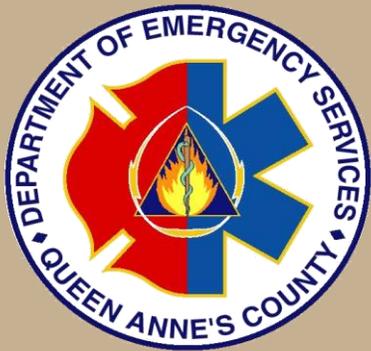




# Queen Anne's County



100 Communication Drive  
Centreville, MD 21617  
Phone: 410-758-4500  
Fax: 410-758-2086

Twitter:

<https://twitter.com/QueenAnneEM?lang=en>

Facebook:

<https://www.facebook.com/gacdes/>

# Multi- Jurisdictional Hazard Mitigation Plan



Adopted: December ??, 2018

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# Chapter 1

# Plan Development

This section of the Plan describes the mitigation planning process undertaken by Queen Anne's County and participating municipalities in the preparation of this Hazard Mitigation Plan update. This section consists of the following elements:

- 1.1 BACKGROUND
- 1.2 PURPOSE
- 1.3 SCOPE
- 1.4 AUTHORITY
- 1.5 GUIDING PRINCIPLES FOR PLAN DEVELOPMENT
- 1.6 OVERVIEW OF HAZARD MITIGATION PLANNING
- 1.7 LOCAL METHODOLOGY AND UPDATE PROCESS
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- 1.10 PUBLIC AND OTHER STAKEHOLDER PARTICIPATION
- 1.11 MULTI-JURISDICTIONAL PARTICIPATION
- 1.12 EXISTING PLANNING MECHANISMS & PLAN INTEGRATION
- 1.13 COMMUNITY PROFILE, LAND USE, AND DEVELOPMENT TRENDS

## 1.1 Background

Emergency Management is the discipline of identifying, managing, and avoiding risks. It is a discipline that involves preparing for a disaster before it occurs, supporting those affected by the disaster, as well as rebuilding after the natural or man-made disaster event. Emergency Management is an ever-changing process by which all individuals, groups, and communities attempt to manage hazards in an effort to avoid or reduce the impact of disasters. One method to attempt to prevent hazards from developing into disasters all together is Hazard Mitigation Planning. Hazard Mitigation Planning is a process to identify policies, capabilities, activities, and tools necessary to implement successful and sustainable mitigation actions.

**Why undertake mitigation planning?** Mitigation planning offers many benefits, including:

- Saving lives and property;
- Saving money;
- Quick and effective recovery following disasters;
- Reducing future vulnerability through wise development and post-disaster recovery and reconstruction;
- Enhancing coordination within and across participating jurisdictions;
- Expediting the receipt of pre-disaster and post-disaster grant funding; and,
- Demonstrating a firm commitment to improving community health and safety.

***Instead of repeated damage and continual demands for federal disaster assistance, resilient communities proactively protect themselves against hazards, build self-sufficiency, and become more sustainable.***

*Source: FEMA. 2013 Local Hazard Mitigation Planning Handbook*

Typically, mitigation planning is described as having the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster loss. A core assumption of hazard mitigation is that pre-disaster investments will significantly reduce the demand for post-disaster assistance by lessening the need for emergency response, repair, recovery and reconstruction. Furthermore, mitigation practices will enable local residents, businesses and industries to re-establish themselves in the wake of a disaster, getting the community economy back on track sooner and with less interruption.

### **Effective Emergency Management Activities**

**Mitigation.** Sustained actions taken to reduce or eliminate long-term risk to life and property from hazards. \*

**Prevention.** Actions necessary to avoid, prevent, or stop an imminent threat or actual act of terrorism. \*\*

**Protection.** Actions necessary to secure the homeland against acts of terrorism and manmade or natural disasters. \*\*

**Preparedness.** Actions taken to plan, organize, equip, train, and exercise to build and sustain the capabilities necessary to prevent, protect against, mitigate the effects of, respond to, and recover from those threats that pose the greatest risk to the security of the Nation. \*\*

**Response.** Actions necessary to save lives, protect property and the environment, and meet basic human needs after an incident has occurred. \*\*

**Recovery.** Actions necessary to assist communities affected by an incident to recover effectively. \*\*

*\*Source: 44 CFR §201.2 Mitigation Planning - Definitions.*

*\*\* Source: National Preparedness Goal, First Edition. September, 2011, FEMA. <http://www.fema.gov/pdf/prepared/npg.pdf>*

The benefits of mitigation planning go beyond reducing hazard vulnerability. Measures such as the acquisition or regulation of land in known hazard areas can help achieve multiple community goals, such as preserving open space, improving water quality, maintaining environmental health and enhancing recreational opportunities. Thus, it is vitally important that any local mitigation planning process be integrated with other concurrent local planning efforts, and any proposed mitigation strategies must take into account other existing community goals or initiatives that will help complement or hinder their future implementation. Queen Anne’s County and its municipalities have embraced this approach, identifying multiple opportunities to link the Plan with pre-existing programs, policies, plans and initiatives.

During the last several decades, the approach to the emergency management cycle has evolved considerably. A renewed emphasis has been placed on planning for disasters before they occur as a complement to effective response and recovery. As a result, hazard mitigation has gained increasing prominence as a critical part of emergency management. By mitigating hazards through sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards, risks can be proactively combated in a systematic manner, rather than being reacted to once they occur.

This Plan update is the result of continuing work by the citizens of the County to update a pre-disaster multi-hazard mitigation plan that will not only continue to guide the County towards greater disaster resistance, but will also respect the character and needs of the community.

## 1.2 Purpose

Queen Anne’s County developed its initial hazard mitigation plan in July 2005 which provided momentum for making homes, businesses, and communities as safe as possible against the impacts of floods, tornadoes, winter weather, and other natural hazards. The initial Plan assessed the effectiveness of prior and current programs and activities in the community and identified shortfalls; mitigation measures were further developed to help reduce Queen Anne’s County’s exposure to these natural hazards.

Queen Anne’s County has remained dedicated in continuing the work started in 2005 by updating the Plan on a five-year cycle as stipulated under the Disaster Mitigation Act of 2000. The plan update process is undertaken in order to:

- Protect life and property by reducing the potential for future damages and economic losses that result from natural hazards;
- Qualify for additional grant funding, in both the pre-disaster and post-disaster environment;
- Provide quick recovery and redevelopment following future disasters;
- Apply and when applicable exceed the minimum standards set forth in the *State of Maryland Local Hazard Mitigation Plan Guidance* and the *Disaster Mitigation Act of 2000*;
- Integrate existing flood mitigation documents;

### **Disaster Mitigation Act of 2000**

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

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

*Source: Local Mitigation Planning Handbook - 2013*

- Integrate hazard mitigation into the existing planning framework; and,
- Demonstrate a firm local commitment to hazard mitigation principles.

### 1.3 Scope

This Plan update has been prepared to meet requirements set forth by the Federal Emergency Management Agency (FEMA) and the Maryland Emergency Management Agency (MEMA) in order for Queen Anne’s County to be eligible for funding and technical assistance from state and federal hazard mitigation programs. It will continue to be updated and maintained to continually address those natural hazards determined to be of high and moderate risk as defined by the updated results of the local hazard, risk, and vulnerability summary. Other natural hazards will continue to be evaluated during future updates to the Plan in order to determine if they warrant additional attention, including the development of specific mitigation measures intended to reduce their impact. This Plan will be updated and FEMA approved within its five-year expiration date.

### 1.4 Authority

This Hazard Mitigation Plan has been adopted by Queen Anne’s County and participating municipalities in accordance with the authority granted to counties and municipalities by the State of Maryland.

This Plan was updated in accordance with current state and federal rules and regulations governing local hazard mitigation plans. The Plan shall be monitored and updated on a routine basis to maintain compliance with the following legislation and guidance:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, Mitigation Planning, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390) and by FEMA’s Interim Final Rule published in the Federal Register on February 26, 2002, at 44 CFR Part 201.
- Maryland Emergency Management Agency (MEMA), established in the Maryland Code. The Emergency Management Policy was updated in 1991 through EXECUTIVE ORDER 01.01.1991.02 State of Maryland Emergency Management Policy.

The following Federal Emergency Management Agency (FEMA) guides and reference documents were used to prepare this document:

- FEMA. 386-1: Getting Started. September 2002.
- FEMA. 386-2: Understanding Your Risks: Identifying Hazards and Estimating Losses. August 2001.
- FEMA. 386-3: Developing the Mitigation Plan. April 2003.
- FEMA. 386-4: Bringing the Plan to Life. August 2003.
- FEMA. 386-5: Using Benefit-Cost Review in Mitigation Planning. May 2007.
- FEMA. 386-6: Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning. May 2005.
- FEMA. 386-7: Integrating Manmade Hazards into Mitigation Planning. September 2003.
- FEMA. Local Mitigation Planning Guidebook. March 2013.
- MEMA. State of Maryland Local Hazard Mitigation Plan Guidance. May 2015.

## 1.5 Guiding Principles for Plan Development

As stated within the *FEMA Local Mitigation Planning Guidebook, March 2013*, the mitigation plan belongs to the local community. While FEMA has the authority to approve plans in order for local governments to apply for mitigation project funding, there is no required format for the plan's organization. When developing the mitigation plan, keep the following guiding principles in mind:

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

These principles were adhered to throughout the plan development process as evidenced in the range and specificity of mitigation strategies. The planning process included a cross-section of members from both local and state government, as well as the municipal Council of Government. In addition, other organizations and the public participated in the planning process. A public opinion survey and hazard mitigation plan development information was posted on the county's website and social media. Finally, the plan is reflective of the area and emphasizes the value of community and resiliency.

## 1.6 Overview of Hazard Mitigation Planning

Local hazard mitigation planning is the process of organizing community resources, identifying and assessing hazard risks, and determining how to best minimize or manage those risks. This process results in a hazard mitigation plan that identifies specific mitigation actions, each designed to achieve both short-term planning objectives and a long-term community vision. To ensure the functionality of each mitigation action, responsibility is assigned to a specific individual, department or agency along with a schedule for its implementation. Plan maintenance procedures are established to implement, as well as evaluate and enhance the Plan as necessary. Developing clear plan maintenance procedures ensures that Queen Anne's County's Hazard Mitigation Plan remains a current, dynamic and effective planning document over time.

## 1.7 Local Methodology and Update Process

The 2018 plan has been reorganized in an effort to separate identified hazards into hazard specific chapters. Organizing the plan into hazard specific chapters will allow users to easily access all hazard specific information in one area of the plan, and seamlessly integrate hazard specific information into other planning documents. In addition, hazard chapters have been presented within the new plan according to the Hazard Identification Risk Assessment (HIRA) Risk Factor (RF) ranking as follows:

- Chapter 3: Flood-RF Ranking of "High"
- Chapter 4: Hurricane & Coastal Erosion- RF Ranking of "High"
- Chapter 5: Drought & Extreme Heat- RF Ranking of "High"
- Chapter 6: High Wind- RF Ranking of "High"
- Chapter 7: Severe Winter Weather - RF Ranking of "Medium"

- Chapter 8: Sea Level Change- RF Ranking of “Medium”
- Chapter 9: Wildfire- RF Ranking of “Medium”
- Chapter 10: Thunderstorm & Lightning- RF Ranking of “Low”
- Chapter 11: Earthquake: RF Ranking of “Low”
- Chapter 12: Tornado-RF Ranking of “Low”

New chapters added to the 2018 plan include Chapter 13: Community Capabilities, Chapter 14: Mitigation Status Report, and Chapter 15 New Mitigation Strategies & Implementation.

In addition, a new essential facility database was developed. Multi-hazard data collection forms were completed for each essential facility. These data collection sheets were used at several of the hazard mitigation planning committee meetings and informed the individual hazard chapters, specifically the hazard vulnerability sections. Appendix B contains the essential facility database and completed facility data collection forms.

Finally, vulnerable population data was added to the 2018 plan. Vulnerable populations were identified to an extent; however additional vulnerable population will be added to the plan overtime. This will be accomplished through continued collaboration and coordination efforts. The county and municipalities recognize the importance of integrating vulnerable population planning into all cycles of emergency management. Queen Anne’s County strives to maintain and enhance partnerships between agencies, departments, and organizations.

Vulnerable populations have been identified in Chapter 2: Hazard Identification & Risk Assessment (HIRA) of the plan. New mapping products and data have been added. This is a new element of the plan.

### 1.8 The Planning Team

In the development of the updated Hazard Mitigation Plan, Queen Anne’s County, Maryland established a new hazard mitigation planning team that included representatives from various county departments, towns, and public and private entities. The Department of Emergency Services, Lori Morris, served as the project lead during the plan update. In addition, the county hired Smith Planning and Design, to assist the planning team by providing technical assistance and coordination throughout the process.

TABLE 1-1: 2018 HAZARD MITIGATION PLANNING COMMITTEE TEAM MEMBERS	
NAME	AGENCY, JURISDICTION, ORGANIZATION
Lori Morris	Department of Emergency Services
Scott Haas	
Geneva Harrison	
Joe Cichocki	
Michael Richardson	
Mike Wisnosky	Department of Planning & Zoning
Helen Spinelli	
Vivian Swinson	
John Kling	Department of Public Works
Lee Edgar	
David Remaniak	
Todd Mohn	
William Hildebrand	Maryland Emergency Management Agency
Jaleesa Tate	
Megan DelGaudio	GIS/IT
John Brockman, Cpl.	Sheriff's Office
Kenneth Rhodes	Centreville Police Department
Stacey Woodworth	QAC Department of Health
Teresa Ward	Finance
Brian Ambrette	Eastern Shore Land Conservancy
Jim Bass	
Michele King	Smith Planning & Design
Virginia Smith	

## 1.9 Planning Meetings and Documentation

The preparation of the Plan update required a series of meetings and workshops intended to facilitate discussion and initiate data collection efforts with local community officials. More importantly, the meetings and workshops prompted continuous input and feedback from local officials throughout the update process.

The summary below provides information on key meetings and workshops conducted by the Queen Anne’s County Hazard Mitigation Planning Team during plan development:

### 1.9.1 KICKOFF MEETING / FIRST MITIGATION PLANNING UPDATE MEETING

The Planning Team Kick-Off Meeting was held on April 12, 2018. Meeting Topics included:

- Project Schedule;
- Hazard Mitigation Planning Team Composition and Purpose;
- Meeting Schedule;
- Phase I Hazard Mitigation Plan Update & Phase II Treat Hazard Identification Risk Assessment;
- Hazard Identification/ Ranking Updates; and,
- Department/Agency Questionnaire & Discussion Session.

Fourteen planning team members participated in the meeting. Meeting minutes were distributed to team members, both those in attendance and not. Meeting minutes have been included in the Appendix of the plan. Highlights of the meeting included the expansion of hazards identified and profiled from those in the previous Plan, the addition of a local perspective to the hazard risk factor ratings, and the obtainment of information including new mitigation ideas from the following department and agencies:

- Economic Development;
- Emergency Services;
- Budget & Finance;
- GIS/IT;
- Police;
- QAC Department of Health; and,
- Mass Care & Sheltering.

Additional questionnaires were emailed to planning team members and other stakeholders not able to attend the kick-off meeting.

### 1.9.2 MID-POINT MEETING / SECOND MITIGATION PLANNING UPDATE MEETING

The Planning Team Kick-Off Meeting was held on June 20, 2018. Meeting Topics included:

- Hazard Mitigation Planning Process Update;
- FEMA Coastal Flood Risk Map Report;
- Depth of Flooding- At-Risk Facilities; and,
- Work Session-Attendees were divided into six groups.

Fifteen planning team members participated in the meeting. Meeting minutes were distributed to team members, both those in attendance and not. Meeting minutes have been included in the Appendix of the Plan. Highlights of the meeting included coastal flood vulnerability and loss estimations for inclusion into the Plan update, and the obtainment of information including new mitigation ideas from the following department and agencies:

- Emergency Services;
- GIS/IT;
- Police;
- Budget & Finance;
- Municipal Representative;
- QAC Department of Health; and,
- Eastern Shore Land Conservancy.



Figure 1-1

Photo Source: SP&D June 20, 2018

Additional information was emailed to planning team members and other stakeholders not able to attend the mid-point meeting.

### 1.9.3 MITIGATION STRATEGIES MEETING /THIRD MITIGATION PLANNING UPDATE MEETING

The Planning Team Mitigation Strategies Meeting was held on August 16, 2018. Meeting Topics included:

- Wind Analysis & Results Presentation;
- Eastern Shore Land Conservancy Presentation-Risk Management for the 21<sup>st</sup> Century Floodplain; and,
- Mitigation Strategies Work Session.

Eleven planning team members participated in the meeting. Meeting minutes were distributed to team members, both those in attendance and not. Meeting minutes have been included in the Appendix of the plan. Highlights of the meeting included two new vulnerability assessments for inclusion into the plan update, and the obtainment of information including new mitigation ideas from the following department and agencies:

- Emergency Services;
- GIS/IT;
- Police;
- QAC Department of Health; and,
- Eastern Shore Land Conservancy.

Additional information was emailed to planning team members and other stakeholders not able to attend the mitigation strategies meeting.

**1.9.4 MITIGATION STRATEGIES PRIORITIZATION/FOURTH MITIGATION PLANNING UPDATE MEETING**

The Planning Team Mitigation Strategies Prioritization Meeting was held on October 17, 2018. Meeting Topics included:

- HMPC Mitigation Strategies Prioritization On-Line Survey Results;
- High Priority Strategies;
- Project Sheets (Discussion, Lead Agency & Partner(s), Funding Opportunities); and,
- Implementation.

As a result of this meeting, the prioritization process and results were finalized. In addition, identification of the lead agency, time frame, and funding opportunities were discussed for inclusion on the mitigation project sheets.

**1.9.5 COUNCIL OF GOVERNMENTS MEETING**

The Council of Governments (COG) meeting was held on September 12, 2018 at the Sudlersville Town Hall. Each municipality is represented on the COG. The Hazard Mitigation Plan Update was added as a main agenda topic to the quarterly COG meeting. The working draft plan and highlights from the plan update were presented and discussed during the meeting. Additionally, new municipal information was sought and clarification of information previously obtained was discussed by planning team members and COG representatives.

**1.9.6 NFIP-COMMUNITY RATING SYSTEM MEETING**

A new element was included in the plan update. Queen Anne’s County is considering applying to the Community Rating System (CRS). As such, an assessment of Repetitive Loss Properties and designation of Repetitive Loss Areas was undertaken as part of the planning process. Appendix A: NFIP & CRS has been added to the 2018 Plan. A sub-committee of the Hazard Mitigation Planning Committee (HMPC) was convened to specifically work on the new appendix. Members of the sub-committee are listed on Table 1-2.

TABLE 1-2: HMPC- NFIP & CRS SUB-COMMITTEE MEMBERS	
NAME	AGENCY, JURISDICTION, ORGANIZATION
Lori Morris	Department of Emergency Services
Mike Wisnosky	Department of Planning & Zoning
John Kling	Department of Public Works
Lee Edgar	
David Remaniak	
Mel DelGaudio	GIS/IT
Michele King	Smith Planning & Design
Virginia Smith	

Sub-committee members met on September 12, 2018 to discuss Repetitive Loss Area(s) designation. As a result, two areas were established. Sub-committee members reviewed and commented on this appendix, which has been redacted within the public version of the plan due to the listing of detailed flood property information, which is protected. This appendix is for official use only, and will assist county staff as they progress through the CRS application process and subsequent program implementation.

### 1.10 Public & Other Stakeholder Participation

The Queen Anne’s County website contains a hazard mitigation page under the Department of Emergency Services. The website included following press release information:

Figure 1-2

Queen Anne's County, Maryland has initiated the process of updating the **Queen Anne's County Hazard Mitigation Plan**. Federal grant funding provided by FEMA has been obtained to complete this planning project.

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



Hazard Mitigation Planning Committee
<b>Organizations</b>
Department of Emergency Services
Department of Planning & Zoning
Department of Public Works
Department of Finance
GIS/IT Department
Sheriff's Office
Health Department
Eastern Shore Land Conservancy
Centreville Police Department
Maryland Emergency Management Agency



**Legend**

At-Risk Structures	Coastal 1% Annual-Chance Flood Depth	Sea Level Rise
Structure Type	Flood Depth	Coastal 1% Annual-Chance Flood Depth
100' Commercial	100' - 50' Flood	100' - 50' Flood
100' Residential	50' - 20' Flood	50' - 20' Flood
200' Residential	20' - 10' Flood	20' - 10' Flood
Manufacturing	10' - 5' Flood	10' - 5' Flood
Church	5' - 0' Flood	5' - 0' Flood
School	0' - 0' Flood	0' - 0' Flood
Other	0' - 0' Flood	0' - 0' Flood

Map Scale: 1 inch = 1 mile

Map Date: 10/15/2018

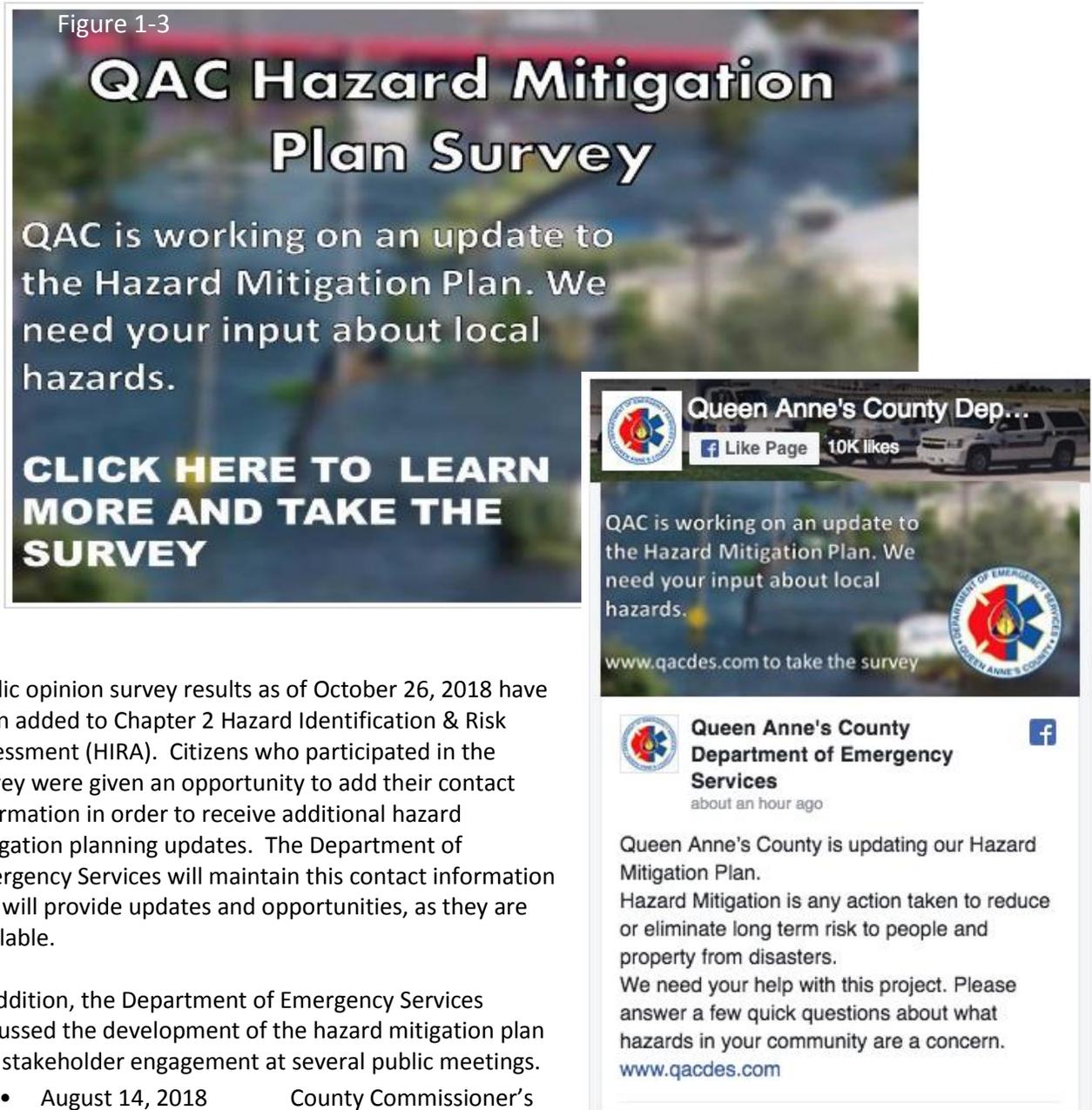
Map Author: Queen Anne's County, Maryland

Map Title: Structures At-Risk to Coastal 1-Percent-Annual-Chance Flood Event

The first step in the process involved the identification of key stakeholders, which resulted in the formation of a planning committee.

A main component of the plan update includes the identification of hazard areas. Special emphasis has been placed on the identification of structures at-risk to flood hazards including: riverine, coastal, storm surge, and sea level-rise. The results will aid in determining ideas to eliminate and/or reduce the affects of hazard events to Queen Anne's County.

In addition, both the county website and Facebook page hosted a QAC Hazard Mitigation Plan Survey for members of the community.



Public opinion survey results as of October 26, 2018 have been added to Chapter 2 Hazard Identification & Risk Assessment (HIRA). Citizens who participated in the survey were given an opportunity to add their contact information in order to receive additional hazard mitigation planning updates. The Department of Emergency Services will maintain this contact information and will provide updates and opportunities, as they are available.

In addition, the Department of Emergency Services discussed the development of the hazard mitigation plan and stakeholder engagement at several public meetings.

- August 14, 2018 County Commissioner’s Meeting (this meeting was filmed and is available on county website);
- October 9, 2018 County Commissioner’s Meeting- National Flood Insurance Program- Application to the Community Rating System (DPW presented);
- August 23, 2018 Department of Emergency Services Advisory Council (DESAC); and,
- November 8, 2018 Department of Emergency Services Advisory Council (DESAC).

## 1.11 Multi-Jurisdictional Participation

The Queen Anne’s County Hazard Mitigation Plan is multi-jurisdictional and includes the participation of County officials and the following incorporated municipalities:

- Barclay;
- Centerville;
- Church Hill;
- Millington;
- Queen Anne;
- Queenstown;
- Sudlersville; and,
- Templeville.

Municipalities participated through various means throughout the plan’s development including, but not limited to:

- Providing requested information;
- Council of Government (COG) meeting held on September 12, 2018; and,
- Completing questionnaire(s).

## 1.12 Existing Planning Mechanisms & Plan Integration

Generally described as the routine consideration and management of hazard risks in the existing planning framework. This framework includes a collection of plans, policies, codes, and programs that guide development in the county. There are numerous existing regulatory and planning mechanisms in place at the state, County, and municipal levels of government which support hazard mitigation planning efforts. These tools include the *2016 State of Maryland Hazard Mitigation Plan*, local floodplain management ordinances, the *Queen Anne’s County Emergency Operations Plan* and annexes, and other local ordinances.

In order access existing efforts and to increase effective integration of hazard mitigation, a **Safe Growth Audit** (SGA), was conducted as part of the update process. According to FEMA, the goal of the audit is to build environments that are safe for current and future generations and to protect buildings, transportation, utilities, and the natural environment from damage. Recommendations from the SGA have been included within the plan and within the SGA Appendix C.

County and municipal documents reviewed during the Safe Growth Audit include:

- 2010 Queen Anne’s County Comprehensive Plan;
- 2010 Water Resource Element;
- Zoning Ordinance;
- Chesapeake Critical Area Act and Flood Plain Ordinance;
- Subdivision of Land; and,
- 2012 Hazard Mitigation Plan.

In addition, there are eight (8) municipalities within Queen Anne’s County, all have completed comprehensive plans, as shown on Table 1-3.

TABLE 1-3: MUNICIPAL PLANS	
MUNICIPALITIES	CURRENT PLAN/ADOPTION DATE
Barclay	CMP-2009 & 2017 Update
Centreville	CMP-2009
Church Hill	CMP-2010
Queen Anne	CMP-2002
Queenstown	CMP-2010
Sudlersville	CMP-2014
Templeville	CMP-2009
Millington	CMP -2018

Source: Maryland Department of Planning – Comprehensive Plan

Finally, there are community plans for three unincorporated areas of the county, as follows:

- Chester/Stevensville Community Plan;
- Grasonville Community Plan; and,
- Kent Narrows Community Plan.

### 1.13 Community Profile, Land Use, and Development Trends

Queen Anne's County was established in 1706 (Chapter 3, Acts of 1706). The County was named for Queen Anne (1665-1714), who ruled Great Britain and Ireland, 1702-1714.

Queen Anne's County was the first English permanent settlement in the State of Maryland, under a 1631 patent from the king. In 1629, three years before the arrival of the Ark and the Dove at St. Mary's, Captain William Claiborne, an agent of the Virginia governor, established a trading post on an island he later named "Isle of Kent." Kent Fort Manor, built in 1640 and still standing is believed to be the oldest structure in Maryland.

Queen Anne's County is strategically located as it offers close proximity to metropolitan areas balanced with the relaxing lifestyle of a waterfront community. Part of the Washington-Baltimore-Northern Virginia Combined Statistical Area, the county is located within a two-hour drive to major cities such as Baltimore, Washington, D.C., Wilmington and Philadelphia. The county's 1,390 businesses employ 11,800 workers, with an estimated 14 of these businesses employing over 100 or more. As the "Gateway to the Eastern Shore," Queen Anne's County's location allows access to major metropolitan markets, government facilities, federal labs, prime contractors, and tech centers. The county is served by major U.S. highways 50 and 301 that link to major interstate roadways. Major industry sectors in the county include agriculture; trade; business and professional services; healthcare and education; manufacturing; and leisure and hospitality.

#### Demographics Brief

- Queen Anne's County's population increased by 17.85% from 2000-2010. This was the 5th highest growth rate among Maryland's twenty-three counties and the City of Baltimore. 2020 projected county population is 53,600.
- Population under 5 years of age: 2,514 or 5/5 %.
- Population 65 years if age or over: 8,725 or 17.8%.
- Median age of 44.5 years.
- The 2016 county workforce was 26,694 with an average unemployment rate of 4.6%.
- Majority of those employed are within the private sector at 82.2%.
- Occupied Housing Units (2011-2015) 17,522 (83.8% owner occupied).

Source: Brief Economic Facts Queen Anne's County, MD, Maryland Dept. of Commerce 2017

The population of Queen Anne’s has steadily increased over the past ten years, and is projected to continue to increase. This trend mirrors the increase seen in the Baltimore Metro area, and the State of Maryland.

Managing growth while maintaining the natural beauty and sustainability of Queen Anne’s County is important to the community. To that end, planning tools that are currently in-place to assist the county include but are not limited to the following information. Please refer to Appendix C: Safe Growth Audit and Project 3 in Chapter 15 New Mitigation Strategies & Implementation for more information and recommendations for future initiatives.

The 2010 Comprehensive Plan outlines the Queen Anne’s County land use ethic to maintain the County as a quintessential rural community. The theme of the 2010 comprehensive plan update is to preserve our connections from the past in order to create the future through sustainability. The following is an excerpt from the plan:

*This Plan strengthens the County’s long-standing guiding principles, growth management policies and recommendations outlined since 1987. It supports creating sustainable communities consistent with the 2030 vision for the County and Maryland’s smart growth goals and objectives. This Plan strengthens the County’s commitment to sustainable smart growth management in the context of the impact of existing and future land uses on the County’s water resources. In this Plan we looked through the “lens of water resources management” to determine appropriate use of land.*

*Source: 2010 Queen Anne’s County Comprehensive Plan*

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Environmental planning program includes outlined on the County’s website at <https://www.qac.org/> Include the following:

#### Chesapeake Bay Critical Area

The Chesapeake Bay Critical Area was established in 1985 to improve water quality, protect the wildlife habitat, and reduce impacts of human activity on sensitive lands. Included is all land area within 1,000 feet of the Mean High Water line of tidal waters and tidal wetlands. It also includes the waters of the Chesapeake Bay, tidal areas, and the land beneath these tidal areas. The Critical Area Buffer consists of a minimum 100 feet landward from the Mean High Water line of tidal waters, top of bank of tributary streams and tidal wetlands. The buffer may be expanded up to 300 feet to include any contiguous sensitive areas, highly erodible soils or steep slopes.

Zoning Regulations on development activities in the Critical Area may be found in Queen Anne’s County’s [Chapter 14:1 Critical Area Ordinance](#). Official maps delineating the Critical Area in Queen Anne’s County are maintained by the Queen Anne’s Office of Planning and Zoning.

#### Floodplain Management

The Department of Public Works is responsible for administering the county’s floodplain program. With over 414 miles of coastline and 29.2 square miles of water area, many properties in Queen Anne’s

County are prone to the effects of hurricanes, tropical storms and heavy rain events.

- All construction or fill within a floodplain requires a permit.
- All new construction or substantial improvements within special flood hazard areas and local flood hazard areas shall comply with the standards set forth in the Floodplain Management Ordinance.
- All proposed new structures or substantial improvement of existing structures in a flood zone must be constructed at least two (2.0) feet above the Base Flood Elevation or 7.0 feet NAVD whichever is higher. Enclosed areas not elevated in these structures are limited to 600 square feet and can only be used for parking, limited storage and access to the building.
- A crawlspace or garage must be vented to allow one square inch of effective flow area for every one square foot of the area below flood elevation, and must automatically allow movement of water in and out. The bottom of the vents may be no more than 1 foot above grade. Flood Vents must meet all requirements in FEMA Technical Bulletin 1 Openings in Foundation Walls and Walls of Enclosures (Aug. 2008).
- After you finish building in a FEMA-regulated floodplain or local flood hazard area—but before anyone moves in or uses the building—you must complete an Elevation Certificate (FEMA Form 086-0-33). The Elevation Certificate form must be completed by a Maryland licensed land surveyor or registered civil engineer. An Elevation Certificate is necessary before you can receive a Certificate of Occupancy.
- The Elevation Certificate is required by the National Flood Insurance Program to determine flood insurance rates for the structure. It also provides documentation that your community is enforcing its building and floodplain ordinances.

### Forest Conservation Act

The County's Forest Conservation Act seeks to protect existing forests and when development requires any forest protection and/or clearing, appropriate replanting and easements are put into place. All development applications (except Administrative Subdivisions) require submittal of the General Forest Information for the County and the Forest Information for the State.

### Watershed Implementation Plan

On December 31, 2010, the U.S. Environmental Protection Agency (EPA) set limits on the amount of nutrients and sediments that can enter the Chesapeake Bay. In addition to setting these limits, known as total maximum daily loads (TMDLs), EPA required the bay states to develop statewide Phase I Watershed Implementation Plans (WIP).

The Phase I WIPs are the 1st phase of a major initiative to create a road map and accountability framework that will lead to the attainment of restoration of the Chesapeake Bay and clean local streams. The WIP allocates the allowable loads among different sources and identifies statewide strategies for reducing nutrients and sediments that impair the Chesapeake Bay.

Maryland's Phase II WIP is the second part of a 3-phased planning process that extends to 2017, with a final implementation target date of 2025. The Phase II WIP is intended to provide more geographic detail to the implementation plans and may result in refinements to the Bay TMDL. EPA guidance for Phase II places a strong emphasis on working with key local partners to ensure that they are aware of their roles and responsibilities in contributing to the planning and implementation process.

Although the Phase II WIP is a State document, required by EPA, it is not a requirement of local

governments. However, Maryland has strongly encouraged local partners to participate in developing the plans.

Agencies and stakeholders within Queen Anne’s County that are working with the State in developing the plan are:

- Chester River Association;
- Department of Natural Resources Forestry Service;
- Midshore Riverkeeper Conservancy;
- QAC Department of Planning and Zoning;
- QAC Department of Public Works;
- QAC Department of Health Environmental Health Services;
- Soil Conservation District;
- Town of Centreville; and,
- University of Maryland Extension.

