County Assessment Office, Kent County Planning, Kent County Emergency Management, Middle Dept. Inspection Agency, and the Towns of Millington and Rock Hall
	Comments: **OES** - Town of Betterton has taken great advantage of this and is in the midst of mitigating erosion, through a FEMA grant, along the Chesapeake Bay within town limits. - Ongoing **PLANNING** - Ongoing, **MILLINGTON** - Incomplete	

Flooding Mitigation cont.	Flood Project	Responsible Organization
Ensure that existing structures in the floodplain are resistant to flood related damage. Continued.	**#9 -** Develop a system for recording and storing elevation certificates and first-floor elevation data using County GIS and database technology.	Kent County Assessment Office, Kent County Planning, Municipalities
	Comments: **PLANNING** - All elevation certificates are kept with building permits, but the information is not stored within the County GIS. - Partial **CHESTERTOWN** - Is this GIS data that is available through Kent County Planning? If so, I have GIS and would like to have that GIS layer. - Incomplete **MILLINGTON** - Incomplete	
Create awareness among county residents of the potential hazards associated with floodplain areas and the ways they can protect themselves and their properties from flood events.	**#10 -** Targeted mailings could be used to inform residents, while detailed information should be made available at the public library.	Kent County Public Works, Kent County Planning, Middle Dept. Inspection Agency, Municipalities
	Comments: **PLANNING** - When a property owner, or prospective owner, inquiries about a property, they are notified of floodplain information that is relevant to that property. Targeted mailings have not been sent. - Partial **CHESTERTOWN** - Incomplete **MILLINGTON** - Incomplete **HISTORIC SOCIETY -** Our organization can easily make this information available to our membership by email.	
	High Priority **#11 -** Provide floodplain regulation seminars to area contractors, real estate agents, and insurance providers on an annual basis.	Kent County Public Works, Kent County Planning, Middle Dept. Inspection Agency, Municipalities
	Comments: **PLANNING** - Training for real estate agents has been conducted by DPHZ, but it hasn't been done annually. - Partial **CHESTERTOWN** - Best done by County personnel, as they deal with the regulations on a more regular basis. - Incomplete **MILLINGTON** - Incomplete	

Flooding Mitigation cont.	Flood Project	Responsible Organization
Protect critical facilities in the 100-year flood plain.	High Priority #12 - For the following critical facilities located within the floodplain, a technical report should be completed. Mitigation measures and a detailed benefit/cost analysis should be conducted as well. * Washington College, Custom House * Washington College, Armory * Water tower in Rock Hall	Kent County Public Works, Kent County Planning, Middle Dept. Inspection Agency, Washington College, State Highway Administration, Towns of Chestertown and Rock Hall
	Comments: **PLANNIG** - These facilities are not located within the unincorporated areas of the County. DPHZ should not be involved with this strategy. **CHESTERTOWN** - I'm curious why only the Custom House and Armory are listed in Chestertown, and why those are identified as critical facilities? What are the criteria for making it onto that list? - Incomplete **HISTORIC SOCIETY** - How were these sites identified as "critical facilities?	
Protect critical facilities in the 100-year flood plain. Continued	**#13 -** Explore tide flex valves in the Town of Rock Hall.	Town of Rock Hall
	Comments:	
	#14 - Develop an enhanced flood warning system to include the use of GIS and loss estimation software (such as FEMA's HAZUS-MH software) in the development of flood stage forecast maps, flood depth maps and images of vulnerable structures linked to parcels and flood stage maps.	Kent County Public Works, Kent County Planning, Municipalities
	Comments: **PLANNING** - DPHZ staff completed HAZUS-MH training, but use of the software has not been implemented by the County. - Partial **CHESTERTOWN** - I assume that this is something that the State is doing. We do not have the staff expertise to do this. - Incomplete **MILLINGTON** - Incomplete	
Prepare/update stormwater management plans for areas in the County.	**#15 -** Prepare a Drainage Plan and a subsequent stormwater management plan to outline a method of evaluating and managing the entire drainage system.	Kent County Public Works, Kent County Planning, Kent County Soil and Water Conservation District, Municipalities
	Comments: **CHESTERTOWN** - Stormwater analysis for the Town has been done piecemeal over the years, starting with a walk-around study by Chester River Association (now ShoreRivers) in the early 2000's. Another study is currently under way with a grant being administered by ShoreRivers. - Partial **MILLINGTON** - Incomplete	

Winter Storm Mitigation	Winter Storm Project	Responsible Organization
Maintain high construction standards by ensuring current building codes and standards follow FEMA's basic guidelines and are properly enforced.	**#16 -** The County, municipalities, or concerned property owners should identify homes that are in need of tie- downs to reduce the vulnerability to high wind damages.	Kent County Planning, Middle Dept. Inspection Agency, Municipalities
	Comments: **PLANNING** - DPHZ has not taken any steps to identify homes that are in need of tie-downs. - **Ongoing** **CHESTERTOWN** - Not sure that this is a viable project. Earthquake damage is more likely. **-** **Incomplete** **MILLINGTON** - **Incomplete** **HISTORIC SOCIETY -** Our organization can survey our members for this information.	
	#17 - Building codes specific to high wind resistance and resilience to heavy rooftop loads in high wind zones must be followed by contractors and enforced by building inspectors.	Kent County Planning, Middle Dept. Inspection Agency, Municipalities
	Comments: **PLANNING** - All building permits are required to meet the 2018 International Building Code. - **Complete** **CHESTERTOWN** - This has already been implemented with the building codes, including solar panels that must be able to withstand certain wind loads. - **Complete** **MILLINGTON - Incomplete**	
Ensure residents are forewarned and prepare County with supplies to face winter storms.	**#18 -** Stock adequate quantities of salt and sand to expedite road clearing.	Kent County Roads, Kent County Emergency Management, State Highway Administration
	Comments: **OES -** We have not had any shortages of salt/sand for road issues **-** **Ongoing** **ROADS DEPT** - **Complete** **CHESTERTOWN** - **Complete**	
	High Priority #19 - Identify areas of frequent snow drifting and install snow fencing in those areas.	Kent County Roads, Kent County Emergency Management, State Highway Administration
	Comments: **OES** - Still working on this. There has been only 1 significant snow event in the last 5 years (Jan 2016) in which we had more than 6" of snow. **-** **Incomplete** **ROADS DEPT** - **Complete**	

Winter Storm Mitigation cont.	Winter Storm Project	Responsible Organization
Ensure residents are forewarned and prepare County with supplies to face winter storms. Cont.	**#20 -** Provide public education (concerning safe driving and driving only if it is required, and also stock up on food, water, batteries, and other supplies) to prepare people for the storm.	Kent County Roads, Kent County Emergency Management, State Highway Administration
	Comments: **OES** - There is always a plethora of public warning information coming out from KC OES prior to a known storm. At the start of each winter season, KC OES holds a conversation on WCTR to advise residents of ways to prepare and mitigate winter storm damage. Media include radio spots, email, twitter, Fb and news media – Ongoing **ROADS DEPT** – Incomplete **HISTORIC SOCIETY –** Our organization can distribute this information.	
	#21 - Vegetation that lies in close proximity to utilities must be examined and trimmed on a regular basis by local utility companies, particularly during the winter. Wherever possible, power lines should be installed underground.	Kent County Roads, Kent County Emergency Management, State Highway Administration, Utility Companies, Kent County Planning
	Comments: **OES** - This is addressed each season of mowing. New high-speed Internet lines have been installed throughout the county in 2018-2019-2020 and all have been laid underground- Ongoing **PLANNING** - Within the Chesapeake Bay Critical Area utility companies apply for Critical Area Utility Line Maintenance Plans and trees are replanted in locations that are better suited. – Ongoing **ROADS DEPT** – Incomplete	

Severe Storm Mitigation	Severe Storm Project	Responsible Organization
Maintain high construction standards by ensuring current building codes and standards follow FEMA's basic guidelines and are properly enforced.	**#22 -** The County, municipalities, or property owners should identify homes in need of tie-downs to reduce the vulnerability to high wind damages.	Kent County Planning, Middle Dept. Inspection Agency, Municipalities
	Comments: **PLANNIING** - DPHZ has not taken any steps to identify homes that are in need of tie-downs. – Ongoing **HISTORIC SOCIETY –** Our organization can survey our members for this information.	
	#23 - Building codes specific to high wind resistance and resilience to heavy rooftop loads in high wind zones must be followed by contractors and enforced by building inspectors.	Kent County Planning, Middle Dept. Inspection Agency, Municipalities
	Comments: **PLANNING** - All building permits are required to meet the 2018 International Building Code. – Complete **CHESTERTOWN** - This is part of the Town's adoption of the most recent building codes, both the IRC and IBC. – Complete **MILLINGTON -** Incomplete	
Ensure residents are forewarned, and prepared to face high winds, hail, or lightning strikes.	**#24 -** Provide public education (concerning safe driving and driving only if it is required, and stock up on food, water, batteries, and other supplies) to prepare people for the storm.	Kent County Roads, Kent County Emergency Management, State Highway Administration
	Comments: **OES**- There is always a plethora of public warning information coming out from KC OES prior to a known storm. At the start of each winter season, KC OES holds a conversation on WCTR to advise residents of ways to prepare and mitigate storm damage. Media include radio spots, email, twitter, Fb and news media – Ongoing **ROADS DEPT** – Incomplete **HISTORIC SOCIETY –** Our organization can distribute this information.	
	#25 -Vegetation that lies in close proximity to utilities must be examined and trimmed on a regular basis by local utility companies, particularly during the winter. Wherever possible, power lines should be installed underground.	Kent County Roads, Kent County Emergency Mgmt., SHA, Utility Companies, Kent County Planning
	Comments: **OES** - This is addressed each season of mowing. New high-speed Internet lines have been installed throughout the county in 2018-2019-2020 and all have been laid underground – Ongoing **PLANNING** - Within the Chesapeake Bay Critical Area utility companies apply for Critical Area Utility Line Maintenance Plans and trees are replanted in locations that are better suited – Ongoing **ROADS DEPT** – Incomplete	

Severe Storm Mitigation cont.	Severe Storm Project	Responsible Organization
Ensure residents are forewarned, and prepared to face high winds, hail, or lightning strikes. Continued	**#26 -** Support farmland crop insurance through education and outreach.	Kent County Planning, Kent County Extension Office; Kent County Soil and Water Conservation District
	Comments: **PLANNING** - DPHZ works in conjunction with other agencies in need of information and support. The Comprehensive Plan supports agriculture. – Ongoing	

Drought Mitigation	Drought Project	Responsible Organization
Introduce farmers and residents on water saving methods and devices through an education process.	**#27 -** Through a public education process, introduce residents and the farming community to a wide variety of water conservation measures outlined in the Plan.	Kent County Planning, Kent County Emergency Management, Kent County Soil and Water Conservation District, American Red Cross
	Comments: **PLANNING** - DPHZ would refer someone interested in this matter to the Kent County Soil and Water Conservation District and the Maryland Extension Office. – Ongoing **HISTORIC SOCIETY** – Our organization could co-sponsor a seminar on this topic.	
Encourage participation in the NRCS's irrigation grant program.	**#28 -** Encourage those members of the agricultural community who use irrigation practices to participate in the Natural Resources Conservation Service's irrigation grant program to upgrade existing irrigation systems to include water conservation measures.	Natural Resources Conservation Service
	Comments:	

rosion Mitigation	Erosion Project	Responsible Organization
Reduce sediment and erosion at the Chester River, Sassafras River, Chesapeake Bay, and Creeks and Tributaries.	**#29 -** Work with Natural Resources Conservation Service to implement Best Management Practices on farms.	Kent County Planning, Kent County Soil and Water Conservation District, Municipalities
	Comments: **PLANNING** - DPHZ works hand in hand with the Kent County Soil and Water Conservation District reviewing permits and variances that may be needed for the construction of BMP. The Comprehensive Plan supports agriculture, the Kent Soil and Water Conservation District, and best management practices. – Ongoing **MILLINGTON** - Incomplete	
	#30 - Strictly enforce sediment control regulations.	Kent County Planning, Kent County Soil and Water Conservation District, Municipalities
	Comments: **PLANNING** - Building permits and sediment control permits are reviewed and inspected by DPHZ. On-site inspections are completed when a project is under construction. – Ongoing **CHESTERTOWN** - Already part of the project approval process. – Complete **MILLINGTON** - Incomplete	
	High Priority #31 - Continue to work with the Department of Natural Resources and County residents in the Shore Erosion Control Program.	Kent County Planning, Kent County Soil and Water Conservation District, Municipalities
	Comments: **PLANNING** - The Comprehensive Plan supports shore erosion protection. Sediment control permits are reviewed and inspected. Ongoing **CHESTERTOWN** – Wilmer Park Living Shoreline Project. - Complete **MILLINGTON** - Incomplete	
	#32 - Continue to identify steep cliffs County waterways and to enforce Shoreline Cliff regulations found in the Kent County Land Use Ordinance.	Kent County Planning, Kent County Soil and Water Conservation District
	Comments: **PLANNING** – Ongoing	

Wildfire Mitigation	Wildfire Project	Responsible Organization
Reduce damage and loss to existing community assets including residential structures, critical facilities, and infrastructure due to wildfires.	**#33 -** Conduct a county-wide assessment to identify structures located in areas where trees are thick and recommend fire- resistant walls or glass that can withstand higher temperatures.	Kent County Emergency Management, Fire Departments
	Comments: **OES** - I do not think that this project has been undertaken. While a worthy goal, a dwindling volunteer fire fighter population makes this a challenge – Incomplete	
Reduce the exposure of residences and infrastructure to wildfire hazard incidents.	**#34 -** Introduce residents to the concept of defensible space practices in urban interface areas that requires trees around new homes to be thinned or cut down, creating a buffer zone to reduce the potential for damage from wildfire.	Kent County Emergency Management, Fire Departments
	Comments: **OES** - I don't think this project has been undertaken - Incomplete	
	#35 - Integrate procedures (prepared by County's Office of Emergency Services Department in conjunction with local Fire Departments) regarding training, suppression efforts, use of incident command systems during fire events, and the roles of various local, State and Federal agencies during wildfire events into a single document.	Kent County Emergency Management, Fire Departments
	Comments: **OES** - This type of training is frequent and on-going – Ongoing	

Extreme Heat Mitigation	Extreme Heat Project	Responsible Organization
Educate the public regarding heat index and energy conservation measures.	**#36 -** Encourage residents to heed advice on air quality on extreme heat days.	Kent County Emergency Management, Local Media
	Comments: **OES** - This info is provided to residents via email and social media outlets frequently and via seasonal conversations on WCTR – **Ongoing** **HISTORIC SOCIETY –** Our organization can distribute this information.	
	High Priority #37 - Encourage local media sources to announce air quality and heat indexes and to relay warnings and recommendations.	Kent County Emergency Management, Local Media
	Comments: **OES** - Local media outlets are wonderful partners in helping us to spread our outreach info on social media – **Ongoing** **HISTORIC SOCIETY –** Our organization can distribute this information.	
	#38 - Encourage elderly residents and families without air conditioning to have relocation sites with air conditioning during extreme heat events.	Kent County Emergency Management, Local Media
	Comments: **OES**- This info is encouraged through social media and our partner organizations, especially public health and senior organizations – **Ongoing** **HISTORIC SOCIETY –** Our organization can distribute this information.	
	#39 - Encourage residents to make provisions for pets during extreme heat waves (shade, water, air conditioning when appropriate).	Kent County Emergency Management, Local Media
	Comments: **OES** - Pets are part of the family, and we encourage residents to prepare for pet safety in all kinds of weather. The Pet Rescue Trailer is open for public inspection on several occasions throughout the year to assist in promotion of making pet provisions and accentuating public awareness of the need to consider pets in emergency plans – **Ongoing** **HISTORIC SOCIETY –** Our organization can distribute this information.	
	#40 - Encourage local citizens to heed advice on water restrictions and inform county officials of cases that consistently disregard the mandate.	Kent County Emergency Management, Local Media
	Comments: **OES** - Water restrictions have not been an issue in the last 5 years, but we would absolutely use our email blasts, social media, news media partners and WCTR (radio) to assist in getting this message out – **Ongoing**	
	#41 - Encourage local citizens to heed advice on electricity conservation during extreme heat events due to increased demand on utilities and emergency services.	Kent County Emergency Management, Local Media
	Comments: **OES** - Partnering with local utilities, we share this info regularly during events when there is increased demand for utilities and scarce supply. - **Ongoing**	

Extreme Heat Mitigation	Extreme Heat Project	Responsible Organization
Educate the public regarding the benefits of natural and man-made shade.	High Priority #42 - Encourage businesses to plant shade trees in parking areas to relieve extreme heat reflected off concrete surface.	Agricultural Community, Local Businesses
	Comments: **LOCAL BUISNESS** - Always looking for places to add new growth and/or replace dead and damaged tree. Very active Building and Grounds committee. - Ongoing	
	#43 - Encourage the agricultural community to plant shade trees and/or erect tarp systems for livestock to congregate under during extreme heat events.	Agricultural Community, Local Businesses
	Comments:	

Tornado Mitigation	Tornado Project	Responsible Organization
Improve the County's ability to identify structures that are vulnerable to high winds.	**#44 -** Conduct further assessment to identify structures with high risk/ vulnerability to wind and determine if an increase in the number of Permits and Inspections officers is required to assess the vulnerability of structures.	Kent County Emergency Management, Middle Dept. Inspection Agency
	Comments: **OES** - I don't believe that this project has been undertaken yet; partnership needs to be made with P&Z dept - Incomplete	
	#45 - Conduct engineering inspections of Kent County's fire stations and schools to assess each facility's ability to sustain damage from both flood and wind events and recommend specific retrofitting measures for each building as appropriate to better protect them from flooding and high winds.	Kent County Emergency Management, Middle Dept. Inspection Agency
	Comments: **OES** - Schools are subject to regular inspections for this purpose to ensure safety of children and staff. Fire companies are continually ensuring that their structures are safe for public events, and also for impromptu safe havens in weather events. - Ongoing	
	#46 - Include strengthening measures to all improvements to critical facilities to withstand wind speeds greater than 90 mph.	Kent County Emergency Management, Middle Dept. Inspect. Agency, Municipalities
	Comments: **OES** - Funding-dependent, based upon local governmental budgets – Ongoing **CHESTERTOWN** – Complete **MILLINGTON** - Incomplete	

Tornado Mitigation	Tornado Project	Responsible Organization
Consider actions for wind mitigation wherever appropriate.	**#47 -** Enforce the county and municipal Floodplain Ordinance design standards in high wind areas (velocity zones). Enforce tie down requirements in the mobile home communities in Chestertown, Rock Hall and Worton and identify homes that are in need of tie-downs.	Kent County Emergency Management, Middle Dept. Inspection Agency, Kent County Planning, Municipalities
	Comments: **PLANNING** - The Floodplain Ordinance is enforced in all situations. Specific homes have not been identified. – **Ongoing** **CHESTERTOWN** – **Complete** **MILLINGTON** - **Incomplete**	
	#48 - Increase community awareness and introduce the concept of buffers (pruning back overhanging branches) and windbreaks (planting tall trees to reduce wind velocity or low shrubs to trap snow) to protect against winds.	Kent County Emergency Management, Middle Dept. Inspection Agency, Kent County Planning, Municipalities
	Comments: **OES** - Ongoing public education via WCTR, media partners and social media partners – **Ongoing** **PLANNING** – **Ongoing** **CHESTERTOWN** – **Complete** **MILLINGTON** - **Incomplete**	

Source: 2014 Kent County Hazard Mitigation Plan

APPENDIX C:
STAKEHOLDER & PUBLIC ENGAGEMENT

Stakeholder & Public Engagement

Througthout the planning process for the 2021 Kent County Hazard Mitigation Plan Update, public engagement was encouraged. Multiple outlets were used to provide opportunities for the public to be involved and provide input. These outlets included: Kent County Hazard Mitigation Plan website, stakeholder meetings, and online public survey. The full listing of stakeholder and public engagement opportunities are provided in the table below. Public Survey results are at the provided at the end of the appendix.

Kent County Hazard Mitigation Planning, Training, and Outreach Initiatives				
2020 Dates	Meeting, Training, or Outreach Activity	Target Audience	Materials Provided	Comments/Input
29-May-20	Kent County Government Directors' Meeting	Kent County Government Staff	Ways to Engage tab - advertised Stakeholder Meeting #1 and Public Survey	Leadership made aware of project and planning process, Website: https://www.kentcounty.com/kenthmp2020
3-Jun-20	Website Content	Public	Ways to Engage tab - advertised Stakeholder Meeting #1 and Public Survey	Survey Results, Website: https://www.kentcounty.com/kenthmp2020; Meeting Notes distributed.
9-Jun-20	HMPC Kick-Off Meeting	Stakeholder Group & Public	Agenda, Hazard Identification Worksheet, Hazard Data Tables, Mitigation Action Status Update	Consensus on 2020 Hazard Identification, Feedback & Additional Event Data, Mitigation Status & New Ideas
9-Jun-20	Kent County Commissioners Meeting	Kent County Commissioners, Kent County Government Staff, Public	Ways to Engage tab - advertised Stakeholder Meeting #1 and Public Survey	Leadership made aware of project and planning process, Website: https://www.kentcounty.com/kenthmp2020
10-Jun-20	Stakeholder Survey	Stakeholder Group	2014 Mitigation Action Items Status Update	Survey Results
10-Jun-20	Website Content	Public	Project Overview, Hazard Risk, Activities for Risk Reduction tab content	Website Views/Analytics
11-Jun-20	Kent County Chamber of Commerce Virtual Meeting	KC Chamber Members & Public	Ways to Engage tab - advertised Stakeholder Meeting #1 and Public Survey	Business community and public made aware of the project and ways to engage, Website: https://www.kentcounty.com/kenthmp2020
15-Jun-20	Press Release Sent	Readers of Chestertown Spy, Kent County News, Tidewater Trader & Listeners to WCTR	Ways to Engage tab - advertised Stakeholder Meeting #1 and Public Survey	Public made aware of the project and ways to engage, Website: https://www.kentcounty.com/kenthmp2020
13-Jul-20	HMPC Meeting #2	Stakeholder Group & Public	Agenda, Appendix A: Hazard Risk Ranking Methodology & Data Tables, 2014-2020 Mitigation Action Item Status Update	Public Outreach, 2020 Hazard Risk Ranking Feedback, 2014 Mitigation Status & New Ideas, Capabilities. Metting Notes distributed.

2020 Dates	Meeting, Training, or Outreach Activity	Target Audience	Materials Provided	Comments/Input
14-Jul-20	Public Survey Outreach	Historic Society	Barbara Jorgenson of the Historic Society provided information on plan update and survey link to all members.	Increased survey participation.
15-Jul-20	Web Content	Public	Stakeholder Meeting #2 Notes. Updated Hazard Risk tab with new 2020 Hazard Riak Rankings.	Website Views/Analytics
15th & 19th July, 2020	(2) Email Blast	Public	Town of Betterton sent out two email blasts with the public survey link.	Increased survey participation.
21-Jul	Social Media Post Public Survey	Public	County Facebook Page	Increased survey participation.
22-Jul	Social Media Post Public Survey	Public	Humane Society Facebook Page	Increased survey participation.
21-Jul-20	Social Media Post Public Survey	Public	Town of Betterton Facebook Page	Increased survey participation.
28-Jul-20	Kent County Commissioners Meeting	Commissioners, KC Government, Public	Verbal Update	Provided update to the Commissioners on progress and plans for upcoming meetings & public outreach. Meeting is open to public, so all information discussed was available to the public as well.
5-Aug-20	Social Media Post Public Survey	Social Media Post Public Survey	Town of Betterton Facebook Page	Increased survey participation.
17-Aug-20	Social Media Post Public Survey	Public	County Facebook Page	Increased survey participation.
11-Aug-20	Planning Meeting	Town of Rock Hall	WebEx Meeting	Mitigation Action Items Status Updates & Capabilities; Discussed Stream Assessment
27-Aug-20	HMPC Meeting #3	Stakeholder Group & Public	Agenda, Capability Table, Critical Facilities Database & Map	Added Town Capabilities, Review of Critical Facility Data, and Next Steps
8-Sep-20	Mayor & Town Council	Town of Betterton	Town Hall Meeting	Update on the KC Hazard Mitigation Plan provided by Elizabeth Greenwell, Town Manager & member of the Hazard Mitigation Planning Committee
8-Sep-20	HMP Survey on FB	FB Public	HMP Survey Link	Increased survey participation.