# Chapter 2

# Hazard Identification & Risk Assessment (HIRA)

This section of the Plan describes the Local Hazard Identification & Risk Assessment summary undertaken by Queen Anne's County and participating municipalities in the preparation of this Hazard Mitigation Plan Update. In addition, information on essential facilities and vulnerable populations has been added to the plan as part of the update process. This section consists of the following subsections:

- 2.1 BACKGROUND
- 2.2 HAZARD IDENTIFICATION AND RISK ASSESSMENT
  - 2.2.1 Risk Criteria
  - 2.2.2 Risk Ranking Results
  - 2.2.3 HIRA Conclusions
  - 2.2.4 HIRA Municipal Perspective
- 2.3 PUBLIC OPINION SURVEY DESCRIPTION & RESULTS
- 2.4 ESSENTIAL FACILITIES
- 2.5 VULNERABLE POPULATIONS
  - 2.5.1 Overall Population by Census Tract
  - 2.5.2 Aging Population (People 65 years of age and older)
  - 2.5.3 Population Living with a Disability
  - 2.5.4 Population Living Below Poverty Level
  - 2.5.5 Vulnerable Population Compilation Analysis

## 2.1 Background

A hazard identification and risk assessment provides the factual basis for activities proposed in the strategy portion of a hazard mitigation plan. An effective risk assessment informs proposed actions by focusing attention and resources on the greatest risks. The four basic components of a risk assessment are: 1) hazard identification, 2) profiling of hazard events, 3) inventory of assets, and 4) estimation of potential human and economic losses based on the exposure and vulnerability of people, buildings, and infrastructure.

A key step in preventing disaster losses in Queen Anne’s County is developing a comprehensive understanding of the hazards that pose risks to its communities. The following terms can be found throughout this Plan.

<b>Hazard:</b>	Natural or man-made source or cause of harm or difficulty. A hazard can be actual or potential.
<b>Risk:</b>	Potential for an unwanted outcome resulting from an incident, event, or occurrence, as determined by its likelihood and the associated consequences.
<b>Vulnerability:</b>	Characteristic of design, location, security posture, operation, or any combination thereof, that renders an entity, asset, system, network, or geographic areas susceptible to disruption, destructions, or exploitation.

Source: DHS Risk Lexicon, 2010 Edition

*Are hazard and threats different? Yes, a hazard differs from a threat in that a threat is directed at an entity, asset, system, network, or geographic areas, while a hazard is not directed.*

Source: DHS Risk Lexicon, 2010 Edition

Hazards will be identified and assessed for risk in this chapter of the plan. Threats will be identified, assessed, and documented in the appendix of the plan.

## 2.2 Hazard Identification and Risk Assessment

The Local Hazard Identification and Risk Assessment (HIRA) summary is a process or application of a methodology for evaluating risk as defined by probability and frequency of occurrence of a hazard event, exposure to people and property to the hazard, and consequences of that exposure. Different methodologies exist for assessing the risk of hazard events, ranging from qualitative to quantitative.

Queen Anne’s County and its communities are vulnerable to a wide range of natural and technological hazards that threaten life and property. The hazards identified by the Queen Anne’s County Mitigation Planning Committee for inclusion in this HIRA summary are those natural hazards that have impacted or have potential to impact Queen Anne’s County and its municipalities and are consistent with the hazards identified by the State of Maryland and the Federal Emergency

Management Agency for this part of the State and this region of the country. The hazards for this 2018 Plan update include:

- FLOODING (RIVERINE/URBAN/COASTAL);
- SEA LEVEL CHANGE;
- HURRICANES AND COASTAL EROSION;
- DROUGHT & EXTREME HEAT;
- SEVERE WINTER WEATHER;
- WILD FIRE;
- THUNDERSTORMS AND LIGHTNING;
- HIGH WIND;
- EARTHQUAKE; and,
- TORNADO.

The first step in the HIRA process, hazard identification, was undertaken by the Queen Anne’s County Mitigation Planning Committee and participating municipalities. Hazards identified in the 2012 plan were reviewed and discussed. The consensus was to maintain the listing of hazards previously identified, and add two new hazards to the listing. Both sea level change and high wind was added to the 2018 HIRA. The addition of these two hazards is consistent with the *2016 State of Maryland Hazard Mitigation Plan* and the *State of Maryland Local Hazard Mitigation Plan Guidance*.

Once the hazards were identified and evaluated for inclusion into the 2018 Plan update, the Mitigation Planning Committee then ranked these based on a Risk Factor (RF) approach. To further focus on the list of identified hazards for this Plan, Table 2-1 presents a list of all federal disaster and emergency declarations that have occurred in Queen Anne’s County since 1964, according to the Federal Emergency Management Agency. This list presents the foundation for identifying what hazards pose the greatest risk within Queen Anne’s County.

TABLE 2-1: PRESIDENTIAL DISASTER AND EMERGENCY DECLARATIONS IN QUEEN ANNE’S COUNTY		
DECLARATION #	DATE	EVENT DETAILS
FEMA-DR-127-MD	03/09/1962	Severe Storms, High Tides, Flooding
FEMA-EM-3100-MD	03/16/1993	Severe Snowfall and Winter Storm
FEMA-DR-1081-MD	01/11/1996	Maryland Blizzard
FEMA-DR-1303-MD	09/24/1999	Hurricane Floyd
FEMA-DR-1324-MD	04/10/2000	Winter Storm
FEMA-EM-3179-MD	03/14/2003	Snowstorm
FEMA-DR-1492-MD	09/19/2003	Hurricane Isabel
FEMA-EM-3251-MD	09/13/2005	Hurricane Katrina Emergency Shelter Operations
FEMA-DR-1875-MD	02/19/2010	Severe Winter Storm and Snowstorm
FEMA-DR-1910-MD	05/06/2010	Winter Storms and Snowstorms
FEMA-EM-3335-MD	08/27/2011	Hurricane Irene
FEMA-DR-4034-MD	09/16/2011	Hurricane Irene
FEMA-DR-4091-MD	11/20/2012	Hurricane Sandy
FEMA-DR-4261-MD	03/04/2016	Severe Winter Storm and Snowstorm

Source: Federal Emergency Management Agency Presidential and Emergency Declarations by State

Significant hazard events that occurred in Queen Anne’s County since the last plan update include:

- **Drought Event** - US Small Business Administration Disaster Declaration (SBA Disaster Loan)
  - June 1, 2016- September 29, 2016
- **Straight line Wind Event** - 5-9-2017
- **Severe Weather - EF2 Tornado** on 7-24-2017

Hazards were ranked in order to provide structure and prioritize the mitigation goals and actions discussed in this plan. Ranking was both quantitative and qualitative. First, the quantitative analysis considered all the GIS and HAZUS data available. Then, a qualitative approach, the Risk Factor (RF) approach, was used to provide additional insights on the specific risks associated with each hazard. This process can also be a valuable crosscheck or validation of the quantitative analysis performed.

The RF approach combines historical data, local knowledge, and consensus opinions to produce numerical values that allow identified hazards to be ranked against one another. During the planning process, the Queen Anne’s County Mitigation Planning Committee compared the results of the hazard profile against their local knowledge to generate a set of ranking criteria. In addition to the five categories established for the ranking criteria in the previous plan, another category, local risk perspective, was added by the 2018 planning committee. These criteria were used to evaluate hazards and identify the highest risk hazard.

$$\text{RF Value} = [(\text{Probability} \times .20) + (\text{Impact} \times .20) + (\text{Spatial Extent} \times .20) + (\text{Warning Time} \times .10) + (\text{Duration} \times .10) + (\text{Local Risk Perspective} \times .20)]$$

RF values are obtained by assigning varying degrees of risk to six categories for each hazard: probability, impact, spatial extent, warning time, duration, and local risk perspective. Each degree of risk is assigned a value ranging from 1 to 4 along with a weighing factor for each category by the Mitigation Planning Committee. To calculate the RF value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all six categories equals the final RF value, as demonstrated in the example equation above.

2.2.1 RISK FACTOR CRITERIA

TABLE 2-2: 2018 RISK FACTOR CRITERIA				
RISK ASSESSMENT CATEGORY	LEVEL	DEGREE OR RISK LEVEL	INDEX	WEIGHT
<b>PROBABILITY</b> What is the likelihood of a hazard event occurring in a given year?	UNLIKELY	LESS THAN 1% ANNUAL PROBABILITY	1	20%
	POSSIBLE	BETWEEN 1% & 10% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 10% & 100% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	100% ANNUAL PROBABILITY	4	
<b>IMPACT</b> What injuries, deaths, and damages have occurred?	MINOR	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	20%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN 1 DAY.	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. SHUTDOWN OF CRITICAL FACILITIES MORE THAN 1 WEEK	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/ & INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. SHUTDOWN OF CRITICAL FACILITIES 30 DAYS OR MORE.	4	
<b>SPACIAL EXTENT</b> How large of an area is impacted by hazard event?	NEGLECTIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	3	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	4	
<b>WARNING TIME</b> Is there lead-time associated with hazard event?	MORE THAN 24 HRS	SELF DEFINED	1	10%
	12 TO 24 HRS	SELF DEFINED	2	
	6 TO 12 HRS	SELF DEFINED	3	
	LESS THAN 6 HRS	SELF DEFINED	4	
<b>DURATION</b> How long does the hazard event typically last?	LESS THAN 6 HRS	SELF DEFINED	1	10%
	LESS THAN 24 HRS	SELF DEFINED	2	
	LESS THAN 1 WEEK	SELF DEFINED	3	
	MORE THAN 1 WEEK	SELF DEFINED	4	
<b>LOCAL RISK PERSPECTIVE</b>	HAZARD MITIGATION COMMITTEE MEMBERS IDENTIFIED THE TOP THREE NATURAL HAZARDS THAT AFFECT OR HAVE THE POTENTIAL TO AFFECT QAC. THOSE HAZARD RATED AS "HIGH" RISK WERE ASSIGNED A "4" WHILE ALL OTHERS WERE ASSIGNED AS "1"			20%

According to the default weighting detailed in Table 2-2, the highest possible RF value is 4.0. The methodology illustrated above lists categories that are used to calculate the variables for the RF value.

**2.2.2 RISK RANKING RESULTS**

**TABLE 2-3: RISK FACTOR RESULTS FOR QUEEN ANNE’S COUNTY AND PARTICIPATING JURISDICTIONS**

#	NATURAL HAZARDS	PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	LOCAL RISK PERSPECTIVE 2018 HMPC	RF RATING
1	Flooding: Riverine/Urban/Coastal	4 (1.2)	2 (0.6)	2 (0.4)	3 (0.3)	3 (0.3)	4 (1.2)	4.0
2	Hurricane and Coastal Erosion	3 (0.9)	2 (0.6)	3 (0.6)	1 (0.1)	2 (0.2)	4 (1.2)	3.6
3	Sea Level Change <b>(Added in 2018)</b>	4 (1.2)	3 (0.9)	2 (0.4)	1 (0.1)	4 (0.4)	1 (0.3)	3.3
4	Drought & Extreme Heat	4 (1.2)	2 (0.6)	4 (0.8)	1 (0.1)	4 (0.4)	1 (0.3)	3.4
5	Severe Winter Weather	4 (1.2)	2 (0.6)	4 (0.8)	1 (0.1)	3 (0.3)	1 (0.3)	3.3
6	Temperature Extremes	4 (1.2)	1 (0.3)	4 (0.8)	1 (0.1)	3 (0.3)	1 (0.3)	3.0
7	Wild Fire	3 (0.9)	2 (0.6)	1 (0.2)	4 (0.4)	2 (0.2)	1 (0.3)	2.6
8	Thunderstorm and Lightning	4 (1.2)	2 (0.6)	1 (0.2)	4 (0.4)	1 (0.1)	1 (0.3)	2.8
9	High Wind <b>(Added 2018)</b>	4 (1.2)	2 (0.6)	2 (0.4)	4 (0.4)	1 (0.2)	4 (1.2)	4.2
10	Earthquake	1 (0.3)	2 (0.6)	4 (0.8)	4 (0.4)	1 (0.1)	1 (0.3)	2.5
11	Tornado	2 (0.6)	3 (0.9)	1 (0.2)	4 (0.4)	1 (0.1)	1 (0.3)	2.5

Source: 2018 Queen Anne’s County Hazard Mitigation Planning Committee and SP&D

**2.2.3 HIRA CONCLUSIONS**

Based on the RF analysis, the natural hazards with the highest risk potential are “High Wind” and “Flooding: Riverine/Urban/Coastal”, which have risk factor (RF) rating values of 4.2 and 4.0, respectively. This is primarily due to the probability of the hazard occurring and the local risk perspective rating. It is important to note that “High Wind” was not an identified hazard in the previous plan. This hazard was added and rated as a “high-risk” hazard as part of the plan update process. “Hurricane and Coastal Erosion” and “Drought” were qualitatively calculated as second in risk potential, with RF rating values of 3.6 and 3.4, respectively. No technological hazards were considered in the HIRA; however, the appendix contains the new 2018 Threat Hazard Identification Risk Assessment (THIRA). The Queen Anne’s County Mitigation Planning Team decided to focus on natural hazards for the public Hazard Mitigation Plan, while threats have been evaluated in the appendix to the plan, which is for official use only. The conclusions drawn from the qualitative and quantitative assessments, combined with final determinations from the Queen Anne’s County Mitigation Planning Committee, were fitted into three categories for a final summary of hazard risk for Queen Anne’s County based on High, Moderate or Low risk designations.

**TABLE 2-4: HIRA CONCLUSIONS FOR QUEEN ANNE’S COUNTY AND PARTICIPATING JURISDICTIONS**

<b>HIGH RISK (3.4 or higher)</b>	Flooding, Hurricane and Coastal Erosion, Drought & Extreme Heat, High Wind
<b>MODERATE RISK (2.6 – 3.3)</b>	Sea Level Change, Severe Winter Weather, Wildfire,
<b>LOW RISK (0.1 – 3.2)</b>	Thunderstorm and Lightning, Earthquake, Tornado

Source: 2018 Queen Anne’s County Hazard Mitigation Planning Committee and SP&D

**2.2.4 HIRA MUNICIPAL PERSPECTIVE**

Finally, in order to obtain a municipal perspective a questionnaire was distributed. In addition, municipalities discussed and provided information on risk at the September 12, 2018 Council of Governments meeting, municipalities provided information on hazard affecting their jurisdiction and what they perceived was the highest risk hazard.

**TABLE 2-5: MUNICIPAL HAZARD RISK PERSPECTIVE**

JURISDICTION	HAZARDS								
	RIVERINE & COASTAL FLOODING	DROUGHT	SEVERE WINTER WEATHER	TEMPERATURE EXTREMES	WILDFIRE	THUNDERSTORM & LIGHTNING	HURRICANE & COASTAL EROSION	EARTHQUAKE	TORNADO
Barclay	X		X	X	X	X	X		X
Centreville	X		X			X	X		
Church Hill	X						X		
Millington	X						X		
Queenstown	X		X				X		
Sudlersville		X	X		X	X		X	X

Note: The Town of Queen Anne participated in and adopted the 2017 Talbot County Hazard Mitigation Plan. The Town of Queen Anne is located in both Talbot and Queen Anne’s Counties.

The Town of Templeville participated in the Caroline County Hazard Mitigation Plan. The Town of Templeville is located in both Queen Anne’s and Caroline Counties.

Source: Municipal survey and Council of Governments meeting on September 12, 2018.

**2.3 Public Opinion Survey Description & Results**

Input from community members and organizations were sought throughout the plan development process using an online public survey. The survey included three sections. A brief excerpt from each section of the survey has been provided.

**Excerpt from: Queen Anne's County Hazard Mitigation Plan Survey**

***Beginning Section:***

*The Queen Anne's County Hazard Mitigation Plan is a project that aims to make sure the County is prepared for all kinds of hazards, as well as preparing for the impacts predicted by climate change.*

*Community members and organizations' input to the process is incredibly valuable. This survey is one way the County is collecting your insights and perspectives.*

*The survey consists of 11 questions and will take less than 10 minutes.*

*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 if you wish and we will keep you updated and engaged in the process.*

***Second Section:***

*The following categories of natural hazards were determined by the Hazard Mitigation Planning Committee as likely to affect Queen Anne's County. Hazards were listed with descriptions.*

*These include any events, emergencies, or crises that may occur relatively suddenly or happen largely uncontrollably, such as natural disasters or disease outbreaks. In our efforts to make sure planning documents address your concerns as best as possible, we are interested in knowing how concerned you are for each of the events listed below. (Very Concerned, Concerned, Somewhat Concerned, Not Concerned)*

***Third Section:***

*Emergencies besides natural disasters (like hurricanes and snowstorms) also have the potential to impact Queen Anne's County. The County recognizes it is important to have plans for these events, too. Indicating if you are concerned for these different events will be very helpful for Queen Anne's County in developing preparedness and response plans.*

***Last Section:***

*Do you feel that a specific group or groups in Queen Anne's County are particularly at-risk for or could be harmed by any of the hazards or events listed below? This question is not intended to be limited to certain groups - we are eager to learn of any and all types and sizes of groups you think might be at particular risk.*

A total of two hundred and forty-two (242) members of the community participated in the survey. The majority of survey participants were from the Kent Island/Grasonville area, the Town of Centreville and the area known as North County. Results indicated that survey participants were most concerned about the following natural hazards:

- Flooding;
- Sea Level Change;
- Hurricane & Coastal Erosion;
- High Wind; and,
- Severe Winter Weather.

Additional hazards of concern identified by survey participants included:

- Active Shooter;
- Opioid Crisis;
- Cyber Attacks;
- Terrorism;
- Environmental Emergencies (oil spill, hazardous materials);
- Transportation (congestion, traffic accidents); and,
- Disease Outbreak.

An additional question was posed to survey participants pertaining to which hazard(s) they felt particularly affected their community. Results indicated in order of priority the following:

- Flooding;
- High Wind;
- Opioid Crisis;
- Hurricane & Coastal Erosion; and,
- Transportation (congestion and traffic accidents).

Immediately following the completion of the Hazard Mitigation Plan, the County plans to complete a new Threat Hazard Identification Risk Assessment (THIRA). The THIRA will use survey results to inform the process. The THIRA will be added as an annex to the Hazard Mitigation Plan upon completion.

## 2.4 Essential Facilities

A special emphasis has been placed on essential facilities within this plan update. A new inventory of essential facilities for the Queen Anne’s County Hazard Mitigation Plan has been compiled and listed in the Table 2-6 and displayed on Map 2-1. In addition, essential facility data collection sheets were developed as part of the plan update process. These sheets included facility and multi-hazard specific information. A total of 54 essential facility sheets were developed as part of the plan update process. Hazard Mitigation Planning Committee (HMPC) members reviewed all essential facility sheets during the mid-point meeting. Additional information and modifications were made by the HMPC. The detailed essential facility database as well as the essential facility risk and vulnerability data collection sheets is included in Appendix B: Essential Facility Database & Multi-Hazard Data Collection Sheets.

General Information										Figure 2-1	
<b>Facility Type</b>											
<b>Name of Facility</b>											
<b>Physical Address</b>											
<b>Coordinates</b>		X						Y			
<b>Year Built</b>				<b>Material</b>							
<b>Multi-Story Structure</b>				No				Yes		<b>#of Floors?</b>	
<b>Hazard Information</b>											
<b>FEMA 100 yr. Floodplain</b>				Yes				No			
<i>Comments:</i>											
<b>Storm Surge Inundation Area</b>				Yes				No			
<b>Hurricane Category (1-4)</b>				1	2	3	4				
<i>Comments:</i>											
<b>Sea Level Inundation Area</b>				2050				2100			
<i>Comments:</i>											
<b>Generator</b>		Yes		No	<b>Adequately Sized?</b>		Yes		No		
<i>Comments:</i>											
<b>Located along evacuation route?</b>				Yes				No			
<b>If so, name of route?</b>											
<i>Comments:</i>											
<b>Impact resistant glass?</b>				Yes				No			
<i>Comments:</i>											
<b>Antennae on facility?</b>				Yes				No			
<i>Comments:</i>											
<b>Flat roof?</b>				Yes				No			
<i>Comments:</i>											
<b>Wildland/Urban Interface</b>				Yes				No			
<i>Comments:</i>											
<b>Any past water deficiency issues? Drought Susceptibility</b>				Yes				No			
<i>Comments:</i>											
<b>Susceptible to Extreme Heat?</b>				Yes				No			
<i>Comments:</i>											
<b>Susceptible to Extreme Cold?</b>				Yes				No			
<i>Comments:</i>											

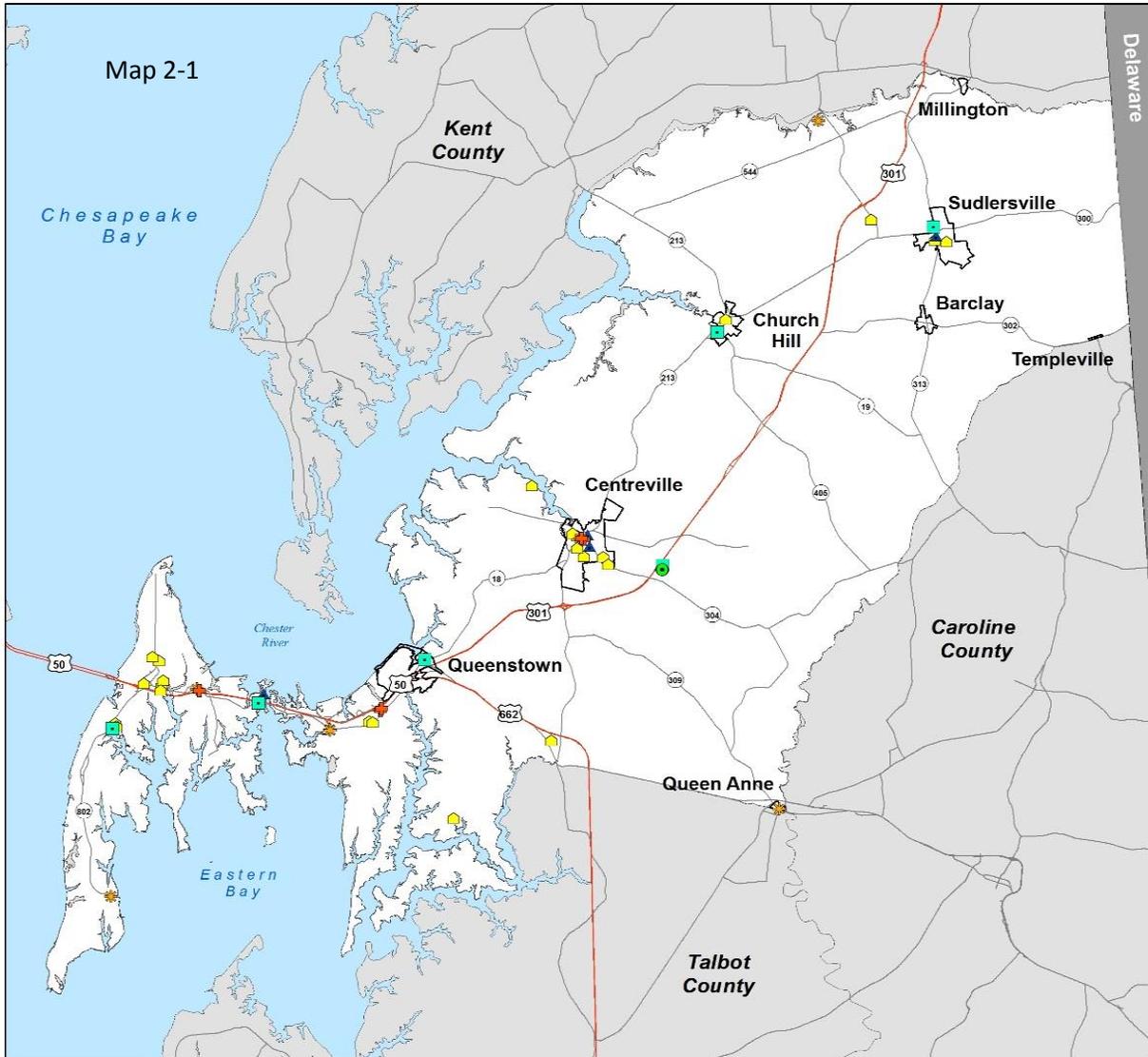
Source: SP&D Essential Facility Hazard Information Form

TABLE 2-6: ESSENTIAL FACILITES			
FACILITY TYPE	FACILITY NAME	ADRESS	TOWN
EOC	QAC Department of Emergency Services	100 Communications Drive	Centreville
Fire	Queen Anne-Hillsboro VFC #8	13512 First Street	Queen Anne
Fire	Queenstown VFC #3	7110 Main Street	Queenstown
Fire	Church Hill VFC #5	316 Main Street	Church Hill
Fire	Sudlersville VFC #6	203 N Church Street	Sudlersville
Fire	Goodwill VFC #4	212 Broadway Street t	Centreville
Fire	EMS Station 100	103 Davidson Road	Stevensville
Fire	EMS Station 400	302 Safety Drive	Centreville
Fire	EMS Station 300	7110 Main Street	Queenstown
Fire	EMS Station 600	203 N Church Street	Sudlersville
Fire	EMS Station 500	316 Main Street	Church Hill
Fire	Grasonville VFC #2	4128 Main Street	Grasonville
Fire	Grasonville Vol Ambulance Dept. #20	4132 Main Street	Grasonville
Fire	Crumpton VFC #7	300 3rd Street	Millington
Fire	United Communities VFC #9	9406 Romancoke Road	Stevensville
Fire	Kent Island VFC #1	1610 Main Street	Chester
Fire	EMS Station 200	101 Medic Drive	Chester
Medical	QAC Department of Health	206 N Commerce Street	Centreville
Medical	QAC Department of Health Annex	205 N Liberty Street	Centreville
Medical	Shore Emergency Center Queenstown	115 Shoreway Drive	Queenstown
Medical	UM Shore Medical Pavilion	125 Shoreway Drive	Queenstown
Medical	AAMC Kent Island Pavilion	1630 Main Street	Chester
Police	Queen Anne's County Sheriff's Office	505 Railroad Avenue	Centreville
Police	Maryland State Police - Barracks S	311 Safety Drive	Centreville
Police	Sheriff's Office - Sudlersville Substation	200 S Church Street	Sudlersville
Police	Centreville Police Department	420 N Commerce Street	Centreville
Police	Sheriff's Office - Kent Narrows Substation	425 Piney Narrows Road	Chester
School-Private	The Gunston School	911 Gunston Road	Centreville
School-Private	Wye River Upper School	316 S Commerce Street	Centreville
School-Private	Lighthouse Christian Academy	931 Love Point Road	Stevensville
School-Private	Eastern Shore Jr. Academy	407 Dudley Corners Road	Sudlersville
School-Private	Shore Up Head Start	5441 Main Street	Grasonville
School-Private	Kiddie Academy of Kent Island	113 St. Claire Place	Stevensville
School-Public	Kennard Elementary School	420 Little Kidwell Avenue	Centreville
School-Public	Church Hill Elementary School	631 Main Street	Church Hill
School-Public	Anchor Points Academy	202 Chesterfield Avenue	Centreville
School-Public	Sudlersville Elementary School	300 S Church Street	Sudlersville
School-Public	Grasonville Elementary School	5435 Main Street	Grasonville
School-Public	Bayside Elementary School	301 Church Street	Stevensville
School-Public	Queen Anne's County High School	125 Ruthsburg Road	Centreville
School-Public	Sudlersville Middle School	600 Charles Street	Sudlersville
School-Public	Centreville Elementary School	213 Homewood Avenue	Centreville
School-Public	Centreville Middle School	231 Ruthsburg Road	Centreville
School-Public	Wye Research & Education Center	124 Wye Narrows Drive	Queenstown
School-Public	Chesapeake College	1000 College Circle Drive	Queenstown

School-Public	Stevensville Middle School	610 Main Street	Stevensville
School-Public	Kent Island Elementary School	110 Elementary Way	Stevensville
School-Public	Kent Island High School	900 Love Point Road	Stevensville
School-Public	Matapeake Elementary School	651 Romancoke Road	Stevensville
School-Public	Matapeake Middle School & Kent Island 9th Grade Annex	671 Romancoke Road	Stevensville

*Source: Queen Anne's County Department of Emergency Services*

## Essential Facilities



<b>Legend</b>			
<b>Essential Facilities</b> ● EOC ★ Fire ■ EMS	+ Medical ▲ Police ▲ School - Private ▲ School - Public	□ Municipalities — Maryland Routes — US Routes	Data Sources: Queen Anne's County IT: - GIS-Mapping Department - GIS Data Download
			 

## 2.5 Vulnerable Populations

*Vulnerability is formally defined as “the characteristics of a person or group and their situation that influences their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard.*

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Source: Ben Wisner et al., *At Risk: Natural Hazards, People’s Vulnerability, and Disasters*, 2d ed. (London: Routledge, 2004)

While vulnerability is not limited to the following groups, these groups were identified as potentially vulnerable to hazards impacting Queen Anne’s County, during the planning process:

- Aging Population (people 65 years of age and older);
- Population living under the Poverty Level; and,
- Population with a Disability.

Impacts from hazards such as mass power outage and displacement are of particular concern.

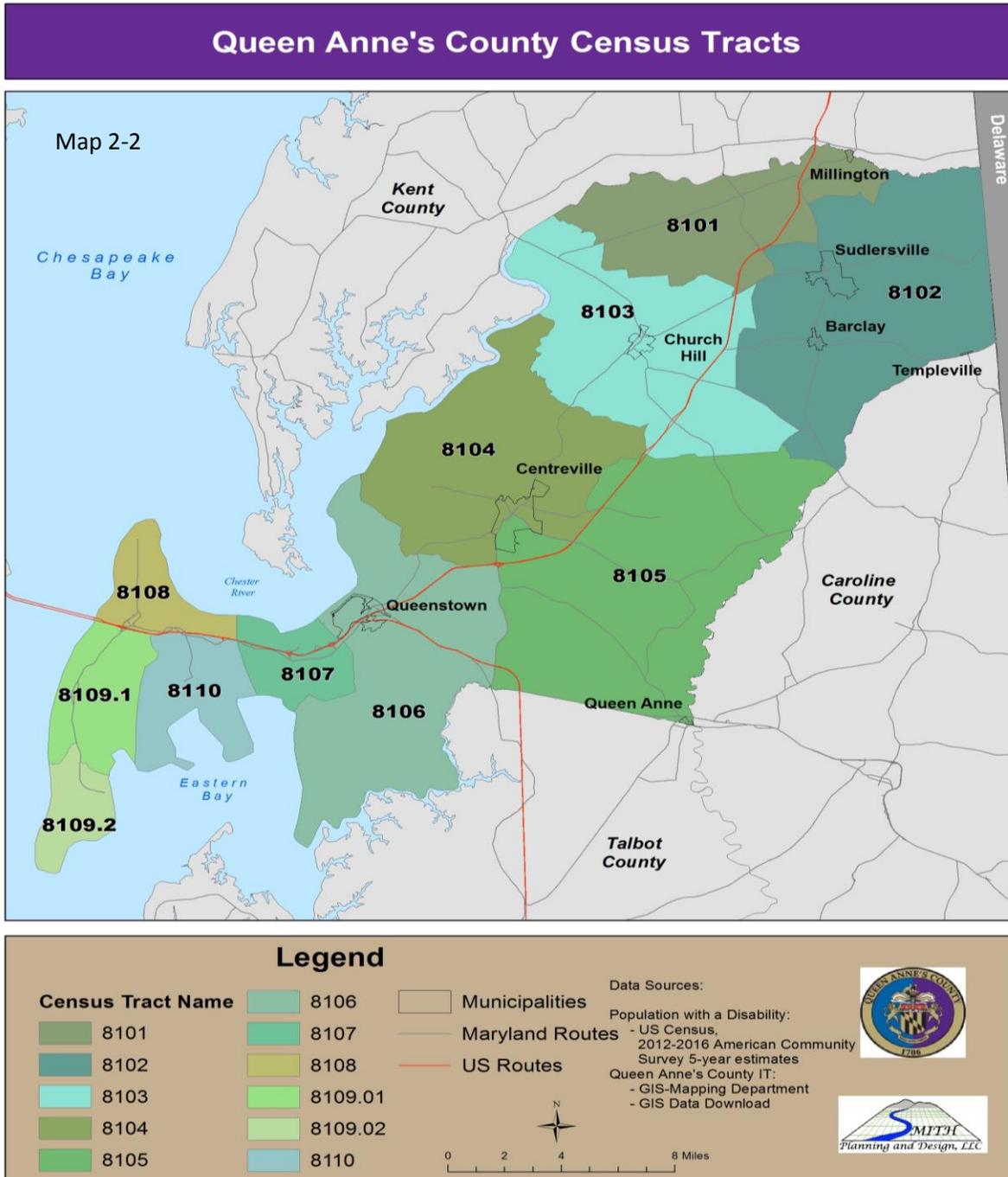
Poverty is a factor that affects how individuals perceive risk and how well they understand and respond to warnings. Both age and disability affect disaster vulnerability.

*The effects of age and disability on disaster vulnerability were clearly seen among elderly individuals trapped in nursing facilities during Hurricane Katrina. Moreover, it is estimated that individual’s ages 65 and older represented over 70 percent of the fatalities from Hurricane Katrina.*

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Source: Brenda Phillips and Maureen Fordham, “Introduction,” in *Social Vulnerability to Disasters*, ed. Brenda D. Phillips et al. (New York: CRC Press, 2010): 1-23.

In an effort to begin the process of analyzing who is at risk within the community to various hazards, identifying potential vulnerable populations is a vital first step. Data available at the census tract level coupled with hazard data provides a basis for this type of analysis. U.S. Census data and geodatabases bring together geography from the 2016 TIGER/Line Shapefiles and data from the 2012-2016 American Community Survey (ACS) 5-year estimates as shown on maps and tables throughout this plan chapter.



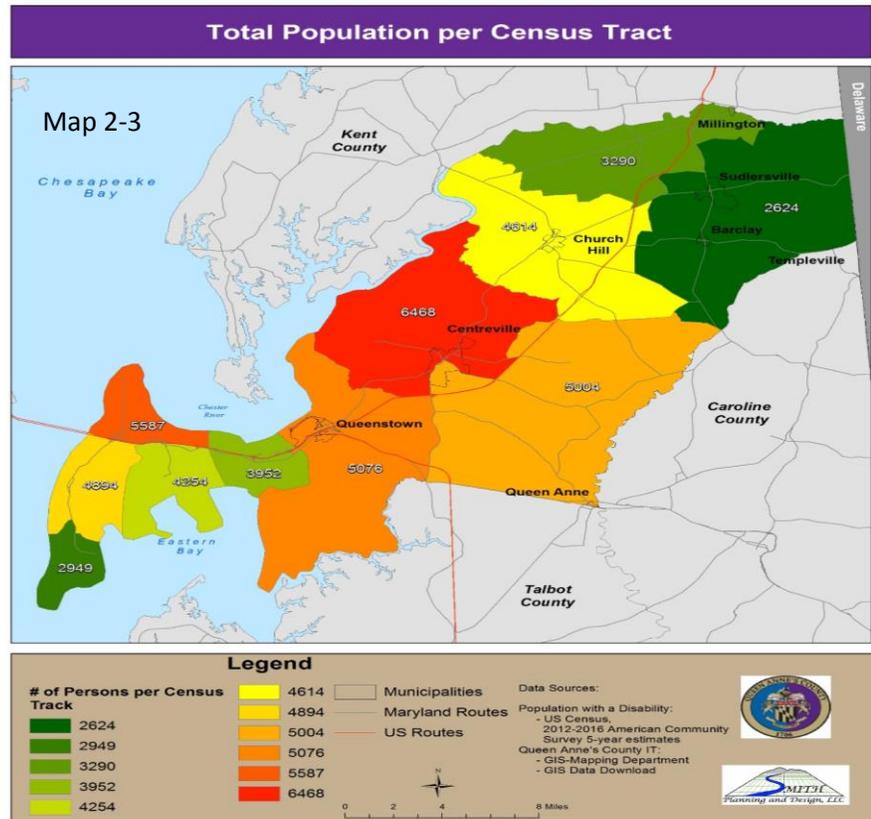
2.5.1 OVERALL POPULATION by CENSUS TRACTS

As shown on Table 2-7 and Map 2-3 population by census track are provided.

TABLE 2-7: POPULATION BY CENSUS TRACK		
CENSUS TRACT NAME	MUNICIPAL WITHIN CENSUS TRACT	TOTAL POPULATION
Census Tract 8101	Millington	3,290
Census Tract 8102	Sudlersville, Barclay, Templeville	2,624
Census Tract 8103	Church Hill	4,614
Census Tract 8104	Centreville	6,468
Census Tract 8105	Queen Anne	5,004
Census Tract 8106	Queenstown	5,076
Census Tract 8107	Unincorporated Areas of the County Only	3,952
Census Tract 8108	Unincorporated Areas of the County Only	5,587
Census Tract 8109.01	Unincorporated Areas of the County Only	4,894
Census Tract 8109.02	Unincorporated Areas of the County Only	2,949
Census Tract 8110	Unincorporated Areas of the County Only	4,254
<b>Total</b>		<b>48,712</b>

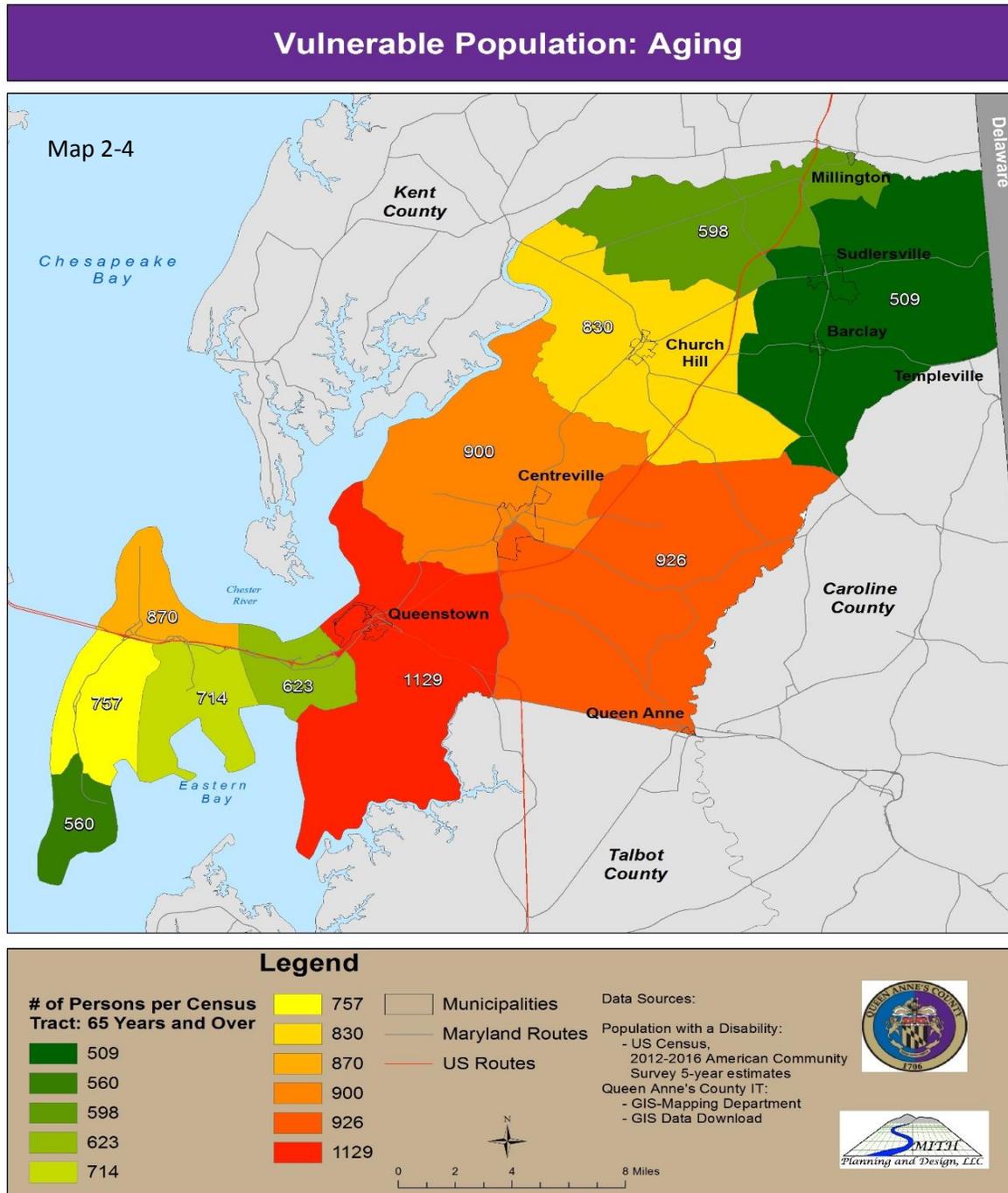
Source: U.S. Census data and geodatabases bring together geography from the 2016 TIGER/Line Shapefiles and data from the 2012-2016 American Community Survey (ACS) 5-year estimates

Those census tracts shown in red and dark orange on the Map 2-3 indicate the areas of the County with the greatest number of people.



**2.5.2 AGING POPULATION (PEOPLE 65 YEARS OF AGE AND OLDER)**

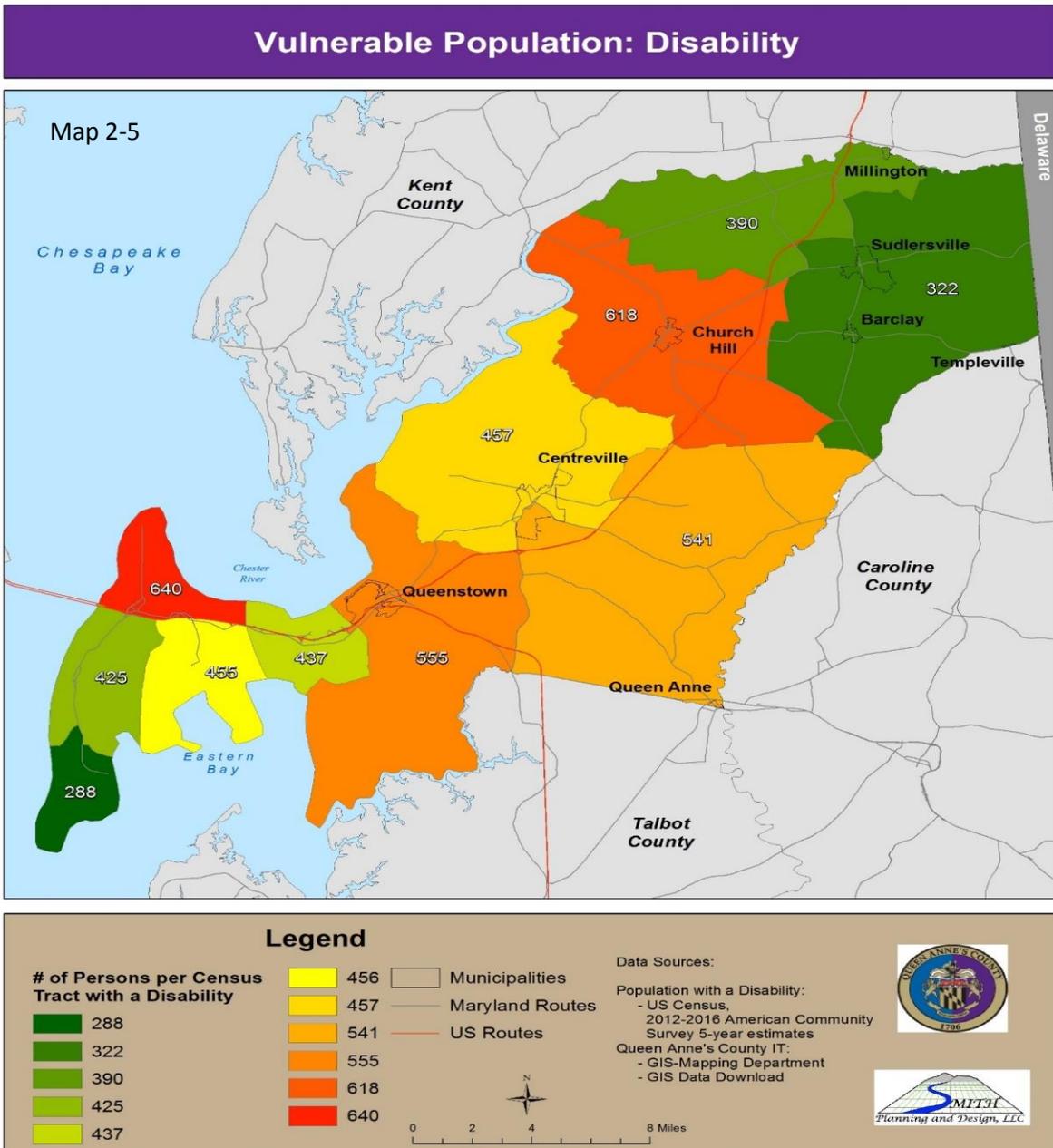
Map 2-4 indicates that Census Tract 8106 containing the municipality of Queenstown has the greatest number of people 65 years of age and older followed closely by census tract 8104 containing the municipality of Queen Anne.



Additional Source Information: Relationship by Household Type (Including Living Alone) For The Population 65 Years & Over: Total: Population 65 years and over -- (Estimate) U.S. Census 2012-2016 American Community Survey 5-year estimates.

**2.5.3 POPULATION LIVING WITH A DISABILITY**

Map 2-5 indicates that Census Tract 8108 located on the northern most tip of Kent Island contains the greatest number of people living with a disability followed closely by census tract 8106 containing the municipality of Queenstown.

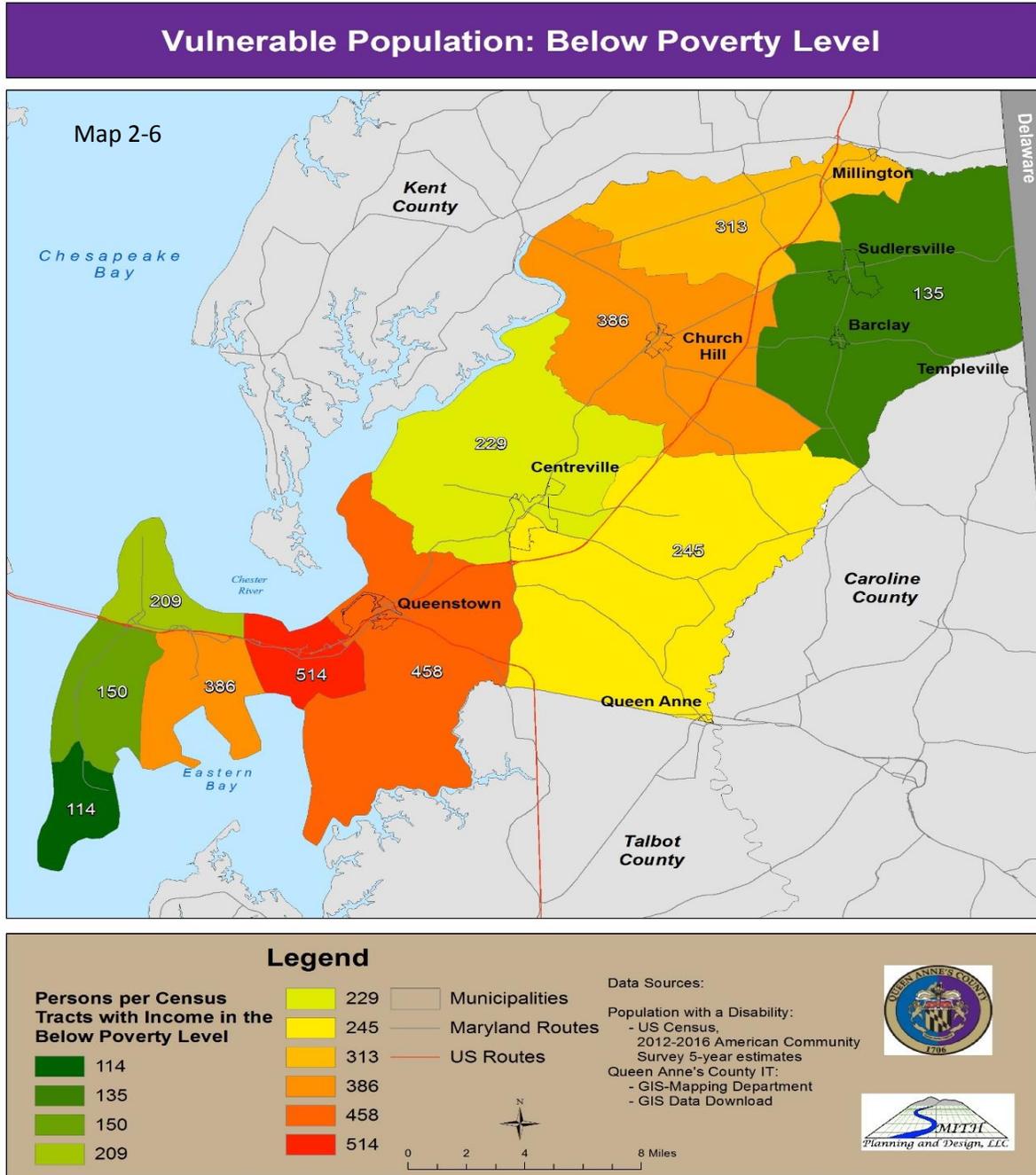


*Additional Source Information: B18101e35, B18101e38 B18101e4, B18101e7, B18101e10, B18101e13, B18101e16, B18101e19, B18101e23, B18101e26, B18101e29, B18101e32, SEX BY AGE BY DISABILITY STATUS: Male & Female: All Ages: With a disability: Civilian non-institutionalized population -- (Estimate) U.S. Census 2012-2016 American Community Survey 5-year estimates.*

- All attributes listed above were used to calculate total population for persons with a disability per each census track

**2.5.4 POPULATION LIVING BELOW THE PROVERTY LEVEL**

Map 2-6 indicates that Census Tract 8107 located in the Kent Narrows/Grasonville area contains the greatest number of people living below poverty level followed closely by census tract 8106 containing the municipality of Queenstown.

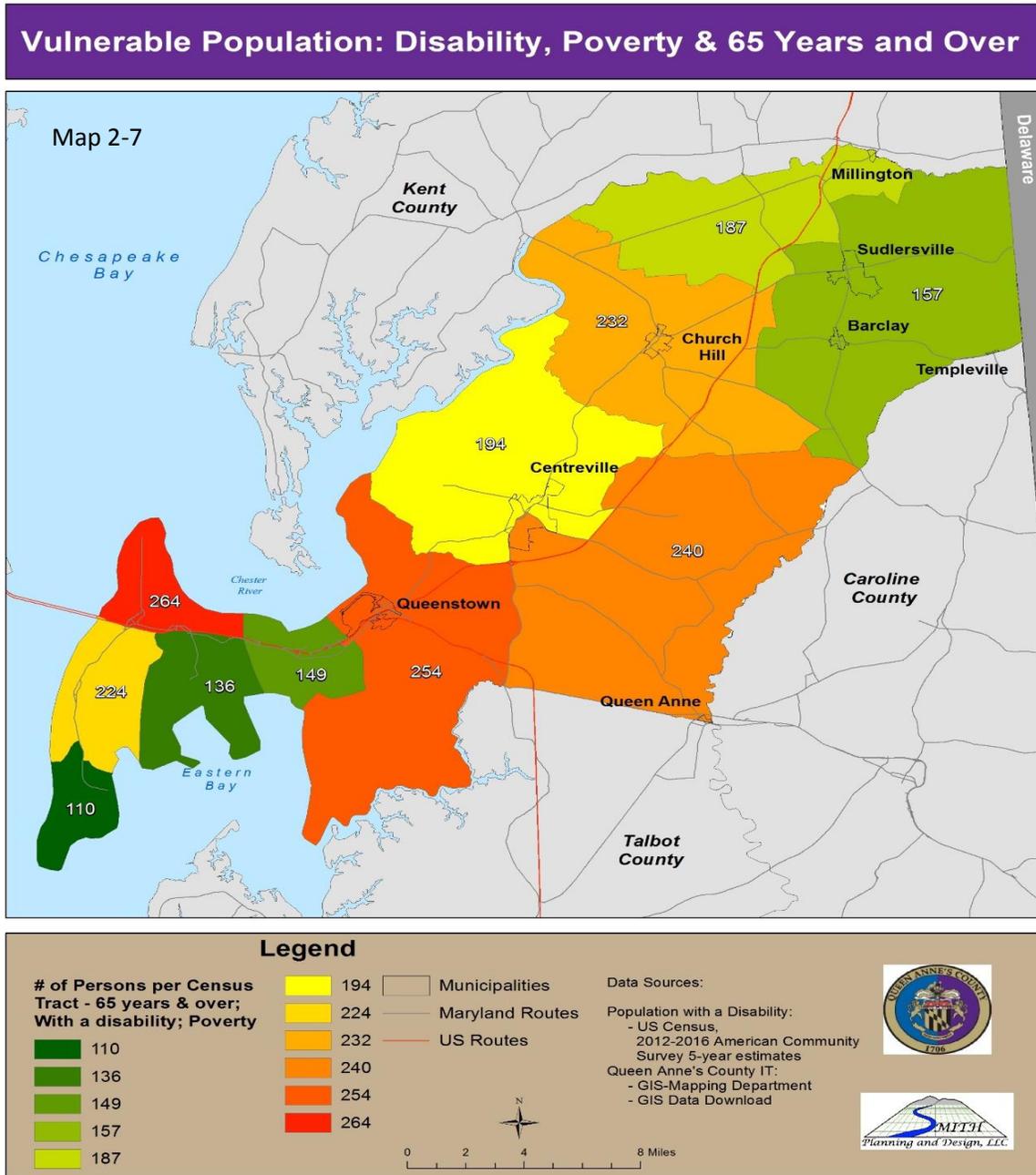


Additional Source Information: **B17001e2**

POVERTY STATUS IN THE PAST 12 MONTHS BY SEX BY AGE: Income in the past 12 months below poverty level: Population for whom poverty status is determined -- (Estimate) U.S. Census 2012-2016 American Community Survey 5-year estimates.

**2.5.5 VULNERABLE POPULATION COMPILATION ANALYSIS**

In an effort to assess identified vulnerable populations a data compilation map was developed, Map 2-7. Results indicate that Census Tract 8107 located in the Kent Narrows/Grasonville followed closely by census tract 8106 containing the municipality of Queenstown are the two areas of the county containing persons that are over 65 years of age with a disability living below the poverty level.



Additional Source Information: **C18130e17**

AGE BY DISABILITY STATUS BY POVERTY STATUS: 65 years and over: With a disability: Civilian non-institutionalized population for whom poverty status is determined -- (Estimate)

# Chapter 3 Flood Hazard

This section of the Plan describes an overall flood profile, risk, and vulnerability for Queen Anne's County and participating municipalities:

- 3.1 FLOOD PROFILE
- 3.2 FLOOD RISK MAPPING
  - 3.2.1 FEMA Flood Zones
- 3.3 HISTORIC FLOODING
- 3.4 FLOOD RISK DATA
- 3.5 FLOOD VULNERABILITY
  - 3.5.1 Flood Loss Estimations
  - 3.5.2 Essential Facilities
  - 3.5.3 Sanitary Facilities
  - 3.5.4 Municipal Areas Prone to Flooding

Flood was ranked as a high-risk hazard for Queen Anne's County, Chapter 2 Table 2-4.

### 3.1 Flood Profile

A flood is a natural event for rivers and streams and occurs when a normally dry area is inundated with water. Excess water from snowmelt or rainfall accumulates and overflows onto the stream banks and adjacent floodplains. As illustrated in the figure below, floodplains are lowlands, adjacent to rivers, streams and creeks that are subject to recurring floods. Flash floods, usually resulting from heavy rains or rapid snowmelt, can flood areas not typically subject to flooding, including urban areas. Extreme cold temperatures can cause streams and rivers to freeze, causing ice jams and creating flood conditions.

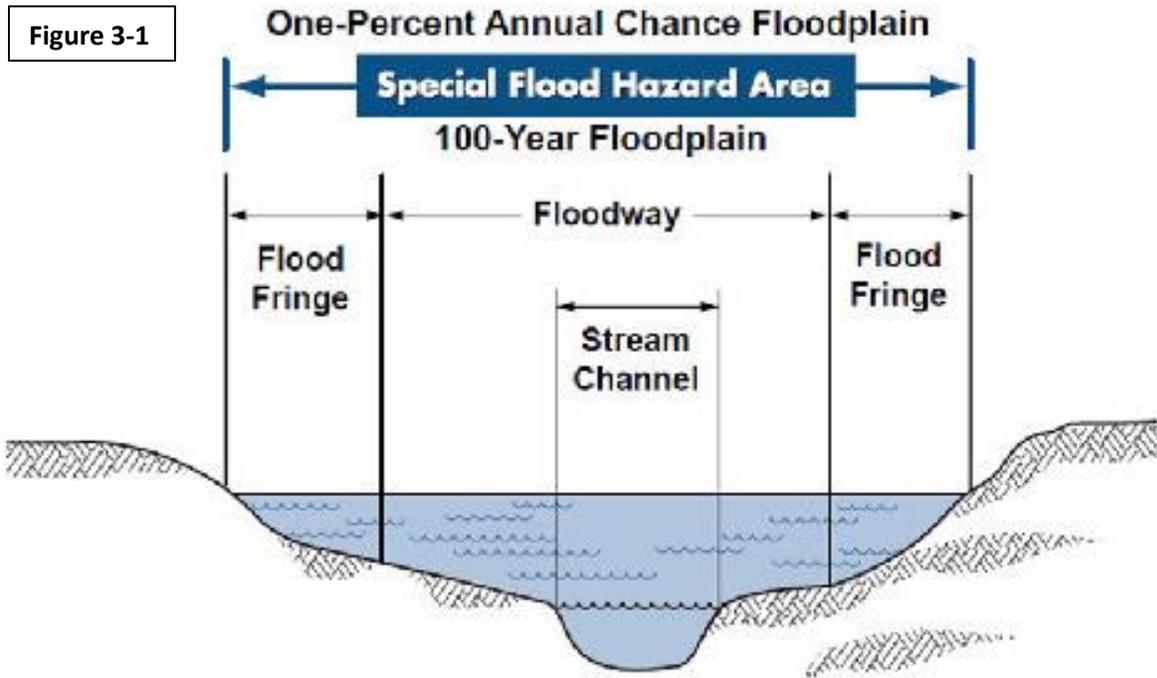


Figure 3-1

Source: Moore County Planning & Community Development, July 2013 Planning for the Future Today Newsletter

Floods are considered hazards when people and property are affected. Nationwide, hundreds of floods occur each year, making it one of the most common hazards in all 50 states and U.S. territories. In Maryland, flooding occurs commonly and can occur during any season of the year from a variety of sources. Most injuries and deaths from flooding happen when people are swept away by flood currents and most property damage results from inundation by sediment-filled water. Fast-moving water can wash buildings off their foundations and sweep vehicles downstream. Pipelines, bridges, and other infrastructure can be damaged when high water combines with flood debris. Basement flooding can cause extensive damage. Flooding can cause extensive damage to crop lands and bring about the loss of



Figure 3-2

Photo Source: <http://www.bviddm.com/residents-urged-to-minimize-flood-risk/>

livestock. Several factors determine the severity of floods, including rainfall intensity and duration, topography and ground cover.

**River floodplains and coastal areas are the most susceptible to flooding, however, it is possible for flooding to occur in areas with unusually long periods of heavy rainfall. The (3) three types of flooding included within the flood hazard profile are described below.**

<b>Riverine Flooding:</b>	Originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Water from snowmelt, rainfall, freezing streams, ice flows, or a combination thereof, causes the river or stream to overflow its banks into adjacent floodplains. Winter flooding usually occurs when ice in the rivers creates dams or streams freeze from the bottom up during extreme cold spells. Spring flooding is usually the direct result of melting winter snow packs, heavy spring rains, or a combination of the two.
<b>Flash Flooding:</b>	Occur anywhere when a large volume of water flows or melts over a short time period, usually from slow moving thunderstorms or rapid snowmelt. Because of the localized nature of flash floods, clear definitions of hazard areas do not exist. These types of floods often occur rapidly with significant impacts. Rapidly moving water, only a few inches deep can lift people off their feet, and only a depth of a foot or two, is needed to sweep cars away. Most flood deaths result from flash floods.
<b>Urban Flooding:</b>	The result of development and the ground's decreased ability to absorb excess water without adequate drainage systems in place. Typically, this type of flooding occurs when land uses change from fields or woodlands to roads and parking lots. Urbanization can increase runoff two to six times more than natural terrain. The flooding of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it.

### 3.2 Flood Risk Mapping

The National Flood Insurance Program (NFIP) produces Flood Insurance Rate Maps (FIRM'S) nationwide. The FIRM is the official map of a community on which Federal Emergency Management Agency (FEMA) has delineated both the special hazard areas and the risk premium zones applicable to the community. The NFIP underwrites flood insurance coverage using the information from the FIRM and the associated Flood Insurance Study (FIS). Communities that adopt and enforce floodplain regulations that meet or exceed NFIP criteria are eligible for NFIP flood insurance. Buildings built in accordance with these regulations have a lower risk of flooding and can be insured at lower rates.

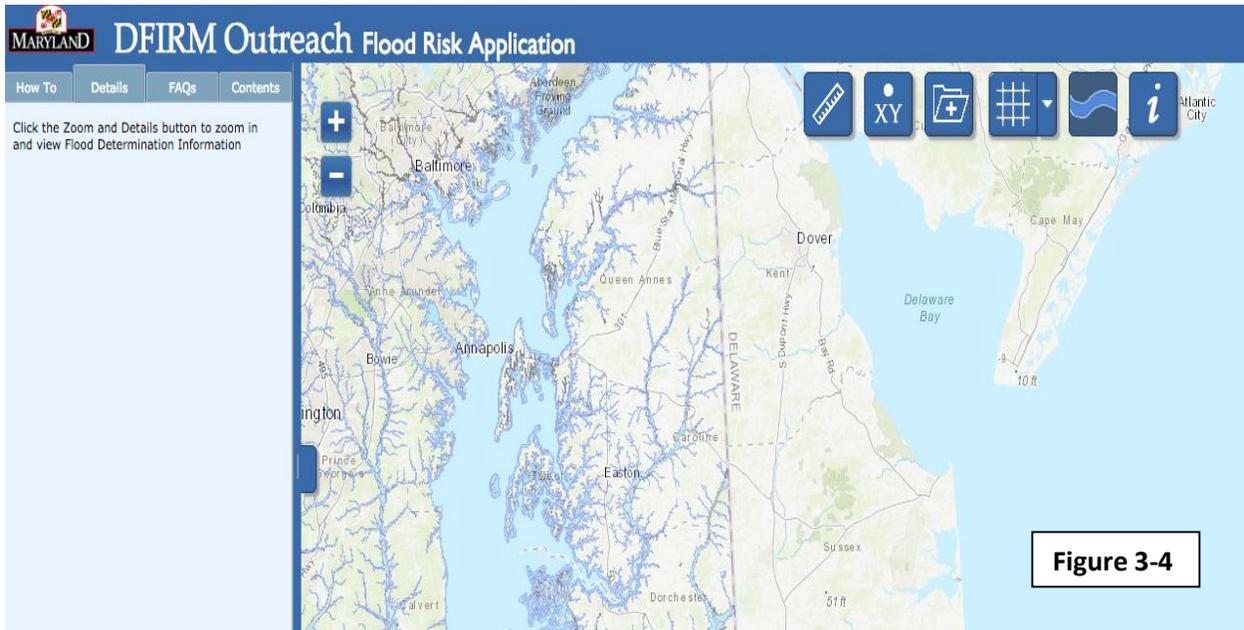
According to the FEMA Community Status Report, Queen Anne's County (QAC) participates in the NFIP and the effective date of the QAC FIRM and Countywide FIS is November 5, 2014. In addition, the towns of Barclay, Centreville, Church Hill, Millington, Queen Anne, and Queentown participate in the NFIP. Digital Flood Insurance Rate Maps (DFIRMS) can be obtained from the FEMA Map Service Center at: <https://www.fema.gov/msc>.

FEMA maps can be used to identify the expected spatial extent and elevation of flooding from a 1% and 0.2% annual chance event. Almost all of the municipalities in the County were determined to have special flood hazard areas (SFHA), with the exception of Barclay, Sudlersville and Templeville. An example of the information available through the FEMA Map Service Center can be viewed below.



Source: FEMA Flood Map Service Center: Town of Centreville

An additional source of information for FEMA DFIRM's is through the Maryland Department of the Environment website at: <http://www.mdfloodmaps.net>.



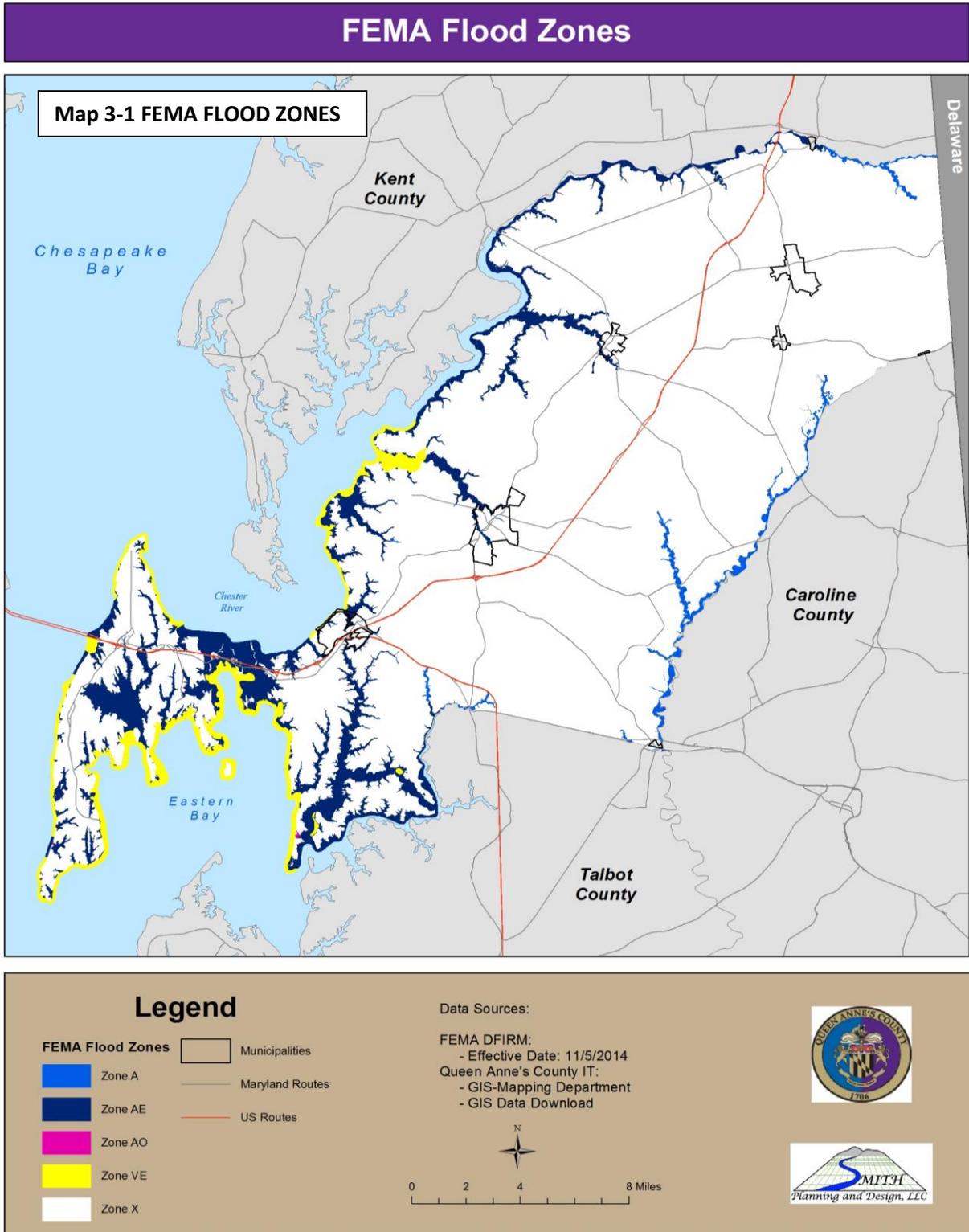
Source: <http://www.mdfloodmaps.net/dfirmimap/>

**3.2.1 FEMA FLOOD ZONES**

Queen Anne’s County is prone to various forms of flooding, therefore, the Digital Flood Insurance Rate Map (DFIRM) Database published by the Federal Emergency Management Agency (FEMA) for the county was utilized to depict flood risk areas. The DFIRM contains flood inundation areas that are depicted as flood zones. Flood zones include: Zones A, AE, AO, VE, and X (shaded and un-shaded).

<b>TABLE 3-1 FEMA FLOOD ZONES</b>	
<b>FLOOD ZONE</b>	<b>DESCRIPTION</b>
<b>SFHA-HIGH RISK AREAS</b>	
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.
AO	River or stream flood hazard area, and areas with a 1-percent 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.
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.
<b>MODERATE RISK AREAS</b>	
X (Shaded) 0.2% or 500 yr.	Moderate flood area(s), shaded area(s) shown on FIRM, are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood.
<b>MINIMUM RISK AREAS</b>	
X (Un-shaded)	The areas of minimal flood hazard, which are areas outside the SFHA and higher than the elevation of the 0.2 percent-annual-chance flood, are labeled Zone X (un-shaded).

Source: Federal Emergency Management Agency



According to the 2015 FEMA Flood Risk Report-Queen Anne’s County, MD Coastal Study three incorporated communities lie within the study area; the Towns of Centreville, Church Hill, and Queenstown. All of these communities are located on the Chester River or one of its tributaries and are affected by coastal flooding.

**TABLE 3-2: QUEEN ANNE’S COUNTY & LOCAL COMMUNITIES WITHIN THE COASTAL REGION**

COMMUNITY NAME	TOTAL POPULATION	% OF POPULATION IN COUNTY (COASTAL)	TOTAL COMMUNITY LAND AREA (sq mi)	% OF LAND AREA IN COUNTY (COASTAL)	NFIP CRS RATING
Town of Centreville	4,285	100	2.4	100	10
Town of Church Hill	745	100	0.7	100	10
Town of Queenstown	664	100	1.4	100	10
Queen Anne’s County (Unincorporated Area)	41,127	94	368.1	74	10

Source: FEMA 2015 FEMA Flood Risk Report-Queen Anne’s County, MD Coastal Study; JUNE 30, 2015

Note: Population according to 2010 U.S. Census

Although part of the Town of Sudlersville is within project area, it was omitted from the study because it contains no Coastal Special Flood Hazard Areas (SFHA’s).

### 3.3 Historical Flooding

According to the Queen Anne’s County website, major floods in the Queen Anne’s County area have occurred in 1933, 1954, 1955, 1960, 1972, 1999, 2003, 2008 and 2011. Few detailed records of historical flood damage are available, narratives for historic floods has been provided below. However, within the next section entitled “Flood Risk Data,” available information gathered from the National Centers for Environmental Information for the time period of 1996 to 2017 has been presented, which includes flood event types, injuries, deaths, damages, and frequency.

#### August 1933

In August 1933, the "Great Storm of 1933" lashed the Eastern Shore of Maryland. Many trees and limbs were downed as a result of high winds. Flooding occurred, but no specific reports were available.

#### October 1954

In late October 1954, Hurricane Hazel caused extensive damage to Queen Anne’s County. Damage estimates were placed at approximately \$500,000. One hundred people were evacuated from Kent Narrows as a result of high storm tides. The storm tides in the Towns of Centreville and Queenstown were reported as the highest in history. The storm tide flooded the office of Valiants Fertilizer in Centreville. Two 18,000-gallon, empty oil tanks were overturned at the Thocar Oil Company by the high tide. Many boats were washed ashore by the high winds and tide.

### **August 1955**

During August 1955, Hurricane Connie struck Queen Anne's County. Advance warning made it possible for residents to prepare their property against high water, drastically reducing property damages in comparison with Hurricane Hazel.

### **September 1960**

In mid-September 1960, Hurricane Donna brought heavy rainfall which was responsible for extensive road washouts and flooding in the Towns of Centreville, Queen Anne, and Queenstown. The major road closings in the vicinity were: Route 213 just south of Church Hill, Route 305 at Tanyard Branch, Route 544 near Crumpton at Red Lion Branch, Route 213 over Mill Stream Branch in the Town of Centreville and Route 213 over Island Creek, north of Centreville, when a 31-foot crack in the concrete bridge occurred.