2020 Dates	Meeting, Training, or Outreach Activity	Target Audience	Materials Provided	Comments/Input
14-Sep-20	Planning Commission	Town of Betterton	Town Hall Meeting	Update on the KC Hazard Mitigation Plan provided by Elizabeth Greenwell, Town Manager & member of the Hazard Mitigation Planning Committee
16-Sep-20	Planning Meeting	Town of Millington	WebEx Meeting	Capabilities Assessment, Current Projects, & New Mitigation Ideas
16-Sep-20	Kent County Council of Governments (COG)	Mayors of all Kent County municipalities	Conference Call	Emphasized the importance of having all KC municipalities involved in the HMP Update process & the benefits to the municipalities & the County
22-Sep-20	Planning Meeting	Town of Betterton	WebEx Meeting	Capabilities Assessment, Current Projects, & New Mitigation Ideas
23-Sep-20	Planning Meeting	Town of Chestertown	WebEx Meeting	Capabilities Assessment, Current Projects, & New Mitigation Ideas
29-Sep-20	Planning Meeting	Town of Galena	WebEx Meeting	Capabilities Assessment, Current Projects, & New Mitigation Ideas
15-Oct-20	Mitigation Workshop	Stakeholder Sub-Group: Public Education & Awareness	WebEx Meeting	Mitigation Strategies Workhop- Review of new mitigation strategies and priortization
15-Oct-20	Mitigation Workshop	Stakeholder Sub-Group: Emergency Services	WebEx Meeting	Mitigation Strategies Workhop- Review of new mitigation strategies and priortization
16-Oct-20	Mitigation Workshop	Stakeholder Sub-Group: Prevention & Property Protection	WebEx Meeting	Mitigation Strategies Workhop- Review of new mitigation strategies and priortization
16-Oct-20	Mitigation Workshop	Stakeholder Sub-Group: Public Health & Emergency Medical	WebEx Meeting	Mitigation Strategies Workhop- Review of new mitigation strategies and priortization
20-Oct-20	Kent County Council of Governments (COG)	Mayors of all Kent County municipalities	Conference Call	Emphasized the importance of having all KC municipalities involved in the HMP Update process & the benefits to the municipalities & the County
2-Nov-20	Web Content	Public	Hazard Mitigation Activities for Risk Reduction Tab	2020-2025 Mitigation Action Items & Prioritization
12-Nov-20	Outreach Meeting	Fire Chiefs Meeting	Review of new HMP & Mitigation Strategy	2020-2025 Mitigation Action Items & Prioritization

2020 Dates	Meeting, Training, or Outreach Activity	Target Audience	Materials Provided	Comments/Input
24-Nov-20	Local Plan Review	Stakeholder Group & Public	Draft Hazard Mitigation Plan	Draft Plan Comments
24-Nov-20	Plan Review	Maryland Emergency Manangement Agency (MEMA)	Draft Hazard Mitigation Plan	Crosswalk Review Comments

Municipal Outreach

Kent County Hazard Mitigation Planning, Training, and Outreach Initiatives				
2020 Dates	Meeting, Training, or Outreach Activity	Target Audience	Materials Provided	Comments/Input
15-Jun-20	Press Release Sent	Readers of Chestertown Spy, Kent County News, Tidewater Trader & Listeners to WCTR	Ways to Engage tab - advertised Stakeholder Meeting #1 and Public Survey	Public made aware of the project and ways to engage, Website: https://www.kentcounty.com/kenthmp2020
21-Jul-20	Social Media Post Public Survey	Public	Town of Betterton Facebook Page	Increased survey participation.
5-Aug-20	Social Media Post Public Survey	Social Media Post Public Survey	Town of Betterton Facebook Page	Increased survey participation.
11-Aug-20	Planning Meeting	Town of Rock Hall	WebEx Meeting	Mitigation Action Items Status Updates & Capabilities; Discussed Stream Assessment
8-Sep-20	Mayor & Town Council	Town of Betterton	Town Hall Meeting	Update on the KC Hazard Mitigation Plan provided by Elizabeth Greenwell, Town Manager & member of the Hazard Mitigation Planning Committee
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23-Sep-20	Planning Meeting	Town of Chestertown	WebEx Meeting	Capabilities Assessment, Current Projects, & New Mitigation Ideas
29-Sep-20	Planning Meeting	Town of Galena	WebEx Meeting	Capabilities Assessment, Current Projects, & New Mitigation Ideas
20-Oct-20	Kent County Council of Governments (COG)	Mayors of all Kent County municipalities	Conference Call	Emphasized the importance of having all KC municipalities involved in the HMP Update process & the benefits to the municipalities & the County

Town of Betterton Mitigation Action Items

Mitigation Action Items 1 to 8 are new actions developed during the 2020 Kent County Hazard Mitigation Plan Update that include your town. For each mitigation action, please answer the two (2) questions that follow.

The survey consists of 8 mitigation actions and will take less than 5 minutes to complete.

We sincerely thank you for your time.

Action Item #1: Forward and repost Kent County Office of Emergency Services' hazard related Facebook posts and other social media content.

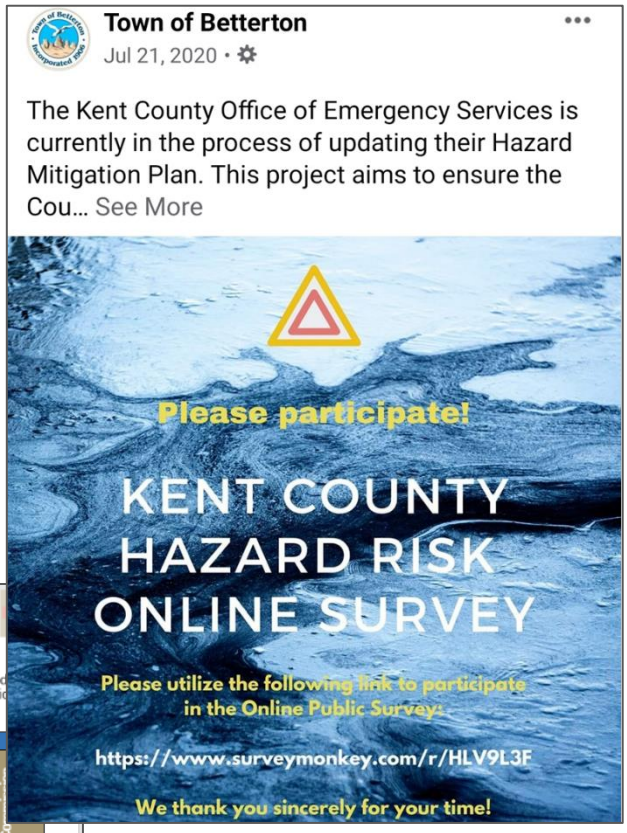
Is this action item applicable to your town?
- (●) Yes
- ( ) No

Is this action item a "high" priority for your town?
- (●) Yes
- ( ) No

Action Item #2: Work with the Office of Emergency Services to assign specific user accounts for the Code Red notification system. These specific user accounts will be designated to Town personnel for Town specific public messaging.

Is this action item applicable to your town?
- (●) Yes
- ( ) No

Is this action item a "high" priority for your town?
- (●) Yes
- ( ) No



2020 Kent County Hazard Mitigation Plan

Administrative and Technical

Kent County has Identified the following administrative and technical capabilities. These includ staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions.

Government Department & Staff Resources

Communities	Land Use Authority		Land Use/ Development Planning		Public Works & Engineering		Emergency Services		Floodplain Manager		GIS		Fiscal Staff		Planning Co	
	Y/N		Y/N	# of. Staff	Y/N	# of. Staff	Y/N	# of. Staff	Y/N	# of. Staff	Y/N	# of. Staff	Y/N	# of. Staff	Y/N	# of. Staff
Kent County	Y		Y	9	Y	6	Y	5	Y	1	Y	1	Y	3	Y	7
Betterton	Y		Y	1	Y	3	Y	VFD	Y	1	N	-	Y	1	Y	5
Chestertown	Y		Y	1	Y	10	Y	VFD	Y	1	Y	1	Y	2	Y	5
Galena	Y		Y	1	Y	1	Y	VFD	N	-	N	-	Y	1	Y	5
Millington	Y		Y	1	Y	1	Y	1	Y	1	N	-	Y	1	Y	5
Rock Hall	Y		Y	1	Y	6	Y	VFD	Y	1	N	-	Y	1	Y	5

Source: County & Municipal Local Information
Note: These positions are often filled by the same person.

Technical		Yes/No	Notes:
Warning systems/services (Reverse 911, outdoor warning signals)	County	Yes	Code Red and Know Your Zone
	Betterton	Yes	County Code Red System, as available
	Chestertown	Yes	County Code Red System, as available and VFD Siren
	Galena	Yes	County Code Red System, as available
	Millington	Yes	County Code Red System, as available
	Rock Hall	Yes	Fire Department Early Warning System and County Code Red System, as available
Hazus analysis	County	Yes	Risk Map Products - FEMA Nov 2014
	Betterton	Yes	Risk Map Products - FEMA Nov 2014
	Chestertown		
	Millington		
	Rock Hall		

How can these capabilities be expanded and improved to reduce risk?

- Work with the Office of Emergency Services to assign specific user accounts for the Code Red notification system. These specific user accounts will be designated to Town personnel for Town specific public messaging.
- Integrate Hazard Mitigation Plan into all Comprehensive Plan updates.

Stakeholder Meeting Notes

Kent County Stakeholder Meeting #1
Webex Meeting

Date: June 9, 2020 **Start Time: 1:30 PM**

Agenda Items

- Hazard Mitigation Planning Process
- Kent County Hazard Identification
- Hazard Risk-Preliminary Data Tables
- 2014-Present Mitigation Action Status

In attendance: Virginia Gregg-Office of Emergency Services; Wayne Darrell-Office of Emergency Services; Shelley Heller-Kent County Administrator; Stephanie Jones-Planning & Zoning; Carla Gerber-Planning & Zoning; Mike Bitting-Planning & Zoning; Benadette Bowman-Tourism; Jamie Williams-Economic Development; Barbara Jorgenson-Historic Society; Vandrick Hamlin-Public Schools; Jesse Haas-MSP; Beth Copp-Shore Regional Health Systems; Bill Webb-Kent County Health Dept; Charlene Perry-Kent County Health Dept; John Beskid-Kent County Health Dept; Sharon Jefferson-Hawkins-American Red Cross; Shelly Neal-Edwards-Kent County DSS; Kathy Nolan-Kent County DSS; Bill Hildebrand-MEMA; Jeffrey Baggett-Citizen; Kees DeMooy-Town ofChestertown; CJ Morales-Town of Millington; Elizabeth Greenwell-Town of Betterton; Warren Walters- Town of Galena.

Meeting Notes

County Project Manager: Virginia Gregg-Office of Emergency Services
Meeting Facilitators: Michele King & Virginia Smith, SP&D

Traditionally hazard mitigation stakeholder meetings have been held in-person, however given the ongoing COVID-19 incident, will be conducted throughout the plan update process. At a minimum, (3) stakeholder webex meetings will be held over the summer months.

Stakeholder involvement includes:

- meeting attendance;
- review of meeting materials and feedback;
- completion of requested fillable PDF's and survey;
- mitigation action and/or project ideas;
- submittal of requested agency, department, or organization data and information; and,
- draft plan review and comment.

In addition to the (3) stakeholder meetings, targeted individual or small group discussions will be held. Stakeholders will be contacted directly for scheduling purposes, as applicable.

Attachments included as 'read ahead" material were discussed in further detail during the webex. Several next step items were identified and include:

- completion of Community Perspective Survey;
- 2014-Present Mitigation Action Status Fillable PDF;
- additional content for 2020 hazard mitigation plan section of Kent County website under the Office of Emergency Services;
- Stakeholder webex meeting #2- July;
- Stakeholder webex meeting #3- August-September.

Doodle polling will be sent in order to determine Stakeholder Meeting #2 date/time.

For additional information or questions, please contact Virginia Gregg, HMP Project Manager-Office of Emergency Services at: vgregg@kentgov.org

Kent County Stakeholder Meeting #2
WebEx Meeting

Date: July 13, 2020 **Start Time: 1:30 PM**

Agenda Items

- Stakeholder Hazard Risk Survey Results
- New Hazard Risk Ranking & Methodology
- 2014-2020 Mitigation Action Items Status Update
- New Hazard: Pandemic & Emerging Infectious Diseases
- Capability Assessment
- Next Steps

In attendance: Virginia Gregg-Office of Emergency Services; Wayne Darrell-Office of Emergency Services; Todd McGinnis- Office of Emergency Services; Shelley Heller-Kent County Administrator; Stephanie Jones-Planning & Zoning; Michael Mouldes-Public Works; Benadette Bowman-Tourism; Jamie Williams-Economic Development; Barbara Jorgenson-Historic Society; Karen Miller-Soil Conservation District; Vandrick Hamlin-Public Schools; Herb Dennis-Detention Center; Beth Copp-Shore Regional Health Systems; Shelly Neal-Edwards-Kent County DSS; Kathy Nolan-Kent County DSS; Bill Hildebrand-MEMA; Eric Reynolds-Humane Society; Kees DeMooy-Town of Chestertown; Robert Resele-Town of Rock Hall; Elizabeth Greenwell-Town of Betterton; Kathleen Billmire- Town of Galena.

Meeting Notes

County Project Manager: Virginia Gregg-Office of Emergency Services
Meeting Facilitators: Michele King & Virginia Smith, SP&D

For this WebEx meeting, a PowerPoint presentation was reviewed and is attached for your convenience.

The results from the hazard risk section of the survey were used for the Community Perspective portion of the Hazard Risk Ranking and Methodology (Appendix A). Hazard Risk Ranking resulted in Pandemic & Emerging Infectious Diseases and Severe Storms as “High Risk.”

In an effort to distribute the survey to the public, Stakeholder members were asked to include the survey link on various media, such as, Town websites, Facebook, Twitter, Community Newsletters. Sample language for media outlets:

The Kent County Office of Emergency Services is currently in the process of updating their Hazard Mitigation Plan. This project aims to ensure the County is prepared for all kinds of hazards, such as floods, hurricanes, etc. The Office of Emergency Services is placing special emphasis on understanding citizens' concerns regarding hazards. Community members input to the process is incredibly valuable. Therefore, a Public Survey has been developed to collect the citizens’ insight and perspective. The survey consists of 9 questions and will take an average of 4 minutes or less to complete. Please use the link the following link to participate in the survey: https://www.surveymonkey.com/r/HLV9L3F. *Thank you for your time!*

The survey’s direct link: https://www.surveymonkey.com/r/HLV9L3F or though the County’s Hazard Mitigation Plan Update website: https://www.kentcounty.com/kenthmp2020 can be used to distribute the survey.

Members were asked to provide information on all outreach initiatives, including discussions on the

hazard mitigation plan during department/agency meetings or publications hazard mitigation planning was included. Information will be collected and included in the *Kent County Hazard Mitigation Planning, Training, and Outreach Initiatives* table; attached. Members can use this table to provide the necessary information to Virginia Gregg.

Appendix B 2014 – 2020 Mitigation Actions Status Report was provided as referenced material and discussed. Members were asked to review the mitigation actions and current status updates. Please provide suggestions for 2014 mitigation action items that could be carried over into the 2020 Plan update and any new mitigation action item ideas.

The new hazard Pandemic & Emerging Infectious Diseases and Capability Assessment were discussed. Targeted emails will be sent in order to obtain necessary information on both subjects.

Next step items were identified and include:

- Hazard Chapter Highlights
- Vulnerability Assessments
- Capability Assessment Results
- New Mitigation Action Ideas

Doodle polling will be sent in order to determine Stakeholder Meeting #3 date/time.

For additional information or questions, please contact Virginia Gregg, HMP Project Manager-Office of Emergency Services at: vgregg@kentgov.org

Kent County Stakeholder Meeting #3
Webex Meeting

Date: August 27, 2020 **Start Time: 1:30 PM**

Agenda Items

- Public Survey
- Critical & Public Facilities
- Hazard Section Preview
- Capability Assessment & Table
- Next steps

In attendance: Virginia Gregg-Office of Emergency Services; Wayne Darrell-Office of Emergency Services; Shelley Heller-Kent County Administrator; Stephanie Jones-Planning & Zoning; Carla Gerber-Planning & Zoning; Barbara Jorgenson-Historic Society; Karen Miller-Soil Conservation District; Beth Copp-Shore Regional Health Systems; Shelly Neal-Edwards-Kent County DSS; Bill Hildebrand-MEMA; Eric Reynolds-Humane Society; Jim Bass-Eastern Shore Land Conservancy; Tim Trumbauer-Chester River Riverkeepers; Jo Manning-Town of Millington; Elizabeth Greenwell-Town of Betterton.

Meeting Notes

County Project Manager: Virginia Gregg-Office of Emergency Services
Meeting Facilitators: Michele King & Virginia Smith, SP&D

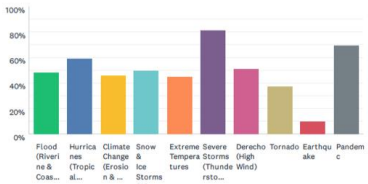
Traditionally hazard mitigation stakeholder meetings have been held in-person, however given the ongoing COVID-19 incident, webex meetings have been conducted throughout the plan update process. Three stakeholder webex meetings have been held over the summer months. Meeting recordings have been added to the Kent County website under the Office of Emergency Services.

Public Survey

Results of the public survey were presented during the meeting. Survey highlights include:

- 177 surveys completed;
- Public survey results are consistent with stakeholder committee survey results used for the hazard risk assessment under the "community perspective" rating category.
- When asked for concern of additional hazards no "new" natural hazards were identified. Note: human-caused and other technological hazards were identified and a "new" mitigation strategy for the development of a Threat Hazard Identification Risk Assessment (THIRA) will be included in the plan update.

Which hazard events you feel may particularly affect your area of the county or town?



ANSWER CHOICES	RESPONSES
Flood (Riverine & Coastal)	48.19%
Hurricanes (Tropical Storms)	59.04%
Climate Change (Erosion & Sea Level Rise)	45.78%
Snow & Ice Storms (Winter Storm/Weather)	49.40%
Extreme Temperatures	45.18%
Severe Storms (Thunderstorm Wind, Lightning & Hail)	81.33%
Derecho (High Wind)	51.20%
Tornado	37.35%
Earthquake	10.24%
Pandemic	69.28%

Screenshot of Survey Results from Presentation

Critical & Public Facilities

A geodatabase of critical and public facilities has been created for this plan update. Critical facilities are facilities that should **remain operational** before, during, and after a disaster event. These facilities are considered **priorities** for hazard mitigation grant funding. In addition, other government owned and operated "public" facilities have been included.

Both the database and overall critical and public facility map was displayed during the meeting. Vulnerability columns for each facility have been included:

- FEMA Flood Zone;
- Depth of Flooding (1% annual chance flood scenario)
- Hurricane Storm Surge; and
- Projected Sea Level Rise Inundation.

Additional facility information from Maryland PropertyView has been included in database for use during various hazard vulnerability analysis and plan sections, such as:

- Building Material Type;
- Number of Floors;
- Improvement Value; and,
- Year Built.

Hazard Section Preview

During the presentation plan section were displayed. While the plan is considered an "update", the plan format and organization has been changed. Working draft plan sections will be sent to the stakeholder group for preview and comment.

Capability Assessment

Each community has a unique set of capabilities, including authorities, policies, programs, staff, funding, and other resources available to accomplish mitigation and reduce long term vulnerability.

A capability assessment table was discussed. Both the county and the towns were asked to review and add information, as available.

Next Steps

- Schedule Town WebEx Meeting (1 mtg. per)

A separate email will be sent to each town requesting meeting date/time availability.

- Vulnerability Assessments

SP&D will continue work on vulnerability for each hazard section of the plan. Additional vulnerability assessment information will be presented at the next stakeholder meeting in September.

- New Mitigation Action Ideas- Work Session

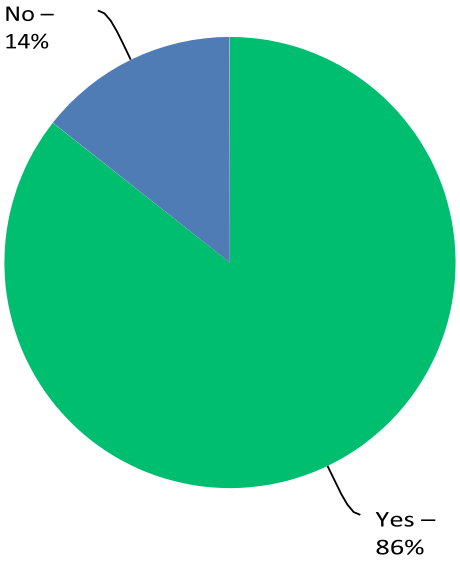
Virginia Gregg is working on gathering stakeholder input on the type of meeting that is best for the September Stakeholder meeting.

- Working draft plan sections will be distributed to stakeholders for review.

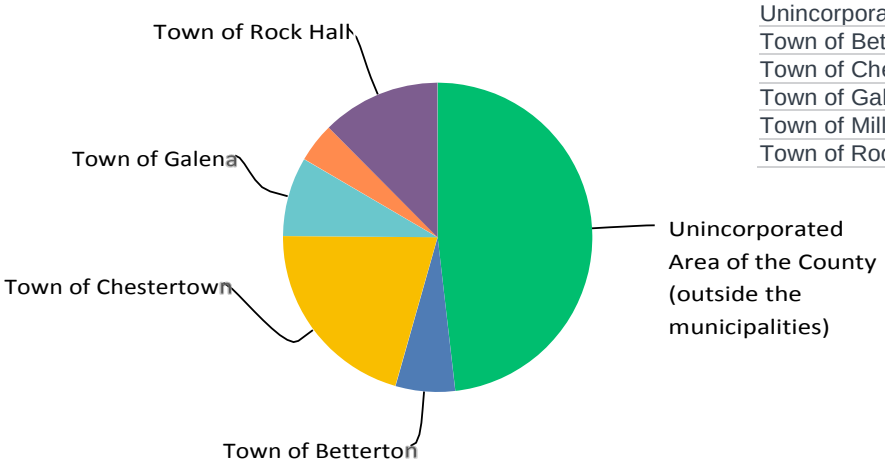
For additional information or questions, please contact Virginia Gregg, HMP Project Manager-Office of Emergency Services at: vgregg@kentgov.org

Public Survey Results

Are you a resident of Kent County?



Kent County has an unincorporated area and 5 municipalities. Please select the area where you currently live.



Unincorporated Area	48.19%
Town of Betterton	6.22%
Town of Chestertown	20.73%
Town of Galena	8.29%
Town of Millington	4.15%
Town of Rock Hall	12.44%

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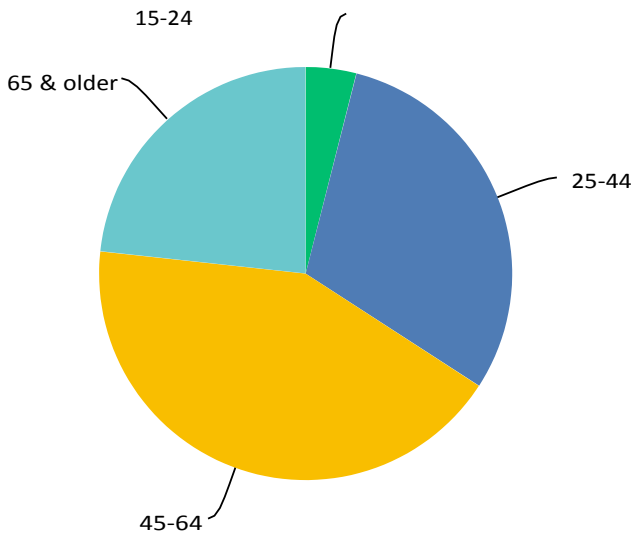
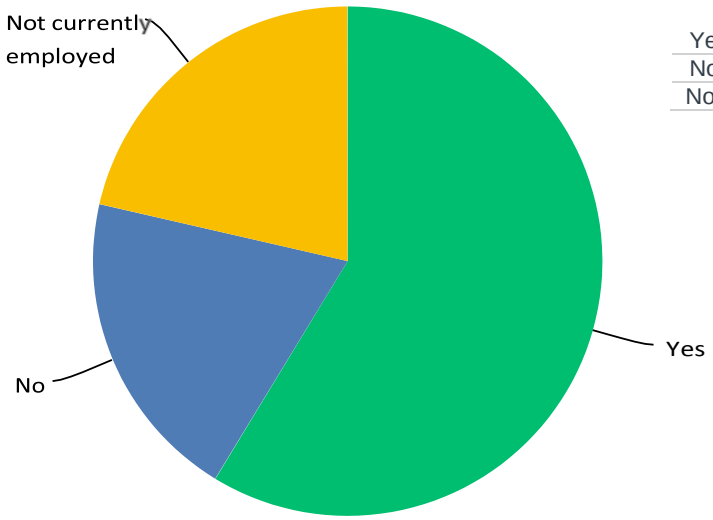
In what age group do you belong?



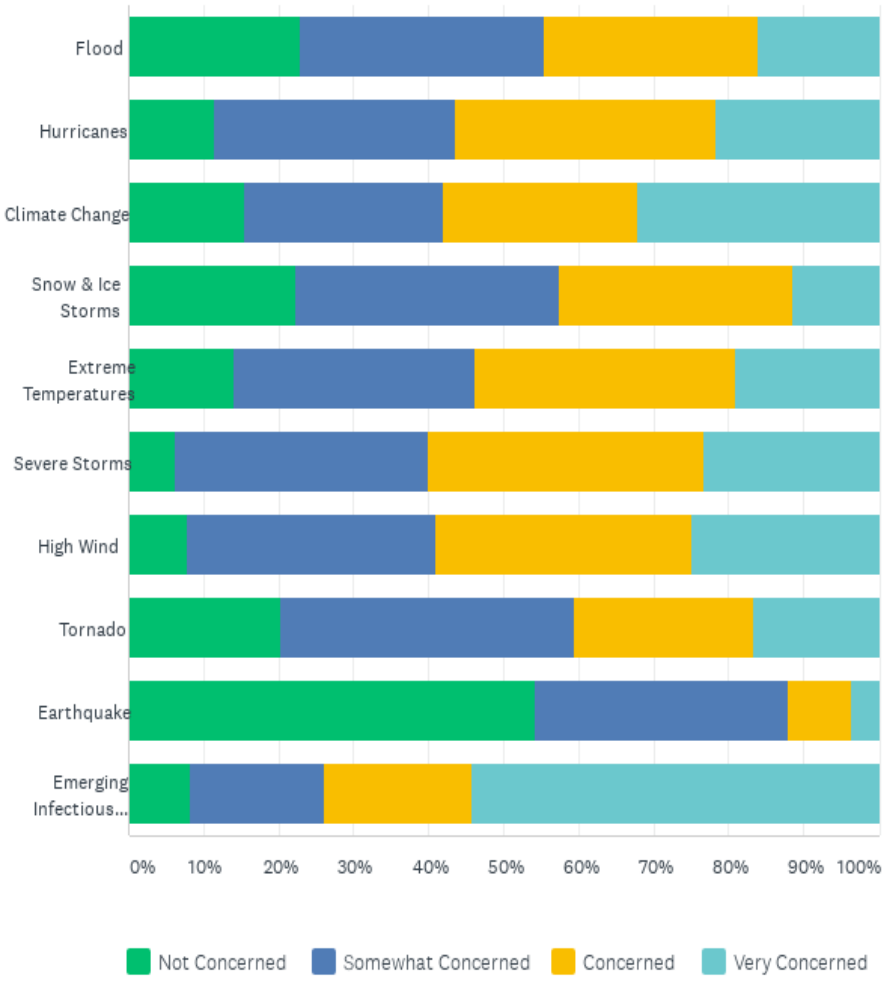
15-24	3.96%
25-44	30.20%
45-64	42.57%
65 & older	23.27%

Do you work in Kent County?

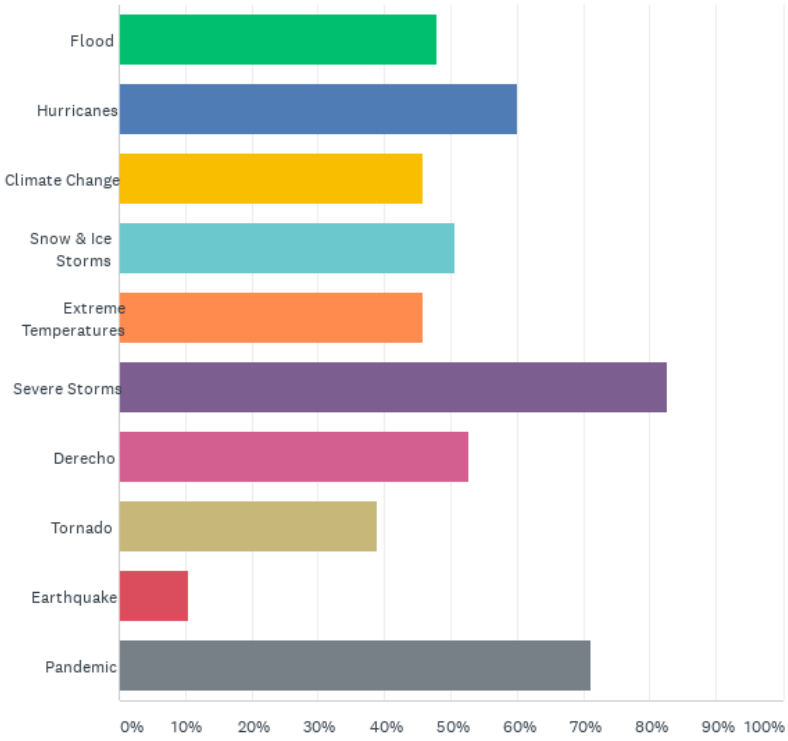


Yes	58.71%
No	19.90%
Not currently employed	21.39%

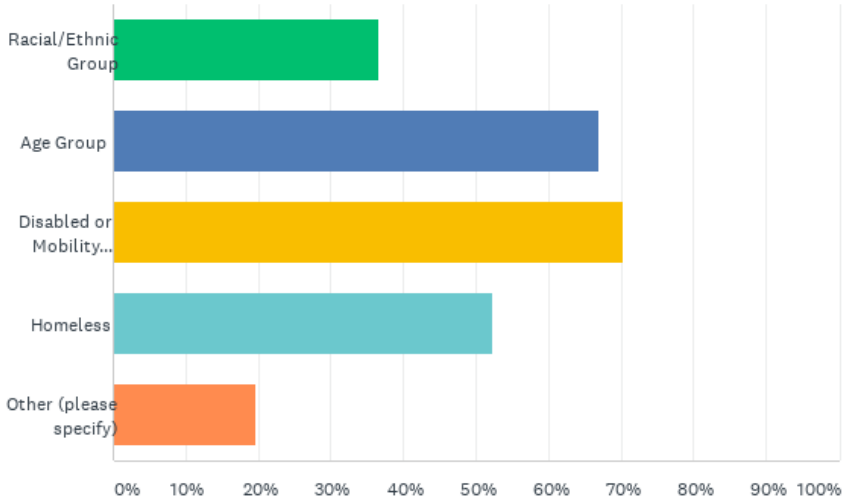
Please indicate your level of concern for each hazard. If you are unsure or unfamiliar with any of the following hazards, please read the definition provided for each hazard.



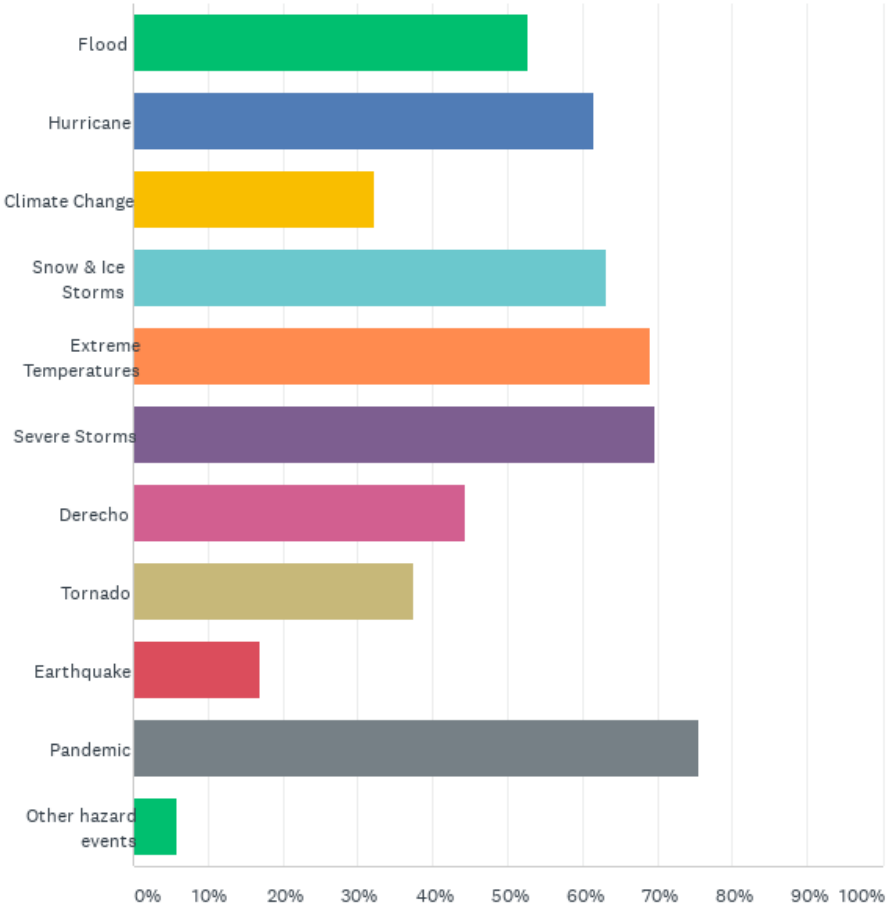
Please choose from the below list to indicate which hazard events you feel may particularly affect your area of the county or town. (Please check all that apply.)



Please indicate the group(s) on which you based your answer, if it is listed, or describe it in the box below. (The listed groups are only meant to serve as initial ideas.)



Based on the group(s) you have selected in the previous question, please select which hazard events you feel may particularly affect those group? (Multiple options may be chosen.)



APPENDIX D:
CAPABILITY ASSESSMENT

Planning and Regulatory

Planning and Regulatory

Kent County has identified capabilities for plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards.

Plans		Yes/No Year	Notes:
Comprehensive/ Master Plan	County	Yes-2018	Critical areas and sensitive areas as identified, both of which include floodplains.
	Betterton	Yes-2009	Update slated for 2022
	Chesterton	Yes-2015	Includes Sustainability Projects/Critical & Sensitive Areas
	Galena	Yes-2009	Updates expected in late 2020 or early 2021
	Millington	Yes-2014	Update 2021 – Potential Annexation area identified which includes flood-prone areas.
	Rock Hall	Yes-2011	
Capital Improvements Plan	County	Yes-FY2021	Annual
Local Emergency Operations Plan	County	Yes-2013	Adopted w/amendments in 2016 & 2019. Hazards impacting county identified in plan.
	Betterton	No	
	Chesterton	No	
	Galena	No	
	Millington	No	However, they have an Memorandum of understanding (MOU) to use the Volunteer Fire Department (VFD) as Emergency Operations Center.
	Rock Hall	No	
Continuity of Operations Plan	County	Yes-2016	All county departments.
	Betterton	No	Working Remotely during COVID-19/Fire Hall available
	Chesterton	No	Back-Up Data and Remote Working.
	Galena	No	
	Millington	No	Memorandum of Agreement w/Fire Company for emergency operations. Reviewed annually. Includes line of succession.
	Rock Hall	No	
Transportation Plan	County	Yes-2018	Comprehensive Plan - Transportation Element
Stormwater Management Plan	County	Yes	Sediment & Erosion Control and Stormwater Management
	Towns	Yes	Follows County - Sediment & Erosion Control and Stormwater Management
Building Code, Permitting, and Inspections		**Yes/No**	**Notes:** **Version/Year:**
Building Code	County	Yes	2018 International Building Codes
	Betterton	Yes	2018 International Building Codes - Statement within code. Automatically adopts updated revisions and codes.
	Chesterton		
	Galena		
	Millington		
	Rock Hall		
Zoning ordinance	County	Yes-2002	Amendments; Comprehensive Zoning Update in development includes sensitive and critical areas.
	Betterton	Yes-2009	Critical Area ½ Town
	Chesterton	Yes-2012	Update due soon
	Galena	Yes-2020	Updated Land Subdivision
	Millington	Yes	w/ (2) amendments to date. Update 2022
	Rock Hall	Yes	

Land Use Planning and Ordinances cont'd		Yes/No	Notes:
Floodplain Ordinance	County	Yes	Section 7 Amendment 2014- 2 ft above Base Flood Elevation (BFE)
	Betterton	Yes	No residential structures located in the floodplain
	Chesterton	Yes	Revise site plans
	Galena	No	No floodplain
	Millington	Yes	Floodplain permits- Note: only (1) permit issued within floodplain in the last 20 years.
	Rock Hall	Yes	2014; Chapter 117 Floodplain Management adopted Maryland Department of Environment (MDE) model floodplain ordinance
Land Use Planning and Ordinances cont'd		**Yes/No**	**Notes:**
Acquisition of land for open space and public recreation uses	County	Yes	Land Preservation and Recreation Plan
	Betterton	No	2019 Critical Areas Plan
	Chesterton	Yes	2020 Critical Areas Plan
	Galena	Yes	Community Park
	Millington	Yes	Flood-prone Areas - 2020 Plan
	Rock Hall	No	

How can these capabilities be expanded and improved to reduce risk?

- Floodplain Management Ordinance currently states that all new development or substantial improvement be built 2 feet above base flood elevation (BFE). Consider amending ordinance to 3 feet above base flood elevation (BFE).
- Consider adopting an expanded floodplain (i.e. including the 0.2% chance "500-year" floodplain) or a "coastal resilience overlay zone" for greater protection from sea level rise and an increased margin of safety against errors in FEMA flood risk maps.
- Include hazard mitigation and climate adaptation strategies into the Capital Improvement Plan process.
- Future projections of sea level change and nuisance flooding should also be integrated into land use planning, floodplain management, comprehensive planning, and capital investment planning.

Administrative and Technical

Administrative and Technical

Kent County has Identified the following administrative and technical capabilities. These include staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions.

Government Department & Staff Resources															
Communities	Land Use Authority	Land Use/ Development Planning		Public Works & Engineering		Emergency Services (Includes Police & Fire)		Floodplain Manager		GIS		Fiscal Staff		Planning Commission	
	Y/N	Y/N	# of Staff	Y/N	# of Staff	Y/N	# of Staff	Y/N	# of Staff	Y/N	# of Staff	Y/N	# of Staff	Y/N	# of Staff
Kent County	Y	Y	9	Y	6	Y	5	Y	1	Y	1	Y	3	Y	7
Betterton	Y	Y	1	Y	3	Y	VFD*	Y	1	N	-	Y	1	Y	5
Chestertown	Y	Y	1	Y	10	Y	VFD*	Y	1	Y	1	Y	2	Y	5
Galena	Y	Y	1	Y	1	Y	VFD*	N	-	N	-	Y	1	Y	5
Millington	Y	Y	1	Y	1	Y	1	Y	1	N	-	Y	1	Y	5
Rock Hall	Y	Y	1	Y	6	Y	VFD*	Y	1	N	-	Y	1	Y	5

Source: County & Municipal Local Information
Note: These positions are often filled by the same person.
**Volunteer Fire Department*

Technical		Yes/No	Notes:
Warning systems/services (Reverse 911, outdoor warning signals)	County	Yes	Code Red and Know Your Zone
	Betterton	Yes	County Code Red System, as available
	Chesterton	Yes	County Code Red System, as available and VFD* Siren
	Galena	Yes	County Code Red System, as available
	Millington	Yes	County Code Red System, as available
	Rock Hall	Yes	Fire Department Early Warning System and County Code Red System, as available
Hazus analysis	County	Yes	Risk Map Products - FEMA Nov 2014
	Betterton	Yes	Risk Map Products - FEMA Nov 2014
	Chesterton		
	Millington		
	Rock Hall		

How can these capabilities be expanded and improved to reduce risk?

- Work with the Office of Emergency Services to assign specific user accounts for the Code Red notification system. These specific user accounts will be designated to Town personnel for Town specific public messaging.
- Integrate Hazard Mitigation Plan into all Comprehensive Plan updates.

**Volunteer Fire Department*

Financial

Financial

Kent County determined its eligibility and access to the following funding resources for hazard mitigation projects.

Funding Resources		Access/ Eligibility (Yes/No)	Notes:
Capital improvements project funding	County	Yes-FY2021	
	Betterton	No	Grant fund used almost exclusively
	Chesterton		
	Galena		
	Millington		
	Rock Hall		
Authority to levy taxes for specific purposes	County	Yes	
	Betterton	Yes	$150 - Owns Land to Offset Water & Sewer System
	Chesterton	Yes	Not Used
	Galena	Yes	Proposed in 2016- Special Sewer District
	Millington	Yes	Special Tax District - Used for Stormwater Pond
	Rock Hall	Yes	
Impact fees for new development	County	Yes	New Single-Family Dwellings $0.15 per square foot, minimum of $200 Two Family Dwelling/Duplex (2 bedrooms) $0.15 per square foot, minimum of $235.00 per unit - Each additional bedroom $25.00 Townhouse/Condo (3 Bedrooms) $0.15 per square foot, minimum of $235.00 -1st unit; each additional unit $85.00 - Each additional bedroom $25.00 Multi-Family Dwelling (2 bedrooms) $.015 per square foot, minimum of $295.00 1st unit; each additional unit $80 - Each additional bedroom $25.00
	Betterton	Yes	Larger Development
	Chesterton	Yes	
	Galena	No	Considering with Comprehensive Plan Update
	Millington	No	
	Rock Hall	No	
Storm water utility fee	County	Yes-July 2009	Stormwater Review Fee - Standard $25 Stormwater Review Fee - Formal Plan - Minor Subdivision or Site Plan $50 per acre of disturbance Stormwater Review Fee - Formal Plan - Major Subdivision or Site Plan $250 Stormwater Review Fee - Waiver $50
	Betterton	No	
	Chesterton	No	
	Galena	No	
	Millington	Yes	$100
	Rock Hall	No	
Community Development Block Grant	County	Yes	
	Betterton	Yes	Wheeler Avenue Reconstruction & Streetscape
	Chesterton	No	Applied for grant but did not receive.
	Galena	Yes	Residential/Covered Facade
	Millington	Yes	Working on Grant for Senior Housing
	Rock Hall	Yes	

How can these capabilities be expanded and improved to reduce risk?
• Secure funding for hazard mitigation and climate adaptation projects and initiatives. Leverage special taxes and impact fees, as applicable.

Education and Outreach

Education and Outreach

Kent County Identified education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information.

Program/Organization		Yes/No	Notes:
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access, and functional needs populations, etc.	County	Yes	Eastern Shore Land Conservatory, Non-Profits: Chester River Health Foundation, Sultana Education Foundation, United Way of Kent County, Women in Need, Inc.
	Betterton	Yes	Betterton Community Group
	Chesterton	Yes	Shore Rivers, Town Environmental Committee, Washington College Environmental
	Galena	No	
	Millington	No	
	Rock Hall	No	
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	County	Yes	Upper Shore Workforce Investment Board, Continuing Education - Chesapeake College, Maryland Apprenticeship Programs, and the Washington College Federal Work Study
	Betterton	Yes	Volunteer Fire Department (VFD)/Social Media Sharing/Quarterly Newsletter for Preparedness
	Chesterton	Yes	Social Media Posts for Preparedness
	Galena	Yes	Installed Water Meters. View and Receive Water Alerts. Informing Citizens of High-Water Usage - View Through Smart Devices.
	Millington	No	
	Rock Hall	Yes	
StormReady certification	County	No	
	Towns	No	

How can these capabilities be expanded and improved to reduce risk?

- Encourage partnership and collaboration with local citizens groups.
- Pursue Storm Ready Certification from the National Weather Service.
- Consider funding foundation sources for hazard mitigation and climate adaptation. Examples include:
    - Bloomberg Philanthropies
    - Kresge Foundation
    - Resilient Communities Program

APPENDIX E:
2020-2025 MITIGATION ACTION ITEMS & PRIORITIZATION

Mitigation actions form the core of the *2021 Kent County Hazard Mitigation Plan*. The mitigations actions were grouped into the following six (6) broad categories.

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

- **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.

- **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.

- **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.

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

- **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.