### **August 3-5, 1967**

On August 3-5, 1967, locally heavy thunderstorms passed through Queen Anne's County and the Town of Queen Anne, resulting in moderate flooding. The greatest amount of rain recorded from those storms was 9.15 inches in 6 hours at nearby Goldsboro. Water was reportedly one foot deep in the main office of K.M.C. Foods in the Town of Queen Anne. Alternate Route 404 at the Town of Queen Anne was completely washed away leaving a gap 12 feet deep and 75 feet wide.

### **June 1972**

Tropical Storm Agnes lashed the Chesapeake Bay region in late June 1972. The northern part of Queen Anne's County and the Towns of Centreville, Queen Anne, and Queenstown were the areas most affected by the storm. High water in the vicinity of Centreville, Queen Anne, and Queenstown closed roads on: Route 213 north of Church Hill, Route 19 between Church Hill and Route 301, Route 300 between Church Hill and Sudlersville and the Route 313 Bridge at the Town of Millington. The high levels of freshwater and high coliform concentrations in the Bay forced state officials to place a ban on the harvesting of shellfish. This caused a severe economic hardship for Queen Anne's County watermen.

### **September 16, 1999**

Hurricane Floyd battered the Maryland Eastern Shore on September 16, 1999 and brought with it torrential rains and damaging winds. The hurricane caused widespread flash flooding as storm totals averaged around ten inches, most of which fell in a twelve-hour period from the early morning through the afternoon on the 16th. The torrential downpours associated with Hurricane Floyd exceeded the 1-percent annual chance flood return period for most of the Eastern Shore. Hundreds of roads and bridges were closed. Hardest hit were homes in Sandfield just outside of Millington. The only railroad service into Queen Anne's County was suspended after flooding along the Charles River crippled the railroad's trestles. There were voluntary evacuations in low-lying areas and also in some mobile home parks. Many roads were also closed on Miller's Island.

Queen Anne's County was one of the harder hit counties on the Eastern Shore by Floyd. Water rescues started at 10 a.m. EDT and continued all day. About 75 persons were evacuated to shelters. Fifty-five roads were closed during the height of the storm including major roadways such as U.S. Route 50 and Maryland State Routes 213, 291, 300, 304 and 313. Two 29-year-old men were injured when their

pickup truck fell into a 30 foot by 30-foot hole on MD 304 near Centreville. Thirty-four roads were closed by either heavy flooding or minor to moderate damage. Twenty bridges or culverts were washed out or had substantial damage. All roads that were not badly damaged were reopened Saturday afternoon the 18th. All county roads were reopened by the 21st although eight bridges and three state roads were still closed. The number of bridge closings was down to six on October 2nd. In addition, fallen trees blocked about 70 roads throughout the county. Most of the damage occurred in the northern half of the county. The worst flood related property damage occurred on the Queen Anne's side of Millington along the Chester River. Forty homes were damaged, 15 of them in Sandtown had six-foot-high water marks on the first floor. Ten homes and several businesses along the Tuckahoe Creek in Queen Anne were badly flooded. Some persons were still displaced on October 9th. Other townships that also were hit hard by flooding were Centreville, Church Hill and Sudlersville (The downtown area became an island.) Another effect of Floyd was a boom in the mosquito population throughout the Middle Atlantic States.

September 18, 2003

On **September 18, 2003**, Tropical Storm Isabel caused a record breaking tide and storm surge up the Chesapeake Bay, heavy rain and strong power outage producing winds. In Queen Anne's County, public and private damage was estimated at 37 million dollars. Thirty-seven homes were destroyed, 151 suffered major damage and 192 suffered minor damage. Most of the damage was caused by the tidal flooding, although four homes were damaged by fallen trees. The heavy rain did not coincide with the tidal flooding and occurred mainly from the afternoon of the 18th into the early morning of the 19th. There were no reports of stream related flooding due to the heavy rain. Because the heaviest rain with tropical systems often falls west of its storm track, the region was spared heavier rain. On the other hand, the strongest winds are often on the right side of the storm track. Winds gusted up to 58 mph in the bay and caused numerous trees, tree limbs and power lines to be knocked down. Storm totals included 2.14 inches in Stevensville.

#### **October 7-8, 2005**

On October 7-8, 2005, the combination of a very slow moving cold front and copious moisture from the remnants of Tropical Storm Tammy produced very heavy rain across the Maryland Eastern Shore. This heavy rain helped propel the state of Maryland to its second wettest October on record since 1895. The monthly statewide average precipitation total of 7.97 inches was 4.59 inches wetter than normal and only 1976 (8.05 inches) was wetter. The slow movement and stalling coupled with an unstable air mass and tropical moisture associated with Tammy helped enhance the torrential downpours. The flooding would have been even worse if not for the unseasonably dry weather that preceded this event from the middle of August.

#### **September 1, 2006**

On September 1, 2006, the combination of the remnants of Tropical Storm Ernesto and a large high pressure system over eastern Canada produced heavy rain and strong winds along the Maryland Eastern Shore. Rain moved into the area during the morning of the 1st and did not exit until around noon EDT on the 2nd. The heaviest rain took a long time to move north. In addition to the heavy rain, persistent east to northeast winds caused tree damage as the heavy rain loosened the root support and weighed down limbs. Strong winds started during the late morning on the 1st, peaked during the evening of the 1st and around midnight EDT on the 2nd and subsided before sunrise on the 2nd. Delmarva Power reported about 21,350 of its customers lost power on the 1st and 2nd. Actual storm totals included 2.50 inches in

Stevensville. The low pressure system that was Ernesto moved slowly north. Of greater importance, was a strong high pressure system (greater than 1032 millibars) that remained over southeastern Canada and maintained the pressure gradient (difference) between it and the remnant low of Ernesto.

**September 6, 2008**

On September 6, 2008, Tropical Storm Hanna brought heavy rain, strong winds and some tidal flooding to the Eastern Shore during the day and into the evening of the 6th. Rain moved into the region during the morning, fell heavy at times from the late morning into the afternoon and ended during the evening. The eastbound lanes of the William Preston Lane Junior Memorial Bridge were closed during the morning of the 6th. It was reopened during the afternoon, but driving restrictions remained in place in both directions into the evening. The persistent strong winds knocked down several weak trees and limbs. This caused scattered power outages and a few road closures. Peak wind gusts included 49 mph in Stevensville. Precipitation totals included 1.80 inches in Church Hill.

**January 25, 2010**

Coastal flooding occurred on January 25, 2010 in Queen Anne's County. The strong south winds up Chesapeake Bay also caused tidal flooding during the afternoon of the 25th in Queen Anne's County. The afternoon high tide caused flooding in the Kent Narrows area of Queen Anne's County. Flooding occurred along Maryland State Route 18 and Wharf Road in Chester. At high tide both directions of Maryland State Route 18 near Dundee Avenue was closed. The same roadway was also closed near Love Point. The strong southerly flow and rain ended after its cold front moved through the Eastern Shore during the early afternoon.

**August 27-28, 2011**

During August 27 through August 28, 2011, Hurricane Irene produced heavy flooding rain, tropical storm force wind gusts and caused one wind related death across the Eastern Shore. Preliminary damage estimates were around three million dollars and approximately 85,000 homes and businesses lost power. Tropical storm force wind gusts overspread the Eastern Shore during the afternoon and early evening of the 27th and persisted into the afternoon of the 28th. Peak wind gusts averaged 50 to 60 mph. Event precipitation totals averaged 6 to 12 inches and caused widespread field and roadway flooding. Because the flash flooding and flooding blended into one, all flooding related county entries were combined into one under flood events. On August 25, Maryland Governor Martin O'Malley declared a state of emergency in preparation for Irene. In Queen Anne's County, in Queenstown, an 88-year-old woman was killed when a tree fell on a chimney, sending bricks through the glass roof of a sun room where she had taken refuge since it had emergency power. Some tomato, corn, and cantaloupe crops were destroyed.

**October 29, 2012**

Hurricane Sandy, unofficially known as Superstorm Sandy, made landfall near Brigantine, New Jersey on October 29, 2012. It brought heavy rainfall and high speed of wind to Queen Anne's County, forcing officials to close Chesapeake Bay Bridge over the Chesapeake Bay and the Millard E. Tydings Memorial Bridge and Thomas J. Hatem Memorial Bridge over the Susquehanna River in the midday hours.

**November 2012**

The county was declared a Disaster Area in November of 2012 but no severe damage was reported.

**August 12, 2014**

On August 12, 2014, a storm produced heavy rain, producing areas of flooding in several areas of the County.

### 3.4 Flood Risk Data

The severity of flooding in Queen Anne’s County is determined by a number of local factors, including river basin topography, precipitation patterns, recent soil moisture conditions, and groundcover/vegetative state. Queen Anne’s County and its municipalities have many streams and small tributaries that are highly susceptible to flooding. The properties in and near the identified floodplains of Queen Anne’s County are subject to flooding events on an almost annual basis. Floodplain management, flood control structures, hazard mitigation, and flood relief funds are strategies that have reduced Queen Anne’s County’s annual flood damages.

According to National Centers for Environmental Information (NCEI) and local data, Queen Anne’s County has been impacted by coastal floods, flash floods, riverine floods, and heavy rain events.

<b>TABLE 3-3: FLOOD EVENT DATA</b>				
<b>COASTAL FLOOD – 1996-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
7	1	0	150.00K	0.32
<b>FLASH FLOOD – 1998-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
21	2	0	4.610M	1.05
<b>FLOOD – 2011-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
10	0	0	1.250M	1.43
<b>HEAVY RAIN – 1996-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
80	0	0	0	3.64

Source: National Centers for Environmental Information (NCEI), Events through April 2018

Reported flood events over the past 19 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. The probability of the County and its municipalities experiencing a flood event can be difficult to quantify, but based on historical record of 118 flood events since 1996, it can reasonably be assumed that flooding events from various sources and severity occur 5.36 times per year on average in Queen Anne’s County.

### 3.5 Flood Vulnerability

#### 3.5.1 FLOOD LOSS ESTIMATION

Estimated flood loss estimations have been integrated into the plan update using the 2015 FEMA Flood Risk Report-Queen Anne’s County, MD Coastal Study. Through Risk MAP, FEMA provides communities with updated Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies (FISs) that focus on the probability of floods and that show where flooding may occur as well as the calculated 1% annual chance flood elevation. The 1% annual chance flood, also known as the base flood or formerly as

the 100-year flood event, has a 1% chance of being equaled or exceeded in any given year. FEMA understands that flood risk is dynamic—that flooding does not stop at a line on a map—and as such, provides the following flood risk products:

- Flood Risk Report (FRR);
- Flood Risk Map (FRM); and,
- Flood Risk Database (FRD).

After the Flood Risk Project is complete, the data can be used in many ways to visualize and communicate flood risk within the Flood Risk Project and other outreach initiatives. The goal of this report is to help inform and enable communities to take action to reduce flood risk. Possible users of this report include:

- Local elected officials;
- Floodplain managers;
- Community planners;
- Emergency managers;
- Public works officials; and,
- Others with special interests (e.g., watershed conservation groups, environmental awareness organizations, etc.)

The risk products may be used to:

- Update local hazard mitigation plans;
- Update community comprehensive plans;
- Update emergency operations and response plans;
- Develop hazard mitigation projects;
- Communicate flood risk; and,
- Inform the modification of development standards.

The 2015 FEMA Flood Risk Report-Queen Anne’s County, MD Coastal Study has been included as part of the update as intended by FEMA. This information has informed the mitigation strategies within the plan and will continue to be of use throughout the plan implementation process. Flood loss estimates provided in the FRR were developed using a FEMA flood loss estimation tool, Hazus. Queen Anne’s County’s coastal flood risk analysis incorporates results from a Hazus (FEMA version 2.1 & 2.2) analysis, which accounts for newly modeled areas in the Coastal Flood Risk Project and newly modeled depths for the 1-percent-annual-chance flood event. Potential losses were compared with updated Hazus General Building Stock (GBS) exposure data to estimate loss ratios for the 1- percent-annual-chance flood scenario. The following data layer provided within the FRD should be used to further analyze potential losses and areas where they are likely to occur.

- **Flood Risk Project Refined Data** This set of tables in the FRD stores the updated Hazus GBS inventory data and resulting losses for this ‘Refined’ study.

Refined losses were calculated for the total project area, Queen Anne’s County and for the communities of:

- Town of Centreville; and,
- Town of Queenstown.

Estimated refined loss data is presented on the following data tables 3-4 thru 3-6.

<b>TABLE 3-4: QUEEN ANNE’S COUNTY (TOTAL PROJECT AREA) ESTIMATED POTENTIAL LOSSES FOR FLOOD EVENT SCENARIOS-REFINED LOSSES</b>			
<b>TYPE</b>	<b>INVENTORY ESTIMATED VALUE</b>	<b>% OF TOTAL</b>	<b>1% (100 YR.) DOLLAR LOSSES</b>
Residential Building & Contents	\$196,000,000	77%	\$10,800,00
Commercial Building & Contents	\$59,300,000	23%	\$7,600,000
Other Building & Contents	\$900,000	<1%	\$40,000
<b>Total Building &amp; Contents</b>	<b>\$256,200,000</b>	<b>100%</b>	<b>\$18,500,00</b>
Business Disruption	N/A	N/A	\$3,300,000
<b>TOTAL</b>	<b>\$256,200,000</b>	<b>N/A</b>	<b>\$21,800,000</b>

Source: FEMA 2015 FEMA Flood Risk Report-Queen Anne’s County, MD Coastal Study; JUNE 30, 2015

Note: Flood Loss Project Refined Losses calculated using Hazus Version 2.2

Business Disruption=Inventory Loss=Relocation Cost+Income Loss+Rental Income Loss+Wages Loss+Direct Output Loss

<b>TABLE 3-5: TOWN OF CENTREVILLE ESTIMATED POTENTIAL LOSSES FOR FLOOD EVENT SCENARIOS-REFINED LOSSES</b>			
<b>TYPE</b>	<b>INVENTORY ESTIMATED VALUE</b>	<b>% OF TOTAL</b>	<b>1% (100 YR.) DOLLAR LOSSES</b>
Residential Building & Contents	\$1,700,000	67%	\$100,00
Commercial Building & Contents	\$800,000	32%	\$30,000
Other Building & Contents	\$30,000	1%	\$0
<b>Total Building &amp; Contents</b>	<b>\$2,500,000</b>	<b>100%</b>	<b>\$100,00</b>
Business Disruption	N/A	N/A	\$20,000
<b>Total</b>	<b>\$2,500,000</b>	<b>N/A</b>	<b>\$200,000</b>

Source: FEMA 2015 FEMA Flood Risk Report-Queen Anne’s County, MD Coastal Study; JUNE 30, 2015

Note: Flood Loss Project Refined Losses calculated using Hazus Version 2.2

Losses shown are rounded up to the nearest \$10,000 for values under \$100,000

Business Disruption=Inventory Loss=Relocation Cost+Income Loss+Rental Income Loss+Wages Loss+Direct Output Loss

**TABLE 3-6: TOWN OF QUEENSTOWN ESTIMATED POTENTIAL LOSSES FOR FLOOD EVENT SCENARIOS-REFINED LOSSES**

TYPE	INVENTORY ESTIMATED VALUE	% OF TOTAL	1% (100 YR.) DOLLAR LOSSES
Residential Building & Contents	\$1,700,000	100%	\$200,00
Commercial Building & Contents	\$0	0%	\$0
Other Building & Contents	\$0	0%	\$0
Total Building & Contents	\$1,700,000	100%	\$200,00
Business Disruption	N/A	N/A	\$0
Total	\$1,700,000	N/A	\$200,000

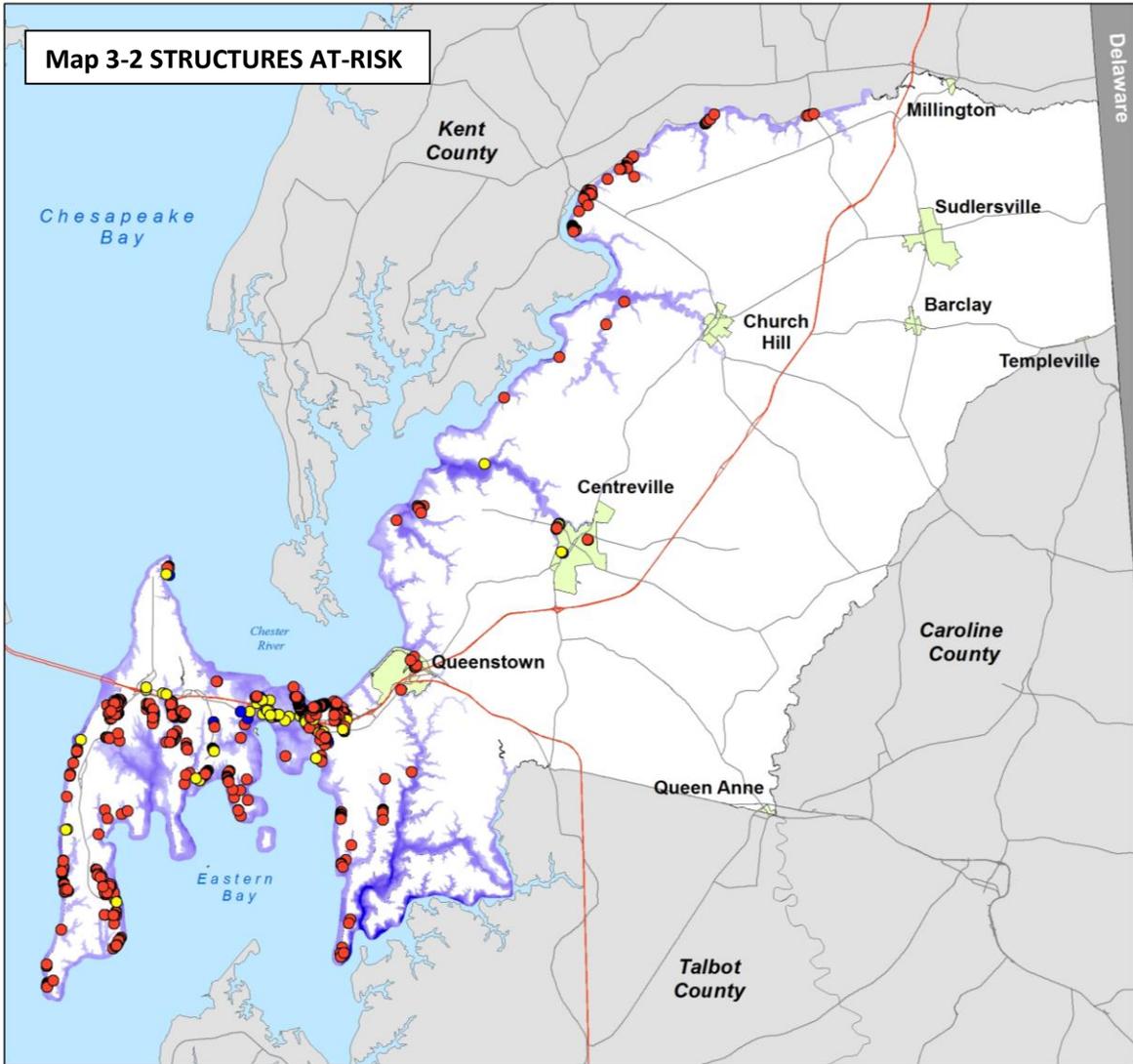
Source: FEMA 2015 FEMA Flood Risk Report-Queen Anne’s County, MD Coastal Study; JUNE 30, 2015

Note: Flood Loss Project Refined Losses calculated using Hazus Version 2.2

Losses shown are rounded up to the nearest \$10,000 for values under \$100,000

Business Disruption=Inventory Loss+Relocation Cost+Income Loss+Rental Income Loss+Wages Loss+Direct Output Loss

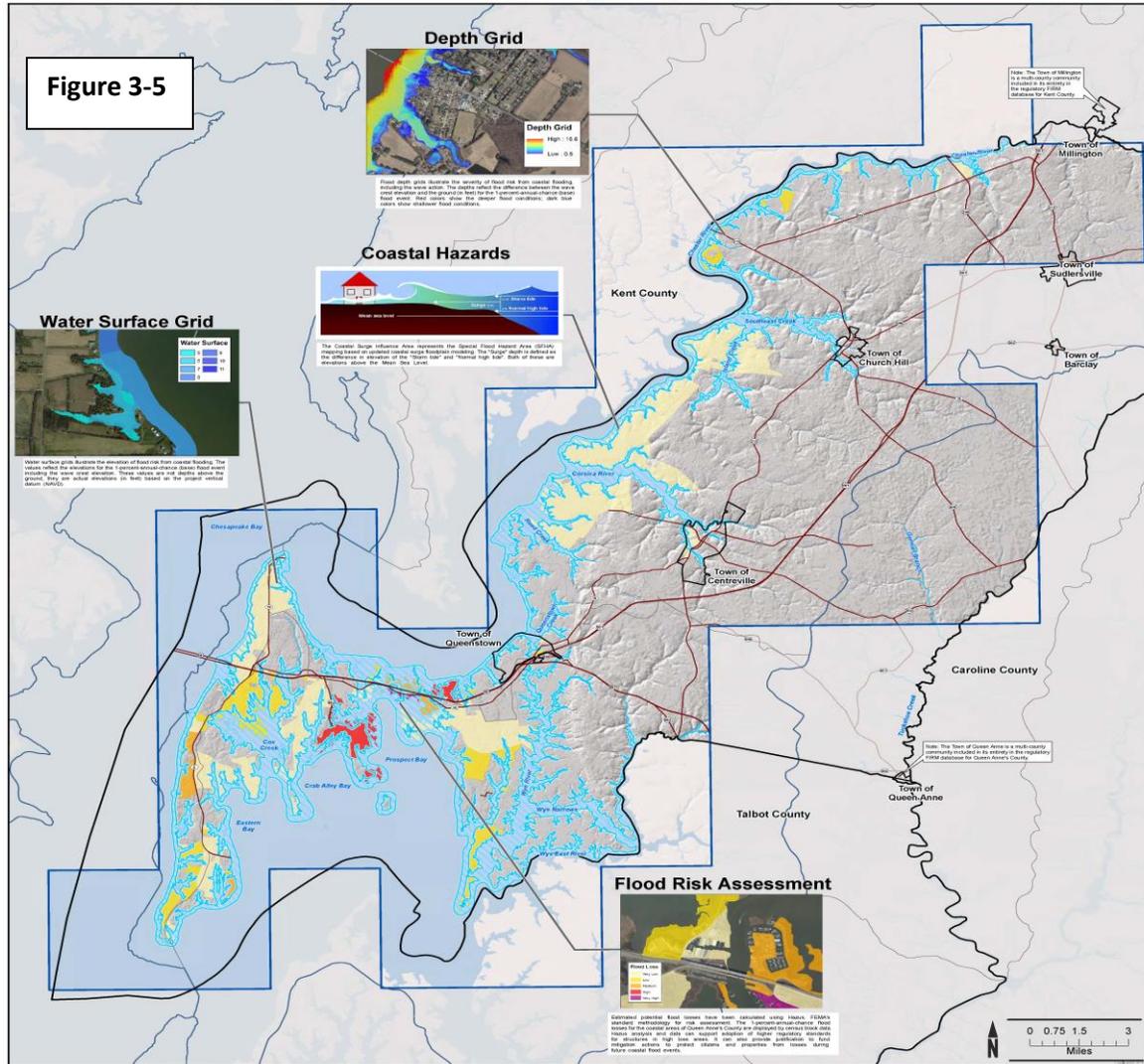
## Structures At-Risk to Coastal 1-Percent-Annual-Chance Flood Event



<b>Legend</b>		<p>Data Sources:</p> <ul style="list-style-type: none"> <li>2015 FEMA Flood Risk Report- Queen Anne's County, MD Coastal Study; June 30, 2015</li> <li>Queen Anne's County IT:                     <ul style="list-style-type: none"> <li>- GIS-Mapping Department</li> <li>- GIS Data Download</li> </ul> </li> </ul>	
<p><b>At-Risk Structures</b></p> <p><b>Structure Type</b></p> <ul style="list-style-type: none"> <li><span style="color: yellow;">●</span> 123 Commercial</li> <li><span style="color: blue;">●</span> 9 Other</li> <li><span style="color: red;">●</span> 712 Residential</li> <li><span style="background-color: #e0ffe0; border: 1px solid black; display: inline-block; width: 15px; height: 10px; vertical-align: middle;"></span> Municipalities</li> </ul>	<p><b>Coastal 100-Year Flood Event</b></p> <p><b>Flood Depth</b></p> <ul style="list-style-type: none"> <li><span style="background-color: #0000ff; width: 15px; height: 10px; display: inline-block; vertical-align: middle;"></span> High : 62.1 feet</li> <li><span style="background-color: #0000ff; width: 15px; height: 10px; display: inline-block; vertical-align: middle;"></span> Low : 0.5 feet</li> </ul> <p>— Maryland Routes</p> <p>— US Routes</p>	 <p>0 2 4 8 Miles</p>	

The Flood Risk Map (FRM) displays base data reflecting community boundaries, major roads, and stream lines; potential losses for the refined 1-percent-annual-chance Coastal Flood Risk Study; new Flood Risk Project Area; and graphics and text that promote access and usage of additional data available. As shown below, the FRM provides an overview of the Flood Risk Project, which highlights areas of risk that should be noted, based on data found in the report.

**Flood Risk Map: Queen Anne's County, MD (Coastal) Effective 6/30/2015**



**MAP SYMBOLOGY**

Base Data	Flood Data	Coastal Flood Risk
Coastal Study Project Area	Rivers and Streams	Very Low
State Boundary	Coastal Surge Influence Area	Low
Corporate Limits	Census Blocks	Medium
Major Roads		High
HUC8 Watershed Boundary		Very High
HUC10 Watershed Boundary		



**Risk Mapping, Assessment, and Planning (Risk MAP)**

**FRM FLOOD RISK MAP: COASTAL QUEEN ANNE'S COUNTY, MD**

HUC-8 CODE: N/A  
 RELEASE DATE: 06/30/2015

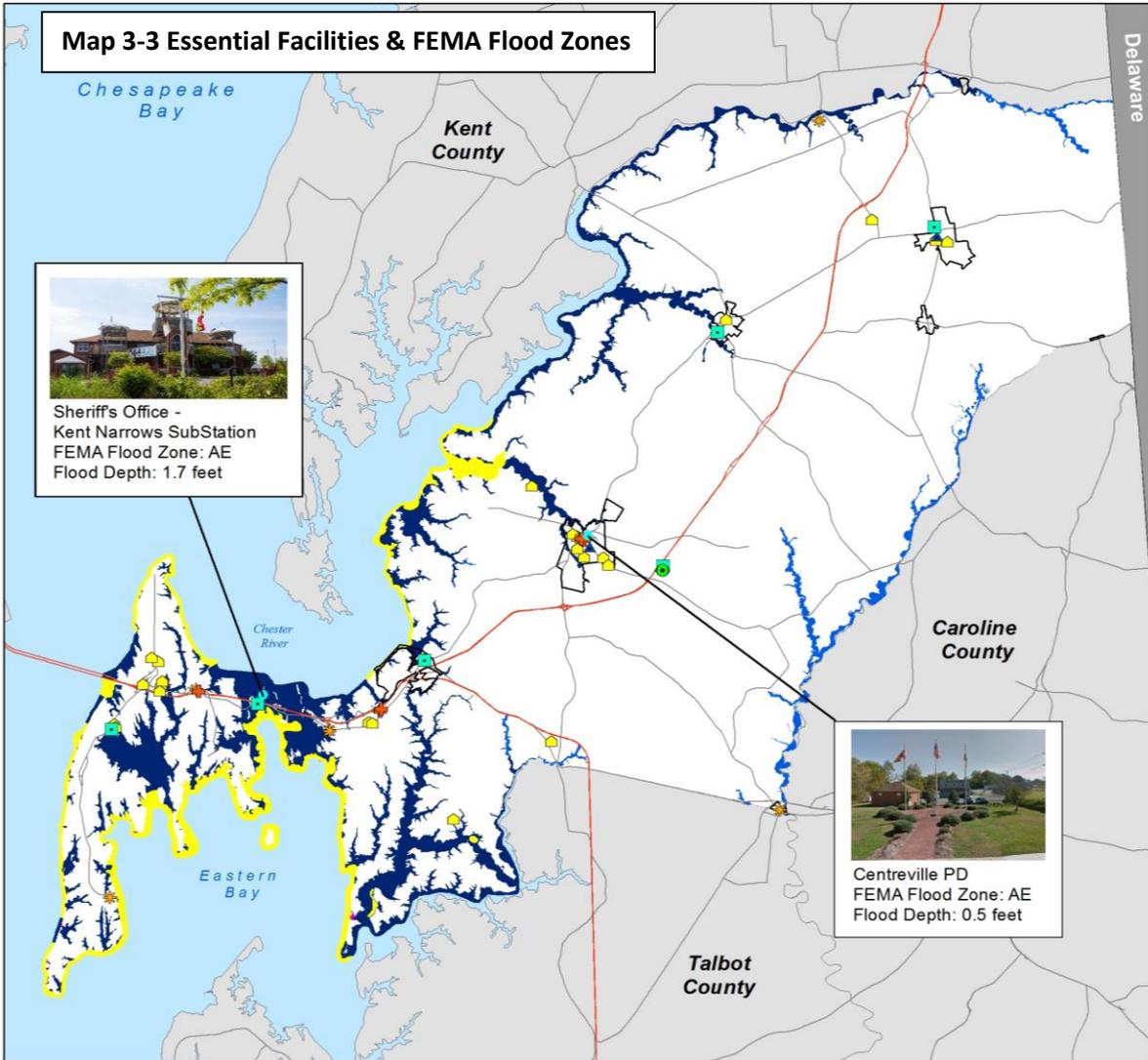
For more information of data used for this non-regulatory map, please contact the Queen Anne's County, MD Coastal Study Flood Risk Database & Flood Risk Report.

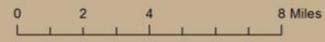
### 3.5.2 ESSENTIAL FACILITIES

Two Essential Facilities are at-risk to the 1-percent-annual-chance flood event. Both facilities are police stations as displayed on Map 3-3.

- Sheriff's Office – Kent Narrow Substation
  - This facility is located between Kent Island Narrows and Piney Creek. The projected flood depth for this facility is 1.7 feet.
- Centreville Police Department
  - Gravel Run is located adjacent to the facility. The projected flood depth for this facility is 0.5 feet.

## Essential Facilities & FEMA Flood Zones



<b>Legend</b>		Data Sources:  FEMA DFIRM: - Effective Date: 11/5/2014 Queen Anne's County IT: - GIS-Mapping Department - GIS Data Download	  
<b>Essential Facilities</b> <ul style="list-style-type: none"> <li> EOC</li> <li> Fire</li> <li> EMS</li> <li> Medical</li> <li> Police</li> <li> School - Private</li> <li> School - Public</li> </ul>	<b>FEMA Flood Zones</b> <ul style="list-style-type: none"> <li> Zone A</li> <li> Zone AE</li> <li> Zone AO</li> <li> Zone VE</li> <li> Zone X</li> </ul>		
 			

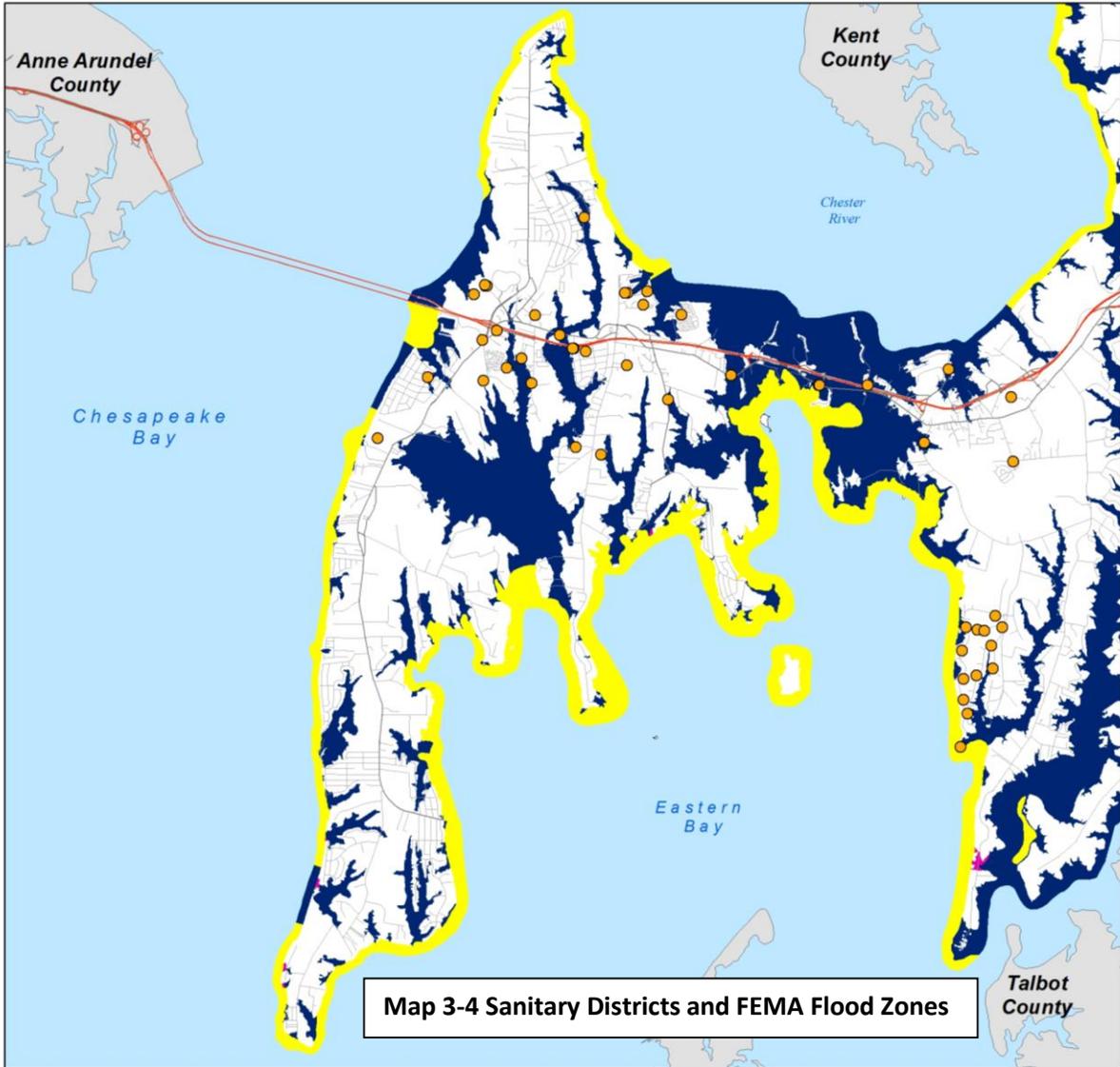
**3.5.3 SANITARY FACILITIES**

County owned and operated sanitary facilities include: Collection Stations, Water Treatment Plants, Pump Stations, Water Towers, Sewage Lift Stations, a Wastewater Treatment Plant, and a Well House. These facilities were assessed to determine which, if any, are located in a flood hazard area. Fourteen (14) county owned and operated Sanitary Facilities are at-risk to the 1-percent-annual-chance flood event. Potential depth of flooding from the 1-percent-annual-chance flood event for each facility has been provided for those facilities within FEMA Flood Zone AE listed on Table 3-7. In addition, six (6) facilities are located within the moderate risk or 500-year flood zone. All remaining facilities are located in the minimal flood risk zone area. All Sanitary Facilities are displayed on Map 3-4.

<b>TABLE 3-7: QUEEN ANNE’S COUNTY SANITARY FACILITIES &amp; FLOOD RISK</b>			
<b>FACILITY NAME</b>	<b>ADDRESS</b>	<b>FLOOD ZONE</b>	<b>FLOOD DEPTH</b>
<b>FLOOD ZONE AE-</b>			
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.			
Sanitary Facility Collection Station F	625 Dominion Rd	AE	1.2
Sanitary Facility Collection Station G	2510 Main St	AE	2.9
Sanitary Facility Collection Station A	828 Main St	AE	2.4
Sanitary Facility Collection Station B	746 Thompson Creek Rd	AE	3.2
Sanitary Facility Collection Station J	311 Long Point Rd	AE	0.5
Sanitary Facility Collection Station R	301 Chenowith Dr	AE	1.3
Sanitary Facility Collection Station Q	774 Kimberly Way	AE	3.4
Sanitary Facility Collection Station H	3232 Main St	AE	1.1
Sanitary Facility Collection Station K	301 Perrys Corner Rd	AE	0.5
Sanitary Facility Oyster Cove Water Treatment Plant	3230 Main St	AE	0.5
Sanitary Facility Pump Station 1	3232 Main St	AE	1.8
Sanitary Facility Collection Station H	3232 Main St	AE	0.5
Sanitary Facility Pump Station 1	3232 Main St	AE	1.8
Sanitary Facility Pump Station 4	301 Perrys Corner Rd	AE	0.8
<b>X (SHADED) 0.2% OR 500 YR.</b>			
Moderate risk flood area(s), shaded area(s) shown on FIRM, are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood.			
<b>FACILITY NAME</b>	<b>ADDRESS</b>	<b>FLOOD ZONE</b>	
Sanitary Facility Collection Station D	201 Benton Pleasure Rd	X (Shaded)	
Sanitary Facility Collection Station L	617 Chester River Beach Rd	X (Shaded)	
Sanitary Facility Collection Station C	1825 Sherman Dr	X (Shaded)	
Sanitary Facility Thompson Creek Water Treatment Plant	610 Marion Quimby Dr	X (Shaded)	
Sanitary Facility Thompson Creek Water Treatment Plant	610 Marion Quimby Dr	X (Shaded)	
Sanitary Facility Pump Station 2	1825 Sherman Dr	X (Shaded)	

Source: QAC Department of Public Works – Sanitary District

## Queen Anne's County Sanitary District & FEMA Flood Zones



Map 3-4 Sanitary Districts and FEMA Flood Zones

<b>Legend</b>		<b>Data Sources:</b>	
<b>FEMA Flood Zones</b>	Sanitary District: Kent	KNSG Facilities Inventory:	
 Zone A	 Narrows/Stevensville/... (KNSG) Facilities	- Queen Anne's County Department of Public Works	
 Zone AE	 Centerlines	FEMA DFIRM:	
 Zone AO	 Maryland Routes	- Effective Date: 11/5/2014	
 Zone VE	 US Routes	Queen Anne's County IT:	
 Zone X		- GIS-Mapping Department	
		- GIS Data Download	

### 3.5.4 MUNICIPAL AREAS PRONE TO FLOODING

The Town of Millington identified the area most at-risk to flooding as the southern portion of town along Sassafras Street (Route 313). Repetitive roadway flooding occurs along Sassafras Street, as well. This flooding results from storm surge events, excessive rain events, tropical storms/hurricanes, or lunar tidal effects. The Chester River overtops its stream banks during these types of events. The Town of Millington has utilized the FEMA Hazard Mitigation Assistance Grant Programs (HMGP) to acquire at-risk flood properties. Additional structures have been targeted for hazard mitigation projects and include properties south of the Chester River (those properties located in the Queen Anne’s County section of the Town of Millington). Finally, the Town has identified the wastewater treatment plant as floodprone and in need of mitigation. In past flood events the wastewater treatment plant has been under water for several days.

The Town of Centreville has identified both the north and south ends of Commerce Street and Liberty Streets as floodprone. Tidal storm surge events flood these areas and require the detouring of vehicles. Sources of flooding include Three Bridges Branch, Gravel Run, and Millstream. In addition, the center of Town is subject to flooding from virtually every significant rainfall event. According to the Town, this flooding is due to the lack of a closed storm drain system and the loss of curb containment height due to the Maryland State Highway Administration (SHA). SHA has paved over existing gutter pans.

Flood mitigation projects that the Town of Centreville are currently engaged in include coordination with SHA to alleviate a small but persistent drainage problem at the corner of Liberty Row and Liberty Street. In addition, the Town has received a grant to remove the dam upstream of Route 213 in Gravel Run.

The Town of Church Hill has identified an area of flood concern on Main Street, both north and south. In terms of flood mitigation, the Town identified debris removal within stream channels as a potential project.

# Chapter 4 Hurricane & Coastal Erosion

This section of the Plan describes the provides an overall hurricane and coastal erosion profile, risk, and vulnerability for Queen Anne’s County and participating municipalities:

- 4.1 HURRICANE PROFILE
- 4.2 HURRICANE RISK
- 4.3 HURRICANE RISK DATA
- 4.4 HURRICANE VULNERABILITY
  - 4.4.1 Hurricane Wind Hazus Model
  - 4.4.2 Hurricane Wind Peak Wind Gusts
  - 4.4.3 Hurricane Wind Building Damages & Displacement
  - 4.4.4 Hurricane Wind Loss Estimations
  - 4.4.5 Hurricane Wind Debris Generation
  - 4.4.6 Hurricane Storm Surge
  - 4.4.7 Essential Facilities At-Risk to Hurricane Storm Surge
  - 4.4.8 Sanitary Facilities At-Risk to Hurricane Storm Surge
  - 4.4.9 Municipal Areas Prone to Hurricane Wind & Storm Surge
- 4.5 COASTAL EROSION PROFILE
- 4.6 COASTAL EROSION RISK
- 4.7 COASTAL EROSION VULNERABILITY
  - 4.7.1 Priority Shoreline Erosion Areas

Hurricane & coastal erosion was ranked as high-risk hazard for Queen Anne’s County, Chapter 2 Table 2-4.

## 4.1 Hurricane Profile

Coastal hazards take many forms ranging from storm systems like tropical storms, hurricanes and nor'easters that can cause storm surge inundation, heavy precipitation that may lead to flash flooding, and exacerbation of shoreline erosion to longer term hazards such as sea level rise.

Tropical cyclones, a general term for tropical storms and hurricanes, are low-pressure systems that usually form over the tropics. These storms are referred to as cyclones due to their rotation. Tropical cyclones are among the most powerful and destructive meteorological systems on earth. Their destructive phenomena include very high winds, heavy rain, lightning, tornadoes, and storm surge. As tropical storms move inland, they can cause severe flooding, downed trees and power lines, and structural damage.

There are three categories of tropical cyclones:

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

Once a tropical cyclone no longer has tropical characteristics it is then classified as an extra tropical system. Most Atlantic tropical cyclones begin as atmospheric —easterly waves that propagate off the coast of Africa and cross the tropical North Atlantic and Caribbean Sea. When a storm starts to move toward the north, the storm begins to leave the area where the easterly trade winds prevail, and enters the temperate latitudes where the westerly winds dominate. This produces the eastward curving pattern of most tropical storms that pass through the Mid-Atlantic region. When the westerly steering winds are strong, it is easier to predict where a hurricane will go. When the steering winds become weak, the storm follows an erratic path that makes forecasting very difficult.

Hurricanes are categorized according to the Saffir/Simpson scale with ratings determined by wind speed and central barometric pressure. Hurricane categories range from One through Five, with Category Five being the strongest (winds greater than 157 mph). A hurricane watch is issued when hurricane conditions could occur within the next 36 hours. A hurricane warning indicates that sustained winds of at least 74 mph are expected within 24 hours or less. The National Weather Service (NWS) National Hurricane Center defines June 1 through November 30 as the Atlantic hurricane season. September is typically the most active month for tropical cyclones in Maryland.

Tropical storms and hurricanes are accompanied by a storm surge, an abnormal local rise in sea level. The storm surge is caused by the difference in wind and barometric pressure between a tropical system and the environment outside the system. The end result is that water is pushed onto a coastline. The height of the surge is measured as the deviation from mean sea level and can reach over 25 feet in extreme circumstances. The most devastating storm surges occur just to the right of the eye of a land falling hurricane. For coastal areas, the storm surge is typically the most dangerous and damaging aspect of the storm.

Howling winds associated with nor'easters also have the potential to produce significant storm surge, similar to that of a Category One hurricane. In addition, these types of storms can also produce wind gusts to near hurricane force as well as flooding rain and crippling snowfall. The wintry impacts of nor'easters are discussed in greater detail in Severe Winter Storms.

All of Queen Anne’s County could be affected by a hurricane or a tropical storm. Since they can disrupt power and inundate roads, tropical storms can cause havoc in the entire community. The county’s proximity to the Chesapeake Bay exposes it to significant storm surge with considerable potential for flooding.

## 4.2 Hurricane Risk

Hurricanes are rated for intensity by using the Saffir-Simpson Scale, which provides an estimate of the potential damage that a hurricane may cause. This scale is based upon both wind speed and surface pressure. Scale categories range from category one to five, with category one having winds from 74-95 mph and pressure greater than 980 mb, while a category five hurricane may have winds in excess of 157 mph and pressure of less than 920 mbar. The table below depicts the five categories of hurricane strength.

TABLE 4-1: SAFFIR-SIMPSON HURRICANE WIND SCALE	
CATEGORY WIND SPEED	EFFECTS
Category 1 74-95 mph	<b>Very dangerous winds will produce some damage:</b> Well-constructed frame homes could have damage to roof, shingles, and vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
Category 2 96-110 mph	<b>Extremely dangerous winds will cause extensive damage:</b> 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	<b>Devastating damage will occur:</b> 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	<b>Catastrophic damage will occur:</b> 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	<b>Catastrophic damage will occur:</b> 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: NOAA National Hurricane Center

In addition to damaging wind, storm surge results from the passage of hurricanes and other related coastal storms. A storm surge is the rise in water level above the regular high tide caused by a severe storm such as a hurricane or nor'easters. These storms bring rain and heavy wind, which drives larger

waves and can blow water up the Chesapeake Bay, thus causing the rivers to rise. Storm surges can create extensive storm damage, erosion, and inundation of low-lying coastal areas.

The Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model is used to evaluate the potential impact of storm surge. Emergency managers use data from SLOSH to identify at-risk populations and determine evacuation areas. Storm surges also affect tidal rivers and creeks, potentially increasing evacuation areas. The scale rates the intensity of hurricanes based on wind speed and barometric pressure measurements. The scale gives an indication of the potential flooding and wind damages associated with each hurricane category. While major hurricanes comprise only 20% of all tropical cyclones making landfall, they account for over 70% of the damage in the United States.

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

In general, storm surge occurs where winds are blowing onshore. The highest surge tends to occur near the “radius of maximum winds,” or where the strongest winds of the hurricane occur.

### 4.3 Hurricane Risk Data

In September 1979, a major hurricane struck Queen Anne’s County, resulting in property damage of over \$2 million. On 16 September 1999, Hurricane Floyd hit Maryland and resulted in property damage worth approximately \$200 million. Hurricane Floyd made landfall just east of Cape Fear, North Carolina, in the early morning hours of the 16th and moved north-northeast across extreme southeast Virginia to near Ocean City, Maryland. A total of 5 to 8 inches fell across Baltimore, Prince George’s, and Queen Anne’s Counties. The amount of damage that Anne Arundel, Calvert, Queen Anne’s, Harford, and St. Mary’s Counties received from the storm qualified them for FEMA disaster assistance. Tidal flooding was reported along the Chesapeake Bay. In Queen Anne’s County, over 20 roads were closed by flooding. Several trees and power lines were downed, resulting in 5,000 power outages.

On 18 September 2003, Queen Anne’s County was struck by Hurricane Isabel. Initially Isabel was identified as a Category 2 hurricane that turned into a tropical storm by the time it struck Queen Anne’s County.

Although the National Centers for Environmental Information lists only a few events for Queen Anne’s County shown on Tables 4-2, 4-3, and 4-4, the county may have experienced some impacts by other hurricane and tropical storm events that have affected the State of Maryland. These additional events are listed below:

#### **August 27, 1667: Unnamed Hurricane**

A strong hurricane ripped through the Mid-Atlantic region, causing 1667 to be known as "the Year of the Hurricane". A government report noted, "A mighty wind...destroyed four-fifths of (our) tobacco and corn and blew down in two hours fifteen thousand houses in Virginia and Maryland." Several separate accounts of the storm describe the great devastation. This was known as a benchmark storm for many generations.

**October 15, 1954: Hurricane Hazel**

Hurricane Hazel made landfall as a Category 4 hurricane near the North Carolina-South Carolina border on October 15. Hurricane-force gusts swept the eastern half of Maryland, while heavy rains pounded the west. Washington National Airport reported a record sustained wind of 78 mph with gusts up to 98 mph. Gusts near 100 mph were commonplace throughout the Chesapeake Bay region and on the Eastern Shore. Severe flooding occurred along the bay and its tidal tributaries, and flash flooding plagued western Maryland, where 3-6 inches of rain fell. Generally, less than 2 inches of rain fell in the eastern half of the state.

**August 12 and 18, 1955: Hurricanes Connie and Diane**

Hurricanes Connie and Diane both passed over Maryland as tropical storms within several days of each other, on Aug. 12 and 18, respectively. The rains from Connie set the stage for the devastating floods caused by Diane, which poured 10-20 inches of rain on the already-soaked region. Major flooding occurred in central Maryland, particularly along the Potomac River. Strong gales from Connie sunk the tour schooner Levin J. Marvel, about 20 miles south of its home port of Annapolis. Fourteen passengers drowned.

**June 21-23, 1972: Hurricane Agnes**

Hurricane Agnes moved through the Atlantic past Maryland as a tropical storm on June 21-23. Widespread and in some places record flooding wrought one of the state's most destructive natural disasters. In the tributaries on the north side of the Potomac River, from the Conococheague Creek at Fairview, Maryland down to Rock Creek at Washington, DC, floods in excess of the 100-year frequency level were observed. Many roads were closed, particularly in central Maryland, and thousands of evacuations occurred. The event proved to be an ecological calamity for the Chesapeake Bay. The damage in Maryland was in excess of \$1.1 million, and there were 19 deaths.

**July 13, 1996: Hurricane Bertha**

Hurricane Bertha moved across the Lower Maryland Eastern Shore on July 13th. The highest sustained wind speed recorded was 23 mph at Salisbury, with gusts up to 63 mph at Ocean City. One confirmed tornado was spawned by the hurricane near Madison in Dorchester County. Numerous trees and power lines were blown down and resulted in scattered property damage and power outages. Rainfall amounts generally ranged from to 5.0 inches and caused some street flooding. Property damages of \$100,000 and crop damages of \$15,000 occurred.

**September 6, 1996: Tropical Storm Fran**

Spiral bands associated with Hurricane Fran affected the Lower Maryland Eastern Shore during Friday, September 6th. The highest sustained wind speed recorded was 22 mph at Salisbury with gusts of 35 mph. A storm surge of 4 to 6 feet inundated portions of the communities of: Taylors Island, Hoopers Island, and Madison in Dorchester County along the Chesapeake Bay. Many roads were flooded with some homes receiving water damage at the time of high tide. Dorchester, Wicomico, Somerset, and Worcester counties were affected, and property damages reached \$1 million. Storm winds channeled water up the Chesapeake Bay and its main tributaries, which became a small-scale storm surge, causing \$1.6 million in property damages and \$5,000 in crop damages in central Maryland.

**October 8, 1996: Tropical Storm Josephine**

Remnants of Tropical Storm Josephine moved quickly up the East Coast during Tuesday, October 8th, affecting the Lower Maryland Eastern Shore. The storm produced 1.5 to 3.5 inches of rain resulting in flooding of several roads. The storm caused \$100,000 in damages.

**September 16, 1999: Hurricane Floyd**

Hurricane Floyd moved north-northeast across extreme southeast Virginia and reached Maryland near Ocean City by evening on the 16th. Hurricane Floyd was a Category 1 hurricane as it crossed the Wakefield WFO county warning area. The storm surge caused tides two to three feet above normal throughout central Maryland. Tropical storm force wind gusts occurred in the northwest quadrant of the storm over portions of the Lower Maryland Eastern Shore. Property damages of over \$1 million and crop damages of \$575,000 occurred.

**September 18, 2003: Hurricane Isabel**

Hurricane Isabel had been downgraded to a tropical storm by the time it reached Maryland, but it still caused significant damage in the state. Isabel's eye tracked well west of the bay, but the storm's 40 to 50 mph sustained winds pushed a bulge of water northward up the bay and its tributaries producing a record storm surge. The Maryland western shore counties of the Chesapeake Bay and along the tidal tributaries of the Potomac, Patuxent, Patapsco and other smaller rivers experienced a storm surge that reached 5 to 9 feet above normal tides. Over 2000 people were evacuated from their homes. Many buildings were destroyed and the Lower Maryland East Shore suffered the worst power outages in history. The storm caused one fatality, 200 injuries, \$530 million in property damages, and \$190,000 in crop damages. Counties affected include Anne Arundel, Calvert, Queen Anne's, Harford, Baltimore, Prince George's, and St. Mary's.

**September 1, 2006: Tropical Storm Ernesto**

Moderate coastal flooding occurred due to the storm surge from the remnants of Tropical Storm Ernesto. The tide crest at Annapolis was 3.56 MLLW late Friday. Property damage reached \$50,000.

**September 6, 2008: Tropical Storm Hanna**

Tropical Storm Hanna brought heavy rain, strong winds and some tidal flooding to the Eastern Shore during the day and into the evening of the 6th. Maximum sustained winds reached 50 mph. Tree damage was sustained throughout much of the state, and many roads were closed due to trees down.

**August 27, 2011: Hurricane Irene**

Hurricane Irene, a Category One hurricane brought rain and heavy winds to Maryland. Sustained winds speed measured at nearly 85 mph. Tree damage, power outages, and road closures were sustained as were several deaths throughout Maryland and neighboring Virginia. Queen Anne's County was estimated at \$509,000 with mandatory evacuations issued for the southern part of the county and flooding in the northern part of the county, with some homes inundated with six feet of flood water. There was also one storm-related death in Queen Anne's County.

According to National Centers for Environmental Information (NCEI) and local data, Queen Anne’s County has been impacted by 3 hurricanes/tropical storms, 1 storm surge event with significant reported damages from 2003-2017. In addition, no events were reported in 2018. Finally, NCEI has added high surf events to their dataset. One event has been reported for Queen Anne’s County from 2017 to present.

TABLE 4-2 TROPICAL STORM – 2003-2017				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
3	0	1	550.00K	0.20

Source: National Centers for Environmental Information (NCEI), Events through April 2018

TABLE 4-3: STORM/SURGE TIDE – 2003-2017				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
1	0	0	37.000M	0.67

Source: National Centers for Environmental Information (NCEI), Events through April 2018

TABLE 4-4: HIGH SURF – 2017-2017				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
1	0	0	0	0.50

Source: National Centers for Environmental Information (NCEI), Events through April 2018

## 4.4 Hurricane Vulnerability

### 4.4.1 HURRICANE WIND HAZUS MODEL

According to the Federal Emergency Management Agency (FEMA) the Hazus Hurricane Model makes use of an existing state-of-the-art windfield model, which has been calibrated and validated using full-scale hurricane data. The model incorporates sea surface temperature in the boundary layer analysis and calculates wind speed as a function of central pressure, translation speed and surface roughness.

The Hazus Hurricane Model is an improvement over existing loss estimation models because it uses a wind hazard-load-damage-loss framework. The hurricane wind model addresses wind pressure, windborne debris, duration/fatigue and rain. It includes the following features:

- A building classification system that depends on the characteristics of the building envelope and building frame.
- The capability to compute damage based on building classes and the effects of rain and progressive failure.
- The capability to compute damage to contents and building interior.
- The capability to estimate tree blow down and structure debris quantities.
- Loss estimates that include direct and indirect economic loss, shelter requirements and casualties.
- Modules that facilitate future assessment of mitigation, benefit-cost and building code issues.

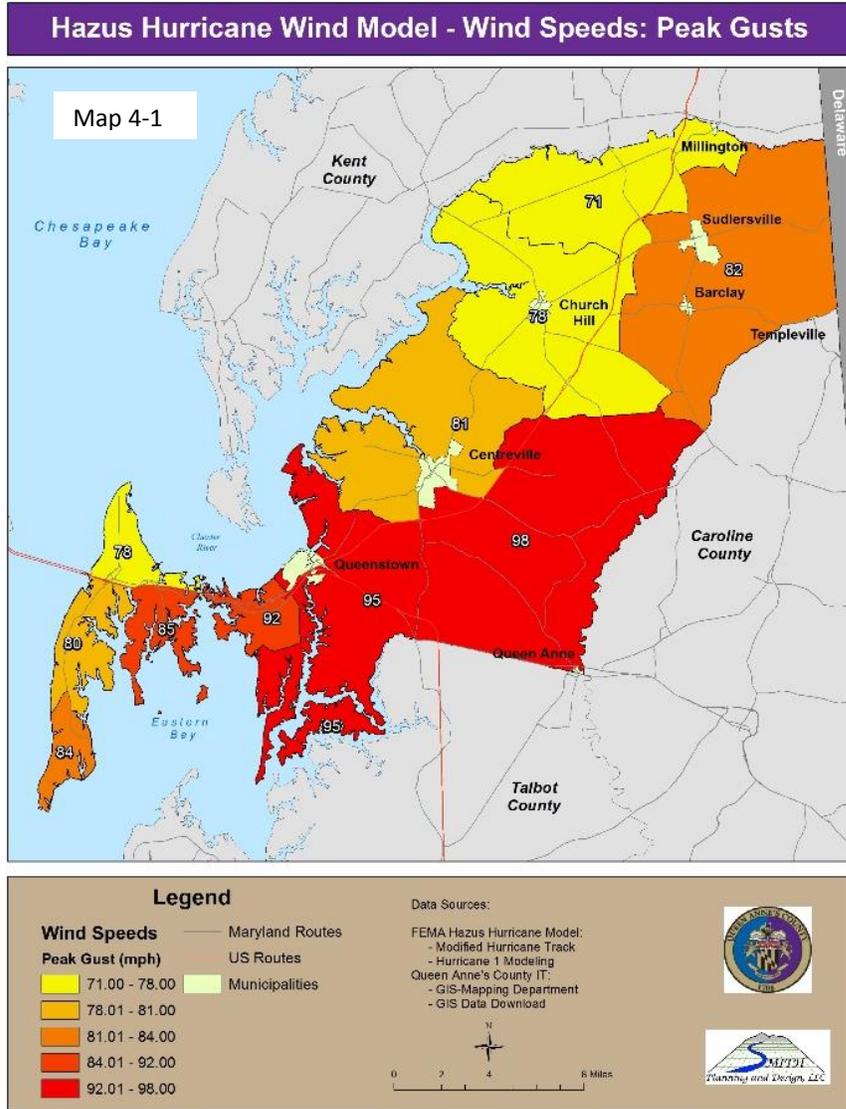
As part of the plan update process, a new Hazus Hurricane Model, version Hazus-MH 3.1, was prepared for Queen Anne’s County. It was determined that average wind speeds from both Hurricane Isabel and the July 2017 tornado would be incorporated into the model. Both of these events impacted Queen Anne’s County resulting in damages. Note that Hurricane Isabel was downgraded to Tropical Storm Isabel by the time it reached Maryland. Tropical storm Isabel had wind speeds of approximately 58 mph,

while the July 2017 tornado had approximate sustained wind speeds of 124 mph, resulting in an average sustained wind speed of 91 mph, equating to a Category 1 Hurricane. Using Queen Anne’s County specific information, as referenced above, user defined information was incorporated into the model.

**4.4.2 HURRICANE PEAK WIND GUSTS**

Modifications to the Tropical Storm Isabel storm track were made to increase the impact to Queen Anne’s County in the user defined storm analysis. These modifications included: alterations to the coordinates so the hurricane track was in closer proximity to Queen Anne’s County and the severity of the storm was increased to a Category One. Peak wind gusts for tropical storms are 55 mph, while peak gusts for the Category One storm are 95 mph. The following map depicts the peak wind gusts from the modified storm track used in the analysis. The wind speeds shown on this map are the estimated maximum 3-second gusts in open terrain at 10m above ground at the centroid of each census tract.

All gusts are a type of wind. A gust is a sudden increase of the wind's speed that lasts no more than 20 seconds. This usually occurs when wind speeds reach a peak of at least 16 knots.



Areas with the highest wind gusts are shown in red on Map 4-1. The highest wind speed peak gusts affect the areas in and around Kent Island- Chester and Grasonville, and the election districts of Queenstown, Queen Anne, and Centreville.

**4.4.3 HURRICANE WIND BUILDING DAMAGE & DISPLACEMENT**

Hazus estimates that about 151 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the region. There are an estimated 7 buildings that will be completely destroyed. The total economic loss estimated for the hurricane is 60.2 million dollars, which represents

0.85 % of the total replacement value of the buildings within the study area.

**TABLE 4-5: BUILDING DAMAGE BY COUNT BY GENERAL OCCUPANCY FOR HAZUS WIND ANALYSIS**

OCCUPANCY TYPE	NUMBER OF BUILDINGS					TOTAL
	NONE	MINOR	MODERATE	SEVERE	DESTROYED	
Agriculture	153	10	2	1	0	167
Commercial	994	48	13	2	0	1,057
Education	35	2	0	0	0	37
Government	36	3	1	0	0	40
Industrial	364	18	4	1	0	387
Religion	79	4	1	0	0	84
Residential	17,785	1,255	117	3	7	19,167
<b>TOTAL</b>	<b>19,448</b>	<b>1,340</b>	<b>137</b>	<b>7</b>	<b>7</b>	<b>20,940</b>

Source: Hazus Hurricane Model developed by the Dept. of Homeland Security/FEMA, version Hazus-MH 3.1, 2018 Smith Planning and Design

Hazus estimates the number of households that are expected to be displaced from their homes. Due to the hurricane the number of displaced people that will require accommodations in temporary public shelters could be as many as 22 people. The model estimates 9 households to be displaced at 2.5 people per household.

**4.4.4 HURRICANE WIND LOSS ESTIMATIONS**

Loss estimations were produced using the new Hazus Hurricane Model, version Hazus-MH 3.1, prepared for Queen Anne’s County using the Hurricane Category 1 scenario.

**TABLE 4-6: BUILDING-RELATED ECONOMIC LOSS ESTIMATES FOR HAZUS WIND ANALYSIS**

OCCUPANCY TYPE	LOSS ESTIMATES (THOUSANDS OF DOLLARS)			
	BUILDING	CONTENT	INVENTORY	TOTAL
Residential	\$43,002.66	\$11,637.75	\$0	<b>\$54,640.41</b>
Commercial	\$936.42	\$264.28	\$12.53	<b>\$1,213.23</b>
Industrial	\$365.16	\$189.96	\$32.28	<b>\$587.41</b>
Others	\$357.14	\$128.87	\$8.81	<b>\$494.83</b>
<b>TOTAL</b>	<b>\$44,661.38</b>	<b>\$12,220.86</b>	<b>\$53.62</b>	<b>\$56,935.88</b>

Source: Hurricane Model developed by the Dept. of Homeland Security/FEMA, version Hazus-MH 3.1, 2018 Smith Planning and Design

**4.4.5 HURRICANE WIND DEBRIS GENERATION**

The eligible tree debris columns (Eligible Tree Weight and Eligible Tree Volume) provide estimates of the weight and volume of downed trees that would likely be collected and disposed of at public expense. The eligible tree debris estimates produced by the Hurricane Model tend to underestimate reported volumes of debris brought to landfills for some of the events that occurred in the past several years. The underestimate suggests that there are sources of vegetative and non-vegetative debris that are not modeled in Hazus.

For landfill estimation purposes, it is recommended that the Hazus debris volume estimate be treated as an approximate lower bound. Based on actual reported debris volumes, it is recommended that the

Hazus results be multiplied by three to obtain an approximate upper bound estimate. It is also important to note that the Hurricane Model assumes a bulking factor of 10 cubic yards per ton of tree debris. If the debris is chipped prior to transport or disposal, a bulking factor of 4 is recommended.

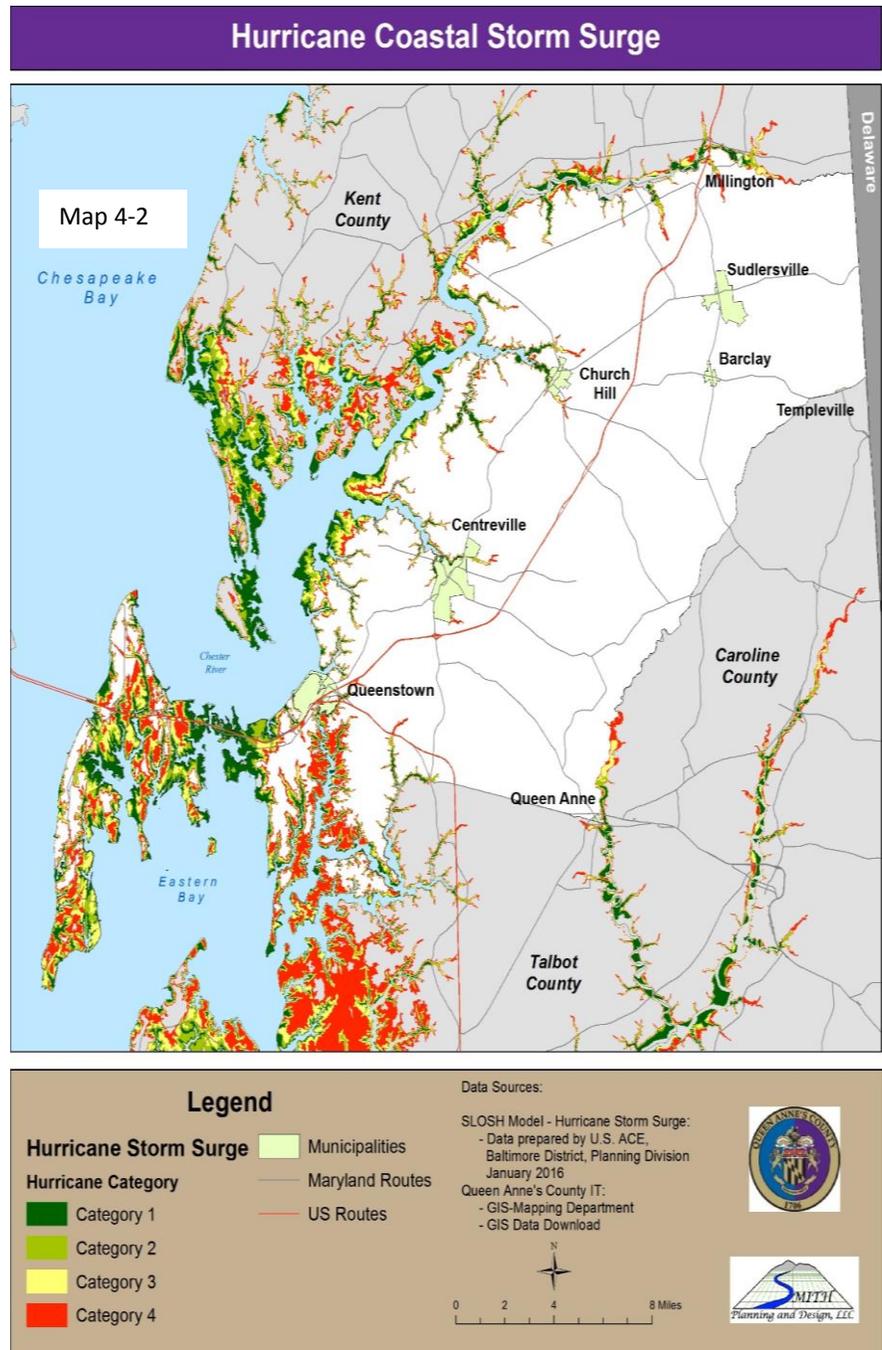
The model estimates that a total of 138,878 tons of debris will be generated. Of the total amount, 125,104 tons (90%) is Other Tree Debris. Of the remaining 13,774 tons, Brick/Wood comprises 26% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads; it will require 146 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 10,113 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally, ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, un-compacted debris.

<b>TABLE 4-7: DEBRIS GENERATION SUMMARY FOR HAZUS WIND ANALYSIS</b>			
<b>DEBRIS TYPES</b>	<b>TOTAL (TONS)</b>	<b>PERCENTAGE OF TOTAL</b>	<b>TOTAL TRUCKLOADS</b>
Brick/Wood	3,619	3%	145
Reinforced Concrete/Steel	42	0%	1
Eligible Tree Debris	10,113	7%	Depended upon amount collected and processed
Other Tree Debris	125,104	90%	
<b>TOTAL</b>	<b>138,878</b>	<b>100</b>	<b>146</b>

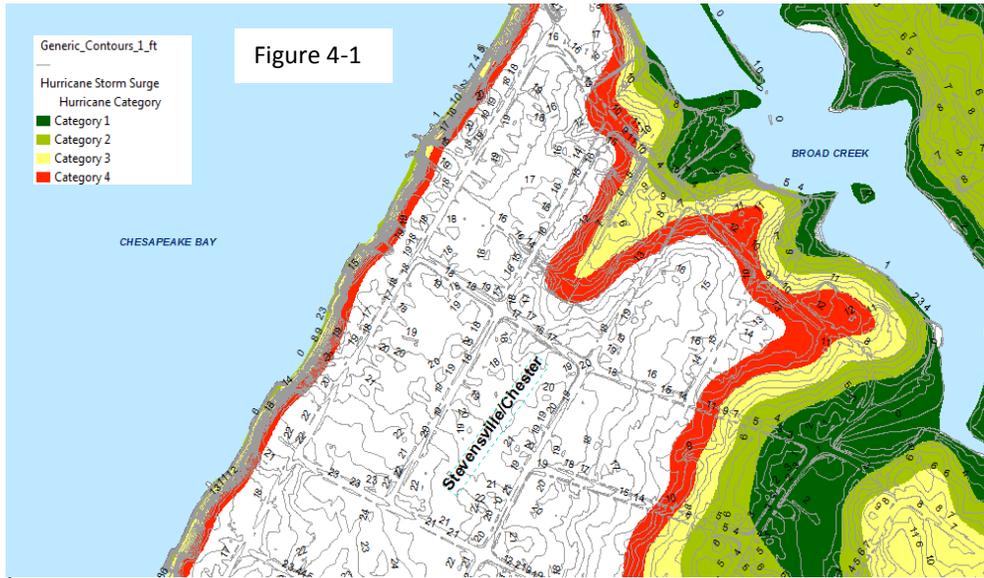
Source: Hurricane Model developed by the Dept. of Homeland Security/FEMA, version Hazus-MH 3.1, 2018 Smith Planning and Design

**4.4.6 HURRICANE STORM SURGE**

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



As illustrated on the Figure 4-1 below, elevation in the Stevensville/Chester communities begins at mean sea level and increases to 20 feet above mean sea level in certain areas. Elevation increases, such as this, account for the lack of uniformity in the storm surge risk areas shown on Map 4-2. These elevation variations account for storm surge inundating or not inundating the land area. Areas most susceptible to storm surge inundation are those areas shown in green, representing areas impacted by a Category 1 Hurricane, the most likely hurricane event to impact Maryland.



Source: SLOSH Model - Hurricane Storm Surge: - Data prepared by U.S. ACE, Baltimore District, Planning Division January 2016 & Queen Anne's County IT: - GIS-Mapping Department & GIS Data Download

#### 4.4.7 ESSENTIAL FACILITIES AT-RISK TO HURRICANE STORM SURGE

Essential facilities at-risk to hurricane storm surge have been identified during the plan update process. Two facilities are at-risk to the most likely hurricane storm event, a Category 1 Hurricane. These facilities include:

- EMS Station 200 (Structure not flooded by Category 1 Hurricane, however the structure is surrounded by water); and,
- Sheriff's Office- Kent Narrows Substation (Projected flood depth of 1.2 feet of water at structure's lowest adjacent grade).

Table 4-8: Essential Facilities At-Risk to Hurricane Storm Surge indicates the category of hurricane storm surge projected to impact each facility, as well as the associated depth of flooding.