Mitigation Action Items & Prioritization				
Action Items	**Hazard(s)/ Sections**	**Category**	**Responsible Entity(s)**	**Ranking**
SECTION 2 FLOOD				
Identify and solicit low/no cost partners to create awareness and promote outreach and conduct a business continuity planning workshop to promote disaster resistance, mitigation, and preparedness to help businesses develop contingency plans to minimize loss during disasters.	All-Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Public Education & Awareness	Kent County Office of Emergency Services, Dept. of Public Works, Dept. of Economic Development, Historical Society, Heron Point, Towns, Chamber of Commerce	High
Forward and repost Kent County Office of Emergency Services' hazard related Facebook posts and other social media content.	All-Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Public Education & Awareness	Town of Chestertown	N/A
			Town of Rock Hall	High
			Town of Millington	Medium
			Town of Betterton	High
			Town of Galena	High
			Historical Society, American Red Cross, Economic Development, Chamber of Commerce, Partnered Media Outlets	High
Create awareness among county residents of the potential hazards associated with floodplain areas and the ways they can protect themselves and their properties from flood events.	Flood/ Section 2	Public Education & Awareness	Kent County Office of Emergency Services, Historical Society	High
Consider pursuing FEMA's Community Rating System to lower flood insurance costs for property owners and provide outreach to at-risk properties. Review Map 2-3 thru 2-8 for at-risk structures.	Flood/ Section 2	Public Education & Awareness	Town of Chestertown	N/A
			Town of Rock Hall	High
			Town of Millington	Medium
			Town of Betterton	Medium
			Kent County Dept. of Planning, Housing & Zoning	Medium
Conduct public awareness campaign on severe wind through various outreach activities.	Tornado, High Wind, Hurricane, Severe Storms/ Sections 3, 5, 7, 8	Public Education & Awareness	Kent County Dept. of Planning, Housing & Zoning, Dept. of Economic Development, Historic Society, Towns	Medium
Develop and use updated delivery methods for winter storm public outreach activities. Topics to include warming center locations, driving conditions, and other preparedness items.	Snow & Ice Storms/ Section 6	Public Education & Awareness	Kent County Office of Emergency Services, Faith Centers & Towns	Medium
Expand public information capabilities by hosting regional training and workshops. Continue Joint Information Center initiative.	All-Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Public Education & Awareness	Kent County Office of Emergency Services	High
Increase citizen participation in the County's hazard warning and notification system - Code Red.	All-Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Public Education & Awareness	Kent County Office of Emergency Services	High

Action Items	Hazard(s)/ Sections	Category	Responsible Entity(s)	Ranking
Pursue Storm Ready Certification through the National Weather Service.	All-Weather Related Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10	Emergency Services	Kent County Office of Emergency Services	Medium
Work with the Office of Emergency Services to assign specific user accounts for the Code Red notification system. These specific user accounts will be designated to Town personnel for Town specific public messaging.	All-Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Emergency Services	Town of Betterton	High
			Town of Galena	High
			Town of Chestertown	N/A
			Town of Millington	Medium
			Washington College	Medium
Host and conduct Regional Incident Command Training courses including multi-disciplines. Encourage cross-training among various hazard response and mitigation disciplines. Consider the 0305 All-Hazard Incident Management Course for a group training multi-day event.	All-Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Emergency Services	Kent County Office of Emergency Services	Low
Continue work on the development of the County Debris Management Plan. Coordinate the development of the plan with various stakeholders.	Tornado, High Wind, Hurricane, Severe Storms/ Sections 3, 5, 7, 8	Prevention	Kent County Office of Emergency Services, Dept. of Public Works, Towns	High
Complete a fire and rescue station garage door assessment to determine high wind risk and mitigation needs, if any. Note: Of the (8) stations, (3) were built in or before 1975.	Tornado, High Wind, Hurricane, Severe Storms/ Sections 3, 5, 7, 8	Property Protection	Volunteer Fire & Rescue Stations	High
Install lightning rod(s) at Shore Regional Health and Washington College.	Severe Storms/ Section 7	Property Protection	Shore Regional Health, Washington College	High
Following the review of FEMA E-74 Practical Guide, examine critical and public facilities for proper anchorage and bracing of non-structural components.	Earthquake/ Section 9	Property Protection	Kent County Office of Emergency Services, Dept. of Public Works, Towns	Low
Continue to participation in The Great Shake Out Drill - Drop.	Earthquake/ Section 9	Property Protection	Kent County Office of Emergency Services, Health Dept.	Medium
Install generator at Washington College campus: Johnson Fitness Center, Hudson Hall & gym. These locations would be where students congregate during a hazard event. Johnson Fitness Center is also used as shelter for several elementary schools. Dining Hall needs a generator to be able to continue to provide meals to students and first responders when necessary.	All-Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Emergency Services	Washington College	Medium
Obtain and strategically deploy mobile message sign boards throughout the county.	All-Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Emergency Services	Kent County Office of Emergency Services, Washington College	High

Action Items	Hazard(s)/ Sections	Category	Responsible Entity(s)	Ranking
Establish Vulnerable Population Committee that meets periodically. Maintain updated Committee listing with primary and secondary contacts.	All-Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Emergency Services	Kent County Office of Emergency Services, Health Dept., Dept. of Social Services, Samaritan Group, Kent County Commission on Aging	Medium
Consider adopting an expanded floodplain (i.e. including the 0.2% chance "500-year" floodplain) or a "coastal resilience overlay zone" for greater protection from sea level rise and an increased margin of safety against errors in FEMA flood risk maps.	Climate Adaptation/ Section 10	Prevention & Natural Resource Protection	Kent County Dept. of Planning, Housing & Zoning	Medium
Consider adopting an expanded floodplain (i.e. including the 0.2% chance "500-year" floodplain) or a "coastal resilience overlay zone" for greater protection from sea level rise and an increased margin of safety against errors in FEMA flood risk maps.	Climate Adaptation/ Section 10	Prevention & Natural Resource Protection	Town of Betterton	Medium
			Town of Chestertown	Medium
			Town of Rock Hall	High
			Town of Millington	Medium
Promote awareness of assets and resources located within the 0.2% chance ("500-year") floodplain that may become increasingly at risk due to sea level rise. Currently, properties located within the 0.2% chance floodplain are neither required to meet floodplain requirements nor carry flood insurance. A disclosure regarding such properties should be developed to better-inform residents of their vulnerability and protection options.	Flood & Climate Adaptation/ Sections 2 & 10	Prevention & Natural Resource Protection	Kent County Dept. of Planning, Housing & Zoning	Low
Create a prioritized list of properties for land acquisition for flood mitigation and conservation	Flood & Climate Adaptation/ Sections 2 & 10	Prevention & Natural Resource Protection	Kent County Dept. of Planning, Housing & Zoning	Medium
Enforce tie down requirements in the mobile homes community in Worton. Identify homes that lack proper tie downs in the (1) mobile home community within the County to reduce their vulnerability to high wind damages.	Tornado, High Wind, Hurricane, Severe Storms/ Sections 3, 5, 7, 8	Prevention	Kent County Dept. of Planning, Housing & Zoning	Medium
Enforce tie down requirements in the mobile homes in the Town of Rock Hall. Identify homes that lack proper tie downs in the (2) mobile home communities within the Town to reduce their vulnerability to high wind damages.	Tornado, High Wind, Hurricane, Severe Storms/ Sections 3, 5, 7, 8	Prevention	Town of Rock Hall	High
Enforce tie down requirements in the mobile homes in the Town of Chestertown. Identify homes that lack proper tie downs in the (4) mobile home communities within the Town to reduce their vulnerability to high wind damages.	Tornado, High Wind, Hurricane, Severe Storms/ Sections 3, 5, 7, 8	Prevention	Town of Chestertown	High
Develop a 5-year maintenance and upgrade plan (modeled after the county's water infrastructure maintenance plan) for major building systems (e.g. HVAC, groundwater elevation control) with additional capacity for higher outdoor temperatures, higher cooling loads from electronics, and increased precipitation rates.	Climate Adaptation/ Section 10	Prevention & Natural Resource Protection	Kent County Dept. of Public Works	Medium

Action Items	Hazard(s)/ Sections	Category	Responsible Entity(s)	Ranking
Design with additional elevation when repairing or upgrading county bulkheads, retaining walls, jetties, riprap, and docks to preserve function with rising water levels.	Flood & Climate Adaptation/ Sections 2 & 10	Prevention & Natural Resource Protection	Kent County Dept. of Public Works	Medium
Review county owned critical & public facilities within the FEMA regulated 1% annual-chance flood event area listed on Table 2-4. (5) properties were identified and are located within Rock Hall, Chestertown, and Worton.	Flood/ Section 2	Property Protection	Kent County Office of Emergency Services, Dept. of Public Works	Medium
Place fixed high-water signage on vulnerable bridges & roads.	Flood/ Section 2	Prevention & Natural Resource Protection	Kent County Office of Emergency Services, Dept. of Public Works	High
The Kent County Detention Center is particularly vulnerable because it has a groundwater spring located nearby. A set of pumps keeps the water table at least 12 feet below the building's foundation. However, during wet or rainy periods the pumps cannot keep up and the basement floors get wet. This is a problem because the Emergency Operations Center and communications equipment is housed in the basement.	Flood & Climate Adaptation/ Sections 2 & 10	Prevention	Kent County Office of Emergency Services, Kent County Detention Center, Dept. of Public Works, Kent County Dept. of Planning, Housing & Zoning	High
Encourage agricultural community to plant shade trees and/or erect tarp systems for livestock to congregate under extreme heat events.	Extreme Temperatures/ Section 4	Natural Resource Protection	Soil Conservation District	Medium
Bayside erosion issues identified by the Town. Note: Partial funding has been obtained for erosion mitigation project by FEMA 2021; project includes revetment and riparian planting.	Climate Adaptation/ Section 10	Natural Resource Protection	Town of Betterton	High
Install back-up generators at pump stations.	All-Weather Related Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10	Property Protection	Town of Betterton	High
Investigate Ericsson Avenue storm water management issues. Potential Streetscape Project- project is multi-faceted.	Flood/ Section 2	Property Protection	Town of Betterton	High
Install Rain Garden into landscaping plan around Cerino Center.	Climate Adaptation/ Section 10	Natural Resource Protection	Town of Chestertown	High
Provide flood insurance and flood related regulations training area contractors, real estate agents and insurance providers.	Flood/ Section 2	Prevention	Town of Millington	Medium
			Kent County Dept. of Planning, Housing & Zoning	High
Pursue funding and conceptual design for stream restoration project(s) along the Chester River at Little Chester Bridge. Both sides display bridge abutment scour issues.	Flood & Climate Adaptation/ Sections 2, 10	Property & Natural Resource Protection	Town of Millington	Medium
Install back-up generators at public utility facilities, Town Hall, and VFD.	All-Weather Related Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10	Property Protection	Town of Millington	Medium

Action Items	Hazard(s)/ Sections	Category	Responsible Entity(s)	Ranking
Determine potential flood impacts to the WWTP located within the FEMA regulated 1% annual-chance flood event area listed on Table 2-4.	Flood/ Section 2	Property Protection	Town of Millington	Medium
Complete Sustainable Maryland certification and/or recertification.	Climate Adaptation/ Section 10	Natural Resource Protection	Town of Galena	High
			Town of Chestertown	High
			Town of Betterton	Medium
			Town of Millington	Medium
Complete application process for the Resilient Maryland Grant Program. Note: projects include distributed energy resource (DER) systems such as, micro grids, advance Combined Heat and Power (CHP) systems, and community resiliency hubs.	Climate Adaptation & Extreme Temperatures/ Sections 4, 10	Property & Natural Resource Protection	Town of Galena	High
			Town of Betterton	N/A
			Town of Chestertown	N/A
			Town of Millington	Medium
Establish a working group to complete a field visit to identify potential stream restoration project locations.	Flood & Climate Adaptation/ Sections 2 & 10	Natural Resource Protection	Town of Millington	Medium
			Town of Rock Hall, University of MD	High
Strictly enforce sediment erosion control regulations. Pursue grants for planting projects to stabilize soil and mitigate erosion.	Climate Adaptation/ Section 10	Prevention & Natural Resource Protection	Town of Rock Hall	High
Explore (10) tide flex valve installation.	Flood/ Section 2	Property Protection	Town of Rock Hall	High
Install snow fences at strategic locations identified by the Town.	Snow & Ice Storms/ Section 6	Property Protection & Natural Resource Protection	Town of Rock Hall	Medium
Develop a Flood Mitigation Plan.	Flood/ Section 2	Property Protection	Kent County Office of Emergency Services, Kent County Dept. of Planning, Housing & Zoning	High
Add link to MDE's Flood Risk application on the Kent County's Mapping Tools homepage.	Flood/ Section 2	Property Protection	Kent County Dept. of Planning, Housing & Zoning	High
Encourage the planting of shade trees to relieve extreme heat reflected off concrete services. Target both public and private property.	Extreme Temperatures/ Section 1	Natural Resource Protection	Kent County & Area Businesses	Medium
Expand number and locations of cooling and warming centers within the County. Currently, public libraries are used.	Extreme Temperatures/ Section 4	Emergency Services	DSS, OES, HD, Aging	Medium
Host and promote training courses such as DHS and FEMA certified courses.	Emerging Infectious Diseases/ Section 11	Emergency Services	Kent County Health Dept. and Office of Emergency Services	Medium

Action Items	Hazard(s)/ Sections	Category	Responsible Entity(s)	Ranking
Prepare an After-Action Report and Improvement Plan for COVID-19 incident.	Emerging Infectious Diseases/ Section 11	Emergency Services	Health Department, Office of Emergency Services	Medium
Consider additional training such as Incident Command System (ICS), Incident Management Team (IMT), and Public Information for public health personnel.	All-Hazards/ Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Emergency Services	Health Department	High

APPENDIX F:
CRITICAL & PUBLIC FACILITIES

Critical & Public Facilities

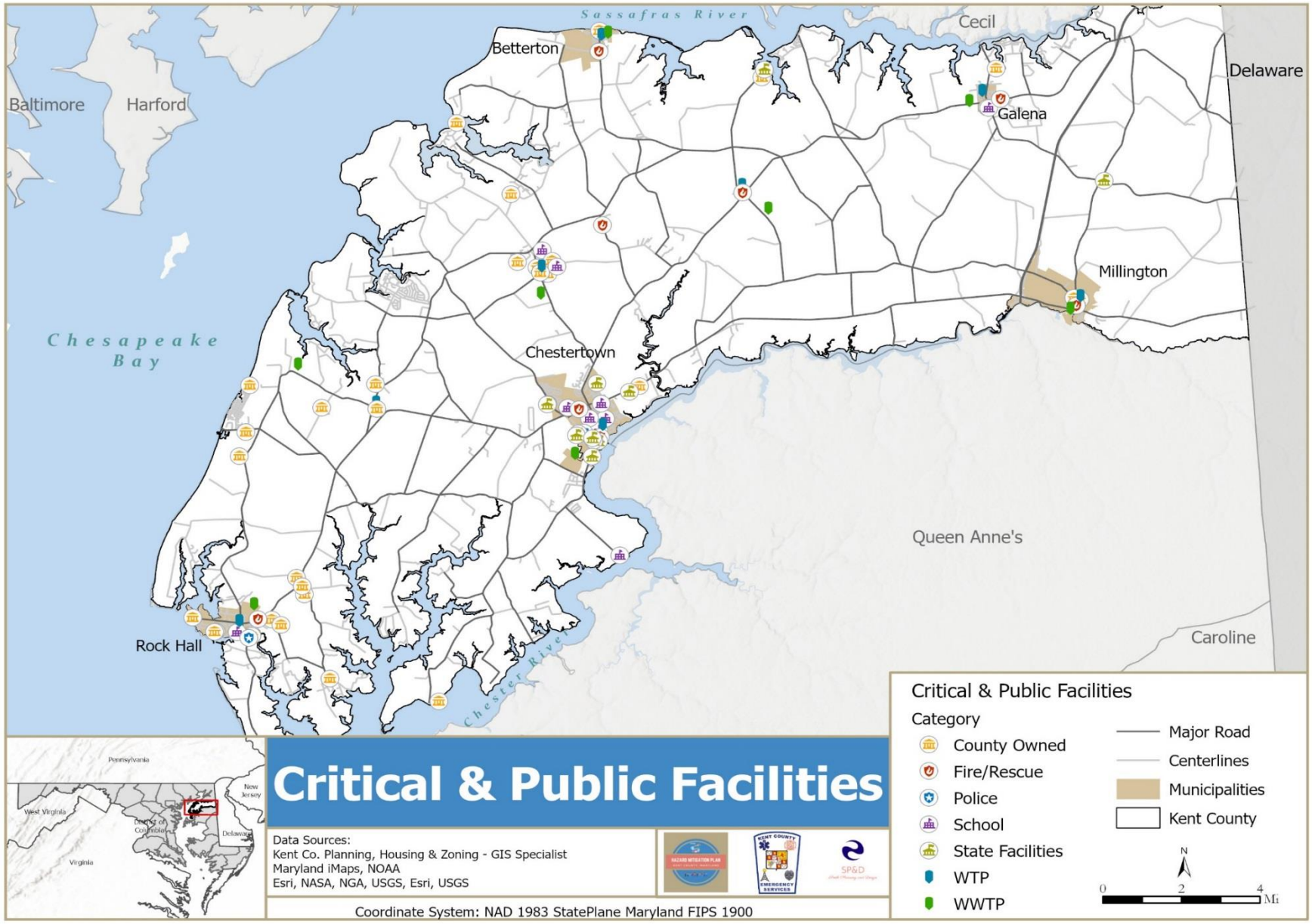
A new inventory of Critical and Public Facilities was compiled for the 2021 Plan Update. In order to develop the facilities listing, GIS data was obtained from Kent County's Planning, Housing and Zoning's GIS Specialist. The data was reviewed for the following categories: County Owned, Fire Stations, Educational, Medical, Police Stations, State Facilities, Water Treatment Plants, Wastewater Treatment Plan. A total of 84 critical and public facilities were identified during the planning process. The following table provides all new critical and public facilities identified and information obtained during the vulnerability assessment. This table should be viewed in a large format and printed on ledger paper, 11X17. Following the Critical and Public table are maps depicting facility location.

Critical & Public Facilities																				
Account ID	Category	Name	Address	City	Zip Code	Year Built	Square Feet	Building Value	# of Stories	Flood Zone	Coastal Flood Depth	Storm Surge CAT 1	Storm Surge CAT 2	Storm Surge CAT 3	Storm Surge CAT 4	SLR-1ft	SLR-2ft	SLR-3ft	SLR-4ft	SLR-5ft
1505024684	County Owned	Bayside Landing Park	20927 Bayside Avenue	Rock Hall	21661		1144	259100	1	AE	0.90	No	No	No	No	No	No	No	No	Yes
1505026393	County Owned	Marina	Bayside Avenue	Rock Hall	21661		0	45200	1	AE	0.50	Yes	No	No	No	No	No	No	No	No
1503024466	County Owned	Betterton Beach	Main Street	Betterton	21610	1986	951	193800	1	X	0.00	No	No	Yes	No	No	No	No	No	No
1505020166	County Owned	Board of Education	5608 Boundary Avenue	Rock Hall	21661		0	0	1	X	0.00	No	No	No	Yes	No	No	No	No	No
1505023335	County Owned	Board of Education	5608 Boundary Avenue	Rock Hall	21661	1975	29206	2311800	1	X	0.00	No	No	No	Yes	No	No	No	No	No
1503030970	County Owned	Water Tower	25021 Heather Lane	Worton	21678		0	1000000	1	X	0.00	No	No	No	No	No	No	No	No	No
1504018567	County Owned	Kent County Public Library	408 High Street	Chestertown	21620	1978	12434	1544400	1	X	0.00	No	No	No	No	No	No	No	No	No
1504017781	County Owned	County Commissioners	207 Calvert Street	Chestertown	21620	1958	720	21100	1	X	0.00	No	No	No	No	No	No	No	No	No
1507338580	County Owned	Cliff City Boat Ramp	Cliff City Road	Chestertown	21620		0	0	1	AE	3.40	Yes	No	No	No	No	Yes	Yes	Yes	Yes
1504018362	County Owned	Circuit Court for Kent County	103 N Cross Street	Chestertown	21620	1870	23568	1952500	2	X	0.00	No	No	No	No	No	No	No	No	No
1505026598	County Owned	County Commissioners	Edesville-Piney Neck	Rock Hall	21661		0	38200	1	X	0.00	No	No	No	No	No	No	No	No	No
1505026326	County Owned	Water Tower	Lovers Lane	Rock Hall	21661		0	509400	1	X	0.00	No	No	No	No	No	No	No	No	No
1506026575	County Owned	Storage Building	Raleigh Road	Chestertown	21620	1992	1800	171900	1	X	0.00	No	No	No	No	No	No	No	No	No
1503015394	County Owned	County Commissioners	24938 Montabello Lake Road	Worton	21678	1900	1150	8100	1	X	0.00	No	No	No	Yes	No	No	No	No	No
1506014925	County Owned	County Commissioners	Georgetown Road	Chestertown	21620		0	301400	1	X	0.00	No	No	No	No	No	No	No	No	No
1504018354	County Owned	Kent County Economic Development	400 High Street	Chestertown	21620	1901	19304	808300	3	X	0.00	No	No	No	No	No	No	No	No	No
1506026486	County Owned	County Fairgrounds	21349 Tolchester Beach Road	Chestertown	21620	1950	20366	762700	1	X	0.00	No	No	No	No	No	No	No	No	No
1501010778	County Owned	Vacant School	172 Sassafras Street	Millington	21651	1974	36377	2655900	1	X	0.00	No	No	No	No	No	No	No	No	No
1501012088	County Owned	Millington Pool	154 Millington Road	Millington	21651	1969	1225	82200	1	X	0.00	No	No	No	No	No	No	No	No	No
1506026583	County Owned	Solar Farm	9274 Fish Hatchery Road	Chestertown	21620		0	0	1	X	0.00	No	No	No	No	No	No	No	No	No
1506013406	County Owned	Stone Materials	8208 Tolchester Road	Chestertown	21620		0	417600	1	X	0.00	No	No	No	No	No	No	No	No	No
1504000188	County Owned	Public Works	709 Morgnec Road	Chestertown	21620	1976	28798	1320700	2	X	0.00	No	No	No	No	No	No	No	No	No
1505028191	County Owned	Storage Sheds	Crosby Road	Rock Hall	21661		0	11800	1	X	0.00	No	No	No	No	No	No	No	No	No
1505025524	County Owned	Storage Sheds	Crosby Road	Rock Hall	21661		0	16600	1	X	0.00	No	No	No	Yes	No	No	No	No	No
1503023281	County Owned	Storage Sheds	Worton-Muddy Branch Road	Worton	21678		0	800	1	X	0.00	No	No	No	No	No	No	No	No	No
1505005728	County Owned	Storage Sheds	22099 Johnson Avenue	Rock Hall	21661		0	44300	1	X	0.00	No	No	No	No	No	No	No	No	No
1505020344	County Owned	Water Tower	Rock Hall Road	Rock Hall	21661		0	89500	1	AE	0.90	Yes	No	No	No	No	No	No	No	Yes
1506024041	County Owned	Storage Sheds	Vermont Avenue	Chestertown	21620		0	13900	1	X	0.00	No	No	No	No	No	No	No	No	No
1505023351	County Owned	Communications Tower	Sharptown Road	Chestertown	21620		0	1100	1	X	0.00	No	No	No	Yes	No	No	No	No	No
1503020827	County Owned	Coast Guard Dock at Still Pond	24188 Streetill Pond Neck Road	Worton	21678	1970	11726	161900	1	AE	2.90	Yes	No	No	No	No	No	Yes	Yes	Yes
1501028650	County Owned	Toal Park	13753 Augustine Herman Hwy	Galena	21635		0	28500	1	X	0.00	No	No	No	No	No	No	No	No	No
1502013061	County Owned	Turner Creek Park	13681 Turners Creek Road	Kennedyville	21645	1990	874	261400	2	X	0.00	No	No	No	No	No	No	No	No	No
1503002969	County Owned	Park & Recreations Department	10932 Worton Road	Worton	21678	1959	13225	243200	1	X	0.00	No	No	No	No	No	No	No	No	No
1503020886	County Owned	Kent County Parks and Recreation	Worton Road	Worton	21678	1992	22108	5548000	1	X	0.00	No	No	No	No	No	No	No	No	No
1504000978	County Owned	Kent County EOC/OES	104 Vickers Drive	Chestertown	21620	1987	20244	0	1	X	0.00	No	No	No	No	No	No	No	No	No
1503004538	County Owned	Garage	10837 Worton Road	Worton	21678	1983	4360	142300	1	X	0.00	No	No	No	No	No	No	No	No	No
1503017087	Fire/Rescue	Kent County EMS - Lynch	11528 Lynch Road	Worton	21678	1950	914	98300	1	X	0.00	No	No	No	No	No	No	No	No	No
1505007933	Fire/Rescue	Rock Hall VFC Station 7	21500 Rock Hall Avenue	Rock Hall	21661	2005	29430	2149700	1	X	0.00	No	No	Yes	No	No	No	No	No	No
1504019121	Fire/Rescue	Kent & Queen Anne's Rescue Squad	140 Morgnec Road	Chestertown	21620	1971	10445	426600	1	X	0.00	No	No	No	No	No	No	No	No	No