**TABLE 4-8: ESSENTIAL FACILITIES AT-RISK TO HURRICANE STORM SURGE**

FACILITY TYPE	FACILITY NAME	STORM SURGE HURRICANE CATEGORY	PROJECTED FLOOD DEPTH (FEET)
Fire	Grasonville VFC #2	2	< 1
		3	3.2
		4	6.7
Fire	Grasonville Vol Ambulance Dept. #20	2	< 1
		3	3.0
		4	6.0
Fire	Crumpton VFC #7	4	< 1
Fire	United Communities VFC #9	2	Structure not flooded but surrounded
		3	1.35
		4	3.89
Fire	Kent Island VFC #1	4	< 1
Fire	EMS Station 200	1	Structure not flooded but surrounded
		2	< 1
		3	4.24
		4	> 6
Medical	AAMC Kent Island Pavillion	4	< 1
Police	Sherrif's Office - Kent Narrows Substation	1	1.2
		2	4.3
		3	6.1
		4	9.5
Police	Centreville Police Department	3	3.9
		4	9.4
School-Public	Stevensville Middle School	4	< 1
School-Public	Kent Island Elementary School	4	< 1
School-Public	Kent Island High School	4	Structure not flooded but surrounded
School-Public	Matapeake Elementary School	3	< 1
		4	2.5
School-Public	Matapeake Middle School & Kent Island 9th Grade Annex	3	< 1
		4	3.0
School-Private	Kiddie Academy of Kent Island	4	1.5

Source: Queen Anne's County Department of Emergency Service & SLOSH Model - Hurricane Storm Surge: - Data prepared by U.S. ACE, Baltimore District, Planning Division January 2016

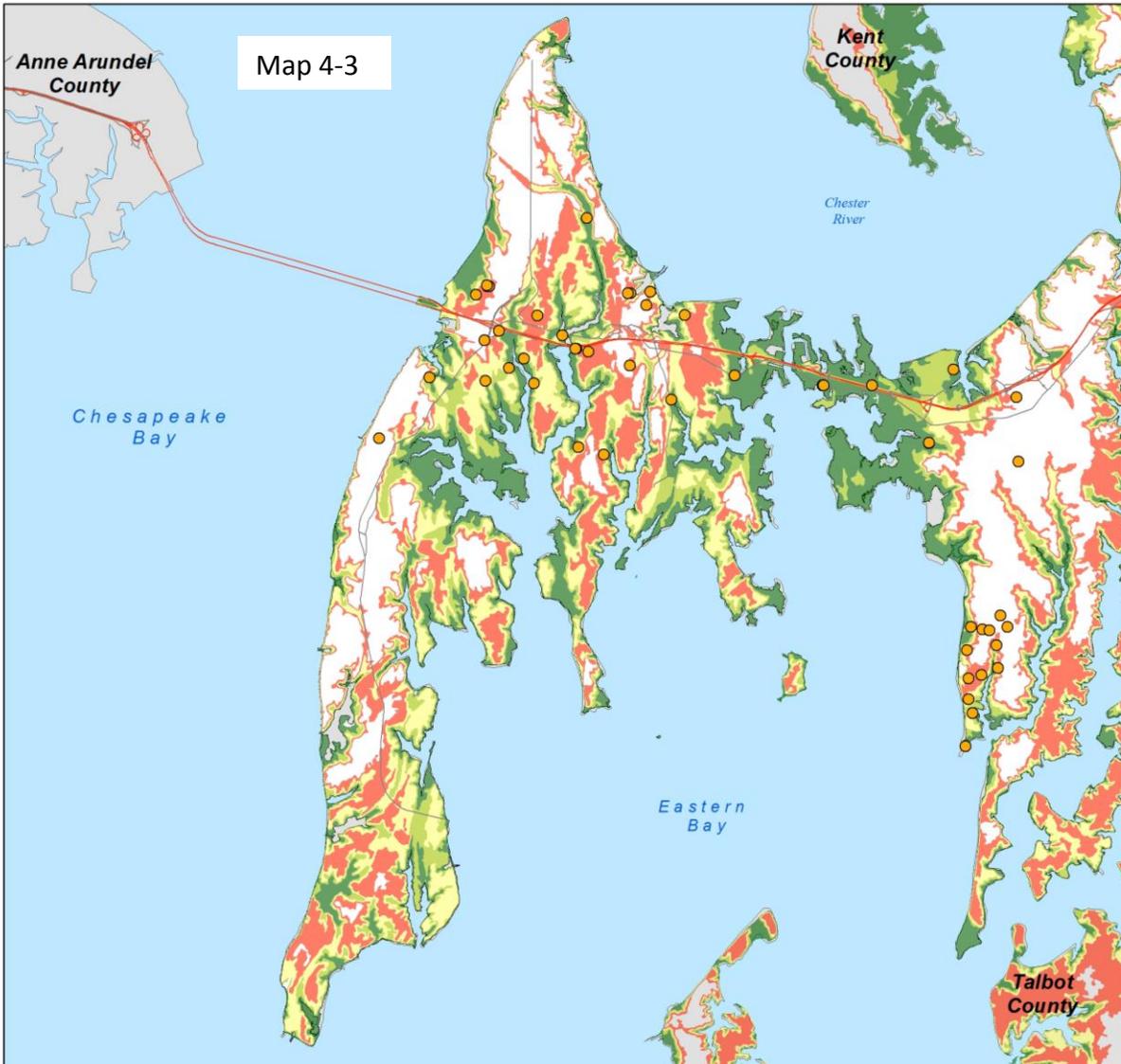
**4.4.8 SANITARY FACILITIES AT-RISK TO HURRICANE STORM SURGE**

County owned and operated sanitary facilities include: Collection Stations, Water Treatment Plants, Pump Stations, Water Towers, Sewage Lift Stations, a Wastewater Treatment Plant, and a Well House. Sanitary facilities at-risk to hurricane storm surge have been identified during the plan update process listed on Table 4-9 and shown on Map 4-3.

<b>TABLE 4-9: SANITARY FACILITIES AT-RISK TO HURRICANE STORM SURGE</b>			
<b>FACILITY NAME</b>	<b>HURRICANE STORM SURGE INUNDATION AREA (CATEGORIES 1-4) YES/NO</b>	<b>FACILITY NAME</b>	<b>HURRICANE STORM SURGE INUNDATION AREA (CATEGORIES 1-4) YES/NO</b>
Collection Station F	Yes	CBBP Water Tower	Yes
Collection Station G	Yes	Prospect Bay Water Tower	No
Collection Station A	Yes	Matapeake Water Tower	Yes
Collection Station B	Yes	Queens Landing Water Tower	Yes
Collection Station J	Yes	KNSG Sewage Treatment Plant	Yes
Collection Station R	Yes	Lift Station #8	Yes
Collection Station Q	Yes	Lift Station #3	No
Collection Station H	Yes	Lift Station #5	Yes
Collection Station K	Yes	Lift Station #7	Yes
Oyster Cove WTP	Yes	Lift Station #1	Yes
Pump Station 1	Yes	Lift Station #6	Yes
Collection Station H	Yes	Lift Station #9	Yes
Pump Station 1	Yes	PROSPECT WELLHOUSE #2 / Inactive	Yes
Pump Station 4	Yes	Pump Station 7	Yes
Collection Station D	Yes	Pump Station 8	Yes
Collection Station L	Yes	Pump Station 10	Yes
Collection Station C	Yes	Pump Station 9	Yes
Thompson Creek WTP	Yes	Pump Station 3	Yes
Thompson Creek WTP	Yes	Pump Station 6	No
Pump Station 2	Yes	Pump Station 11	Yes
Collection Station M	No	Pump Station 5	Yes
Collection Station E	Yes	Grasonville WTP	No
Queenstown WWTP	Yes	Riverside WTP	Yes
CBBP WTP	Yes	Stevensville WTP	Yes
Bayside WTP	No	Queens Landing WTP	Yes
Prospect Bay WTP	Yes	Thompson Creek Booster Pump	Yes
Kent Island Village WTP	Yes		
Bridge Pointe WTP	Yes		

Source: Kent Narrows/Stevensville/ (KNSG) Facilities Inventory: Queen Anne’s County Dept. of Public Works, GIS Mapping Dept. & Data Download; and, SLOSH Model-Hurricane Storm Surge: U.S. ACE, Baltimore District, Planning Division, January 2016

Queen Anne's County Sanitary District & Hurricane Storm Surge



**Legend**

<b>Hurricane Category</b>	Sanitary District: Kent Narrows/Stevensville/... (KNSG) Facilities
Category 1	Maryland Routes
Category 2	US Routes
Category 3	
Category 4	

0 0.75 1.5 3 Miles

**Data Sources:**

- KNSG Facilities Inventory:
  - Queen Anne's County Department of Public Works
- SLOSH Model - Hurricane Storm Surge:
  - Data prepared by U.S. ACE, Baltimore District, Planning Division January 2016
- Queen Anne's County IT:
  - GIS-Mapping Department
  - GIS Data Download




#### 4.4.9 MUNICIPAL AREAS PRONE TO HURRICANE WIND & STORM SURGE

The entire county is at-risk to the hurricane hazard, however as shown on Map 4-1: HAZUS Hurricane Wind Model-Wind Speeds Peak Gusts, indicates that Queenstown, Centreville, & the Town of Queen Anne are most at-risk, from a wind perspective. In terms of coastal storm surge, shown on Map 4-2, Queenstown, Centreville, Queen Anne, Church Hill, and Millington all at-risk to coastal storm surge.

### 4.5 Coastal Erosion Profile

A side effect or sub-hazard of tropical storms is erosion. Erosion is a naturally occurring normal part of nature and occurs everywhere on earth. Erosion typically occurs when earth's surface is exposed to the impacts of rainfall or water causing sediment to be carried away by the water and deposited at a different location. Erosion also creates a chain reaction causing reduced stream capacity sometimes resulting in flooding and helps contribute to a decline in water quality which blocks sunlight and can destroy plant and animal species located in waterways.

Erosion can be grouped into two types of categories, geologic erosion and accelerated erosion.

- **Geologic Erosion**, also known as natural erosion, is the action of wind, water, ice and gravity in wearing away rock to form soil and shape the ground surface. This is a slow continuous process with the exception of stream/shore erosion and is often unnoticed. Geologic erosion accounts for 30% of all sediment in the United States each year.
- **Accelerated Erosion** is the process of speeding up erosion due to human activity. This human activity usually involves destroying or removing natural vegetation and altering the contour of the ground without providing surface protection. Accelerated erosion is reported to account for nearly 70% of all sediment generated in the United States. The primary causes of accelerated erosion are logging, construction and mining.

### 4.6 Coastal Erosion Risk

There are many different ways to determine rate of erosion. Shore/bank erosion can be calculated using the Bank Erosion Hazard Index (BEHI) and the Near Bank Stress (NBS) tools. These tools allow for the rate of stress a shore bank receives based on height, shape and passing water flow to be calculated. To predict bank erosion, various methods to identify and map various risk ratings commensurate with bank and channel changes as well as flow distribution are used. Once an estimate of erosion rate has been made, it is then multiplied by the bank height, times the length of the bank of a similar condition. This calculation provides an estimate of cubic yards and/or tons of sediment per year.

The following table indicates the scale for determining severity of risk for near bank stress.

TABLE 4-10: SEVERITY OF RISK FOR NEAR BANK STRESS		
BANK EROSION RISK RATING	VELOCITY GRADIENT	NEAR-BANK STRESS/ SHEAR STRESS
Very Low	Less than 0.5	Less than 0.8
Low	0.5-1.0	0.8-1.05
Moderate	1.1-1.6	1.06-1.14
High	1.61-2.0	1.15-1.19
Very High	2.1-2.4	1.2-1.6
Extreme	Greater than 2.4	Greater than 1.60

Source: Bank Erosion Prediction, Environmental Protection Agency (EPA), [http://water.epa.gov/scitech/datait/tools/warsss/pla\\_box08.cfm](http://water.epa.gov/scitech/datait/tools/warsss/pla_box08.cfm)

Queen Anne’s County has had millions of dollars of damage from erosion over the years. Hurricane Isabel was a major contributor to coastal erosion along the county shoreline. Following the hurricane, the county had over \$2 million worth of damage from erosion which blocked and backed up storm drains causing flooding in addition to coastal erosion caused by the storm surge. While the coastal erosion ate away at the land near the river, there was also inland erosion caused by the flooding from the hurricane.

Due to the different types of erosion, it is sometimes difficult to predict and is dependent upon many factors such as rain, wind and human actions. Shoreline erosion can be easily studied and steps taken to prevent further erosion such as berms and rock walls along the water’s edge can easily be put into place. Shoreline erosion is currently considered such a threat to the county.

Inland erosion is difficult to predict as it can happen anywhere. Areas of concern for inland erosion are hillsides, unprotected surfaces such as construction sites and areas where logging is occurring. These factors all contribute to the destabilization of the earth’s surface by removing soil anchor points such as trees, root systems and grass.

## 4.7 Coastal Erosion Vulnerability

Erosion typically has a very localized limited direct impact on the county. However, when erosion does occur, the effects may be devastating to the localized area where it has occurred. Potential losses from erosion include shoreline loss, damaged or destroyed sections of road, loss of hillsides (potentially caused by localized mudslides) and various other types of localized damages attributed to shifting or eroding soils. Generally, these damages occur infrequently in Queen Anne’s County, however, during severe storms and flooding events, erosion can become devastating causing a large loss of shoreline or widespread damages from large amounts of soil being washed away.

An additional type of erosion that has the potential to affect the county is underground erosion such as a sinkhole that can be caused by a number of factors. Sinkholes are often unpredictable and can open up at any time. Sinkholes will usually occur where there is some type of an underground utility system or a natural water flow path. Often times during the cold winter months, water system pipes break causing a large sinkhole to open up around it due to the rushing water eroding the surrounding soil. When these water main breaks occur, it normally also damages a roadway as utility pipes are often run next to or underneath a roadway.

Vulnerability to erosion is often times predictable based on location. Prior to building, Queen Anne's County Grading and Sediment Control Ordinance require strict guidelines to be followed including a strict permitting process as well as adherence to a soil/erosion conservation plan. Such plans include pre-determined run-off points to be created during the construction process, certain types of fill to be placed over the ground surface for construction roads and collection points for storm flow. The current ordinance in place outlines very specific ground compaction rates for fill sites and also outlines drainage requirements.

Hillsides should be protected by berms, swales or brow ditches. County code further requires that all areas around a building be graded to allow for positive drainage away from the building and toward a disposal area. Further anti-erosion devices and techniques such as soil fencing, structural rock and vegetation may be used to help minimize erosion. When building next to a slope, certain guidelines must be met regarding the proximity of a structure to the slope. Slope set back is the act of grading a slope to prevent a large slide from occurring and allows for reverse inclines to prevent a massive slide.

Areas located near the Chesapeake Bay area are much more susceptible to erosion than areas located away from the river. Due to the location of hillsides and underground pipes, no area is free from the threat of erosion, but those areas located on bedrock or firm less sandy/loamy soil will be at less of a risk of facing erosion. The Gradient and Sediment Control Ordinance dictates all jurisdictions within the county must adhere to the soil stabilization guidelines upon initiating any construction project. This allows for a uniform approach to tackling and preventing erosion. While each erosion prevention technique is unique for the type of soil in the area, the plan allows for protective measures to be undertaken in order to prevent soil destabilization.

# MARYLAND COASTAL RESILIENCY ASSESSMENT

March, 2016

With its extensive shoreline, Maryland's coasts experience flooding and erosion, caused by tides and storms and exacerbated by sea level rise. Natural habitats, such as marshes and coastal forests, can reduce the impacts of these hazards through the processes of wave attenuation, increased infiltration and sediment stabilization. While the Maryland Department of Natural Resources (DNR) utilizes various tools to target restoration and protection of habitats based on ecological, water quality and other criteria, these tools do not evaluate the risk-reduction benefits of natural features such as forests, marshes, dunes, oyster reefs, and underwater grasses. To support the DNR in their efforts to incorporate risk-reduction benefits into decision-making, The Nature Conservancy (TNC) partnered with the Chesapeake and Coastal Services (CCS) to conduct a Statewide Coastal Resiliency Assessment.

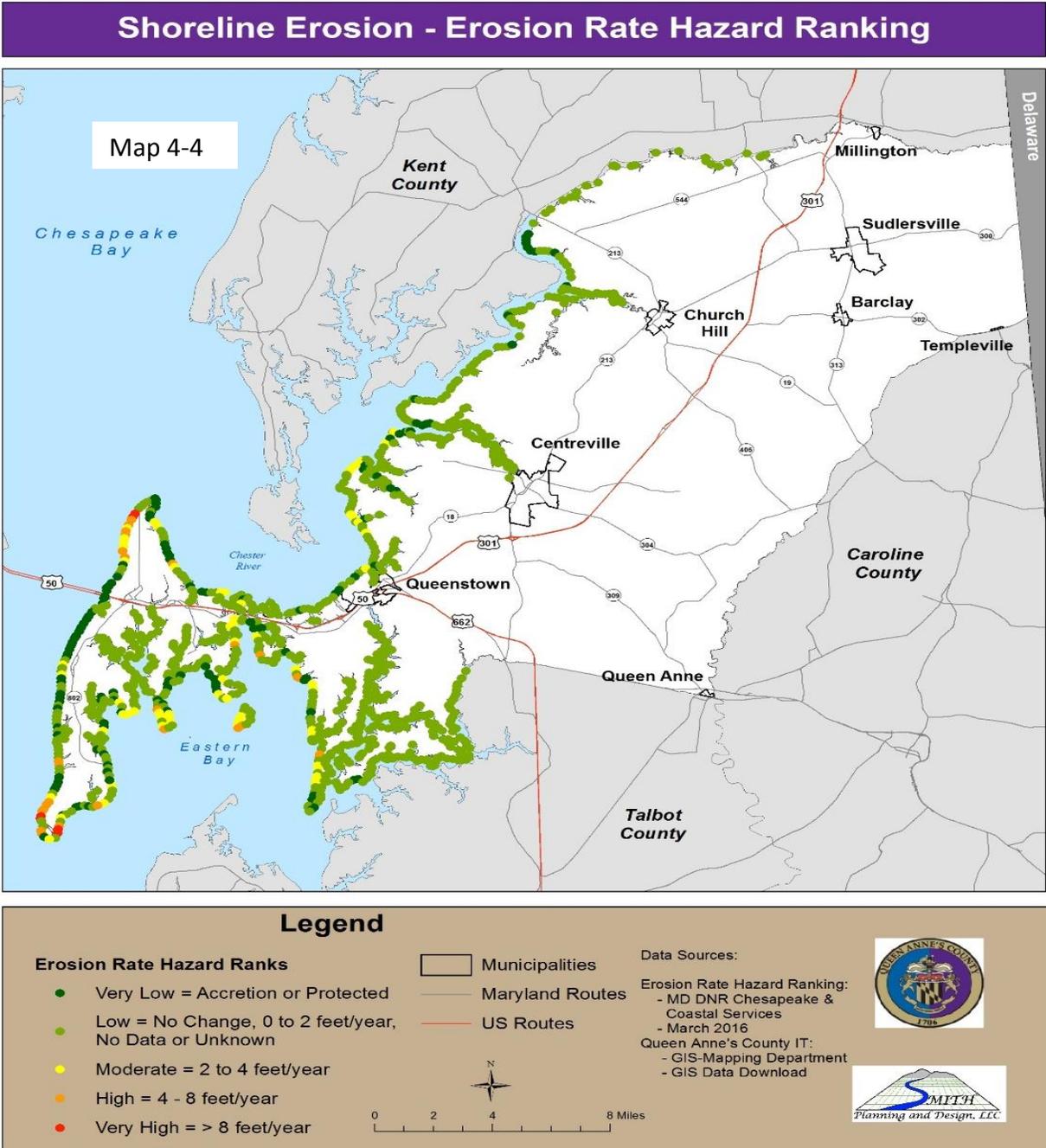
In order to spatially assess where natural habitats have the greatest potential to reduce risk for people, it is important to address three questions: where are the hazards, where are the people, and where are the habitats? The project team used spatially explicit computer modeling informed by scientific literature and local expert opinion to answer these questions and identify where natural habitats provide the greatest potential risk reduction for Maryland's coastal communities. The products of the Assessment include calculation of a Shoreline Hazard Index, which estimates the relative exposure to coastal hazards for the entire Maryland shoreline; delineation of Coastal Community Flood Risk Areas; selection of Priority Shoreline Areas for conservation and/or restoration; and the calculation of a Marsh Protection Potential Index. Habitats play a large potential role in risk reduction for MD coastal residents. The results of this Assessment provide tools to target coastal adaptation efforts so that protecting or restoring natural habitats also provides the greatest risk reduction benefit to coastal residential communities.

**Report Citation:** The Nature Conservancy, 2016. Maryland Coastal Resiliency Assessment. M.R. Canick, N. Carlozo and D. Foster. Bethesda, MD.

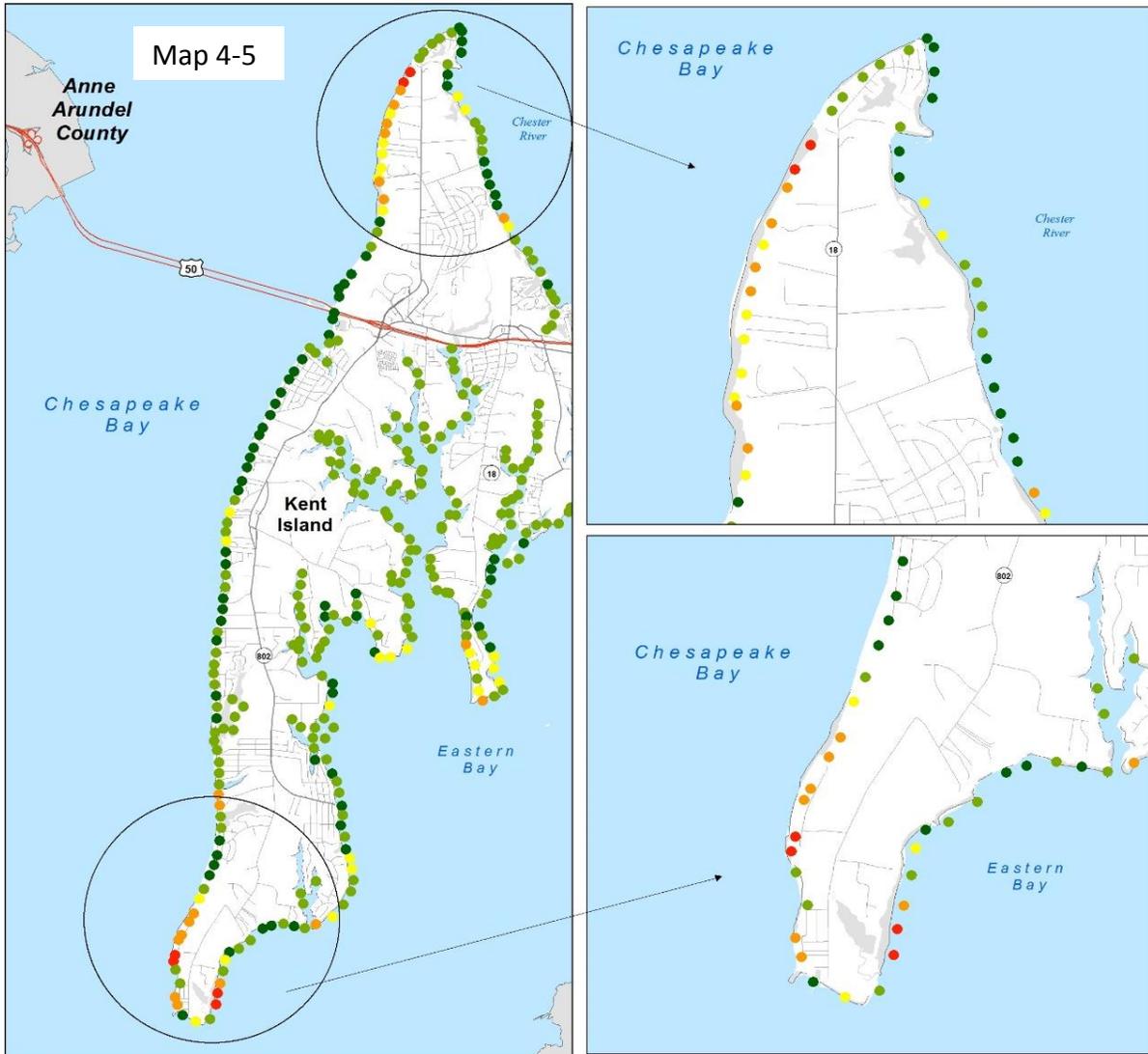
**Cover Page Photo Credits:** forest, marsh, dune - Maryland Department of Natural Resources; underwater grass - University of Maryland Center for Environmental Science/Cassie Gurbisz; oysters - Oyster Recovery Partnership



Maryland Department of Natural Resources Erosion Rate Hazard Ranks were assigned as follows, based on categories used by the Maryland Geological Survey (MGS): Very Low (1) = Accretion or Protected; Low (2) = No change, 0 to 2 feet/year, No Data or Unknown; Moderate (3) = 2 to 4 feet/year; High (4) = 4 - 8 feet/year; and Very high (5) = > 8 feet/year. As shown on Maps 4-4 and 4-5, the very high erosion rate areas are located in both the northern and southern portion of Kent Island predominantly on the windward side.



## Shoreline Erosion - Erosion Rate Hazard Ranking



<h3>Legend</h3>		Data Sources:	
<p><b>Erosion Rate Hazard Ranks</b></p> <ul style="list-style-type: none"> <li><span style="color: green;">●</span> Very Low = Accretion or Protected</li> <li><span style="color: lightgreen;">●</span> Low = No Change, 0 to 2 feet/year, No Data or Unknown</li> <li><span style="color: yellow;">●</span> Moderate = 2 to 4 feet/year</li> <li><span style="color: orange;">●</span> High = 4 - 8 feet/year</li> <li><span style="color: red;">●</span> Very High = &gt; 8 feet/year</li> </ul>	<ul style="list-style-type: none"> <li> Centerlines</li> <li> Maryland Routes</li> <li> US Routes</li> <li> Municipalities</li> <li> Queen Anne's County</li> </ul>	<p>Erosion Rate Hazard Ranking:</p> <ul style="list-style-type: none"> <li>- MD DNR Chesapeake &amp; Coastal Services</li> <li>- March 2016</li> </ul> <p>Queen Anne's County IT:</p> <ul style="list-style-type: none"> <li>- GIS-Mapping Department</li> <li>- GIS Data Download</li> </ul>	  <p>0 0.75 1.5 3 Miles</p>

#### 4.7.1 PRIORITY SHORELINE EROSION AREAS

The ArcGIS Spatial Join geoprocessing tool was used to determine the maximum flood risk score of any flood risk area located within 2 kilometers of a given shoreline segment, as well as the risk score of the closest flood risk area located within 2 kilometers of a given shoreline segment. A two (2) kilometer search distance was applied after analyzing the average distance from each shoreline segment to the closest risk area by county and across the entire state.

Priority Shoreline Areas are those areas where protection and restoration of natural habitats has the greatest potential to reduce the coastal hazard risk faced by residential communities. Two tiers of priority were determined. **Tier 1 or High Priority** areas or **Tier 2 or Moderate Priority** areas. Tier 1 areas comprise 22% of the MD coastline and Tier 2 areas comprise an additional 40% of the MD coastline.

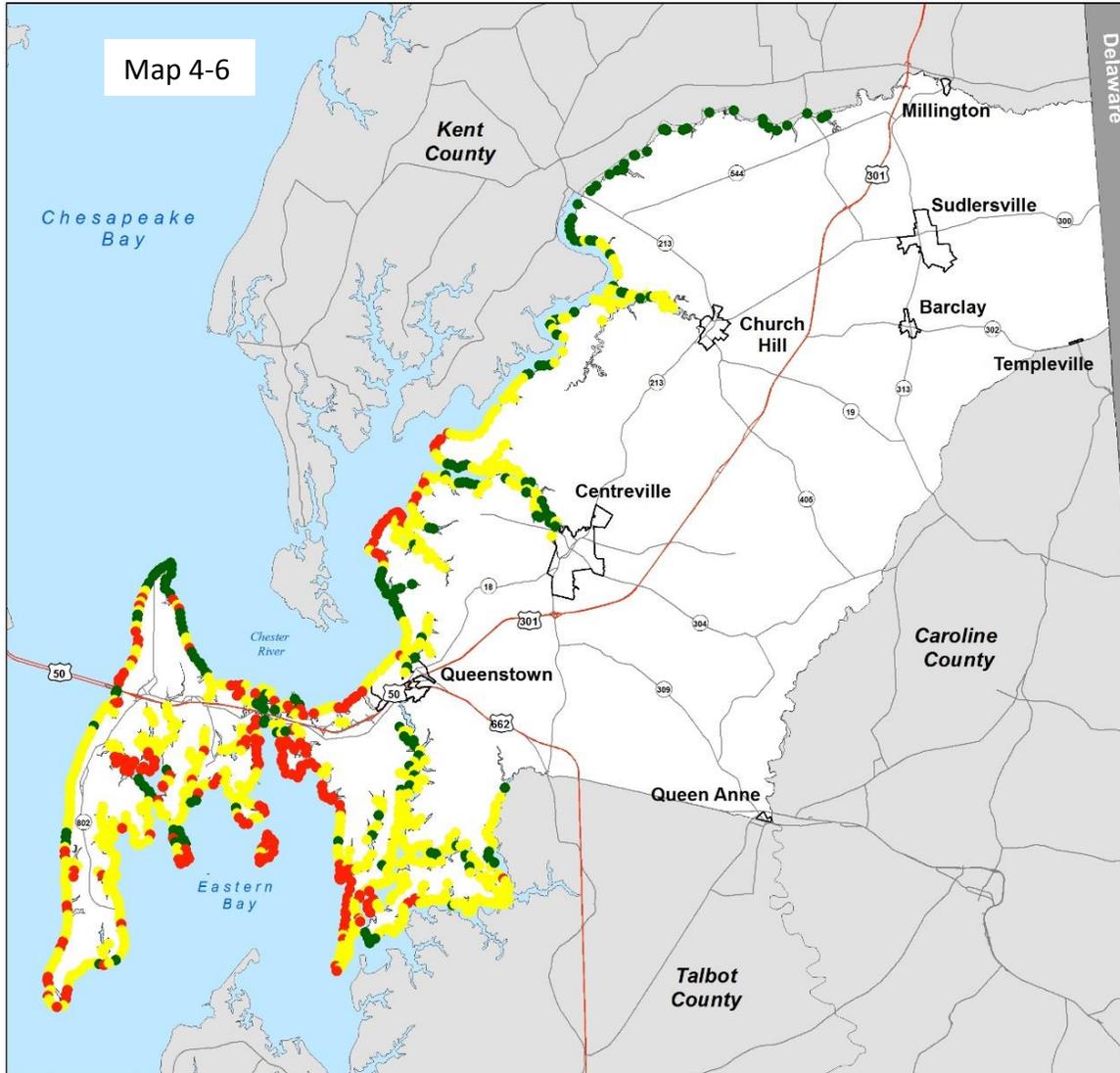
Tier 1 priority shoreline areas where the habitat role in reducing shoreline hazard is currently high should be targeted for acquisition, easement, or other means of securing them from conversion to development.

Tier 2 priority shoreline areas, all of which have no more than a moderate habitat role, will likely offer the greatest number of opportunities for restoration.

*Source: MARYLAND COASTAL RESILIENCY ASSESSMENT March 2016*

Note: Both Tier 1 and Tier 2 Priority Areas are displayed on Map 4-6.

## Shoreline Erosion - Priority Shoreline Areas



### Legend

**Priority Shoreline Areas**

- Tier 1
- Tier 2
- n/a

Municipalities  
 Maryland Routes  
 US Routes

Data Sources:

Erosion Rate Hazard Ranking:  
 - MD DNR Chesapeake & Coastal Services  
 - March 2016

Queen Anne's County IT:  
 - GIS-Mapping Department  
 - GIS Data Download

# Chapter 5 Drought & Extreme Heat

This section of the Plan describes the provides an overall drought profile, risk, and vulnerability for Queen Anne’s County and participating municipalities:

- 5.1 DROUGHT PROFILE
- 5.2 DROUGHT RISK
  - 5.2.1 Drought Impacts
- 5.3 DROUGHT RISK DATA
- 5.4 DROUGHT VULNERABILITY
  - 5.4.1 Drought Monitoring
- 5.5 EXTREME HEAT PROFILE
- 5.6 EXTREME HEAT DATA & RISK
- 5.7 EXTREME HEAT VULNERABILITY

Drought was ranked as a high-risk hazard for Queen Anne’s County, Chapter 2 Table 2-4. However, a temperature extreme, heat, was ranked as a medium-risk hazard.

## 5.1 Drought Profile

Drought is a normal part of virtually all climates, including areas with high and low average rainfall. Droughts are periods of time when natural or managed water systems do not provide enough water to meet established human and environmental uses because of natural shortfalls in precipitation or stream flow. Although maintaining water supplies for human use is an important aspect of drought management, drought can also have many other dramatic and detrimental effects on the environment and wildlife.

Droughts can be grouped as meteorological, hydrologic, agricultural, and socioeconomic. Representative definitions commonly used to describe the types of drought are summarized below.

**Meteorological** drought is defined solely on the degrees of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.

**Hydrologic** drought is related to the effects of precipitation shortfalls on streamflows and reservoir, lake, and groundwater levels.

**Agricultural** drought is defined principally in terms of soil moisture deficiencies relative to water demands of plant life, usually crops.

**Socioeconomic** drought associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of a weather related supply shortfall. The incidence of this type of drought can increase because of a change in the amount of rainfall, a change in societal demands for water (or vulnerability to water shortages), or both.

**The Standardized Precipitation Index (SPI)** is a drought index based on the probability of an observed precipitation deficit occurring over a given prior time period. The assessment periods considered range from 1 to 36 months. The variable time scale allows the SPI to describe drought conditions important for a range of meteorological, agricultural, and hydrological applications. For example, soil moisture conditions respond to precipitation deficits occurring on a relatively short time scale, whereas groundwater, stream flow, and reservoir storage respond to precipitation deficits arising over many months.

Wayne Palmer in the 1960s and uses temperature and rainfall information in a formula to determine dryness developed the Palmer Drought Severity Index (PDSI). It has become the semi-official drought index. The Palmer Index is most effective in determining long-term drought—a matter of several months—and is not as good with short-term forecasts (a matter of weeks). It uses a 0 as normal, and drought is shown in terms of minus numbers; for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought.

TABLE 5-1: DROUGHT SEVERITY CLASSIFICATION					
DROUGHT SEVERITY	RETURN PERIOD (YEARS)	DESCRIPTION OF POSSIBLE IMPACTS	DROUGHT MONITORING INDICES		
			Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Minor Drought	3 to 4	Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-0.5 to -0.7	D0	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme Drought	18 to 43	Major crop and pasture losses; extreme fire danger; widespread water shortages or restrictions	-1.6 to -1.9	D3	-4.0 to -4.9
Exceptional Drought	44 +	Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies	Less than -2	D4	-5.0 or less

Source: National Drought Mitigation Center

## 5.2 Drought Risk

There is no commonly accepted approach for assessing risk associated with droughts given the varying types and indices. Drought risk is based on a combination of the frequency, severity, and spatial extent (the physical nature of drought) and the degree to which a population or activity is vulnerable to the effects of drought. The degree of Queen Anne’s County’s vulnerability to drought depends on the environmental and social characteristics of the region and is measured by its ability to anticipate, cope with, resist, and recover from drought.

Because drought is usually considered a regional hazard, it is not enhanced or analyzed by County-level mapping. All jurisdictions are assumed to have the same risk level within Queen Anne’s County. Mapping of the current drought status is published by the National Integrated Drought Information System (NIDIS): U.S. Drought Portal which can be found online at: [www.drought.gov](http://www.drought.gov).

### 5.2.1 DROUGHT IMPACTS

Impacts from the drought hazard include:

- *Agriculture:* Impacts associated with agriculture, farming, and ranching. Examples of drought-induced agricultural impacts include: damage to crop quality; income loss for farmers due to reduced crop yields; reduced productivity of cropland (due to wind erosion, long-term loss of organic matter, etc.); insect infestation; plant disease; increased irrigation costs; costs of new or supplemental water

resource development (wells, dams, pipelines); reduced productivity of rangeland; forced reduction of foundation stock; closure/limitation of public lands to grazing; high cost/unavailability of water for livestock; and range fires.

- *Water/Energy:* Impacts associated with surface or subsurface water supplies (i.e., reservoirs or aquifers), stream levels or stream flow, hydropower generation, or navigation. Examples of drought-induced water/energy impacts include: lower water levels in reservoirs, lakes, and ponds; reduced flow from springs; reduced stream flow; loss of wetlands; estuarine impacts (e.g., changes in salinity levels); increased groundwater depletion, land subsidence, reduced recharge; water quality effects (e.g., salt concentration, increased water temperature, pH, dissolved oxygen, turbidity); revenue shortfalls and/or windfall profits; cost of water transport or transfer; cost of new or supplemental water resource development; and loss from impaired navigability of streams, rivers, and canals.
- *Environment:* Impacts associated with wildlife, fisheries, forests, and other fauna. Examples of drought-induced environment impacts include: loss of biodiversity of plants or wildlife; loss of trees from urban landscapes, shelterbelts, wooded conservation areas; reduction and degradation of fish and wildlife habitat; lack of feed and drinking water; greater mortality due to increased contact with agricultural producers, as animals seek food from farms and producers are less tolerant of the intrusion; disease; increased vulnerability to predation (from species concentrated near water); migration and concentration (loss of wildlife in some areas and too many wildlife in other areas); and increased stress to endangered species.
- *Fire:* Impacts associated with forest and range fires that occur during drought events. The relationship between fires and droughts is very complex. Not all fires are caused by droughts and serious fires can result when droughts are not taking place.
- *Social:* Impacts associated with the public, or the recreation/tourism sector. Examples of drought-induced social impacts include: health-related low-flow problems (e.g., cross-connection contamination, diminished sewage flows, increased pollutant concentrations, reduced firefighting capability, etc.); loss of human life (e.g., from heat stress, suicides); public safety from forest and range fires; increased respiratory ailments; increased disease caused by wildlife concentrations; population migrations (rural to urban areas, migrants into the United States); loss of aesthetic values; reduction or modification of recreational activities; losses to manufacturers and sellers of recreational equipment; and losses related to curtailed activities (hunting and fishing, bird watching, boating, etc.).
- *Other:* Drought impacts that do not easily fit into any of the above categories.

### 5.3 Drought Risk Data

According to National Centers for Environmental Information (NCEI), Queen Anne’s County has experienced 62 recorded drought events from 1997-2017.

TABLE 5-2: DROUGHT – 1997-2017				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
62	0	0	\$2,083,000	2.95

Source: National Centers for Environmental Information (NCEI), Events through April 2018

A recent drought event occurred June 1, 2016 through September 29, 2016, which prompted the Small Business Administration to offer working capital loans, known as federal economic injury disaster loans. Maryland jurisdictions eligible included Caroline, Dorchester, Kent, Wicomico, and Queen Anne’s counties.

## 5.4 Drought Vulnerability

Due to the nature of drought, all jurisdictions within Queen Anne’s County are expected to be impacted equally due to drought conditions. Note, land use codes do require that firebreaks be utilized in areas susceptible to wildfire.

The National Oceanic and Atmospheric Administration Paleoclimatology Program studies drought by analyzing records from tree rings, lake and dune sediments, archaeological remains, historical documents, and other environmental indicators to obtain a broader picture of the frequency of droughts in the United States. According to their research, “...paleoclimatic data suggest that droughts as severe as the 1950’s drought have occurred in central North America several times a century over the past 300-400 years, and thus we should expect (and plan for) similar droughts in the future. The paleoclimatic record also indicates that droughts of a much greater duration than any in the 20th century have occurred in parts of North America as recently as 500 years ago.” Based on this research, the 1950’s drought situation could be expected approximately once every 50 years or a 20% chance every ten years. An extreme drought, worse than the 1930’s “Dust Bowl,” has an approximate probability of occurring once every 500 years or a 2% chance of occurring each decade. (National Oceanic and Atmospheric Administration, 2003). A 500-year drought with a magnitude similar to that of the 1930’s that destroys the agricultural economy and leads to wildfires is an example of a high magnitude event.

Impacts to vegetation and wildlife can include death from dehydration and spread of invasive species or disease because of stressed conditions. However, drought is a natural part of the environment in Maryland and native species are likely to be adapted to surviving periodic drought conditions. It is unlikely that drought would jeopardize the existence of rare species or vegetative communities.

Environmental impacts are more likely at the interface of the human and natural world. The loss of crops or livestock due to drought can have far-reaching economic effects. Wind and water erosion can alter the visual landscape and dust can damage property. Water-based recreational resources are affected by drought conditions. Indirect impacts from drought arise from wildfire, which may have additional effects on the landscape and sensitive resources such as historic or archeological sites.

Drought typically does not have a direct impact on critical facilities or structures. However, possible losses/impacts to critical facilities include the loss of critical function due to low water supplies. Severe droughts can negatively affect drinking water supplies. Should a public water system be affected, the losses could total into the millions of dollars if outside water is shipped in. Private springs/wells could also dry up. Possible losses to infrastructure include the loss of potable water.

A drought evolves slowly over time and the population typically has ample time to prepare for its effects. Should a drought affect the water available for public water systems or individual wells, the availability of clean drinking water could be compromised. This situation would require emergency actions and could possibly overwhelm the local government and financial resources.

In 2010, the U.S. Department of Agriculture reported that \$1.1 million was awarded to Queen Anne’s County through the Supplemental Revenue Assistance Payment (SURE) program. This program provides financial assistance for crop production and/or quality losses due to a natural disaster. Cropland is a valuable resource to Queen Anne’s County and is vulnerable to drought conditions.

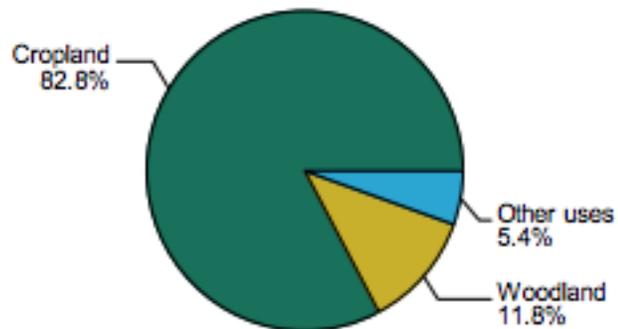
The Maryland Farm Bureau-Queen Anne’s County reports:

- 530 County Farms; and,
- 156,941 Farm Acres.

<https://www.mdfarmbureau.com>

The most recent US Department of Agriculture-Census of Agriculture indicates Queen Anne’s County an average size farm of 296 acres. The primary land use of farmland is cropland, eight-two percent. This cropland is vulnerable to water shortages resulting drought.

Figure: 5-1



Source: US Department of Agriculture-National Agriculture Statistics Service; [www.agcensus.usda.gov](http://www.agcensus.usda.gov)

Society’s vulnerability to drought is affected by (among other things) population growth and shifts, urbanization, demographic characteristics, technology, water use trends, government policy, social behavior, and environmental awareness. These factors are continually changing, and society’s vulnerability to drought may rise or fall in response to these changes. For example, increasing and shifting populations put increasing pressure on water and other natural resources—more people need more water.

Future development’s greatest impact on the drought hazard would possibly be to ground water resources. New water and sewer systems or significant well and septic sites could use up more of the water available, particularly during periods of drought. Public water systems are monitored, but individual wells and septic systems are not as strictly regulated. Therefore, future development could have an impact on the drought vulnerabilities.

### 5.4.1 DROUGHT MONITORING

In order to monitor potential drought conditions, Maryland uses four indicators for water sufficiency. The indicators are based on the amount of precipitation (or lack of precipitation) in the hydrologic system. These indicators include: precipitation levels, stream flows, ground water levels, and reservoir storage.

According to the Maryland Department of the Environment, Maryland will implement a staged process for defining drought conditions. Drought indicators will be monitored on an ongoing, year-round basis, and

drought status will be determined on a variable timeframe according to drought stage. The frequency of evaluation will increase if the drought intensifies as indicated below:

- *Stage 1* Monthly;
- *Stage 2* Bi-weekly;
- *Stage 3* Weekly; and,
- *Stage 4* Weekly or as needed.

### **Stage 1 – Normal (Green)**

No more than one indicator outside of the normal range.

- Precipitation exceeds the percent of normal precipitation for the time period;
- Streamflows are above the 25<sup>th</sup> percentile;
- Ground water levels are above the 25<sup>th</sup> percentile; and,
- Reservoirs exceed 120 days of storage.

### **Stage 2 – Watch (Yellow)**

At least 2 indicators meet the following conditions:

- Precipitation levels are at or below the percent of normal precipitation for the time period;
- Streamflows fall between the 10<sup>th</sup> and 25<sup>th</sup> percentile;
- Ground water levels fall between the 10<sup>th</sup> and 25<sup>th</sup> percentile; and,
- Reservoirs contain between 90 and 120 days of storage.

### **Stage 3 – Warning (Orange)**

At least 2 indicators meet the following conditions:

- Precipitation levels are at or below the percent of normal precipitation for the time period;
- Streamflows fall between the 5<sup>th</sup> and 10<sup>th</sup> percentile;
- Ground water levels fall between the 5<sup>th</sup> and 10<sup>th</sup> percentile; and,
- Reservoirs contain between 60 and 90 days of storage.

### **Stage 4 – Emergency (Red)**

At least 2 indicators meet the following conditions:

- Precipitation levels are at or below the percent of normal precipitation for the time period;
- Streamflows are at or below the 5<sup>th</sup> percentile;
- Ground water levels are at or below the 5<sup>th</sup> percentile; and,
- Reservoirs contain 60 days or less of storage.

During periods of drought, Maryland implements mandatory water use restrictions including the following prohibited uses:

- Watering of lawns;
- Water of gardens and irrigation, except for agriculture and certain commercial uses;
- Restrictions on irrigation and watering of golf courses;
- Washing of paved surfaces such as streets, roads, sidewalks, driveways, garages, parking areas, tennis courts and patios;
- Use of water for the operation of ornamental fountains, waterfalls, and reflecting pools;
- Use of water for washing or cleaning of mobile equipment including automobiles, trucks, trailers, and boats;

- Use of water to fill and top off swimming pools; and,
- Homeowner power-washing of buildings, fences, decks, or other structures.

Note: There are additional exceptions to the Maryland Water Use Restrictions listed above.

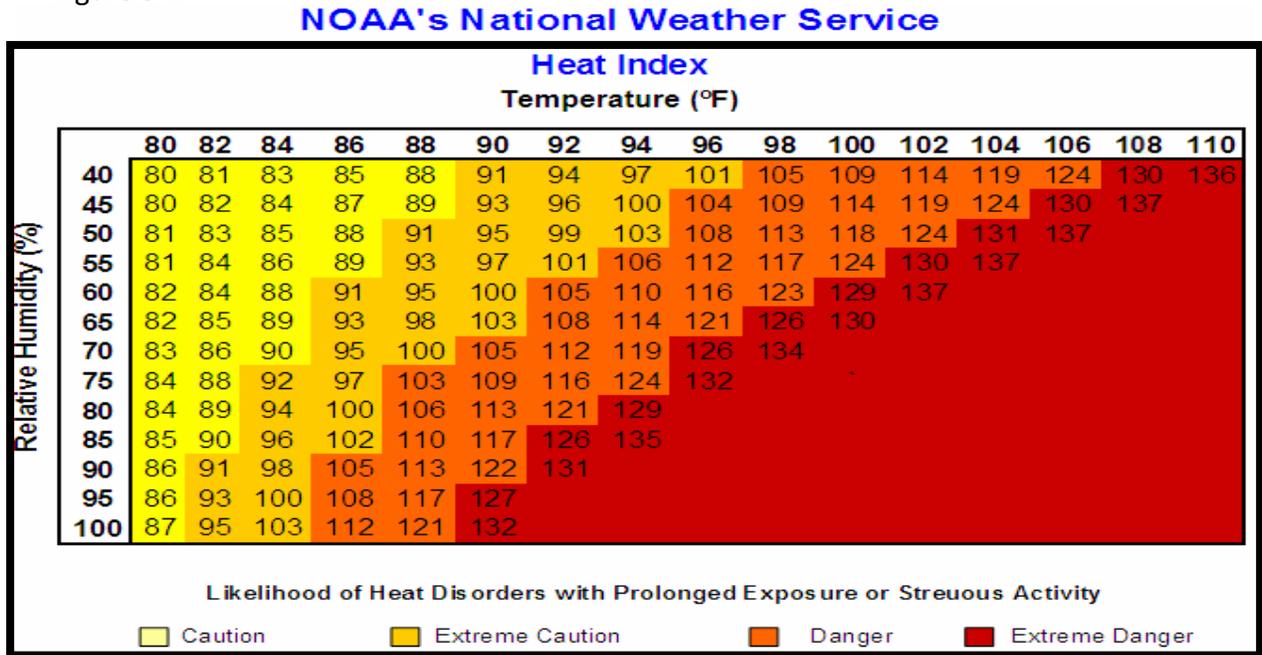
The USGS Water Science for Maryland, Delaware and the District of Columbia monitors conditions and host a MD-DE-DC Drought Watch at: <http://md.water.usgs.gov/drought/index.html>. Real time Maryland Streamflow data is available, as well as drought status and resources.

## 5.5 Extreme Heat Profile

Temperature extremes can occur at almost any time of the year, but are most prevalent in the summer and winter. Extreme temperatures can be dangerous due to the way that they affect individuals who are exposed to them. Extreme heat is usually defined through a combination of temperature and humidity. The recorded extreme heat events have occurred from June through September.

Temperature advisories, watches and warnings are issued by the National Weather Service relating the above impacts to the range of temperatures typically experienced in Maryland. Exact thresholds vary across the State including Queen Anne’s County, but in general *Heat Advisories* are issued when the heat index will be equal to or greater than 100°F, but less than 105°F, *Excessive Heat Warnings* are issued when heat indices will attain or exceed 105°F, and *Excessive Heat Watches*, are issued when there is a possibility that excessive heat warning criteria may be experienced within twelve to forty-eight hours (NOAA NWS, 2010).

Figure 5-2



Source: NOAA National Weather Service

## 5.6 Extreme Heat Risk & Data

According to National Centers for Environmental Information (NCEI), Queen Anne’s County has experienced 16 excessive heat events from 2000-2017 and 59 heat events from 1996-2017.

**TABLE 5-3: EXCESSIVE HEAT – 2000-2017**

# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
16	0	0	0	0.89

Source: National Centers for Environmental Information (NCEI), Events through April 2018

**TABLE 5-4: HEAT – 1996-2017**

# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
59	5	0	0	2.68

Source: National Centers for Environmental Information (NCEI), Events through April 2018

According to the National Weather Service, an Excessive Heat Warning **means** that a prolonged period of dangerously hot temperatures will occur. The combination of hot temperatures and high humidity will combine to create a dangerous situation in which heat illnesses are likely. As an example, if the air temperature is 96°F and the relative humidity is 65%, the heat index--how hot it feels--is 121°F. The National Weather Service will initiate alert procedures when the Heat Index is expected to exceed 105°-110°F (depending on local climate) for at least 2 consecutive days. Whereas, a Heat Advisory means that a period of hot temperatures is expected. The combination of hot temperatures and high humidity will combine to create a situation in which heat illnesses are possible.

## 5.7 Extreme Heat Vulnerability

It is evident from past events that extreme heat is dangerous and can cause human related illnesses and death. As temperatures go up so do the number of people hospitalized for heat related illnesses. Therefore, it is important to understand how many people are exposed to such conditions, and how many buildings exist, where potential problems could arise should power be lost. Additionally, extreme heat can cause damage to buildings or contents by overheating HVAC or air conditioning systems, contributing to jurisdictional losses. It is unlikely that an entire building would be impacted in an extreme heat event, though.

The elderly, just like small children, are more susceptible to temperature extremes. Additionally, buildings of significant age may be more susceptible to temperature extremes from extreme heat. Facilities need to be maintained to ensure that they operate in appropriate conditions for people. Temporary periods of extreme hot temperatures typically do not have significant environmental impact. However, prolonged periods of hot temperatures may be associated with drought conditions and can damage or destroy vegetation, dry up rivers and streams, and reduce water quality.

# Chapter 6 High Wind

This section of the Plan describes the provides a high wind profile, risk, and vulnerability for Queen Anne's County and participating municipalities:

- 6.1 HIGH WIND PROFILE
- 6.2 HIGH WIND RISK
- 6.3 HIGH WIND RISK DATA
- 6.4 HIGH WIND VULNERABILITY
  - 6.4.1 Mobile Home Vulnerability
  - 6.4.2 Essential Facilities Vulnerability

High Wind was ranked as a high-risk hazard for Queen Anne's County, Chapter 2 Table 2-4.

## 6.1 High Wind Profile

Damaging winds are often called “straight-line” winds to differentiate the damage they cause from tornado damage. Strong thunderstorm winds can come from a number of different processes. Most thunderstorm winds that cause damage at the ground are a result of outflow generated by a thunderstorm downdraft. Damaging winds are classified as those exceeding 50-60 mph. According to the National Severe Storms Laboratory, there are various types of damaging winds.

**Straight-line wind** is a term used to define any thunderstorm wind that is not associated with rotation, and is used mainly to differentiate from tornadic winds.

A **downdraft** is a small-scale column of air that rapidly sinks toward the ground.

A **macroburst** is an outward burst of strong winds at or near the surface with horizontal dimensions larger than 4 km (2.5 mi) and occurs when a strong downdraft reaches the surface. To visualize this process, imagine the way water comes out of a faucet and hits the bottom of a sink. The column of water is the downdraft and the outward spray at the bottom of the sink is the macroburst. Macroburst winds may begin over a smaller area and then spread out over a wider area, sometimes producing damage similar to a tornado. Although usually associated with thunderstorms, macrobursts can occur with showers too weak to produce thunder.



A macroburst is an outward burst of strong winds at or near the surface with horizontal dimensions larger than 4 km (2.5 mi) and occurs when a strong downdraft reaches the surface. These trees were felled by straight-line winds in Minnesota in 2011. (Credit: Stacy Hopke/Burnett County Sheriff's Department)

A **microburst** is a small concentrated downburst that produces an outward burst of strong winds at or near the surface. Microbursts are small — less than 4 km across — and short-lived, lasting only five to 10 minutes, with maximum windspeeds sometimes exceeding 100 mph. There are two kinds of microbursts: wet and dry. A wet microburst is accompanied by heavy precipitation at the surface. Dry microbursts, common in places like the high plains and the intermountain west, occur with little or no precipitation reaching the ground.

A **gust front** is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. Gust fronts are characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm. Sometimes the winds push up air above them, forming a shelf cloud or detached roll cloud.

A **derecho** is a widespread, long-lived wind storm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous microbursts, downbursts, and downburst clusters. By definition, if the 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, then the event may be classified as a derecho.

## 6.2 High Wind Risk

Everyone is potentially at-risk to damaging high wind events. However, people living in mobile homes are especially at risk. Winds from thunderstorms can cause EF-2 damage (Enhanced Fujita Scale-Tornado EF-2-111-135 mph resulting in considerable damages). Queen Anne’s County Construction Codes includes a wind design speed of 115 mph for new structures. One of the biggest risks from high wind events is flying debris. Flying debris causes injuries, deaths, and property damage.

## 6.3 High Wind Data

According to National Centers for Environmental Information (NCEI) and local data, Queen Anne’s County has experienced 8 recorded high wind events and 88 recorded strong wind events from 1999-2017.

TABLE 6-1: HIGH WIND – 1999-2017 HIGH WIND EVENTS 50KTS OR STRONGER				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
8	0	0	691.50K	0.42
TABLE 6-2: STRONG WIND – 1997-2017 STRONG WIND EVENTS 30KTS OR STRONGER				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
88	3	0	302.88K	4.19

Source: National Centers for Environmental Information (NCEI), Events through April 2018

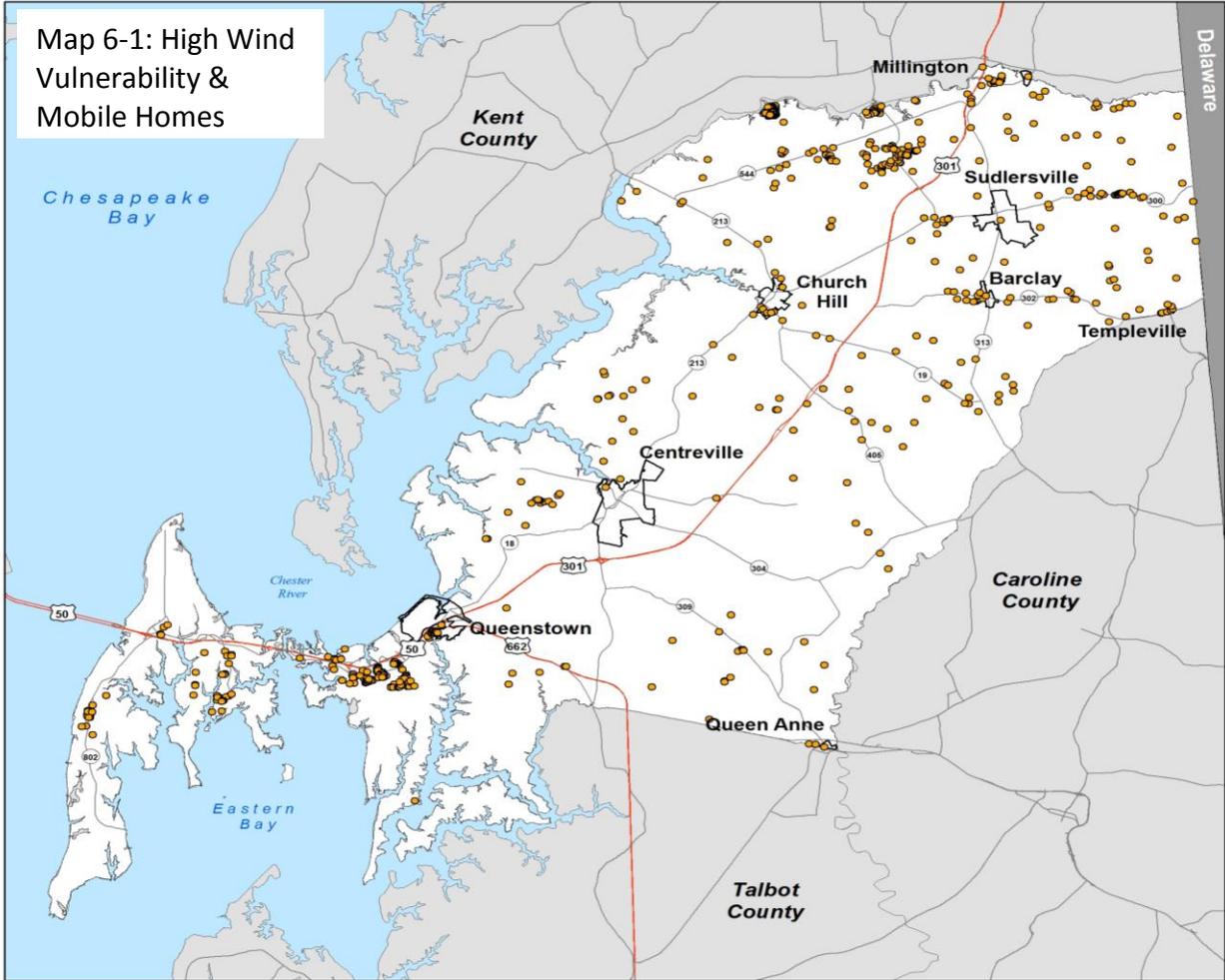
## 6.4 High Wind Vulnerability

The entire county and all municipalities are vulnerable to high wind events. Wind hazard effects include wind-borne debris, wind driven rain, wind driven storm surge, and wind pressure.

6.4.1 MOBILE HOME VULNERABILITY

Mobile homes are particularly susceptible to wind damage. According to the most recent Maryland Property View, 2015, there are five hundred and ninety-one mobile homes located throughout Queen Anne's County. People living in mobile homes are especially at risk for injury and death. Even anchored mobile homes can be seriously damaged when winds gust reach over 80 mph.

**Queen Anne's County - Mobile Homes**



Map 6-1: High Wind Vulnerability & Mobile Homes

**Legend**

- Mobile Homes - 591
- Queen Anne's County
- Municipalities
- Maryland Routes
- US Routes

**Data Sources:**

- Maryland Department of Planning
  - Maryland Property View Data
  - 2015
- Queen Anne's County IT:
  - GIS-Mapping Department
  - GIS Data Download

0 2 4 8 Miles

**6.4.2 ESSENTIAL FACILITY VULNERABILITY**

All essential facilities were assessed to determine which, if any, had installed impact resistant glass windows. It is important to note that most impact windows consist of several layers of glass or other synthetic materials that make shattering and penetration difficult. Impact resistant glass protects from flying debris during a high wind events. As shown on Table 6-3, two facilities have installed impact resistant glass, adding protection against damaging winds.

In addition, many essential facilities have communication antenna that are highly susceptible to high wind events. Damages to communications systems may lead to disruption of emergency communications. Those facilities include fire, emergency medical and police.

**TABLE 6-3: ESSENTIAL FACILITIES HIGH WIND VULNERABILITY**

FACILITY TYPE	FACILITY NAME	ADDRESS	TOWN	IMPACT RESISTENT GLASS	ANTENNA ON/AT FACILITY
EOC	QAC Department of Emergency Services	100 Communications Dr.	Centreville		
Fire	Queen Anne-Hillsboro VFC #8	13512 First Street	Queen Anne		✓
Fire	Queenstown VFC #3	7110 Main Street	Queenstown		
Fire	Church Hill VFC #5	316 Main Street	Church Hill		✓
Fire	Sudlersville VFC #6	203 N Church Street	Sudlersville		✓
Fire	Goodwill VFC #4	212 Broadway Street t	Centreville		✓
Fire	EMS Station 100	103 Davidson Road	Stevensville		
Fire	EMS Station 400	302 Safety Drive	Centreville		
Fire	EMS Station 300	7110 Main Street	Queenstown		
Fire	EMS Station 600	203 N Church Street	Sudlersville		✓
Fire	EMS Station 500	316 Main Street	Church Hill		✓
Fire	Grasonville VFC #2	4128 Main Street	Grasonville		✓
Fire	Grasonville Vol Ambulance Dept. #20	4132 Main Street	Grasonville		✓
Fire	Crumpton VFC #7	300 3rd Street	Millington		✓
Fire	United Communities VFC #9	9406 Romancoke Road	Stevensville		✓
Fire	Kent Island VFC #1	1610 Main Street	Chester		✓
Fire	EMS Station 200	101 Medic Drive	Chester		
Medical	QAC Department of Health	206 N Commerce Street	Centreville		
Medical	QAC Department of Health Annex	205 N Liberty Street	Centreville		
Medical	Shore Emergency Center Queenstown	115 Shoreway Drive	Queenstown		
Medical	UM Shore Medical Pavilion	125 Shoreway Drive	Queenstown		
Medical	AAMC Kent Island Pavilion	1630 Main Street	Chester		
Police	Queen Anne's County Sheriff's Office	505 Railroad Avenue	Centreville		
Police	Maryland State Police - Barracks S	311 Safety Drive	Centreville	✓	✓
Police	Sheriff's Office - Sudlersville Substation	200 S Church Street	Sudlersville		✓
Police	Centreville Police Department	420 N Commerce Street	Centreville		
Police	Sheriff's Office - Kent Narrows Substation	425 Piney Narrows Road	Chester		
School-Private	The Gunston School	911 Gunston Road	Centreville		
School-Private	Wye River Upper School	316 S Commerce Street	Centreville		
School-Private	Lighthouse Christian Academy	931 Love Point Road	Stevensville		
School-Private	Eastern Shore Jr. Academy	407 Dudley Corners Road	Sudlersville		

School-Private	Shore Up Head Start	5441 Main Street	Grasonville		
School-Private	Kiddie Academy of Kent Island	113 St. Claire Place	Stevensville		
School-Public	Kennard Elementary School	420 Little Kidwell Avenue	Centreville		
School-Public	Church Hill Elementary School	631 Main Street	Church Hill		
School-Public	Anchor Points Academy	202 Chesterfield Avenue	Centreville		
School-Public	Sudlersville Elementary School	300 S Church Street	Sudlersville		
School-Public	Grasonville Elementary School	5435 Main Street	Grasonville		
School-Public	Bayside Elementary School	301 Church Street	Stevensville		
School-Public	Queen Anne's County High School	125 Ruthsburg Road	Centreville		
School-Public	Sudlersville Middle School	600 Charles Street	Sudlersville		
School-Public	Centreville Elementary School	213 Homewood Avenue	Centreville	✓	
School-Public	Centreville Middle School	231 Ruthsburg Road	Centreville		
School-Public	Wye Research & Education Center	124 Wye Narrows Drive	Queenstown		
School-Public	Chesapeake College	1000 College Circle Drive	Queenstown		
School-Public	Stevensville Middle School	610 Main Street	Stevensville		
School-Public	Kent Island Elementary School	110 Elementary Way	Stevensville		
School-Public	Kent Island High School	900 Love Point Road	Stevensville		
School-Public	Matapeake Elementary School	651 Romancoke Road	Stevensville		
School-Public	Matapeake Middle School & Kent Island 9th Grade Annex	671 Romancoke Road	Stevensville		

Source: Queen Anne's County Essential Facility Database

# Chapter 7 Severe Winter Weather

This section of the Plan describes the provides a severe winter storm profile, risk, and vulnerability for Queen Anne’s County and participating municipalities:

- 7.1 SEVERE WINTER WEATHER PROFILE
  - 7.1.1 Blizzards
  - 7.1.2 Heavy Snow
  - 7.1.3 Ice Storms
  - 7.1.4 Extreme Cold
- 7.2 SEVERE WINTER WEATHER RISK
- 7.3 SEVERE WINTER WEATHER RISK DATA
- 7.4 SEVERE WINTER WEATHER VULNERABILITY
  - 7.4.1 Essential Facility
  - 7.4.2 Vulnerable Populations

Severe winter storm was ranked as a medium-risk hazard for Queen Anne’s County, Chapter 2 Table 2-4.

## 7.1 Severe Winter Weather Profile

Severe winter weather can result in the closing of primary and secondary roads, particularly in rural locations, loss of utility services, and depletion of oil heating supplies. Environmental impacts often include damage to shrubbery and trees due to heavy snow loading, ice build-up, and/or high winds, which can break limbs or even bring down large trees. Gradual melting of snow and ice provides excellent groundwater recharge; however, high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flash flooding.

The State of Maryland has an extensive history of severe winter weather. In fact, Maryland has had seven Presidential Disaster and Emergency Declaration that included Queen Anne’s County, with the earliest declaration in 1993 and the most recent in 2016. Maryland’s most intense winter storms are oftentimes nor’easters. For nor’easters to occur in Maryland, an arctic air mass would 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; therefore, it funnels south down the valleys and along the Coastal Plain. Winds around the nor’easter’s center can become intense. The strong northeast winds that track the East Coast and inland areas give the storm its name. 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 while dragging more sand away from the beaches.

### 7.1.1 BLIZZARDS

Blizzards as defined by the National Weather Service, are a combination of sustained winds or frequent gusts of 35 mph or greater and visibilities of less than a quarter mile from falling or blowing snow for 3 hours or more. A blizzard, by definition, does not indicate heavy amounts of snow, although they can happen together. The falling or blowing snow usually creates large drifts from the strong winds. The reduced visibilities make travel, even on foot, particularly treacherous. The strong winds may also support dangerous wind chills. Ground blizzards can develop when strong winds lift snow off the ground and severely reduce visibilities.

### 7.1.2 HEAVY SNOW

Heavy snow, in large quantities, may fall during winter storms. Six inches or more in 12 hours or eight inches or more in 24 hours constitutes conditions that may significantly hamper travel or create hazardous conditions. The National Weather Service issues warnings for such events. Smaller amounts can also make travel hazardous, but in most cases, only results in minor inconveniences. Heavy wet snow before the leaves fall from the trees in the fall or after the trees have leafed out in the spring may cause problems with broken tree branches and power outages.

### 7.1.3 ICE STORMS

Ice storms develop when a layer of warm (above freezing), moist air aloft coincides with a shallow cold (below freezing) pool of air at the surface. As snow falls into the warm layer of air, it melts to rain, and then freezes on contact when hitting the frozen ground or cold objects at the surface, creating a smooth layer of ice. This phenomenon is called freezing rain. Similarly, sleet occurs when the rain in the warm layer subsequently freezes into pellets while falling through a cold layer of air at or near the Earth’s surface. Extended periods of freezing rain can lead to accumulations of ice on

roadways, walkways, power lines, trees, and buildings. Almost any accumulation can make driving and walking hazardous. Thick accumulations can bring down trees and power lines.

#### 7.1.4 EXTREME COLD

Extreme cold, in extended periods, although infrequent, could occur throughout the winter months in Queen Anne’s County. Heating systems compensate for the cold outside. Most people limit their time outside during extreme cold conditions, but common complaints usually include pipes freezing and cars refusing to start. When cold temperatures and wind combine, dangerous wind chills can develop. Wind chill is how cold it “feels” and is based on the rate of heat loss on exposed skin from wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature, and eventually, internal body temperature. Therefore, the wind makes it feel much colder than the actual temperature. For example, if the temperature is 0°F and the wind is blowing at 15 mph, the wind chill is -19°F. At this wind chill, exposed skin can freeze in 30 minutes. Wind chill does not affect inanimate objects. (National Weather Service)

## 7.2 Severe Winter Weather Risk

The science of meteorology and records of severe weather are not quite sophisticated enough to identify what areas of the county are at greater risk for damages. Therefore, all areas of the county are assumed to have the same winter weather risk countywide. Severe winter weather can cause hazardous driving conditions, communications and electrical power failure, community isolation and can adversely affect business continuity.



Figure 7-1

In Centreville, late Friday evening, Jan. 22, snow blankets this development with an abundance of the white stuff. The county reached about 15 inches total snowfall.

Source: [www.myeasternshorem.com/news/queen-annes-county/winter-storm-dumps-a-foot-of-snow-across-mid-shore/article\\_ae144523-c874-5794-8a20-491f94e97a70.html](http://www.myeasternshorem.com/news/queen-annes-county/winter-storm-dumps-a-foot-of-snow-across-mid-shore/article_ae144523-c874-5794-8a20-491f94e97a70.html) Photo by Jeff Straight 2016

### 7.3 Severe Winter Weather Data

According to National Centers for Environmental Information (NCEI) and local data, Queen Anne’s County has experienced various types of severe winter weather events, as detailed on Table 7-1.

<b>TABLE 7-1: SEVERE WINTER WEATHER EVENTS</b>				
<b>BLIZZARD – 2010-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
1	0	0	0	0.13
<b>FROST/FREEZE – 2007-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
1	0	0	0	0.09
<b>HEAVY SNOW – 1996-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
24	0	0	0	1.09
<b>SLEET – 1997-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
4	0	0	0	0.19
<b>WINTER STORM – 1996-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
22	1	1	320.00K	1
<b>WINTER WEATHER– 1996-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
74	0	0	0	3.36

Source: National Centers for Environmental Information (NCEI), Events through April 2018

Notable historic winter storms include the January 28<sup>th</sup>, 1969 storm. The 1969 winter storm was a devastating one, injuring 29 people as a result of an ice glaze. Another freezing rain/glaze event occurred on January 13<sup>th</sup>, 1971 and resulted in another 20 people injured. The “President’s Day Storm” of 1979 resulted in almost 2 million dollars of property damage. This storm was considered the worst storm in 57 years to strike the Baltimore-Washington area. Snow depths from the storm were up to 26 inches in Maryland. At times, the snow was falling 2 to 3 inches an hour and the temperatures were in the single digits to teens.

In addition to winter storm events, extreme cold events occur in the winter months affecting Queen Anne’s County. The National Weather Service (NWS) Wind Chill Temperatures (WCT) is based on the rate of heat loss from skin that is exposed to wind and cold temperatures. Hourly station data are obtained from the National Centers for Environmental Information's Integrated Surface Data (ISD) dataset (<ftp://ftp.ncdc.noaa.gov/pub/data/noaa/isd-lite/>). In this dataset observation times are Universal Time Coordinator (UTC), but maximum, minimum and average wind chill temperatures are calculated for local standard time days. The mean base period is 1981-2010, and the "feel cold" threshold is defined as the 15th percentile of daily January and February values in this same period. As the wind increases, the body is cooled faster, causing skin temperature to drop below that of the ambient air. In short, WCT is what it "feels like".

According to National Centers for Environmental Information (NCEI), Queen Anne’s County has experienced twenty-five cold/wind chill events, as detailed on Table 7-2.