Account ID	Category	Name	Address	City	Zip Code	Year Built	Square Feet	Building Value	# of Stories	Flood Zone	Coastal Flood Depth	Storm Surge CAT 1	Storm Surge CAT 2	Storm Surge CAT 3	Storm Surge CAT 4	SLR-1ft	SLR-2ft	SLR-3ft	SLR-4ft	SLR-5ft
1504018664	Fire/Rescue	Chestertown VFC Station 6	211 Maple Avenue	Chestertown	21620	1979	13562	627000	1	X	0.00	No	No	No	No	No	No	No	No	No
1502013304	Fire/Rescue	Kennedyville VFC Station 4	11993 Kennedyville Road	Kennedyville	21645	1957	5760	116500	1	X	0.00	No	No	No	No	No	No	No	No	No
1503024954	Fire/Rescue	Betterton VFC Station 5	11993 Kennedyville Road	Betterton	21610	1999	19829	784500	1	X	0.00	No	No	No	No	No	No	No	No	No
1501025376	Fire/Rescue	Galena VFC Station 3	90 E Cross Street	Galena	21635	1992	18000	1246600	1	X	0.00	No	No	No	No	No	No	No	No	No
1501020927	Fire/Rescue	Millington VFC Station 2	90 E Cross Street	Millington	21651	1975	13067	532400	1	X	0.00	No	No	No	No	No	No	No	No	No
1504000978	Police	Kent County Sheriff's Office	104 Vickers Drive	Chestertown	21620	1987	20244	3548400	1	X	0.00	No	No	No	No	No	No	No	No	No
1505020182	Police	Rock Hall Police Department	5585 N Main Street	Rock Hall	21661	1945	19045	1064100	1	X	0.00	No	No	No	No	No	No	No	No	No
1504005066	Police	Chestertown Police Department	601 High Street	Chestertown	21620	2003	9272	1103700	2	X	0.00	No	No	No	No	No	No	No	No	No
1501010794	School	Galena Elementary/Middle School	114 S Main Street	Galena	21635	1960	57717	2596400	1	X	0.00	No	No	No	No	No	No	No	No	No
1504018494	School	HH Garnet Elementary School	320 Calvert Street	Chestertown	21620	1948	46810	3506600	2	X	0.00	No	No	No	No	No	No	No	No	No
1503020851	School	Kent County High School	25301 Lambs Meadow Road	Worton	21678	1971	226134	14757000	1	X	0.00	No	No	No	No	No	No	No	No	No
1504018508	School	Kent County Middle School	402 E Campus Avenue	Chestertown	21620	1950	66271	2609000	1	X	0.00	No	No	No	No	No	No	No	No	No
1505023343	School	Rock Hall Elementary School	21203 W Sharp Street	Rock Hall	21661	1949	56709	1847200	1	X	0.00	No	No	Yes	No	No	No	No	No	No
1504019547	School	Chestertown Christian Academy	401 Morgnec Road	Chestertown	21620	1980	29274	2269300	1	X	0.00	No	No	No	No	No	No	No	No	No
1501010794	School	Chesapeake College (GED Or ESL)	114 S Main Street	Galena	21635	1960	57717	2596400	1	X	0.00	No	No	No	No	No	No	No	No	No
1503028151	School	Friendship Montessori School	25528 Worton Lynch Road	Worton	21678		2208	30000	1	X	0.00	No	No	No	No	No	No	No	No	No
1507007841	School	Kent School	6788 Wilkins Lane	Chestertown	21620	1998	30208	1183500	1	X	0.00	No	No	No	No	No	No	No	No	No
1504026535	School	Radcliffe Creek School	201 Talbot Blvd	Chestertown	21620		2963	1747100	1	X	0.00	No	No	No	No	No	No	No	No	No
1504022688	School	Chester River Adventist School	305 N Kent Street	Chestertown	21620		0	0	1	X	0.00	No	No	No	No	No	No	No	No	No
1504019008	School	Washington College	300 Washington Avenue	Chestertown	21620	2016	556902	49900700	4	X	0.00	No	No	No	No	No	No	No	No	No
1504000978	State Facilities	Kent County Detention Center	104 Vickers Drive	Chestertown	21620	1987	20244	0	1	X	0.00	No	No	No	No	No	No	No	No	No
1504027175	State Facilities	Maryland State Department of Assessments and Taxation	114-A Lynchburg Street	Chestertown	21620	1991	15844	625500	1	X	0.00	No	No	No	No	No	No	No	No	No
1504015916	State Facilities	The Public Defender System	115 Court Street	Chestertown	21620	1860	750	58400	1	X	0.00	No	No	No	Yes	No	No	No	No	No
1504027183	State Facilities	Kent County Health Department	125 S Lynchburg Street	Chestertown	21620	1987	18288	1159900	3	X	0.00	No	No	No	No	No	No	No	No	No
1502013088	State Facilities	Sassafras NRMA	13761 Turners Creek Road	Kennedyville	21620		0	127500	1	X	0.00	No	No	No	No	No	No	No	No	No
1504004051	State Facilities	J. DeWeese Carter Youth Facility	300 Scheeler Road	Chestertown	21620	1980	78579	6008700	1	X	0.00	No	No	No	No	No	No	No	No	No
1504009339	State Facilities	Department of Juvenile Services - Chestertown Office	315 High Street	Chestertown	21620	1997	19416	1062100	2	X	0.00	No	No	No	Yes	No	No	No	No	No
1504005791	State Facilities	Kent County Department of Social Services - Maryland Health Benefit Exchange	350 High Street	Chestertown	21620	1945	8250	538500	1	X	0.00	No	No	No	No	No	No	No	No	No
1504019466	State Facilities	Chestertown Shop	615 Morgnec Road	Chestertown	21620	1983	35704	2186700	1	X	0.00	No	No	No	No	No	No	No	No	No
0000000000	State Facilities	Massey Maintenance Shed	12193 Massey Road	Massey	21650		0	0	1	X	0.00	No	No	No	No	No	No	No	No	No
1504018311	Washington College Owned	Chestertown Armory	509 Cross Street	Chestertown	21620	1930	11930	576000	2	AE	1.10	No	Yes	No	No	No	No	No	No	Yes
1502005409	WTP	Kennedyville	12000 Kennedyville Road	Kennedyville	21645	1996	750	333900	1	X	0.00	No	No	No	No	No	No	No	No	No
1503022609	WTP	Worton	Worton-Catts Cor Road	Worton	21678		0	130000	1	X	0.00	No	No	No	No	No	No	No	No	No
1503020983	WTP	Betterton	3Road Avenue	Betterton		1983	1452	124700	1	X	0.00	No	No	No	No	No	No	No	No	No
1501027697	WTP	Galena	S Boxwood Lane	Galena	21635		0	92200	1	X	0.00	No	No	No	No	No	No	No	No	No
1504018613	WTP	Chestertown	405 N Kent Street	Chestertown	21620		0	0	1	X	0.00	No	No	No	Yes	No	No	No	No	No
1505023386	WTP	Rock Hall	405 N Kent Street	Rock Hall	21661	1984	1520	643300	1	X	0.00	No	No	No	Yes	No	No	No	No	No
1501338552	WTP	Millington	E/S Sassafras Street	Millington	21651		0	0	1	X	0.00	No	No	No	No	No	No	No	No	No

Account ID	Category	Name	Address	City	Zip Code	Year Built	Square Feet	Building Value	# of Stories	Flood Zone	Coastal Flood Depth	Storm Surge CAT 1	Storm Surge CAT 2	Storm Surge CAT 3	Storm Surge CAT 4	SLR-1ft	SLR-2ft	SLR-3ft	SLR-4ft	SLR-5ft
1506027369	WWTP	Fairlee-Tolchester	22010 Bay Shore Road	Chestertown	21620	1996	6264	282100	1	X	0.00	No	No	No	No	No	No	No	No	No
1502016036	WWTP	Kennedyville	11651 Kennedyville Road	Kennedyville	21645	2006	1953	115900	1	X	0.00	No	No	No	No	No	No	No	No	No
1503023117	WWTP	Worton	25300 Chinquapin Road	Worton	21678	1995	500	2068300	1	X	0.00	No	No	No	No	No	No	No	No	No
1503020959	WWTP	Betterton	28 3Road Avenue	Betterton	21610		672	14700	1	X	0.00	No	No	No	Yes	No	No	No	No	No
1501010832	WWTP	Galena	13265 Augustine Herman Hwy	Chestertown	21661		672	0	1	X	0.00	No	No	No	No	No	No	No	No	No
1507006608	WWTP	Chestertown	25792 John Hanson Road	Chestertown	21620		672	0	1	X	0.00	No	No	No	No	No	No	No	No	No
1505023408	WWTP	Rock Hall	6015 N Main Street	Rock Hall	21661	2000	12633	719100	1	X	0.00	No	No	Yes	No	No	No	No	No	No
1807012241	WWTP	Millington	227 Sassafras Street	Millington	21651		0	0	1	AE	6.10	No	No	No	No	No	No	No	No	No

Abbreviation	Explanation
EOC	Emergency Operations Center
OES	Office of Emergency Services
EMS	Emergency Medical Services
VFC	Volunteer Fire Company
GED	General Educational Development
ESL	English as a Second Language
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant


Sassafras River
Cecil
Betterton
Delaware
Baltimore
Harford
Galena
Millington
Chesapeake Bay
Chestertown
Queen Anne's
Rock Hall
Caroline
Chester River
Critical & Public Facilities
Data Sources:
Kent Co. Planning, Housing & Zoning - GIS Specialist
Maryland iMaps, NOAA
Esri, NASA, NGA, USGS, Esri, USGS
Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900
Critical & Public Facilities
Category
County Owned
Fire/Rescue
Police
School
State Facilities
WTP
WWTP
Major Road
Centerlines
Municipalities
Kent County
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APPENDIX G:
FUNDING SOURCES

Note: The following table should be viewed in a large format and printed on ledger paper, 11x17.

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Animals: Emergency Haying and Grazing	USDA Farm Services Administration Emergency and Non-insured Assistance Programs FSA USDA 1400 Independence Ave, SW Washington, DC 20013 202-720-4053	agriculture; Conservation Reserve Program; CRP; disaster; drought; farm; FSA; haying; grazing; livestock; natural disaster; rural; USDA	Haying and grazing on Conservation Reserve Program (CRP) acreage to provide emergency relief to livestock producers due to certain natural disasters. Emergency haying and grazing on CRP acreage to provide relief to livestock producers in areas affected by a severe drought or similar natural disaster.	No information provided	Producers must be enrolled in the USDA Farm Service Agency's Conservation Reserve Program. For more information on the program, visit: https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/index	Anytime
Building Blocks for Sustainable Communities	U.S. Environmental Protection Agency (EPA) Office of Community Revitalization (MC 1807T) 1200 Pennsylvania Ave NW Washington, D.C. Abby Hall at hall.abby@epa.gov or 202-631-5915 https://www.epa.gov/smartgrowth/building-blocks-sustainable-communities	EPA; local government; nonprofits; smart growth	FY20 Applications should focus on regional projects that address a disaster risk faced by those communities. Projects should align with and support related efforts and local hazard mitigation plans. Eligible applicants: local, county, or tribal governments, nonprofit organizations.	N/A	This program provides technical assistance to communities using a variety of tools (e.g. smart growth, climate change, disaster resiliency and recovery, etc.). The EPA provides technical assistance through uses teams of experts who conduct workshops in communities related to the tools. Grant focus changes yearly. FY20 Grants must focus on helping regions to build large-scale resilience to natural disasters, aligning resilience priorities across federal, state, and local planning requirements and funding sources.	November 8, 2019
Capital Project Financial Assistance / Water Quality Improvement Projects (Maryland Water Quality Financing Administration, MWQFA)	Maryland Department of the Environment (MDE) For assistance, please contact Elaine Dietz at elaine.dietz@maryland.gov https://mde.maryland.gov/programs/water/WQFA/Pages/index.aspx	Chesapeake Bay; drinking water; MS4; MWQFA; restoration; revolving loan; septic system; sewer extension; stormwater; wastewater; wastewater treatment; water quality	Water Quality State Revolving Loan Fund - Low interest rate loan and loan principal forgiveness (if eligible) for publicly-owned treatment works projects and publicly or privately-owned non-treatment works projects. Drinking Water State Revolving Fund – Low interest rate loan and loan principal forgiveness (if eligible) for public or privately-owned drinking water projects. Bay Restoration Fund Wastewater Program - Grant funds for · ENR upgrade at major or minor wastewater treatment plants · Improvements to existing wastewater conveyance systems · Sewer extension to connect homes on septic systems to a BNR/ENR wastewater treatment plant · Nitrogen reducing BAT upgrade at shared community septic systems · Stormwater (MS4) projects by local governments with a system of charges Water Supply Financial Assistance - Grant funds not to exceed $1.5 million for drinking projects at publicly-owned facilities, based on system size, compliance, and affordability.	No information provided; N/A for loans	If your project will be ready-to-proceed to construction by December 2022, please complete a separate application for each capital project for which you are seeking financial assistance and submit to MDE per instructions provided in the application. If you previously applied for financial assistance and your project was only partially or not funded, a new/updated application is required. (Applicants with stormwater projects to meet MS4 permits may (and are strongly encouraged to) submit multiple BMP projects that will start construction within 12 - 18 months of notification of funding as a "program" of projects using a single funding application, as opposed to submitting individual BMP projects in separate applications.) Projects in construction prior to MDE's verification of competitive procurement and compliance with all programmatic requirements will not be funded. Do not submit applications for projects in construction that have not already have had these reviews completed by MDE.	January 31, 2020
Certified Local Government (CLG) Program	Maryland Historical Trust (MHT) 100 Community Place, 3rd Floor Crownsville, MD 21032 Nell Ziehl, Chief, Office of Planning, Education and Outreach, nell.ziehl@maryland.gov 410-697-9592	archaeology; archeology; CLG; certified local government; cultural resources; documentation; education; evaluation; heritage; historic; historic building; historic preservation; historic structure; nomination; NPS; National Park Service; NRHP; National Register of Historic Places; planning; preservation; preservation planning; research; studies; training	There are two grant tracks: Education and Training and Projects. Education and Training grants are available for attendance at training, workshops, and conferences. Project grants are available for research, survey, documentation, conservation, planning and educational activities involving historic, architectural, archeological or cultural resources (i.e., the tangible remains of Maryland's past). Only Certified Local Governments are eligible to apply for funding.	N/A	Education and Training Grant awards do not exceed $1,000 per Certified Local Government and Program Grants do not exceed $25,000. Individual awards for Program Grants generally range from $5,000 to $15,000. Hazard mitigation planning for cultural resources (historic structures, historic communities, archeological sites) in CLGs may be fundable under this program. Contact Program Administrator prior to submitting a hazard mitigation planning grant to verify project eligibility.	January or February

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
State FY21 Clean Water Commerce Act Grant	Maryland Department of the Environment (MDE) Walid.Saffouri walid.saffouri@maryland.gov 410-537-3757 https://mde.maryland.gov/programs/water/WQFA/Pages/index.aspx	Chesapeake Bay; Clean Water Act; environmental; nutrient reduction; sediment load reduction; sediment; sediment reduction; water quality	The Clean Water Commerce Act (CWCA) passed by the Maryland General Assembly during the 2017 Session (SB314/HB417) expanded the uses of the Bay Restoration Fund to include the costs associated with the purchase of cost-effective nitrogen, phosphorus, or sediment load reductions in support of the State's efforts to restore the health of the Chesapeake Bay, not to exceed $6,000,000 in fiscal year 2019, and $10,000,000 in fiscal years 2020 and 2021. The nitrogen, phosphorus, and sediment load reductions purchased cannot come from the agriculture sector and must be created by July 1, 2017.	No information provided	MDE may enter into any contract until June 30, 2021. The contract may last as long as the expected life of the environmental practice resulting from nutrient load reductions.	January 31, 2020
Community Assistance Program - State Support Services Element (CAP-SSSE)	Maryland Department of the Environment 160 South Water Street Frostburg, MD 21532 For more information contact: Kevin Wagner Community Assistance Program Coordinator kevin.wagner@maryland.gov 301-689-1495 https://www.fema.gov/community-assistance-program-state-support-services-element	flood; flooding; flood insurance; flood mitigation; flood openings; flood risk reduction; floodplain management; floodplain mapping; floodplain regulations; hazard mitigation; NFIP; technical assistance	The Maryland Department of the Environment will provide technical assistance on the National Flood Insurance Program (NFIP). Assist with questions about construction in the floodplain, flood insurance, and floodplain mapping to local governments and municipalities.	N/A	N/A	N/A
Community Development Block Grants / Disaster Recovery	U.S Department of Housing and Urban Development (HUD) Office of Block Grant Assistance 451 7th Street, SW Washington, DC 20410-7000 202-708- 1112	CDBG-DR; community; communities; disaster; economic revitalization; housing; HUD; infrastructure; recovery	State and local governments may apply for funding. Eligible activities include "…necessary expenses related to disaster relief, long-term recovery, and restoration of infrastructure, housing, and economic revitalization." Each activity must meet these three requirements: (1) Address a disaster-related impact (direct or indirect) in a Presidentially declared area for the covered disaster (2) Be a CDBG eligible activity and (3) Meet a CDBG national objective	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
Community Legacy	Maryland Department of Housing and Community Development (DHCD) Contacts vary by region. Community Legacy Contact List available here: https://dhcd.maryland.gov/Communities/Pages/programs/CL.aspx	acquisition; business; business retention; community; community development; communities; demolition; development; DHCD; economic revitalization; improvements; open space; revitalization; Sustainable Communities; sustainable; sustainability	Projects should help the local government's implementation of their Sustainable Communities Action Plan. Typical projects/activities include (but are not limited to): mixed-use development consisting of residential, commercial and/or open space; business retention, expansion and attraction initiatives; streetscape improvements; increasing homeownership and home rehabilitation among residents; residential and commercial façade improvement programs; real estate acquisition, including land banking, and strategic demolition.	State - 100%	Projects must be located in a one of Maryland's designated Sustainable Communities. Eligible applicants are local governments, community development organizations (county councils, community development corporations, main street organizations, downtown partnerships), and groups of local governments sharing a common purpose or goal.	Late Spring

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Comprehensive Flood Management Grant Program (FMG)	Maryland Department of the Environment (MDE) 1800 Washington Blvd Baltimore, MD 21230 For more information, please contact Cheryl Reilly at cheryl.reilly@maryland.gov	acquisition; capital projects; elevation; flood; flood control; flood damage; flood management plan; flood mitigation; MDE; mitigation; plan; planning relocation; watershed management; watershed studies; watershed	The grant funds the development of local flood management plans, studies of watersheds, and supports capital projects for flood control and watershed management. This program also provides grants to Maryland counties and municipalities after flood events to implement flood control projects, and for acquisition of flood-damaged owner-occupied dwellings. Elevation and relocation of homes are also eligible for funding. Acquired land is converted to open space in perpetuity.	When federal funds do not participate in the cost of a project, the FMG may fund up to 75% of the cost of the project and the local share would be 25%. If federal funds are participating in the project cost, the FMG can provide 50% of the match requirement and the local share would be 50%.	Only county and municipal governments are eligible to receive grants. During the 2019 Session of the Maryland General Assembly HB 428/SB 269 was passed, which requires at least $3 million in both fiscal year 2021 and fiscal year 2022, and for fiscal year 2023 at least $2 million be appropriated.	January 31, 2020
Conservation Reserve Program	USDA Farm Services Administration (FSA) https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/	agriculture; conservation; CRP; erosion; habitat; habitat restoration; land conservation; open space; protection; restoration; soil erosion protection; soil erosion; USDA; water quality; wildlife habitat	For land to be eligible it must be: Cropland that has been planted or considered planted to an agricultural commodity 4 of the 6 years between 2008 and 2013; and Physically and legally capable of being planted in a normal manner to an agricultural commodity. Alfalfa or other multiyear grasses and legumes grown in a rotation, not to exceed 12 years, also may be eligible. Also, cropland must meet one of the following criteria: Have a weighted average Erodibility Index of eight, or greater; Be expiring CRP; or Be located in a national or State conservation priority area.	N/A	Contracts for land enrolled in CRP are 10-15 year in length.	Summer, Announcement in late Spring
Continuing Authorities Program (CAP)	U.S. Army Corps of Engineers (USACE) 441 G Street, NW Washington, DC 20314 202-761-0011 https://www.nae.usace.army.mil/Missions/Public-Services/Continuing-Authorities-Program/	beaches; beach erosion; beneficial use of dredged materials; channel clearing; dredged materials; environmental; erosion; flood control; hazard mitigation; hazard protection; natural hazards; storm damage reduction; navigation improvements; mitigation; protection; public services; public works; streams; streambank; shoreline; USACE; water resources	USACE will plan, design, and implement certain types of water resources projects. Activities are section-dependent: streambank and shoreline erosion protection of public works and non-profit public services; beach erosion and hurricane and storm damage reduction; navigation improvements; shore damage prevention or mitigation caused by Federal navigation projects; beneficial uses of dredged materials; flood control; aquatic ecosystem restoration; removal of obstructions, clearing channels for flood control; project modifications for the improvement of the environment	The feasibility phase is Federally funded up to $100,000, any remaining feasibility costs are shared 50/50 with the Non-Federal sponsor. The implementation phase costs phase are shared per the authorizing legislation for that section.	A local sponsor must identify the problem and request assistance. Small flood control projects are also available. Baltimore District, USACE General Information: 1-800-434-0988	Anytime

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Emergency Advance Measures for Flood Prevention	U.S. Army Corps of Engineers (USACE) 441 G Street, NW Washington, DC 20314 202-761-0011	advance measures; contamination; disaster; drought; emergency operations; emergency; water; flood control; flood response; post-flood response; preparedness; rehabilitation; response; shoreline protection; USACE	The USACE is authorized to undertake activities including disaster preparedness, Advance Measures, emergency operations (Flood Response and Post Flood Response), rehabilitation of flood control works threatened or destroyed by flood, protection or repair of federally authorized shore protective works threatened or damaged by coastal storm, and provisions of emergency water due to drought or contaminated source.	No information provided	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 Watershed Protection (EWP) Program - Recovery Assistance	Natural Resources Conservation Service (NRCS) 1400 Independence Avenue SW Washington, DC 20250 Shawn Anderson, Acting EWP Program Manager, shawn.anderson@wdc.usda.gov, 202-720-5795	debris removal; conservation; erosion protection; EWP; levee repair; NRCS; recovery; streams; streambank erosion; streambank protection; USDA; watershed	Debris removal from stream channels, roads culverts, and bridges; reshape and protect eroded streambanks; correct damaged drainage facilities; establish vegetative cover on critically eroding lands; repair levees and structures; repair conservation practices	Federal - 75% Non-Federal - 25%	Public and private landowners can apply for assistance for EWP Program - Recovery projects through a local sponsor, or a legal subdivision of state or tribal government. Eligible sponsors include cities, counties, towns, conservation districts, flood and water control districts, or any federally recognized Native American tribe or tribal organization. Does not fund operation and maintenance work or repair private or public transportation facilities or utilities. Any work performed under this program cannot adversely affect downstream water rights and funds cannot be used to install measures not essential to the reduction of hazards.	TBD - Post disaster
Emergency Watershed Protection (EWP) Floodplain Easement Program - Floodplain Easement Option (EWPP-FPE)	Natural Resources Conservation Service (NRCS) Emergency Watershed Protection Program-Floodplain Easement (EWPP-FPE) Program Manager Jeff Williams Easement Programs Division, jeff.williams3@usda.gov 202-720-6268 Contact Local NRCS Field Office: https://offices.sc.egov.usda.gov/locator/app?service=page/CountyMap&state=MD&stateName=Maryland&stateCode=24	acquisition; demolition; easements; EWP; EWPP-FPE; floodplain; floodplain enhancement; floodplain restoration; NRCS; open space; relocation; restoration; USDA	Permanent easements are available for eligible lands: Agricultural or open lands; lands primarily used for residential house. Individuals and communities can directly contact NRCS about this program.	N/A	A project sponsor is required for lands primarily used for residential housing and for the purchase of the remaining lot after structures are removed. NRCS may purchase EWPP-FPE permanent easements in floodplains for the following reasons: 1) The land has been damaged by flooding at least once during the previous calendar year or subject to flood damage at least twice within the previous 10 years 1. 2) Other lands within the floodplain may be eligible if they contribute to the restoration of floodwater storage and flow, offer a way to control erosion, or improve the practical management of the floodplain easement. 3) Lands that would be inundated or adversely impacted as a result of a dam breach. 1If FPE is being offered as recovery for a specific natural disaster, at least one instance of flooding must have occurred because of that natural disaster.	Anytime

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Federal Emergency Management Agency, Flood Mitigation Assistance Program (FMA)	Maryland Emergency Management Agency (MEMA) 5401 Rue Saint Lo Drive Reisterstown, MD 21136 Contact: mitigation.mema@maryland.gov	aquifer; critical facilities; FEMA; FMA; flood; flood control; flood damage; flood mitigation; flood mitigation plan; flood protection; floodwater storage; floodwater diversion; HMA; infrastructure; MEMA; mitigation; NFIP; plan; planning; protection; recovery; repetitive loss; RL; restoration; sanitary sewer system; severe repetitive loss; streams; stream restoration; SRL; stormwater; stormwater management; water system; wetlands; wetland restoration	Infrastructure protective measures; floodwater storage and diversion; utility protective measures; stormwater management; wetland restoration/creation; aquifer storage and recovery; localized flood control project to protect critical facility; floodplain and stream restoration; water and sanitary sewer system protective measures	Federal - 75% Non-Federal - 25% RL: Federal - 90% Non-Federal - 10% SRL: Federal - 100% Non-Federal - 0% Small, Impoverished Community: Federal - 90% Non-Federal - 10% RL = Repetitive Loss Property SRL = Severe Repetitive Loss Property	Projects must be cost effective, environmentally sound and solve a problem. Repetitive and Severe Repetitive Loss properties are a high priority. Program is nationally competitive. *Sub applicants must submit a Notice of Intent (NOI) to MEMA to apply for funding under this grant and must coordinate with MEMA prior to submission.* MEMA submits all grants for the State of Maryland (including sub-grants to local governments). Applicants (the State of Maryland) and sub applicants (local government) must have a FEMA approved hazard mitigation plan as of the application deadline and at the time of obligation of funding for project grants. Some projects may require the property be covered by a flood insurance policy for the life of the structure upon project completion. Local government must be in compliance with the National Flood Insurance Program to be eligible.	NOIs due to MEMA - August 2019 Applications due to MEMA - November 15, 2019
Federal Emergency Management Agency, Hazard Mitigation Grant Program (HGMP)	Maryland Emergency Management Agency (MEMA) 5401 Rue Saint Lo Drive Reisterstown, MD 21136 Contact: mitigation.mema@maryland.gov	acquisition; code enforcement; demolition; disaster; elevation; FEMA; flood; flood risk reduction; floodproofing; generators; hazard mitigation; hazard mitigation plan; hazard mitigation planning; hazard mitigation project; HMA; HMGP; management costs; mitigation; MEMA; NFIP; planning; plans; protection; reconstruction; relocation; retrofitting; safe rooms; soil stabilization; wildfire; wildfire mitigation; wind retrofit; 5 percent initiative	Acquisition, demolition, relocation, elevation, reconstruction, dry floodproofing, generator purchase, flood risk reduction projects, retrofitting, safe room construction, wind retrofits (1- and 2-family residences), soil stabilization, wildfire mitigation, hazard mitigation planning, management costs, post-disaster code enforcement, 5 percent initiative projects, hazard mitigation planning related planning activities	Federal - 75% Non-Federal - 25%	Projects must be cost effective, environmentally sound and solve a problem. Sub applicants must submit a Notice of Intent (NOI) to MEMA to apply for funding under this grant and must coordinate with MEMA prior to submission. *MEMA submits all grants for the State of Maryland (including sub-grants to local governments). Applicants (the State of Maryland) and sub applicants (local government) must have a FEMA approved hazard mitigation plan at the time of obligation of funding for project grants. Some projects may require the property be covered by a flood insurance policy for the life of the structure upon project completion.*	After a Presidential Disaster Declaration

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Federal Emergency Management Agency, Building Resilient Infrastructure and Communities (BRIC)	Applications are processed through the FEMA GO system. To access the system, go to https://go.fema.gov/. Hard copies of the NOFO can be downloaded at Grants.gov or For a hardcopy of the full NOFO, please submit a request to: Kayed Lakhia Director, Hazard Mitigation Assistance Division, Mitigation Directorate Federal Insurance and Mitigation Administration Federal Emergency Management Agency 400 C Street, SW Washington, DC 20472	acquisition; demolition; elevation; FEMA; flood; flood risk reduction; floodproofing; generators; hazard mitigation; hazard mitigation plan; hazard mitigation planning; hazard mitigation project; HMA; management costs; mitigation; MEMA; NFIP; PDM; planning; plans; protection; reconstruction; relocation; retrofitting; safe rooms; soil stabilization; wildfire; wildfire mitigation; wind retrofit	To achieve these principles, FEMA will provide financial assistance to eligible BRIC Applicants for the following activities: (1) Capability- and Capacity-Building (C&CB) - activities which enhance the knowledge, skills, expertise, etc., of the current workforce to expand or improve the administration of mitigation assistance. This includes activities in the following sub-categories: building codes activities, partnerships, project scoping, mitigation planning and planning-related activities, and other activities; (2) Mitigation Projects - cost-effective projects designed to increase resilience and public safety; reduce injuries and loss of life; and reduce damage and destruction to property, critical services, facilities, and infrastructure; and (3) Management Costs - financial assistance to reimburse the Recipient and subrecipient for eligible and reasonable indirect costs, direct administrative costs, and other administrative expenses associated with a specific mitigation measure or project in an amount up to 15 percent of the total amount of the grant award, of which not more than 10 percent of the total award amount may be used by the Recipient and 5 percent by the subrecipient for such costs. FEMA will also provide non-financial Direct Technical Assistance to communities to build a community's capacity and capability to improve its resiliency to natural hazards and to ensure stakeholders are capable of building and sustaining successful mitigation programs, submitting high-quality applications, and implementing new and innovative projects that reduce risk from a wide range of natural hazards.	Federal - 75% Non-Federal - 25% Small Impoverished Community: Federal - 90% Non-Federal - 10% Insular Areas:	The Building Resilient Infrastructure and Communities (BRIC) program makes federal funds available to states, U.S territories, Indian tribal governments, and local communities for pre-disaster mitigation activities. The guiding principles of the program are to (1) support state and local governments, tribes, and territories through capability and capacity-building to enable them to identify mitigation actions and implement projects that reduce risks posed by natural hazards; (2) encourage and enable innovation while allowing flexibility, consistency, and effectiveness; (3) promote partnerships and enable high-impact investments to reduce risk from natural hazards with a focus on critical services and facilities, public infrastructure, public safety, public health, and communities; (4) provide a significant opportunity to reduce future losses and minimize impacts on the Disaster Relief Fund; and (5) support the adoption and enforcement of building codes, standards, and policies that will protect the health, safety, and general welfare of the public, take into account future conditions, and have long-lasting impacts on community risk reduction, including for critical services and facilities and for future disaster costs.	Application Start Date: 9/30/2020 Application Submission Deadline: 1/29/2021 by 3:00 PM EST
Fire Management Assistance Program Fire Management Assistance Grant	Federal Emergency Management Agency (FEMA) FEMA Region III 615 Chestnut Street One Independence Mall, Sixth Floor Philadelphia, PA 19106-4404 215-931-5500	disaster; FEMA; fire; fire control; forests; grassland; grassland mitigation; management; mitigation; private land; public land; wildfire	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. Eligible costs may include, but are not limited to, expenses for: field camps, equipment use, equipment repair and replacement, tools, materials, supplies, and mobilization and demobilization activities.	Federal - 75% State - 25%	Prior to award, the State must demonstrate that the total eligible costs for the declared fire meet or exceed the individual fire cost threshold.	After Fire Management Assistance declaration
Oil Spill Liability Trust Fund	U.S. Coast Guard (USCG) Director, USCG National Pollution Funds Center Stop 7605 2703 Martin Luther King Jr. Avenue, SE Washington, DC 20593-7605 202-795-6000 Visit this website for more information: https://www.uscg.mil/Mariners/National-Pollution-Funds-Center/Response/	cleanup; contamination; disposal; haz mat; hazardous materials; NPFC; oil spill; Oil Spill Act; OPA; removal; USCG	Compensation may be available under the Oil Spill Act (OPA) if the claim meets the requirements and all costs and damages from the spill are documented. Funding can be used for Federal removal costs including payment to cleanup contractors, overtime for government personnel, equipment used in removal operations, testing to identify the type and source of oil, disposal of recovered oil and oily debris, and preparation of associated cost documentation.	Reimbursement for eligible activities, cost share does not apply	These agencies/organizations can access the fund: all Federal on-scene coordinators (FOSCs); Federal, State, local, and Tribal government agencies assisting the FOSC; natural resources trustees (designated by the President of the United States, state, territorial governor, or Indian tribal governing authority), claimants (individuals, corporations, and government entities) can submit claims for uncompensated removal costs and OPA damages caused by the oil spill to the USCG's National Pollution Funds Center (NPFC) if the responsible party (RP) does not satisfy their claims.	Anytime

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Local Government Infrastructure Financing Program	Maryland Department of Housing and Community Development (DHCD) Charles Day, Program Manager 7800 Harkins Road Lanham, MD 20706 301-429-7891	DHCD; equipment; facilities; infrastructure; infrastructure improvements; landscaping; loan; public services; public safety; public land; refinancing; stormwater; sidewalks; street lighting; vehicles; water treatment; water storage	Project must support an essential physical element of a municipality's public service system. Projects may include (but are not limited to): street lighting, landscaping, sidewalks, and public space improvements; public safety vehicles and equipment; water production, treatment, storage, and distribution systems; stormwater control, and sewer collection and treatment facilities; government office and meeting facilities; police, fire, transportation, education, health, recreation, maintenance, and other service related facilities; refinancing of existing debt for eligible projects as listed above.	N/A (loan) Through funding raised through tax-exempt bonds issued on behalf of counties, municipalities, and/or their instrumentalities, the State uses the bond proceeds to issue a *loan* to the local government (interest rate depends on market conditions at time of loan issuance).	All Maryland counties, municipalities and/or their agencies are eligible, provided they have legal authority necessary for: constructing, operating and maintaining the proposed project; pledging security for and repaying the proposed loan, and; pledging income tax payments and various other shared revenue from the state. Local governments must secure local legislative approval(s) to incur the debt, certify the capacity to inspect the project's construction progress, and agree to submit periodic status reports. Additionally, they must ensure adequacy and sufficiency in the project's design and construction, and they must meet credit requirements sufficient to satisfy rating agencies and secure a favorable credit rating.	Applications accepted on an ongoing basis
Maryland Business Recovery Loan Program	Maryland Department of Housing and Community Development (DHCD) Neighborhood Business Works Program 7800 Harkins Road, 4th Floor Lanham, MD 20706 Colleen Cord-Malone Business Lending Programs, Manager II 301-429-7517 Toll Free: 1-800-756-0119 colleen.cord-malone@maryland.gov Aisha K. Taylor Business Lending Programs, Loan Underwriter 301-429-7721 Toll free: 1-800-756-0119 aisha.taylor@maryland.gov	DHCD; disaster; equipment; fixtures; furniture; inventory; leasing expenses; loan; lost revenue; lost operating expenses; nonprofits; recovery; renovation; repair; replacement; small business; working capital	Renovations; repairs and replacement of furniture, fixtures, and equipment; inventory replacement; loss of revenue/operating and leasing expense assistance; certain other costs associated with recovery of a small business, including working capital. Eligible businesses include retail, manufacturing, goods and services. Business must be located in Baltimore City, Baltimore County, Frederick County, Howard County, or Washington County.	N/A (loan)	Offers assistance up to $50,000 (amount based on damage assessment) at an interest rate of zero percent (0%). Higher amounts will be considered on a case-by-case basis. Financing may be used in conjunction with other financing, insurance proceeds, etc., and the target loan term is 1-5 years, depending on loan size and affordability.	Available when activated after state declaration of emergency.
Maryland Disaster Housing Assistance Program	Maryland Department of Housing and Community Development (DHCD) Gregory Hare Deputy Director, Multifamily Housing 7800 Harkins Road, Lanham, MD 20706 301-429-7775	assistance; DHCD; disaster; disaster assistance; emergency assistance; emergency rental assistance; housing; housing assistance; housing voucher; MDHAP; rental assistance; voucher	Eligible recipients: Families or individuals are assisted on a referral basis through referrals made by MEMA, DHR, local government human resources or emergency management offices, or other designated disaster relief agencies. Generally, all families or individuals displaced by a natural disaster are eligible and can be referred to the program.	None: State funds 100% of costs	The term of the voucher is 90 days, extensions will be considered if the home is not ready for occupancy at the end of 90 days.	Available when activated after state declaration of emergency.

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Maryland Energy Administrant (MEA), Resilient Maryland	Questions and feedback regarding the Resilient Maryland program should be directed to Brandon Bowser, CHP & Energy Resilience Program Manager, at BrandonW.Bowser@Maryland.gov or via phone at (443) 306-0304.	MEA; clean; efficient; affordable; energy; vulnerable populations.	At a minimum, eligible projects must: Be located within the State of Maryland; Clearly demonstrate the organizational and/or societal benefits of system implementation; Include an Applicant contribution that can be at a minimum an amount of donated work hours (excluding administrative duties related to Grant reporting); Demonstrate clean energy systems that achieve greenhouse gas reductions; and Permit showcasing of project findings and installations by MEA to the public. Applicants must be in Good Standing with the Maryland State Department of Assessments and Taxation (SDAT), when applicable.	Resilient Maryland provides direct funding for project planning and design and connects eligible projects with other MEA programs that provide funding for equipment or installation.		ALL APPLICATIONS DUE BY 11:59 P.M. EST, FRIDAY, JANUARY 29, 2021
Maryland Energy Administrant (MEA), Combined Heat and Power (CHP) Grant Program	Questions or comments regarding the FY21 CHP Grant Program should be directed to Brandon Bowser, CHP & Energy Resilience Program Manager. He can be reached via email at BrandonW.Bowser@Maryland.gov or via phone at (443) 306-0304.	CHP; capital costs; energy resilience; energy efficiency; renewable natural gas; RNG;	Commercial businesses Nonprofit organizations Critical infrastructure Industrial and manufacturing Chemical and pharmaceutical Institutional (colleges, universities, etc.) Public and private education Multifamily housing Agricultural Maryland State and local government	Up to $1.65 million is available to eligible entities in Round 1, and is divided between two (2) Areas of Interest (“AOIs”): AOI 1: CHP for Energy Resilience AOI 2: CHP for Energy Efficiency		ALL ROUND 1 APPLICATIONS DUE BY 11:59 P.M. EDT, FRIDAY, OCTOBER 30, 2020
Maryland Housing Rehabilitation Program (Single Family; 1-4 Family Rental Units)	Maryland Department of Housing and Community Development (DHCD) Single Family Housing 7800 Harkins Road, Lanham, MD 20706 singlefamilyhousing.dhcd@maryland.gov 301-429-7821 Toll Free (Maryland Only): 800-638-7781 TTY 711 or 1-800-735-2258	DHCD; homeowners; landlords; loan; single family; rehabilitation; rental properties	Eligible Applicants: Household income of owner-occupants of single-family homes and all residents of financed rental housing cannot exceed 80 percent of the statewide or Washington, D.C. Metropolitan Statistical Area median income.	Community/Campus Microgrid	$100,000	Open and ongoing

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Maryland Sea Grant (NOAA)	NOAA, Sea Grant Maryland Fredrika Moser, Director moser@mdsg.umd.edu Michael Allen, Associate Director for Research and Administration mallen@mdsg.umd.edu 301-405-7500	aquaculture; climate change; coastal; coastal ecosystems; ecosystems; economy; economic equity; equity; estuary; fisheries; land use; natural hazards; nutrient reduction; outreach; pollution abatement; research; resiliency; resilience; resilient communities; resilient economies; resiliency; restoration; seafood safety; sediment; sediment reduction; socioeconomic equity; social equity; sustainable; sustainability; sustainable fisheries; sustainable aquaculture; watershed; water quality	Eligible activities are research proposals that provide scientific and socioeconomic information that can inform policy decisions for fisheries management and sustainable aquaculture, climate change adaptation, coastal community resilience, and ecosystem restoration in coastal systems in Maryland. Projects must demonstrate a connection between the proposed research and the focus areas and strategies (one or more) highlighted in the RFP. A proposal must demonstrate integration among its scientific approaches, research outcomes, and outreach plan. Eligible applicants: Principal Investigators (PIs) must be affiliated with an academic institution or research laboratory in Maryland or the District of Columbia. Co-Principal Investigators (Co-PIs) on projects can be from institutions outside of Maryland or the District of Columbia. Single investigators and multiple investigator research teams from different institutions are encouraged to apply. Maryland Sea Grant extension personnel are welcome to serve as Co-PIs or senior personnel but are restricted from requesting salary support.	Resilient Facility Power System	$25,000	Pre-proposal: January 30, 2019 Full proposal: mid-June 2019 This is for the billing cycle Feb 1, 2020 to Jan 31, 2022
National Estuary Program Coastal Watersheds Grant Program	EPA & Restore America's Estuaries Suzanne Simon NEP Coastal Watersheds Grant Program Director ssimon@estuaries.org 413-695-8922 https://estuaries.org/initiatives/watershedgrants/	adaptation; aquatic; aquatic invasive species; climate adaptation; climate change; climate vulnerability; comprehensive conservation and management plan; CCMP; ecosystems; estuary; green infrastructure; habitat; invasive species; nutrient reduction; pollution reduction; restoration; TMDL; water quality; wetlands	Activities may include: protecting and restoring up to 100,000 acres of estuarine habitat; protecting and restoring estuarine water quality in NEP study areas; supporting core Clean Water Act programs; conducting vulnerability assessments and/or implementing climate adaptation strategies in over 50% of NEP study areas and collaborating with other EPA programs and with agencies like NOAA to build regional, local, and tribal coastal community resilience to impacts of climate change on coastal ecosystems, public health, and economies; building local capacity to reach out to and involve urban community residents who typically may not have had access to water bodies in NEP study areas nor have been actively engaged in urban water body protection and restoration. Eligible applicants include state agencies; public and nonprofit agencies; institutions; organizations and individuals (Section 320(g)(l)). Profit making organizations are not eligible for grants.	Advanced CHP System	$10,000	Appears to be December/ Winter
National Flood Insurance Program (NFIP)	Maryland Department of the Environment (MDE) 1800 Washington Blvd Baltimore, MD 21230	financial protection; flood; flood insurance; floodplain; floodplain regulations; insurance; MDE; NFIP; regulations	Provides financial protection by enabling persons to purchase insurance against floods, mudslide or flood related erosion. *Anyone can purchase flood insurance. You do NOT need to be in a regulatory floodplain to purchase flood insurance*.	Community Resiliency Hub	$10,000	Anytime
National Flood Insurance Program - Increased Cost of Compliance (ICC)	Maryland Department of the Environment (MDE) 1800 Washington Blvd Baltimore, MD 21230	acquisition; compliance; demolition; elevation; flood; flood damage; flood insurance; floodplain; floodplain regulations; floodproofing; ICC; increased cost of compliance; insurance; MDE; mitigation; NFIP; regulations; relocation; repetitive loss; RL; SFHA; substantial damage	Bringing the building into compliance with the community's floodplain regulations and reduce future flood risk. Generally, this is one of four options: demolition, elevation, dry floodproofing, or relocation. Eligible applicants must have flood insurance (with ICC coverage) and the property in question must be declared substantially damaged or meet the definition of a Repetitive Loss Property.	*Subject to funding availability and may be adjusted by MEA.		After a building in the SFHA is declared substantially damaged or meets the definition of a Repetitive Loss property

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Neighborhood Business Works Program	Maryland Department of Housing and Community Development (DHCD) Business Lending Team 7800 Harkins Road Lanham, MD 20706 dhcd.businesslending@maryland.gov 301-429-7408	acquisition; commercial; community; communities; construction; development corporations; DHCD; loan; mixed use; new construction; nonprofits; Priority Funding Areas; rehabilitation; residential; SBA; soft costs; small business; Sustainable Communities; sustainable; sustainability	Eligible projects and uses of funds include: mixed-use projects combining residential and commercial uses in the same building; new construction or rehabilitation; machinery and equipment; certain other costs associated with opening or expanding a small business; real estate acquisition; manufacturing; service providers, and; retail. Projects must be located in a designated Maryland Sustainable Community or Priority Funding Area. Priority is given to projects that strengthen neighborhood commercial districts and are part of a greater revitalization strategy. Eligible applicants include Maryland-based small businesses (as defined by the SBA), local development corporations, and nonprofit organizations.			Open and ongoing
Non-Capital Historic Preservation Projects Grant	Maryland Historical Trust (MHT) 100 Community Place, 3rd Floor Crownsville, MD 21032 Contacts: Archeology - Matt McKnight, 410-697-9572 matthew.mcknight@maryland.gov Architectural Survey - Heather Barrett, 410-697-9536 heather.barrett@maryland.gov All other projects - Karen Golder, 410-697-9550 karen.golder@maryland.gov	archaeology; archeology; architecture; conservation; cultural resources; documentation; education; historic; historic building; historic preservation; historic structure; MHT; planning; research; survey	Non-Capital grants are available for research, survey, documentation, conservation, planning and educational activities involving historic, architectural, archeological or cultural resources (i.e., the tangible remains of Maryland's past). It is strongly recommended that you contact MHT staff to discuss the project prior to submission of an application.	Entities seeking additional capital support for the equipment and installation of the planned DER system are encouraged to explore other MEA programs that provide funding for equipment and installation incentives.		Intent to Apply - July 12, 2019 Application due September 3, 2019
Small Business Administration (SBA) Predisaster Mitigation Loan Program	Small Business Administration (SBA) James Rivera, Office of Disaster Assistance 409 3rd Street, SW, STE 6050 Washington, DC 20416 202-205-6734	business; disaster; economic injury; equipment; homeowners; inventory; loan; military duty; mitigation; machinery; operating expenses; personal property; real estate; SBA	Business or home must have been affected by disaster. Eligible activities include repairs and replacements of physical assets damaged in a declared disaster (real estate and personal property) and small business operating expenses (machinery and equipment, economic injury, inventory), and active military duty.	Grants will be awarded on a competitive basis. Award announcements for these funds are expected sometime in quarter 1 (Q1) of 2021.		After SBA disaster declaration
Strategic Demolition Fund - Statewide	Maryland Department of Housing and Community Development (DHCD) Contacts vary by region. Regional Contact List available here: https://dhcd.maryland.gov/Communities/Documents/SRP/PM-Map-ContactInfo.pdf	community; communities; demolition; DHCD; Sustainable Communities; sustainable; sustainability	Eligible projects include demolition of derelict structures; site acquisition and assembly to create redevelopment-sized parcels for solicitation or planned development; site development, and; construction-level architectural and engineering designs.	State - 100%	Projects must be located within in a designated Maryland Sustainable Community except Baltimore City. The programs help catalyze activities that accelerate economic development and job production in existing Maryland communities, aims to improve the economic viability of grey field development, which often faces more barriers than sprawling, green field development. The fund focuses on those projects that can have a high economic and revitalization impact in their existing communities.	Varies - once per State Fiscal Year

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Strategic Demolition Fund - Project C.O.R.E.	Maryland Department of Housing and Community Development (DHCD) Contacts vary by region. Regional Contact List available here: https://dhcd.maryland.gov/Communities/Documents/SRP/PM-Map-ContactInfo.pdf	Baltimore; CORE; community; communities; DHCD; demolition; Sustainable Communities; sustainable; sustainability	Eligible projects include demolition of derelict structures; site acquisition and assembly to create redevelopment-sized parcels for solicitation or planned development; site development, and; construction-level architectural and engineering designs. Lead applicants for Strategic Demolition Fund - Project C.O.R.E. are Maryland Stadium Authority and nonprofit community development organizations working Baltimore City.	State - 100%	Projects must be located within Baltimore City. The programs help catalyze activities that accelerate economic development and job production in existing Maryland communities, aims to improve the economic viability of grey field development, which often faces more barriers than sprawling, green field development. The fund focuses on those projects that can have a high economic and revitalization impact in their existing communities.	Varies - once per State Fiscal Year
Transportation: Emergency Relief Program	Federal Highway Administration (FHA) 1200 New Jersey Avenue Washington, DC 20590 202-366-4043	bridges; critical infrastructure; damage; disaster; DOT; Federal aid roads; Federal land; FHWA; highway; infrastructure; MDOT; repair; roads; route; transportation	Repair work within the right of way along federal aid highways is generally eligible. Engineering, right of way, and indirect costs may also be eligible. Funding is intended to address immediate needs and to restore damaged facilities to pre-disaster conditions. Permanent construction can cover repairs to bring facilities to current standards and expected traffic requirements. Improvements (betterments) may be eligible if costs are justified.	Emergency Repairs conducted within 180 days of disaster: Federal - 100% Nonfederal - 0% Emergency Repairs conducted after 180 days of disaster: Federal - 80-90% Nonfederal - 20-10%	Application is submitted by the MDOT for damages to Federal-aid highway routes, and by the applicable Federal agency for damages to roads on Federal lands. Cause of damages can be due to a natural disaster or a catastrophic failure of bridges or other infrastructure due to external causes. Cost threshold: estimated Federal share for all repairs for an event should be at least $700,000 and each individual repair should be at least $5,000 to be eligible.	After serious damage to Federal-aid roads or roads on Federal lands caused by a natural disaster or by catastrophic failure.
U.S Economic Development Administration (EDA), 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	access roads; critical infrastructure; economic development; EDA; infrastructure; port improvements; rail spurs; roads; sewer; technology; water	Water and sewer, Industrial access roads, rail spurs, port improvements technological and related infrastructure	Federal - 50-70% Non-Federal - 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
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	critical facilities; economic development; EDA; improvements; public facilities; reconstruction; research	Improvements and reconstruction of public facilities after a disaster or industry closing. Research studies designed to facilitate economic development.	Federal - 50-70% Non-Federal - 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
Watershed and Flood Prevention Operations Program	Natural Resources Conservation Service (NRCS) 1400 Independence Avenue, SW Washington, DC 20250 J'Que C. Jones, Maryland State Conservation Engineer jque.jones@wdc.usda.gov 443-482-5543	conservation; erosion; erosion control; flood; flood control; flood damage; flood prevention; land management; natural hazards; natural resources protection; NRCS; protection; sediment; sediment control; sediment reduction; USDA; water quality; watershed; watershed management; watershed protection	NRCS offers financial and technical assistance for these purposes: erosion and sediment control; watershed protection; flood prevention; water quality improvements; rural, municipal, and industrial water supply, water management, fish and wildlife habitat enhancement, and hydropower sources. Federal, state, local, and tribal government entities eligible to apply.	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.	January or February

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Watershed Rehabilitation	Natural Resources Conservation Service (NRCS) 1400 Independence Avenue, SW Washington, DC 20250 Jesse Wilson National Watershed Rehabilitation Program Manager jesse.wilson@wdc.usda.gov 202-720-0189	dam; dam rehabilitation; NRCS; plan; planning; rehabilitation; watershed; watershed plan; watershed rehabilitation; USACE	Rehabilitation of aging dams reaching the end of their 50-year design lives.	Cost share exists, but not quantified	Requires development of a watershed plan to address environmental impacts, costs, benefits, planned conservation practices, and responsibilities of each party to complete the rehabilitation project. NRCS provides financial and technical assistance to project sponsors and assists them with the planning, design, and construction of the project.	Anytime
BUILD Transportation Grant Program	U.S. Department of Transportation (US DOT) Office of Infrastructure Finance and Innovation Office of the Secretary of Transportation 1200 New Jersey Ave, SE Washington, DC 20590 United States BUILDgrants@dot.gov 202-366-0301 https://www.transportation.gov/BUILDgrants	bridges; capital projects; DOT; freight rail; infrastructure; intermodal; local government; metropolitan planning organizations; MPO; passenger rail; port authorities; ports; port infrastructure; rail; roads; state government; transportation; transit agencies; Tribal government	Eligible projects for BUILD Transportation Grants are capital projects that include, but are not limited to: road or bridge projects eligible under title 23, United States Code; public transportation projects eligible under chapter 53 of title 49, United States Code; passenger and freight rail transportation projects; port infrastructure investments (including inland port infrastructure and land ports of entry); and intermodal projects. Eligible applicants: State, local and tribal governments, including U.S. territories, transit agencies, port authorities, metropolitan planning organizations (MPOs), and other political subdivisions of State or local governments.	BUILD Transportation grants may be used for up to 80 percent of the costs of projects located in an urban area and up to 100 percent of the costs of a project located in a rural area. For a project located in an urban area, total Federal assistance for a project receiving a BUILD grant may not exceed 80 percent.	please note that research, demonstration, or pilot projects are eligible only if they result in long-term, permanent surface transportation infrastructure that has independent utility. A BCA is needed to determine the independent utility. If a project is located within an Urbanized Area (UA) as designated by the U.S. Census, the urban or rural designation under BUILD 2019 is based on the population of that UA. If the UA had a population greater than 200,000 in the 2010 Census, the project will be designated as urban.	NOFO release: Spring Application Due: Summer
Alcoa Foundation Grant Program	Alcoa World Location Grants Coordinator 100 Bethlehem Blvd Edgemere, MD 21219 Alcoa Forgings & Extrusions Location Grants Coordinator 1954 Halethorpe Farms Rd, #800 Halethorpe, MD 21227 410-737-6980 Alcoa Concrete & Masonry Location Grants Coordinator 4908 46th Ave Hyattsville, MD 20781 301-699-9300 Alcoa Concrete & Masonry Location Grants Coordinator 786 Sunny Chapel Rd Odenton, MD 21113 301-912-3515	adaptation; Alcoa; capital projects; biodiversity; climate adaptation; climate change; emissions reduction; environmental; environmental literacy; habitat; habitat protection; habitat restoration; natural resources; nonprofits; prevention; protection; resilience; resiliency; restoration; recycling; STEM; sustainability	Promote prevention and resilience of climate change and restore and preserve biodiversity. Projects or organizations must serve communities where Alcoa has operating plants or offices: Edgemere, Halethorpe, Hyattsville, Odenton Nonprofit-focused, local governments may apply if funds are used for charitable purposes.	N/A	Minimum grant award is $15,000. Projects must fall with Alcoa Foundation themes and subthemes.	Anytime

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Chesapeake Initiative	Campbell Foundation Chesapeake Office 410 Severn Avenue, Suite #210 Annapolis, MD 21403 410-990-0900	capacity building; capital campaign; Chesapeake Bay; environmental; habitat; habitat preservation; habitat restoration; nonprofits; preservation; nutrient reduction; restoration; stormwater; water quality	Activities that promote the health of the Chesapeake Bay region. Grants may be used for general support, capacity building, capital campaigns, and more. Nonprofits only.	N/A	More information, including a list of past grantees and projects is available here: https://www.campbellfoundation.org/chesapeake-what-we-fund/	Cycle 1 - Late Winter/Early Spring Cycle 2 - Late Summer/Early Fall
Capacity Building Grant Coordination & Collaboration Grant	Climate Resilience Fund https://www.climateresiliencefund.org/contact	adaptation; capacity building; climate adaptation; climate change; climate resiliency; collaboration grants; coordination grants; environmental; resiliency; resilience; sustainability; sustainable	Two grant tracks: Capacity Building and Coordination & Collaboration. Climate resilience planning; policy guidance; adaptation training; funding to facilitate the use of climate service tools and resources. Nonprofits only.	N/A	View past grantees and projects here: https://www.climateresiliencefund.org/grants	No information provided, contact organization
Community Support	Coca-Cola Foundation, Inc. https://www.coca-colacompany.com/stories/community-requests-guidelines-application	capital projects; clean water; environmental; gray water; nonprofits; water; water capture; water conservation; water quality; recycling; reuse	Eligible projects align with these three Priority Areas: empowering women (economic empowerment and entrepreneurship); protecting the environment (access to clean water, water conservation, and recycling); and enhancing communities (education, youth development, other community and civic initiatives). Nonprofits only.	N/A	Fundable project includes but are not limited to access to clean water, water conservation, recycling; capital projects; nonprofits; capital projects like water capture and grey water reuse.	Anytime
Conservation Acquisition Revolving Fund Conservation Loans Natural Capital Investment Fund Working Forest Fund	Conservation Fund, the 1655 N. Fort Myer Drive, Suite 1300 Arlington, VA 22209 703-525-6300 webmaster@conservationfund.org	acquisition; conservation; environmental; forests; forest management; loan; plans; revolving loan; stewardship	Land acquisition and conservation; development and implementation of sustainable forest management plans; transfer of forestland to private ownership.	N/A (revolving fund; loan)	Revolving Fund for land acquisition (conservation). Conservation loans. Working Forest Fund provides bridge capita for projects.	Anytime
U.S. Natural Climate Solutions Accelerator Grant	Nature Conservancy, The (TNC) www.nature.org/ncsaccelerator Contact: NCSAccelerator@TNC.org	adaptation; agriculture; carbon storage; climate change; coastal; coastal wetlands; conservation; emissions reduction; environmental; forests; grassland; greenhouse gas reduction; land management; natural climate solutions; NCS; nature-based solutions; nonprofits; reforestation; restoration; soil health; wetlands	Carbon capture through natural climate solutions (NCS). Examples include, but are not limited to improving soil health, reforestation, coastal wetlands restoration, and other management practices for natural and working lands (forests, agricultural lands, grasslands, wetlands).	N/A	Applicants may request up to $250,000 per project. Nonprofit organizations only.	Early 2020
Climate Change Strategy Grant	Oak Foundation USA http://oakfnd.org/application-process.html	air quality; clean energy; climate change; community; communities; community resilience; community resiliency; disadvantaged communities; environmental; nonprofits; policy; policy development; resilience; resiliency; transportation; vulnerable populations	Climate Change Strategy Grant - Projects that: increase energy efficiency and integrate clean energy solutions into poverty-reduction programs; develop energy-efficient mobility systems in urban areas; promote cleaner transport methods; encourage financing and regulations to improve public transit systems safe for women, children, and the elderly; and collect and monitor data to measure improvements or assess deficits in air quality.	Oak Foundation - 50% Grant Recipient - 50%	International organization focused on human-rights and gender-equity mainly in the EU, Africa, and India. Climate Change Strategy Grants do not appear to be tied to a location. Unsolicited proposals from nonprofits through a letter of inquiry. Marine Conservation Grant only available to projects that benefit communities in the EU, the Arctic, East Asia, and Africa. Wildlife Conservation Grants only protects rhinoceros and elephant populations from illegal wildlife trade.	N/A - Accepts unsolicited proposals via Letter of Enquiry

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Acres for America	National Fish & Wildlife Foundation (NFWF) Kimberly Shriner Coordinator, Conservation Programs Kimberly.Shriner@nfwf.org https://www.nfwf.org/acresforamerica/Pages/home.aspx	acquisition; conservation; open space; connecting land; connectivity; easements; forests; habitat; local economy; local government; migration; migration routes; migratory; local government; nonprofits; open space; ranching; recreation; state government; Tribal government	Land conservation of critical habitats, connecting protected lands to unify wild places and protect migration routes; provide access for people to enjoy the outdoors; ensure the future of local economies that depend upon forestry, ranching, and recreation. Project must be linked to a national or state conservation priority. Eligible applicants: nonprofits; state government agencies; local governments; municipal governments; Indian tribes, and educational institutions.	1:1 Cost share - Federal/Applicant (cash, in-kind contribution of goods and services, and/or donated land value) Federal funds may be used as a match	Competitive grant: full proposal is by invite-only. Acquired land goes into a perpetual conservation easement.	RFP due March Pre-Proposal due April Proposal due June
Atlantic Flyway Shorebird Initiative	National Fish & Wildlife Foundation (NFWF) Ian Davidson Director, Bird Biology and Conservation Ian.Davidson@nfwf.org C. Scott Hall Senior Scientist, Bird Conservation, Scott.Hall@nfwf.org https://www.nfwf.org/amoy/Pages/home.aspx	American oystercatcher; Atlantic; birds; Chesapeake Bay; beaches; coastal; business; conservation; dunes; educational institutions; habitat; habitat management; individuals; international organizations; migration; migratory; migratory birds; North Atlantic; ocean; red knot; restoration; shorebirds; whimbrel; local government; nonprofits; open space; ranching; recreation; state government; Tribal government	Focus is on conserve and restore the habitat of the American oystercatcher, red knot, and whimbrel and improve habitat management. Eligible applicants: nonprofits; state government agencies; local governments; municipal governments; Indian tribes, educational institutions, businesses, unincorporated individuals, and international organizations.	1:1 Cost share - Federal/Applicant (match - cash and/or in-kind services)	American oystercatcher lives on beaches, mud flats, and exposed oyster bars along the lower Chesapeake Bay. Red Knots migrate through Maryland and Delaware on their way north in the spring, feeding on horseshoe crabs' eggs. Whimbrel migrate along the Chesapeake Bay and Atlantic Coast of Maryland. The majority of awards will range between $50,000 and $250,000.	RFP due January
Bring Back the Natives	National Fish & Wildlife Foundation (NFWF) Kate Morgan, Coordinator, Water Investments Katherine.Morgan@nfwf.org https://www.nfwf.org/bbn/Pages/home.aspx	American shad; assessment; Chesapeake Bay; Chesapeake Bay watershed; Delaware watershed; connectivity; conservation; environmental; habitat; habitat restoration; instream habitat; instream; marine; marine resources; local government; native fish; nonprofits; restoration; riparian; riparian habitat; river herring; rivers; schools; special districts; state government; streams; Tribal government; universities; water quality; watershed	Conservation strategies for native fish of eastern U.S. rivers, especially river herring and American shad in the Chesapeake and Delaware watersheds, particularly: restoring connectivity, riparian and instream habitat, and water quality. Invasive species management; and the development of decision support tools and innovative approaches to fish conservation, including landscape-scale assessments, piloting innovative restoration techniques, and identification of key flow restoration thresholds that enhance fish habitat and water quality in low-flood systems.	1:1 Cost share - Federal/Applicant (matching - cash, in-kind donations and/or volunteer labor)	Grant awards generally range from $50,000 to $100,000.	Pre-Proposal due June 27, 2019 Proposal due August 22, 2019

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Central Appalachia Habitat Stewardship Program	National Fish & Wildlife Foundation (NFWF) Amanda Bassow, Director, Northeastern Regional Office Amanda.Bassow@nfwf.org John Wright, Manager, Northeastern Regional Office John.Wright@nfwf.org https://www.nfwf.org/centralapps/Pages/home.aspx	Appalachia; assessment; cerulean warbler; connectivity; diversity; eastern brook trout; eastern hellbender; educational institutions; environmental; forests; forest management; freshwater; freshwater mussels; golden winged warbler; habitat; habitat diversity; habitat restoration; Laurel Highlands; local government; mussels; native birds; native fish; nonprofits; planning; restoration; riparian; rivers; species; state government; streams; technical assistance; Tribal government; trout; warbler; water quality; wood thrush	Restoration of forest blocks and forest management (assessment/planning - forest management decision support tools). Outreach and technical assistance to engage private landowners in adopting forest management practices. Create forest demonstration projects to accelerate adoption of forest management to improve species habitat and diversity. Eligible applicants: nonprofit organizations, state agencies, local governments, municipal governments, tribal governments, and educational institutions.	Federal/Non-Federal match: 1:1 (match - cash, contributed goods and services, volunteer hours, and/or property raised/or secured and spent for the project during the period of performance)	The program supports projects in portions of the Appalachian regions of Maryland (Garrett County - Laurel Highlands). Grants will range from $50,000 to $200,000.	Proposal due July 11, 2019
Chesapeake Bay Stewardship Fund	National Fish & Wildlife Foundation (NFWF) Jake Reilly, Program Director, Chesapeake Bay jake.reilly@nfwf.org Stephanie Heidbreder, Manager, Chesapeake Programs stephanie.heidbreder@nfwf.org Sydney Godbey, Coordinator Regional Programs (Northeast Region) sydney.godbey@nfwf.org https://www.nfwf.org/chesapeake/Pages/home.aspx	Chesapeake Bay; Chesapeake Bay watershed; habitat; habitat restoration; nutrient reduction; restoration; sediment; sediment reduction; water quality; watershed	See below under Innovative Nutrient and Sediment Reduction Grants and Small Watershed Grants		There are two competitive grant programs; the Innovative Nutrient and Sediment Reduction Grant Program and the Small Watershed Grants Program. These programs benefit the communities, farms, habitats and wildlife of the Chesapeake Bay region.	

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Innovative Nutrient and Sediment Reduction Grants	National Fish & Wildlife Foundation (NFWF) Sydney Godbey, Coordinator, Regional Programs (Northeast Region) Sydney.Godbey@nfwf.org 202-857-0166 https://www.nfwf.org/chesapeake/Pages/2020-insr-rfp.aspx	agriculture; agricultural runoff; Chesapeake Bay; Chesapeake watershed; collaboration; connectivity; conservation; educational institutions; estuary; estuarine habitat; farms; floodplain; floodplain connection; freshwater habitat; green infrastructure; habitat; habitat improvement; habitat restoration; local government; management; local government; Native American Tribal groups; nonprofits; nutrient management; nutrient reduction; partnership; planning; pollution reduction; restoration; riparian; riparian habitat; runoff; sediment; sediment reduction; soil health; soil management; state government; stormwater; stormwater improvements; streams; stream restoration; urban; urban runoff; tidal; tidal habitat; Tribal governments; water quality; wetlands; wetland reconnection; whole farm conservation; whole farm; watershed	Through collaboration and partnership, projects that conduct watershed and habitat planning; manage upland agricultural runoff through farm-scale conservation systems and solutions; manage upland urban runoff through green stormwater infrastructure improvements; and/or restore riparian and freshwater habitats through forested buffers, estuarine and tidal habitat restoration, conservation, and management; floodplain and wetland reconnection, stream restoration, and habitat improvement. Eligible applicants include nonprofit organizations, state government agencies, local governments, municipal governments, Indian tribes, and educational institutions.	1:1 match (Federal / Non-Federal)	This is a competitive grant focused on achieving success through collaboration and partnerships among stakeholders focused on improving water quality in the Chesapeake Bay watershed. All eligible projects must occur wholly within the Chesapeake Bay watershed (which only excludes the western half of Garrett County), and projects located within NFWF's Targeted Rivers and Watersheds will be prioritized. These locations were identified by NFWF as having significant opportunities for shared water quality improvement, habitat restoration and species recovery outcomes.	Applicant Webinar: Thursday, January 9, 2020, 1:00pm EDT FieldDoc Webinar: Thursday March 5,2020, 10:30am EDT Pre-Proposal Due Date: Friday, February 28,2020, 11:59 PM EDT Full Proposal Invitation: Monday, March 16, 2020 Full Proposal Due Date: Friday, May 1, 2020, 11:59 PM EDT Awards Announced: September 2020 (anticipated)

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Small Watershed Grants	National Fish & Wildlife Foundation (NFWF) Jake Reilly, Program Director, Chesapeake Bay Jake.Reilly@nfwf.org Stephanie Heidbreder, Manager, Chesapeake Program, Stephanie.Heidbreder@nfwf.org Sydney Godbey, Coordinator, Regional Programs (Northeast Region) Sydney.Godbey@nfwf.org https://www.nfwf.org/chesapeake/Pages/2019-insr-rfp.aspx	American black duck; capacity building; Chesapeake; Chesapeake Bay; Chesapeake watershed; connectivity; conservation; eastern brook trout; eastern oyster; educational institutions; erosion; green infrastructure; habitat; habitat planning; habitat protection; habitat restoration; K-12; livestock exclusion; local government; marshes; marsh restoration; local government; Native American Tribal groups; nonprofits; nutrient reduction; planning; protection; oyster reefs; restoration; river herring; sediment; sediment reduction; shoreline erosion; state government; stormwater; stormwater improvements; streams; stream restoration; tidal marsh; Tribal governments; water quality; watershed; wetlands; whole farm; watershed	Projects that: manage upland agricultural runoff through farm-scale conservation systems and solutions; manage upland urban runoff through green stormwater infrastructure Improvements including the adoption of new technologies and management approaches; restore riparian and freshwater habitats through forested buffers, floodplain and wetland reconnection, and stream restoration and habitat improvements; increase habitat integrity for Eastern Brook Trout; improve riparian management through livestock exclusion; conserving high-quality riparian corridors; restore large-scale oyster reefs; restoring river herring habitat connectivity; restore and conserve wetland and tidal marsh habitat for American Black Duck; manage shoreline erosion and marsh loss; build capacity for landscape-scale watershed and habitat outcomes, and conduct watershed and habitat planning, prioritization, design, and permitting. SWG-I Eligible Applicants: nonprofit organizations, local governments, municipal governments, Indian tribes, K-12 educational institutions SWG-PTA Eligible Applicants: nonprofit organizations, state government agencies, local governments, municipal governments, Indian tribes, educational institutions, and for-profit entities	SWG-I - Federal 70% Non-Federal 30% (in 2019) SWG-PTA - No match requirement (in 2019)	There are two programs under this grant: SWG-Implementation (SWG-I) and SWG-Planning and Technical Assistance (SWG-PTA). All eligible projects must occur wholly within the Chesapeake Bay watershed. Projects located within NFWF's Targeted Rivers and Watersheds will be prioritized. In 2019, SWG-I grant awards ranged from $20,000 to $200,000 and SWG-PTA awards were capped at no more than $50,000.	
Fisheries Innovation Fund	National Fish & Wildlife Foundation (NFWF) Erika Feller, Director, Marine and Coastal Conservation Erika.Feller@nfwf.org https://www.nfwf.org/fisheriesfund/Pages/home.aspx	aquaculture; business; capacity building; bycatch reduction; educational institutions; environmental; fisheries; individuals; international organizations; local government; marine; marine aquaculture; mitigation; monitoring; local government; Native American Tribal groups; nonprofits; operations; planning; protection; recreational fisheries; reporting; risk reduction; seabed; siting; state government; Tribal governments	Projects should develop or pilot innovative ideas and implement proven ideas at-scale for bycatch reduction and capacity building; address needs identified for recreational fisheries in the NOAA Fisheries National Saltwater Recreational Fisheries Policy Implementation Plan; planning projects and implementation of risk mitigation strategies that help minimize risk factors for marine aquaculture and protect the seabed; planning to improve siting of marine aquaculture operations and avoid environmental risks; and projects that implement regional-scale electronic monitoring and reporting strategies. Eligible applicants include nonprofit organizations; state government agencies; local governments; municipal governments; Indian tribes; educational institutions; businesses; international organizations, and unincorporated individuals.	1:1 match (Federal / Non-Federal) Non-Federal can be cash and in-kind	The Fisheries Innovation Fund releases two requests for proposals (RFPs) each year to work towards sustainable fisheries in the United States: a Fisheries Innovation Fund RFP and an Electronic Monitoring and Reporting Grant Program RFP. Can be used for all commercial or recreational fisheries in the U.S., but priority is given to projects in the New England groundfish fishery, the Gulf of Mexico reef fish fishery, and the Gulf of Alaska halibut and groundfish fisheries. Marine aquaculture projects can be proposed for fisheries anywhere in the U.S., but priority is given to projects within the four priority areas: New England, Southern California, the Gulf of Mexico, and Alaska.	Fisheries Innovation Fund and Electronic Monitoring and Reporting Grant Program due July
Fishing for Energy	National Fish & Wildlife Foundation (NFWF) Erika Feller, Director, Marine and Coastal Conservation Ericka.Feller@nfwf.org Michelle Pico, Program Director Marine Conservation, Pico@nfwf.org Kaity Goldsmith, Manager, Marine Conservation Kaitlin.Goldsmith@nfwf.org https://www.nfwf.org/fishingforenergy/Pages/home.aspx	blue crabs; Chesapeake Bay; coastal; commercial; conservation; derelict fishing gear; derelict fishing gear removal; education and outreach; educational institutions; for-profit; habitat; habitat improvement; individuals; local government; locating derelict gear; marine; local government; Native American Tribal groups; prevention; removal; state government; Tribal governments	Identification of gear accumulation sites and species/habitat concerns for removal; removal of accumulated gear; development of prevention strategies for abandonment of gear; planning that links conservation activities with removal of derelict gear; outreach to raise awareness of the effects of derelict gear on the environment and engagement with local public and fishing communities. Eligible applicants include nonprofit organizations; state or territorial government agencies; local government; municipal governments; Indian tribes; educational institutions; commercial (for profit) organizations, or unincorporated individuals.	Non-Federal match not required, but encouraged	This is a competitive grant, targeting coastal waters. Priority is given to projects within five focus areas, one of which is the Chesapeake Bay with targeted benefits to the blue crab. Awards generally fall within $30,000 to $300,000.	Proposal due April

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Five Star and Urban Waters Restoration Grant Program	National Fish & Wildlife Foundation (NFWF) Carrie Clingan, Program Director, Community Stewardship and Youth Carrie.Clingan@nfwf.org Chloe Elberty, Coordinator, Community Stewardship Programs Chloe. Elberty@nfwf.org https://www.nfwf.org/fivestar/Pages/home.aspx	BMPs; best management practices; capacity building; coastal; conservation; education and outreach; educational institutions; green infrastructure; habitat; habitat restoration; invasive species; invasive species removal; livestock fencing; local government; local government; Native American Tribal groups; nonprofits; partnership; riparian; restoration; runoff; stormwater; stormwater improvements; stormwater management; stormwater runoff; state government; training; Tribal governments; wetlands; wetlands; wetland restoration	Projects must involve five or more partners (public and private entities, including the applicant). Eligible activities include but are not limited to restoration or creation of wetlands, coastal or riparian areas; outreach, education, and/or training involving the restoration or creation activities that advance local watershed and conservation goals. Eligible applicants include nonprofit organizations, state government agencies, local governments, municipal governments, Indian tribes and educational institutions.	1:1 match (Federal / Non-Federal) at a minimum (in-kind staff contributions, volunteer time, work performed, materials and services donated, cash or other tangible contributions are allowed for the non-federal match)	Under this grant program, three sub-programs are applicable to areas in Maryland: US EPA Five Star Restoration Training Program - available to all communities. The Urban Waters Federal Partnership, US EPA/USDA Forest Service Funding has two eligible locations: the Anacostia Watershed and the Patapsco Watershed (Baltimore Region). The US FWS Urban Partner Funding is available to locations in Maryland within +/- 25 miles of the Service lands or nearby offices in Baltimore City and Washington, D.C. Grant awards under the entire Five Star and Urban Waters Restoration Grant Program range from $20,000 to $50,000, with roughly 40-50 grants award per year.	Proposal due January
Hurricane Sandy Coastal Resiliency Competitive Grant Program	National Fish & Wildlife Foundation (NFWF) Amanda Bassow, Director, Northeastern Regional Office Amanda.Bassow@nfwf.org Lynn Dwyer, Program Director, Northeast-Coastal Lynn.Dwyer@nfwf.org Claire Flynn, Manager, Northeastern Region Claire.Flynn@nfwf.org https://www.nfwf.org/hurricanesandy/Pages/home.aspx	coastal hazards; coastal storms; disaster; disaster funding; ecosystem protection; ecosystems; education; flood; hazard mitigation; habitat; habitat protection; mitigation; natural hazards; outreach; protection; resiliency; resilience; sea level rise; storm surge; wave velocity reduction	Reduce impacts of coastal storms, sea level rise and associated natural hazards on coastal and inland communities; strengthen ecological integrity and functionality of coastal/inland ecosystems to protect communities and enhance fish and wildlife and their associated habitats; conduct outreach/education to enhance understanding of impacts of storm events; and identify cost-effective resilience tools to mitigate the effects of future storms.	N/A	*Obviously closed, only included here to show that NWFW does occasionally offer grants for disaster assistance. Four projects were award in Maryland: two in central Maryland, one in Southern Maryland, and one on the Eastern Shore.*	N/A
Monarch Butterfly and Pollinators Conservation Fund - Habitat Improvement	National Fish & Wildlife Foundation (NFWF) Todd Hogrege, Director, Central Regional Office Todd.Hogrefe@nfwf.org Crystal Boyd, Manager, Pollinator Programs Crystal.Boyd@nfwf.org Daley Burnes, Regional Program Coordinator Daley.Burnes@nfwf.org https://www.nfwf.org/monarch/Pages/home.aspx	butterfly; conservation; educational institutions; federal government; habitat; habitat conservation; habitat restoration; local government; milkweed; monarch butterfly; local government; Native American Tribal groups; native plants; nonprofits; open space; pollinators; restoration; Tribal governments	Restore or enhance monarch butterfly and pollinator habitat; increase native milkweed and native plant resources supply. Eligible applicants include nonprofit organizations, US federal government agencies, state government agencies, local governments, municipal governments, Indian tribes and educational institutions.	1:1 match (Federal / Non-Federal) Non-Federal can be cash, in-kind contributions of staff and volunteer time, work performed, materials and services donated, or other tangible contributions to the project objectives and outcomes	Competitive grant. Project must be within the monarch butterfly range in the U.S. Priority is given to projects East of the Rockies in these states: Arkansas, Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, Texas, and Wisconsin. Priority is given to projects in the West located on or adjacent to working lands, important monarch butterfly overwintering sites, and US Forest Service and Bureau of Land Management lands.	Pre-Proposal due May Proposal due July

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Monarch Butterfly and Pollinators Conservation Fund - Technical Assistance for Private Working Lands	National Fish & Wildlife Foundation (NFWF) Todd Hogrege, Director, Central Regional Office Todd.Hogrefe@nfwf.org Crystal Boyd, Manager, Pollinator Programs Crystal.Boyd@nfwf.org Daley Burnes, Regional Program Coordinator Daley.Burnes@nfwf.org https://www.nfwf.org/monarch/Pages/home.aspx	butterfly; conservation; conservation plans; educational institutions; employment; federal government; habitat; habitat conservation; habitat restoration; job creation; job support; landowners; local government; milkweed; monarch butterfly; local government; Native American Tribal groups; native plants; nonprofits; open space; private landowners; pollinators; restoration; Tribal governments; working lands	Increasing the number of private landowners engaged in monarch butterfly and pollinator conservation practices on working lands; creation of conservation plans. Proposed projects would support full time employee (FTE) equivalents. Eligible applicants include nonprofit organizations, US federal government agencies, state government agencies, local governments, municipal governments, Indian tribes and educational institutions.	1:1 match (Federal / Non-Federal) Non-Federal can be cash, in-kind contributions of staff and volunteer time, work performed, materials and services donated, or other tangible contributions to the project objectives and outcomes	Competitive grant. Project must be within the monarch butterfly range in the U.S. Priority is given to projects East of the Rockies in these states: Arkansas, Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, Texas, and Wisconsin. Priority is given to projects in the West located on or adjacent to working lands, important monarch butterfly overwintering sites, and US Forest Service and Bureau of Land Management lands.	Pre-Proposal due May Proposal due July
National Coastal Resilience Fund	National Fish & Wildlife Foundation (NFWF) Erika Feller, Director, Marine and Coastal Conservation Ericka.Feller@nfwf.org Michelle Pico, Program Director, Marine Conservation Pico@nfwf.org Mandy Chesnutt, Director, Program Operations Mandy.Chesnutt@nfwf.org Kaity Goldsmith, Manager, Marine Conservation, Kaitlin.Goldsmith@nfwf.org https://www.nfwf.org/coastalresilience/Pages/home.aspx	assessment; barrier islands; beaches; capacity building; coastal; coastal erosion; coastal storms; commercial; connectivity; conservation; coral reefs; design; dunes; educational institutions; fish; flood; flooding; floodplain; forests; for-profit; habitat; habitat protection; instream restoration; instream; local government; marshes; marsh restoration; monitoring; local government; Native American Tribal group; natural systems; nonprofits; oyster reefs; permitting; project monitoring; protection; restoration; sea level rise; site assessment; streams; wetlands; wetland restoration; wildlife	Projects that create, expand, and restore natural system in areas that will both increase protection for communities from coastal storms, sea level rise, flood, and coastal erosion, while improving habitat for fish and wildlife species. The grant supports three focus areas: project preliminary design and site assessment; project final design and permitting; and project restoration and monitoring. Eligible applicants include nonprofit organizations; state and territorial government agencies, local governments, municipal governments, Native Tribal governments, educational institutions, and commercial (for-profit) organizations.	1:1 match (Federal / Non-Federal) Non-Federal match = cash and/or in-kind services	Eligible project areas include all coastal Hydrologic Unit Code (HUC) 8 watersheds that drain to the sea and any adjacent HUC 8 Watersheds that are particularly low-lying or tidally influenced. Project awards (in 2019) expected to range from $125,000 to $3,000,000.	Pre-Proposal due April Proposal due May

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Emergency Coastal Resilience Fund	National Fish & Wildlife Foundation (NFWF) Jay Jensen, Director, Southern Regional Office Jay.Jensen@nfwf.org Suzanne Sessine, Program Director, Southern Coastal Programs Suzanne.Sessine@nfwf.org https://www.nfwf.org/coastalresilience/emergency/Pages/home.aspx	aquatic; aquatic connectivity; beaches; beach restoration; capacity building; coastal; coastal ecosystems; coastal plain; coastal storms; connectivity; coral reefs; debris flow; design; disaster; disaster declaration; dunes; dune restoration; ecosystems; educational institutions; fish; flood; floodplain; floodplain restoration; flooding; forests; habitat; habitat protection; habitat restoration; instream restoration; instream; local government; marshes; marsh restoration; local government; Native American Tribal group; nonprofits; oyster reef; passage improvements; planning; protection; recovery; reforestation; resiliency; resilience; restoration; runoff; sea level rise; state government; storm surge; stormwater; stormwater runoff; streams; Tribal government; wave velocity; wetlands; wetland restoration; wildlife	Ecosystem restoration projects, and the construction of natural, nature-based and green-gray (hybrid) infrastructure to improve community resilience and conserve natural areas. Projects may include, but are not limited to, marsh, beach and dune restoration, living shorelines, stream restoration, including aquatic connectivity projects that reduce flood risk, and innovative stormwater management. In limited instances this program may consider projects that advance community planning and technical assistance to address barriers and increase the capacity of eligible communities to implement projects where there is a demonstrated need in an affected geography. Eligible applicants include nonprofit organizations, state and territorial government agencies, local governments, municipal governments, Native American tribal governments, and educational institutions.	N/A	Closed. Similar program to the Hurricane Sandy Coastal Resiliency Competitive Grant Program. The ECRF was established to increase the resilience of coastal communities located within federally declared disaster areas impacted by hurricanes Florence and Michael, Typhoon Yutu and wildfires in 2018. Included on this list to show that disasters may be funded through a similar program and that potential applicants should check the NFWF website for emergency funds after a Presidential Disaster Declaration after a major disaster. The grant funds projects located in the Coastal Plain Physiographic Province in Maryland.	N/A
National Wildlife Refuge Friends	National Fish & Wildlife Foundation (NFWF) Project Specific Grants Crystal Boyd, Manager, Pollinator Programs crystal.boyd@nfwf.org	blackwater; capacity building; eastern neck; fishing; friends group; habitat; habitat restoration; NWR; hunting; national wildlife refuge; Patuxent; peer to peer; public access; operational support; restoration	Eligible applicants in Maryland include: Friends of Blackwater; Friends of Eastern Neck; Friends of Patuxent Different activities funded under this grant program include: Nonprofit Capacity Building Grants; Project Specific Grants; Peer-to-Peer Coaching; Public Access Enhancements and Increasing Hunting and Fishing Experiences on National Wildlife Refuges;	Not required, but Friends organizations are encouraged to contribute 1:1 non-federal matching contribution.	Only nonprofit funds friend group projects. A project specific grant could be used to support a larger habitat restoration project. Project Specific Grants - providing funds to refuge Friends organizations seeking support for projects initiated and managed by the Friends in support of the refuge. Projects must be completed within two years of award date. Grant awards range from $1,500 to $15,000.	Proposal due August
Resilient Communities Program	National Fish & Wildlife Foundation (NFWF) Carrie Clingan, Program Director, Community Stewardship and Youth Carrie.Clingan@nfwf.org Chloe Elberty, Coordinator, Community Stewardship Program Chloe.Elberty@nfwf.org https://www.nfwf.org/resilientcommunities/Pages/home.aspx https://www.nfwf.org/programs/resilient-communities-program/resilient-communities-2020-request-proposals	aquatic; aquatic migration connection; capacity building; coastal; coastal habitat; community; communities; community resiliency; connectivity; demonstration projects; dunes; dune restoration; ecosystems; ecosystem protection; flood; flood mitigation; flood resiliency; habitat; habitat restoration; living shorelines; local government; migration; migratory; mitigation; Native American Tribal groups; nonprofits; protection; resilience; resiliency; restoration; sea level rise; storm surge; Tribal governments; wetlands; wetland restoration	Include: • Dune Habitat Restoration • Wetland Restoration • Bird and Wildlife Habitat Restoration • Living Shorelines • Aquatic Migration Connection Eligible applicants include nonprofit organizations; local governments; and Indian tribes	Federal/Non-Federal match: 1:1 (match - cash, in-kind contributions of staff and volunteer time, work performed, materials and services donated or other tangible contributions to the project objectives and outcomes)	**4-year initiative - ENDS 2021**; High-impact resiliency adaptations to help communities prepare for sea-level rise on the Eastern seaboard. Restore wetlands, coastal habitats and other ecosystems to help communities address floods, storm events and sea level-rise; Project Types: Dune Habitat Restoration; Wetland Restoration; Bird and Wildlife Habitat Restoration; Living Shorelines; Aquatic Migration Connection. Grants will be offered once a year to support priority projects in states and communities associated with Wells Fargo operations. 2019 grant awards ranged from $200,000 to $500,000. Projects should be completed within 2 years from the start date.	Pre- Proposal due February 18, 2020 Proposal (Invite Only) due April

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Non-Tidal Wetlands Grant Program	Chesapeake Bay Trust https://cbtrust.org/grants/ Non-Tidal Wetland Program Grants Manager: Sarah Koser, skoser@cbtrust.org, 410-974-2941, ext. 106	CBT; Chesapeake Bay Trust; creation; conservation; endangered species; faith-based organizations; for-profit; habitat; improvements; local government; nonprofits; nontidal; nontidal wetlands; preservation; protection; restoration; threatened species; wetlands; wetlands creation; wetlands preservation; wetlands protection; wetlands restoration	Activities include, but are not limited to: projects that create wetlands; improving the functions of existing wetlands (especially farmed wetlands, partially drained wetlands, or wetlands providing habitat for threatened or endangered species); preservation/protection of existing wetlands if part of a project that includes wetlands creation or restoration. Eligible applicants: nonprofit organizations, local government, for-profit entities, faith-based organizations "and more."	Not required, but cash or in-kind services match is strongly encouraged	Award amounts of up to $500,000. Eligible Locations: Primary watersheds - Isle of Wight Bay; Secondary watersheds - West River, Severn River, Magothy River, South River, Western Branch, Patuxent River (lower), Assawoman Bay, Sinepuxent Bay, Newport Bay; Tertiary watersheds - Youghiogheny River, Casselman River, Northeast River, Deep Creek Lake, Little Youghiogheny River, Eastern Bay, Brighton Dam, Rocky Gorge Dam, Lower Chester River, Miles River	Summer
Green Streets, Green Jobs, Green Towns (G3) Grant Program	Chesapeake Bay Trust https://cbtrust.org/grants/green-streets-green-jobs-green-towns/ G3 Program Grants Manager: Jeffrey Popp, jpopp@cbtrust.org, 410-974-2941, ext. 103	CBT; charrette; Chesapeake Bay; Chesapeake Bay Trust; community; communities; community associations; design; G3; green infrastructure; green streets; implementation; local government; neighborhood associations; nonprofits; planning; project design; project implementation; runoff; stormwater; stormwater runoff; urban; vacant lots; visioning; white paper	Activities include but are not limited to green street project design, implementation of green street projects, white papers on innovative ideas for green infrastructure, charrettes to vision/plan a green street project with key stakeholders (incl. citizens). Eligible applicants: nonprofit organizations, local governments, neighborhood/community associations	Not required, but cash or in-kind services match is strongly encouraged	Applicants applying for implementation/construction and greening of vacant lots must use the G3 Implementation Project Calculator. Grant funding can be applied anywhere in the Chesapeake Bay watershed portion of EPA Region 3. Program goals: reduce stormwater runoff, increase number and amount of green spaces in urban areas, improve the health of local streams and the Chesapeake Bay, enhance quality of life and community livability. Award amounts of up to $15,000 for conceptual plans; up to $30,000 for engineered designs, up to $100,000 for implementation projects, up to $50,000 for greening communities and urban vacant lots, up to $20,000 for white papers.	Spring
Outreach and Restoration Grant Program	Chesapeake Bay Trust https://cbtrust.org/grants/outreach-and-restoration/ Questions & Technical Support: Bre'Anna Brooks, bbrooks@cbtrust.org, 410-974-2941, ext. 112 or Sarah Koser, skoser@cbtrust.org, 410-974-2941, ext. 106	agricultural; agricultural best management practices; best management practices; BMPs; community; communities; community engagement; connectivity; engagement; floodplain; floodplain connection; forests; green infrastructure; habitat; habitat establishment; habitat improvement; invasive plant removal; invasive species; meadow; meadow habitat; native plantings; native plants; outreach; plant removal; rain barrels; rain garden; reforest; restoration; riparian buffer; riparian; runoff; streams; stream restoration; shoreline erosion prevention; stormwater; stormwater runoff; volunteers; water quality; water quantity; wetlands; wetland restoration	Activities such as community outreach and engagement increase stewardship ethic of natural resources; restoration activities that demonstrate restoration techniques and engage citizens in the restoration and protection of the Chesapeake Bay and its rivers. Eligible applicants: nonprofit organizations, community and homeowner associations, faith-based organizations, "and more"	Not required, but cash or in-kind services match is strongly encouraged	Grant sponsored in partnership with City of Baltimore Dept of Public Works, Charles Co, Harford Co, Howard Co, the City of Gaithersburg, Queen Anne's Co, and the City of Salisbury and funds projects in partner areas and throughout Maryland. Applicants can request funds from one of the following tracks. Track 1: Outreach: up to $30,000 for projects focused on education and awareness as project outcomes, up to $50,000 for behavior change projects. Track 2: Restoration: up to $50,000 for implementation projects Track 3: Outreach and Restoration: up to $75,000 for projects that combine restoration and outreach elements to measurably build knowledge within the community served.	Late Summer / Early Fall

Funding Program Name	Contact Information	Key Words	Eligible Activities	Cost Share Requirements	Other Program Characteristics	Application Due Date
Watershed Assistance	Chesapeake Bay Trust https://cbtrust.org/grants/watershed-assistance/ Questions & Technical Support: Emily Stransky, estransky@cbtrust.org, 410-974-2941, ext. 101	action plan; agricultural; agricultural water quality best management practices; BMPs; best management practices; bioretention cells; CBT; Chesapeake Bay; Chesapeake Bay Trust; living shorelines; local government; LID; low impact development; marshes; marsh creation; nonprofits; ordinances; plan; planning; program development; rain garden; streams; stream restoration; stormwater; stormwater management; water quality; water quantity; watershed; watershed action plan; watershed assessment; watershed characterization; watershed planning; watershed restoration; wetlands; wetlands restoration; zoning	Project design for watershed restoration projects identified in WIP milestones, which may include, but are not limited to: bioretention cells, large-scale rain gardens, other low impact development stormwater techniques, environmental site designs, stream restoration, wetland and marsh creation, and agricultural water quality best management practices. Watershed Planning and Program Development projects identified in the existing programmatic milestones submitted to MDE by local governments, including, but not limited to watershed characterization, survey, and stakeholder engagement; creation of watershed action plans; policy development or enhancement to support watershed action plans (e.g. development/enhancement of ordinances or other tools); and development for new programs, enhancement of existing programs, or establishing new institutional frameworks that promote internal and external stakeholder coordination. Eligible applicants; nonprofits, local governments	Not required, but cash or in-kind services match is strongly encouraged	Projects must support implementation of local milestones developed to advance the Watershed Implementation Plan (WIP) strategies. For project design, funding requests will be less than $75,000, but stream restoration design projects may request up to $200,000. Watershed planning and program development funding requests will be less than $75,000.	Late Summer / Early Fall
Exelon Grant	https://www.exeloncorp.com/community/grants	afterschool programs; arts; beautification; clean energy; conservation; education; endangered species; environmental; environmental quality; events; green infrastructure; health; human services; local government; mathematics; membership dues; neighborhoods; nonprofits; preservation; program development; program support; science; STEM; workforce skills; water quality	The grant funds programs that deliver measurable, sustainable improvements in the communities served by Exelon in four areas: education, environment, arts & culture, and neighborhood development. Funds may be used to an event, dues/membership or in-kind requests, and program support/development. Eligible applicants: 501c3 nonprofit organizations; only those organizations which do not discriminate based on age, political affiliation, national origin, ethnicity, gender, gender identity, sexual orientation, disability, HIV/AIDS status or religious belief. Grants are only available to nonprofits in the communities where Exelon has facilities. Grants are only available to organizations that have not received a grant from Exelon or its subsidiaries within the past 12 months. Although only nonprofits are called out as eligible applicants, local governments are among the list of past grant recipients.	No information provided	Education: Programs that encourage students to stay in school and develop their full potential, promote math and science, improve workforce skills, and encourage personal development through scholarships, mentoring and internships. Environment: Programs that improve the quality of our environment; promote environmental education, conservation and preservation; develop cleaner sources of energy; protect endangered species; and beautify neighborhoods. Arts & Culture: Cultural institutions with broad public exposure and programs designed to make arts and culture more accessible to a wider and more diverse audience. Neighborhood Development: The company makes a limited amount of grants to local nonprofit organizations for programs and nonprofit organizations that support a range of offerings from health and human services to after-school programming .	Anytime

APPENDIX H: SOURCES

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