TABLE 7-2: COLD/WIND CHILL – 1996-2017				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
25	0	0	100.00K	1.09

Source: National Centers for Environmental Information (NCEI), Events through April 2018

## 7.4 Severe Winter Weather Vulnerability

All structures and facilities located in Queen Anne’s County can be considered at risk from severe winter weather. This includes 100 percent of the County’s population and all buildings and infrastructure within the County. Damages primarily occur as a result of cold temperatures, and heavy snow or ice. Due to their regular occurrence, these storms are considered hazards only when they result in damage to specific structures or cause disruption to traffic, communications, electric power, or other utilities.

A winter storm can adversely affect roadways, utilities, business activities, and can cause loss of life, frostbite and freezing conditions. They can result in the closing of secondary roads, particularly in rural locations, loss of utility services and depletion of oil heating supplies. Most structures, including the county’s essential and other critical facilities, should be able to provide adequate protection the structures could suffer damage from snow load on rooftops and large deposits of ice. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out.

Risk to people from winter storm events include:

- Frostbite: A medical condition when the skin or body tissue is damaged from freezing. It’s most common in parts of the body farthest from your heart that are exposed, such as fingers, toes, ears and nose.
- Hypothermia: A sickness when your body temperature drops below what is needed to be healthy and work properly. It is the opposite of heat stroke.
- Carbon Monoxide: Deaths related to carbon monoxide are highest during colder months due in part to an increased indoor use of gas-powered furnaces and alternative heating and cooking sources during power outages. Sources that produce carbon monoxide include portable generators, propane, gas-powered stoves and grills, and charcoal briquettes.

A timely forecast may not be able to mitigate the property loss, but could reduce the casualties and associated injury. In severe winter storm events, buildings are vulnerable to widespread utility disruptions, including loss of heat and electricity, as well as building collapse or damage from downed trees.

Snow accumulation and frozen/slippery road surfaces also increases in the frequency and impact of traffic accidents for the general population, resulting in personal injuries. The Department of Public Works-Roads Division maintains approximately 556 miles of roads and 32 bridges. To facilitate timely snow removal, the county is divided into 22 snow plow routes.

**7.4.1 ESSENTIAL FACILITY VULNERABILITY**

All essential facilities were assessed to determine which, if any, had installed generators, and, if so, were the generators installed adequately sized. Those facilities without generators lack continuity of operation and resiliency. As noted on Table 7-3, there are many essential facilities without emergency back-up power.

Roof geometry affects the ability of structure to shed snow. Simple roofs with steep slopes shed snow most easily. Roofs with geometric irregularities and obstructions collect snowdrifts in an unbalanced pattern. These roof geometries include flat roofs with parapets, stepped roofs, saw-tooth roofs, and roofs with obstructions such as equipment or chimneys. Note: there are 17 essential facilities with flat roofs denoted on Table 7-3 and listed on 7-4.

TABLE 7-3: SEVERE WINTER WEATHER ESSENTIAL FACILITY VULNERABILITY					
FACILITY TYPE	FACILITY NAME	TOWN	GENERTAOR	ADEQUATELY SIZED	FLAT ROOF
EOC	QAC Department of Emergency Services	Centreville	Yes	No	Yes
Fire	Queen Anne-Hillsboro VFC #8	Queen Anne	Yes	Yes	No
Fire	Queenstown VFC #3	Queenstown	Yes	No	No
Fire	Church Hill VFC #5	Church Hill	Yes	Yes	No
Fire	Sudlersville VFC #6	Sudlersville	Yes	Yes	No
Fire	Goodwill VFC #4	Centreville	Yes	Yes	Yes
Fire	EMS Station 100	Stevensville	No	N/A	No
Fire	EMS Station 400	Centreville	No	N/A	No
Fire	EMS Station 300	Queenstown	Yes	Yes	No
Fire	EMS Station 600	Sudlersville	Yes	Yes	No
Fire	EMS Station 500	Church Hill	Yes	Yes	No
Fire	Grasonville VFC #2	Grasonville	Yes	Yes	No
Fire	Grasonville Vol Ambulance Dept. #20	Grasonville	Yes	Yes	No
Fire	Crumpton VFC #7	Millington	Yes	Yes	No
Fire	United Communities VFC #9	Stevensville	Yes	Yes	No
Fire	Kent Island VFC #1	Chester	Yes	Yes	No
Fire	EMS Station 200	Chester	No	N/A	No
Medical	QAC Department of Health	Centreville	Yes	No	No
Medical	QAC Department of Health Annex	Centreville	No	N/A	Yes
Medical	Shore Emergency Center Queenstown	Queenstown	MISSING DATA	MISSING DATA	No
Medical	UM Shore Medical Pavilion	Queenstown	MISSING DATA	MISSING DATA	No
Medical	AAMC Kent Island Pavilion	Chester	Yes	Yes	No
Police	Queen Anne's County Sheriff's Office	Centreville	Yes	Yes	No
Police	Maryland State Police - Barracks S	Centreville	Yes	Yes	Yes
Police	Sheriff's Office - Sudlersville Substation	Sudlersville	MISSING DATA	MISSING DATA	No
Police	Centreville Police Department	Centreville	No	N/A	Yes
Police	Sheriff's Office - Kent Narrows Substation	Chester	MISSING DATA	MISSING DATA	No
School-Private	The Gunston School	Centreville	MISSING DATA	MISSING DATA	Yes
School-Private	Wye River Upper School	Centreville	MISSING DATA	MISSING DATA	Yes
School-Private	Lighthouse Christian Academy	Stevensville	MISSING DATA	MISSING DATA	No
School-Private	Eastern Shore Jr. Academy	Sudlersville	MISSING DATA	MISSING DATA	Yes
School-Private	Shore Up Head Start	Grasonville	MISSING DATA	MISSING DATA	Yes
School-Private	Kiddie Academy of Kent Island	Stevensville	MISSING DATA	MISSING DATA	No
School-Public	Kennard Elementary School	Centreville	Yes	Yes	Yes

School-Public	Church Hill Elementary School	Church Hill	Yes	Yes	No
School-Public	Anchor Points Academy	Centreville	Yes	Yes	No
School-Public	Sudlersville Elementary School	Sudlersville	<b>No</b>	N/A	No
School-Public	Grasonville Elementary School	Grasonville	Yes	Yes	No
School-Public	Bayside Elementary School	Stevensville	Yes	Yes	<b>Yes</b>
School-Public	Queen Anne's County High School	Centreville	<b>No</b>	N/A	<b>Yes</b>
School-Public	Sudlersville Middle School	Sudlersville	Yes	Yes	No
School-Public	Centreville Elementary School	Centreville	Yes	Yes	<b>Yes</b>
School-Public	Centreville Middle School	Centreville	Yes	Yes	No
School-Public	Wye Research & Education Center	Queenstown	Yes	Yes	<b>Yes</b>
School-Public	Chesapeake College	Queenstown	Yes	Yes	<b>Yes</b>
School-Public	Stevensville Middle School	Stevensville	Yes	Yes	No
School-Public	Kent Island Elementary School	Stevensville	Yes	Yes	<b>Yes</b>
School-Public	Kent Island High School	Stevensville	Yes	Yes	<b>Yes</b>
School-Public	Matapeake Elementary School	Stevensville	Yes	Yes	No
School-Public	Matapeake Middle School	Stevensville	Yes	Yes	No

Source: 2018 Essential Facility Vulnerability Survey-Hazard Mitigation Planning Committee

Essential facilities built prior to modern building codes and/or aging may be at-risk to potential roof damage and/or collapse due to snow loads. Those facilities with flat roofs and year built are listed on Table 7-4. These facilities may be at-risk and should be considered for potential mitigation, as appropriate.

TABLE 7-4: ESSENTIAL FACILITIES WITH FLAT ROOFS & YEAR BUILT				
FACILITY TYPE	FACILITY NAME	TOWN	FLAT ROOF	YEAR BUILT
EOC	QAC Department of Emergency Services	Centreville	Yes	<b>1988</b>
Fire	Goodwill VFC #4	Centreville	Yes	<b>1946</b>
Medical	QAC Department of Health Annex	Centreville	Yes	<b>1979</b>
Police	Maryland State Police - Barracks S	Centreville	Yes	<b>1986</b>
Police	Centreville Police Department	Centreville	Yes	<b>1982</b>
School-Private	The Gunston School	Centreville	Yes	<b>1950</b>
School-Private	Wye River Upper School	Centreville	Yes	<b>1926</b>
School-Private	Eastern Shore Jr. Academy	Sudlersville	Yes	<b>1975</b>
School-Private	Shore Up Head Start	Grasonville	Yes	<b>1954</b>
School-Public	Kennard Elementary School	Centreville	Yes	<b>1952</b>
School-Public	Bayside Elementary School	Stevensville	Yes	<b>1991</b>
School-Public	Queen Anne's County High School	Centreville	Yes	<b>1978</b>
School-Public	Centreville Elementary School	Centreville	Yes	<b>1950</b>
School-Public	Wye Research & Education Center	Queenstown	Yes	<b>1991</b>
School-Public	Chesapeake College	Queenstown	Yes	<b>1979</b>
School-Public	Kent Island Elementary School	Stevensville	Yes	<b>1955</b>
School-Public	Kent Island High School	Stevensville	Yes	<b>1998</b>

Source: 2018 Essential Facility Vulnerability Survey-Hazard Mitigation Planning Committee

### 7.4.2 VULNERABLE POPULATIONS

Vulnerable populations, including those identified in Chapter 2, are considered most susceptible to the severe winter storm hazard. The high cost of fuel to heat residential homes can create a financial strain on populations with low or fixed incomes. In addition, low-income residents may not have

access to housing or their housing may be less able to withstand cold temperatures, such as, mobile homes and homes with poor insulation and heating supply. According to the most recent Maryland Property View, 2015, there are five hundred and ninety-one mobile homes located throughout Queen Anne’s County. The aging population has an increased risk of injuries and death due to falls and from overexertion and/or hypothermia from attempts to clear snow. In addition, severe winter storm events can reduce the ability of these populations to access emergency services.

# Chapter 8 Sea Level Change

This section of the Plan describes the provides an overall sea level change profile, risk, and vulnerability for Queen Anne’s County and participating municipalities:

- 8.1 SEA LEVEL CHANGE PROFILE
- 8.2 SEA LEVEL CHANGE RISK
- 8.3 SEA LEVEL CHANGE DATA
  - 8.3.1 Storm Surge
- 8.4 SEA LEVEL CHANGE VULNERABILITY- *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018*
  - 8.4.1 Public & Critical Facilities
  - 8.4.2 Evacuation Routes
  - 8.4.3 Residential Property
  - 8.4.4 Commercial Property
- 8.5 SEA LEVEL CHANGE ADAPTIVE STRATEGIES- *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018*
- 8.6 SEA LEVEL CHANGE VULNERABILITY- *Eastern Shore Land Conservancy-Risk Management For The 21<sup>st</sup> Century Floodplain*
  - 8.6.1 Vulnerability Analysis: Sea Level Scenarios
- 8.7 SEA LEVEL CHANGE MITIGATION STRATEGIES- *Eastern Shore Land Conservancy-Risk Management For The 21<sup>st</sup> Century Floodplain*
  - 8.7.1 Mitigation Strategy #1: Higher Floodplain Standards
  - 8.7.2 Mitigation Strategy #2: Nuisance Flooding Plan
  - 8.7.3 Mitigation Strategy #3: Post Disaster Redevelopment Plan

Sea Level Change was ranked as medium-risk hazard for Queen Anne’s County, Chapter 2 Table 2-4. In addition, Sea Level Change was added as a “new” hazard and was not identified in the previous plan.

## 8.1 Sea Level Change Profile

According to NASA Sea Level Change Observations from Space, the seas of the Earth are rising. The rising seas are a direct result of a changing climate. Ocean temperatures are increasing, leading to ocean expansion. As ice sheets and glaciers melt, they add more water.



Figure 8-1

Source: <https://sealevel.nasa.gov> Photo of sunrise over the ocean by NASA astronaut Reid Wiseman.

Queen Anne's County is susceptible to Sea Level Change (SLC) given the 400 miles of coastline, low elevation, and structures located within low-lying land areas. Sea level changes near coastlines include tides. Tides are a type of wave caused by the gravitational effects of the sun and moon, along with the Earth's rotation. Changes in tides, resulted in higher tides, may begin to cause flooding in coastal zones that were previously unaffected.

Storm surge is a higher-than-normal rise of coastal waters, above the astronomical high tide. A direct connection between climate change and individual storms remains difficult to prove globally, improved modeling and data has resulted in interesting results. One modeling study, *Modeling Sea Level Rise impacts on storm surges along US coasts; Claudia Tebaldi et al.* examined long-term data from 55 tide gauges along the coasts of the contiguous United States. The study's authors also used more detailed data from the gauges, from 1979 to 2008, to derive historic patterns of "extreme high water events." They combined those data with sea-level-rise projections to estimate potential storm surge effects through the middle of the 21<sup>st</sup> century.

By 2050, the authors reported, their modeling showed some of the gauge locations would see high-water events yearly that, today, are considered likely to occur once a century (having a one percent chance of occurring in any given year). Once-a-century events, meanwhile, would become decadal (a 10 percent chance of occurring in any given year). Most locations would experience a higher

frequency of storm surge events once considered rare, the study says.

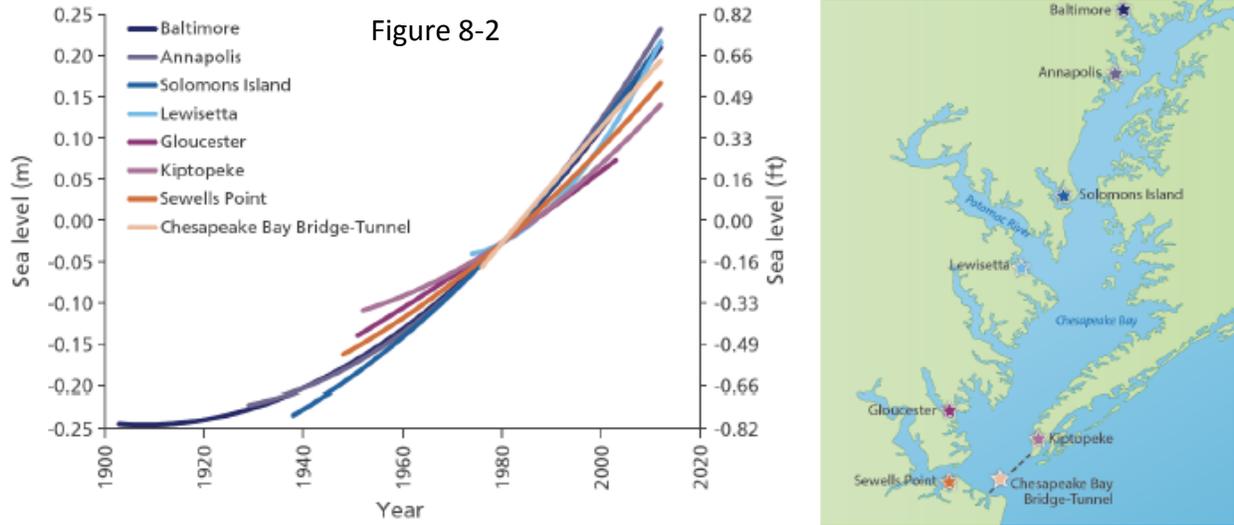
According to the *Maryland Commission on Climate Change 2017 Annual Report*, Maryland is facing consequences of climate change including, but not limited to:

- Changes expected to negatively impact coastal, bay, and inland water quality parameters and potentially change the viable uses of surface water, such as irrigation, recreation, or human consumption;
- More frequent disruptions to urban and coastal infrastructure in Maryland caused by extreme weather events and sea level rise that may indirectly impact the economy of the region by restricting the flow of goods and affecting days worked;
- Common stressors experienced among ecosystems, agriculture, fisheries and forestry, such as those caused by general changes in temperature and precipitation regimes; increased extreme weather events; and increased pressures from weeds, diseases and pests;
- Changes in the severity, frequency, or distribution of human health issues which are affected either directly or indirectly by climate, including impacts on food and water supply, air quality, and extreme weather events; and,
- A higher probability of negative outcomes for individuals and communities inherently more sensitive or with a reduced adaptive capacity for responding to the impacts of climate change.

Projections from the Third National Climate Assessment of the U.S. Global Change Research Program indicate that the Northeastern U.S. is actually experiencing a rate of sea level rise greater than the global or national average. In its 2016 Annual Report, the Maryland Commission on Climate Change (MCCC) projected likely sea level rise in Maryland between 2.2 and 4.1 feet, in 2050 and 2100 respectively, with unrestrained growth in global emissions. According to the MCCC, this puts the people and infrastructure of Maryland's extensive coastline at increased risk of damage from hazards such as flooding, salt-water intrusion, storm surge, and erosion.

## 8.2 Sea Level Change Risk

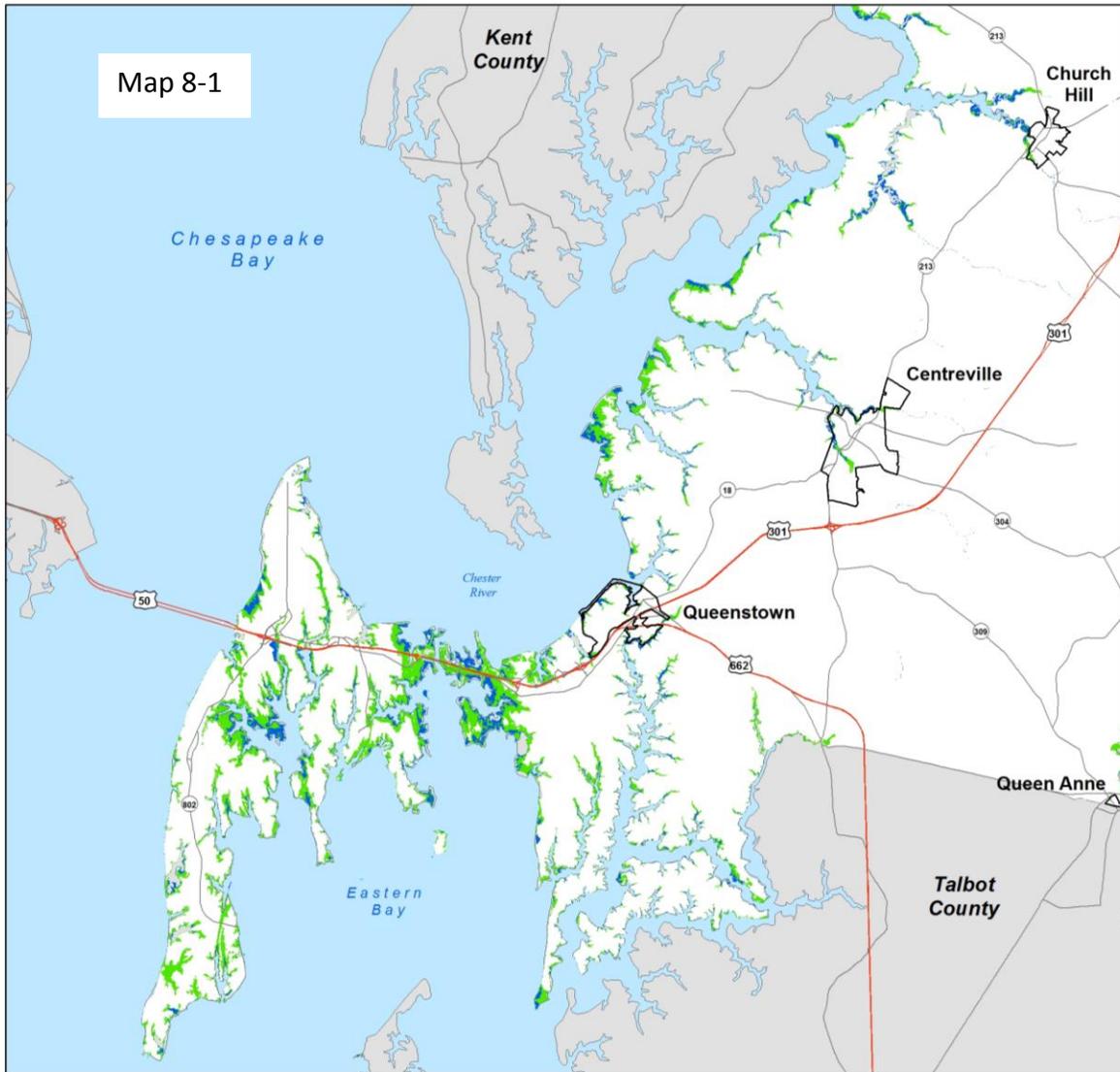
Sea level trends have been recorded by tide stations, which measure the height of water referenced to a stable point on land with a known elevation (benchmark). Tide stations are primarily installed for navigational purposes and their data are used to make tide predictions. Tide gauges indicate that the change in the local mean sea level in Maryland is greater than the global sea level rate. The rate of change recorded at the tide gauge in Annapolis, Maryland is 0.14 inches per year (or 14 inches over 100 years), as compared to global rate of 0.07 inches per year. This difference is due to the vertical movement, land subsidence, of the Earth's crust, which is causing the land in the Mid-Atlantic to slowly sink. This combined motion of the land and the sea is recorded by various tide stations. Detailed analysis of Sea Level Rise (SLR) trends as measured by tide gauges along the Mid-Atlantic coast consistently show that sea level has been rising faster in the Mid-Atlantic region than elsewhere along the Atlantic coast and that the rate of SLR began to increase in the late 1980s. Figure 8-1 depicts trends in relative sea level at tide gauges around the Chesapeake Bay. Map 8-1 and 8-2 depicts projected 2050 & 2100 Sea Level Rise Change.



Source: Scientific and Technical Working Group Maryland Climate Change Commission, *Updating Maryland's Sea-level Rise Projections*, 2013

Projected 2050 & 2100 Sea Level Change

Map 8-1

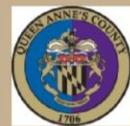


Legend

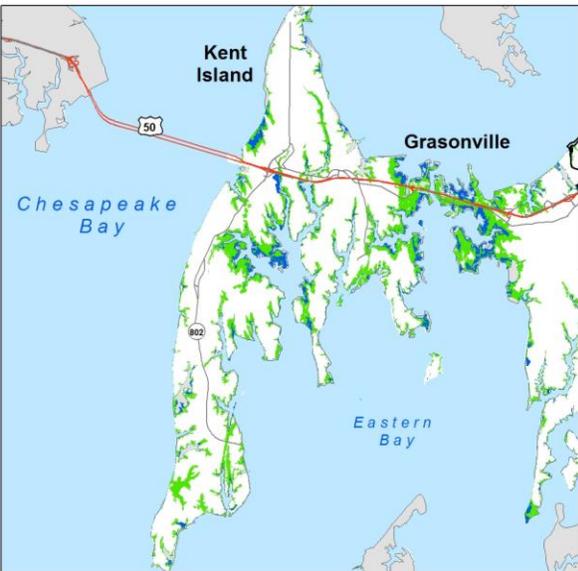
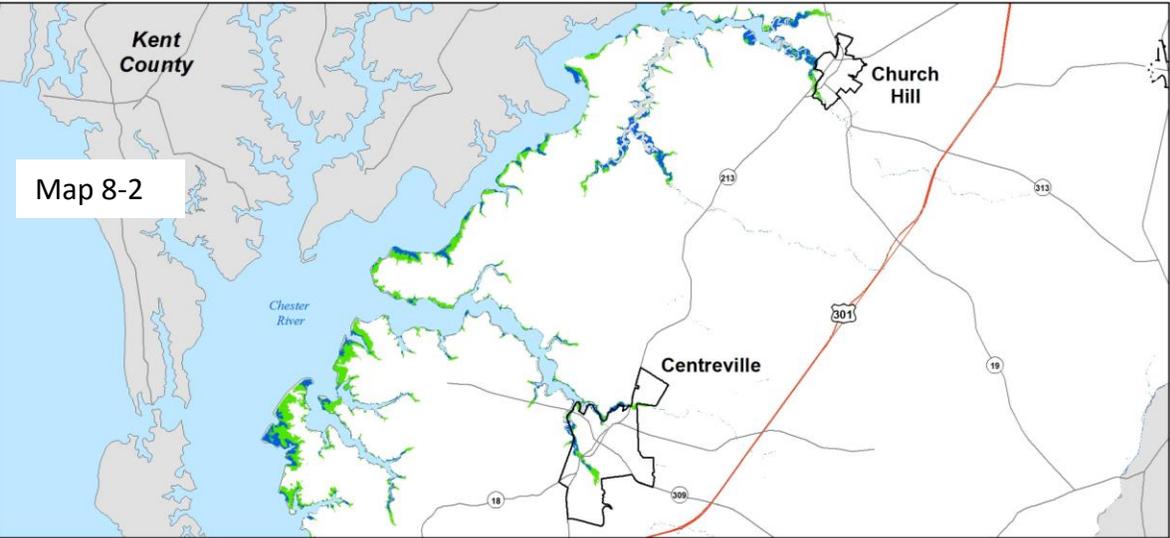
- 2050 Mean Sea Level Change - Projected 2.08 Feet Increase
- 2100 Mean Sea Level Change - Projected 5.7 Feet Increase
- Queen Anne's County
- Maryland Routes
- US Routes
- Municipalities

Data Sources:

- 2050 & 2100 Sea Level Change:
  - State Highway Administration, Salisbury University, NOAA, USACE, USGS, MD iMAP
  - Effective Date: 11/2016
- Queen Anne's County IT:
  - GIS-Mapping Department
  - GIS Data Download



**Projected 2050 & 2100 Sea Level Change**



<b>Legend</b>		Data Sources:	
	2050 Mean Sea Level Change - Projected 2.08 Feet Increase		Maryland Routes
	2100 Mean Sea Level Change - Projected 5.7 Feet Increase		US Routes
	Queen Anne's County		Municipalities

2050 & 2100 Sea Level Change:  
 - State Highway Administration, Salisbury University, NOAA, USACE, USGS, MD iMAP  
 - Effective Date: 11/2016

Queen Anne's County IT:  
 - GIS-Mapping Department  
 - GIS Data Download



0 1.25 2.5 5 Miles




## 8.3 Sea Level Change Risk Data

The MCCC's 2013 Scientific and Technical Working Group (STWG) assessment resulted in providing the best, low, and high projections of relative SLR in Maryland for 2050 and 2100 based on contributions of thermal expansion of the ocean, land-ice loss in glaciers and polar ice caps, vertical land movement (land subsidence) in the Mid-Atlantic, and regional ocean dynamics of the Chesapeake Bay.

**TABLE 8-1: SCIENTIFIC AND TECHNICAL WORKING GROUP MARYLAND RELATIVE SEA LEVEL RISE PROJECTIONS**

MARYLAND RELATIVE SRL	RELATIVE SRL (METERS)	RELATIVE SRL (FEET)
2050 Best	0.4	1.4
2050 Low	0.3	0.9
2050 High	0.7	2.1
2100 Best	1.1	3.7
2100 Low	0.7	2.1
2100 High	1.7	5.7

*Source: Scientific and Technical Working Group Maryland Climate Change Commission, Updating Maryland's Sea-level Rise Projections, 2013*

### 8.3.1 STORM SURGE

As sea levels rise, temporary flooding from coastal storm events may become more widespread. As sea levels increase, so do the storm surge heights generated by a given storm. An increased storm surge height, combined with resulting loss of tidal wetlands that provide natural flood protection may result in increased flood depths and erosive forces in already flood-prone areas. It may also cause flooding in areas further inland that have not previously been flood-prone.

While increased storm surge heights and flooding is an important consideration for understanding the potential range of effects caused by SLR, modeling specific storm surge impacts countywide is a complicated and resource-intensive undertaking that was outside the scope of this assessment. For this reason, the 100-year storm surge elevation for QACO as reported by FEMA in their 2014 Flood Insurance Study (FIS), averaged Countywide, is used in this assessment to assess the vulnerability of several resources. Table 8-2 summarizes the range of storm surge stillwater elevations for the 10-Percent-Annual-Chance (10-Year), 2-Percent-Annual-Chance (50-year), 1-Percent-Annual-Chance (100-Year), and 0.2-Percent-Annual-Chance (500-Year) floods from the FEMA FIS based on tidal and wind setup effects. It is important to note that the 100-Year storm event does not imply that this magnitude of storm will only occur once every one hundred years but that it is a storm that statistically has a one-percent chance of occurring in any given year. All elevations are reported in feet and reference the North American Vertical Datum of 1988 (NAVD88).

**TABLE 8-2: FEMA COASTAL STORM SURGE STILLWATER ELEVATIONS**

FLOODING SOURCE AND LOCATION	10-YEAR	50-YEAR	100-YEAR	500-YEAR
<u>Chester River</u> From the mouth of the Corsica River to Kent Narrows	3.8-4.2	4.4-4.9	4.6-5.1	5.5-6.2
<u>Chesapeake Bay</u> From Kent Narrows to William Preston Lane, Jr. Memorial Bridge	3.7-3.9	4.2-4.5	4.4-4.7	5.4-5.7

<u>Chesapeake Bay</u> From to William Preston Lane, Jr. Memorial Bridge to the mouth of the Eastern Bay	3.5-3.7	4.0-4.2	4.3-4.4	5.1-5.4
<u>Crab Alley</u> Entire Shoreline	3.7-3.9	4.2-4.4	4.4-4.6	5.6-6.0
<u>Eastern Bay</u> From the mouth to the mouth of Crab Alley Bay	3.5-3.9	4.1-4.2	4.4-4.6	5.6-6.0
<u>Eastern Bay</u> From the mouth of Prospect Bay to Bennett Point	3.7-3.8	4.2-4.3	4.4-4.5	5.4-5.8
<u>Prospect Bay</u> Entire Shoreline	3.8-3.9	4.3-4.5	4.5-4.8	5.5-6.4

Source: FEMA Flood Insurance Study (FIS)

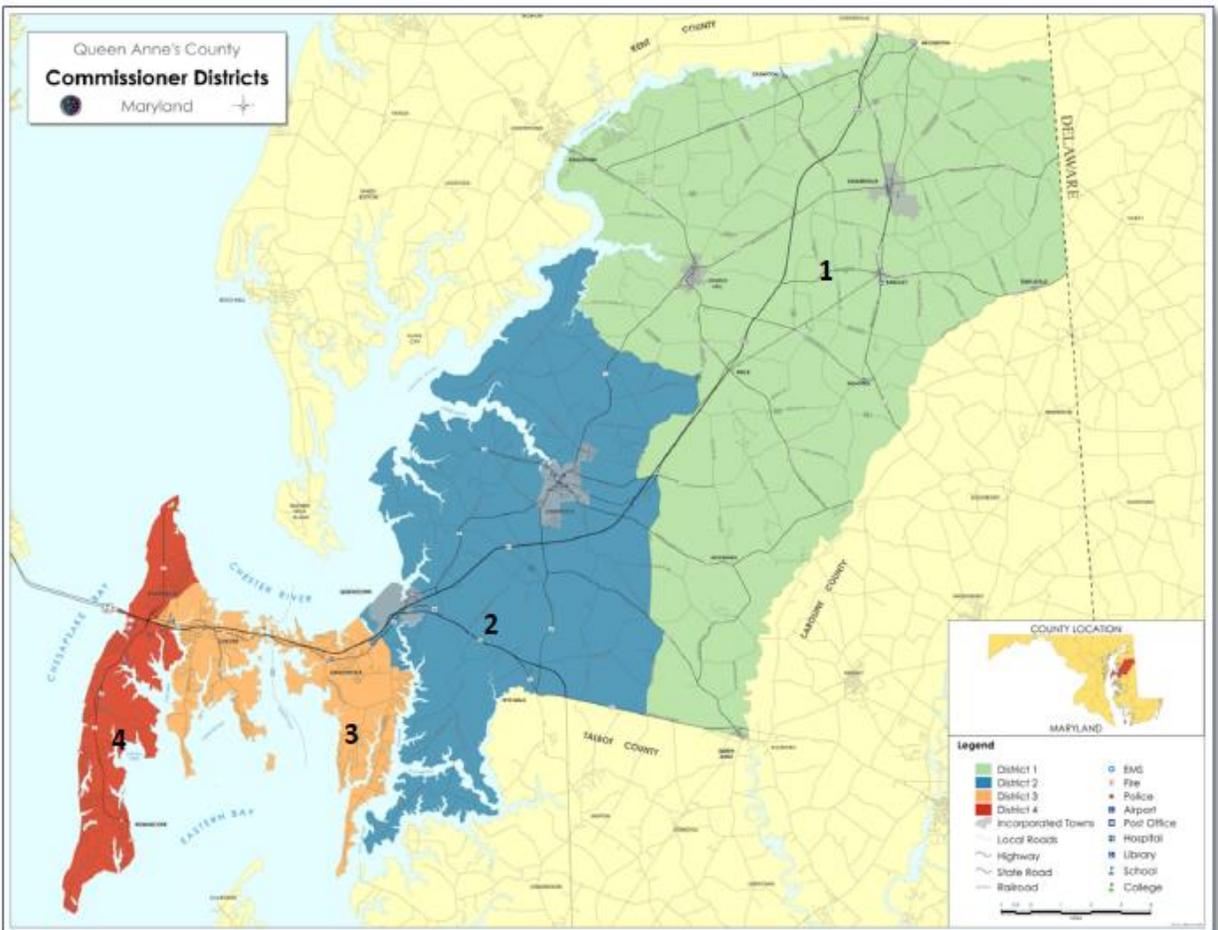
It should also be noted that the effects of wave heights associated with coastal storm surge flooding are not represented in this study. FEMA’s FIS indicates a range of significant wave heights from 0.5 feet in the upper portions of the Chester River and Cox Creek to 4.7 feet along the western shore of Eastern Bay. Generally, within the County, greater wave heights are expected where water depth is greater and fetch length is longer such as in the Chesapeake Bay and Eastern Bay where the coastline is more prone to damaging wave action during high wind events due to the significant fetch over which winds can operate. From the mouth of the Chester River further upstream, the fetch considerably shortens to be within the river channel, therefore lower wave heights are anticipated.

## 8.4 Sea Level Change Vulnerability- Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018

In July of 2014, the Maryland Smart Growth Sub Cabinet granted Queen Anne’s County (QACO) a Priority Funding Area (PFA) exception to extend sewer service to nine communities located on Southern Kent Island (SKI). The project will provide public sewer to more than 1,200 existing homes and more than 600 vacant lots to alleviate the significant public health and environmental concern caused by the existing/ failing septic systems penetrating groundwater. As a condition of the SKI project, the Maryland Smart Growth Sub Cabinet required a sea level rise and coastal vulnerability assessment to be prepared. The assessment entitled *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018* was prepared through the Coast Smart Communities Grant (CCG) administered by the Maryland Department of Natural Resources (DNR). The objective of the assessment was to identify the impacts of SLR and coastal flooding, as well as build and/or plan the resiliency of the County to withstand sea level rise and future storms.

According to *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018*, four study areas were identified and included for mapping purposes. The four study areas match the County’s Commissioner Districts (CCD) for ease of mapping (i.e., CCD 1 = Study Area 1, etc.). Figure 8-3 shows a map of the County’s Commissioner Districts (from QACO Comprehensive Plan).

Figure 8-3



### Study Area 1

Study Area 1 is located in the north and east portions of the County covering approximately 213 square miles. Although this portion of the County is generally higher in elevation, tidally-influenced coastline exists along reaches the Chester River, Island Creek, Southeast Creek, and Tuckahoe Creek. Of the total land area in Study Area 1, 0.5% and 0.8% is vulnerable to SLR of 2 feet and 4 feet respectively.

### Study Area 2

Study Area 2 is located in the central portion of the County covering approximately 113 square miles. Tidally-influenced coastline exists along reaches of the Chester River, Wye River and their tributaries. Of the total land area in Study Area 2, 2.5% and 3.7% is vulnerable to SLR of 2 feet and 4 feet respectively.

### Study Area 3

Study Area 3 is located generally in the western portion of the County covering approximately 24 square miles. Tidally-influenced coastline exists along reaches of the Chester River, Wye River, Eastern Bay, Prospect Bay, Crab Alley Bay, and their tributaries. Of the total land area in Study Area 3, 13.7% and 22.8% is vulnerable to SLR of 2 feet and 4 feet respectively.

#### Study Area 4

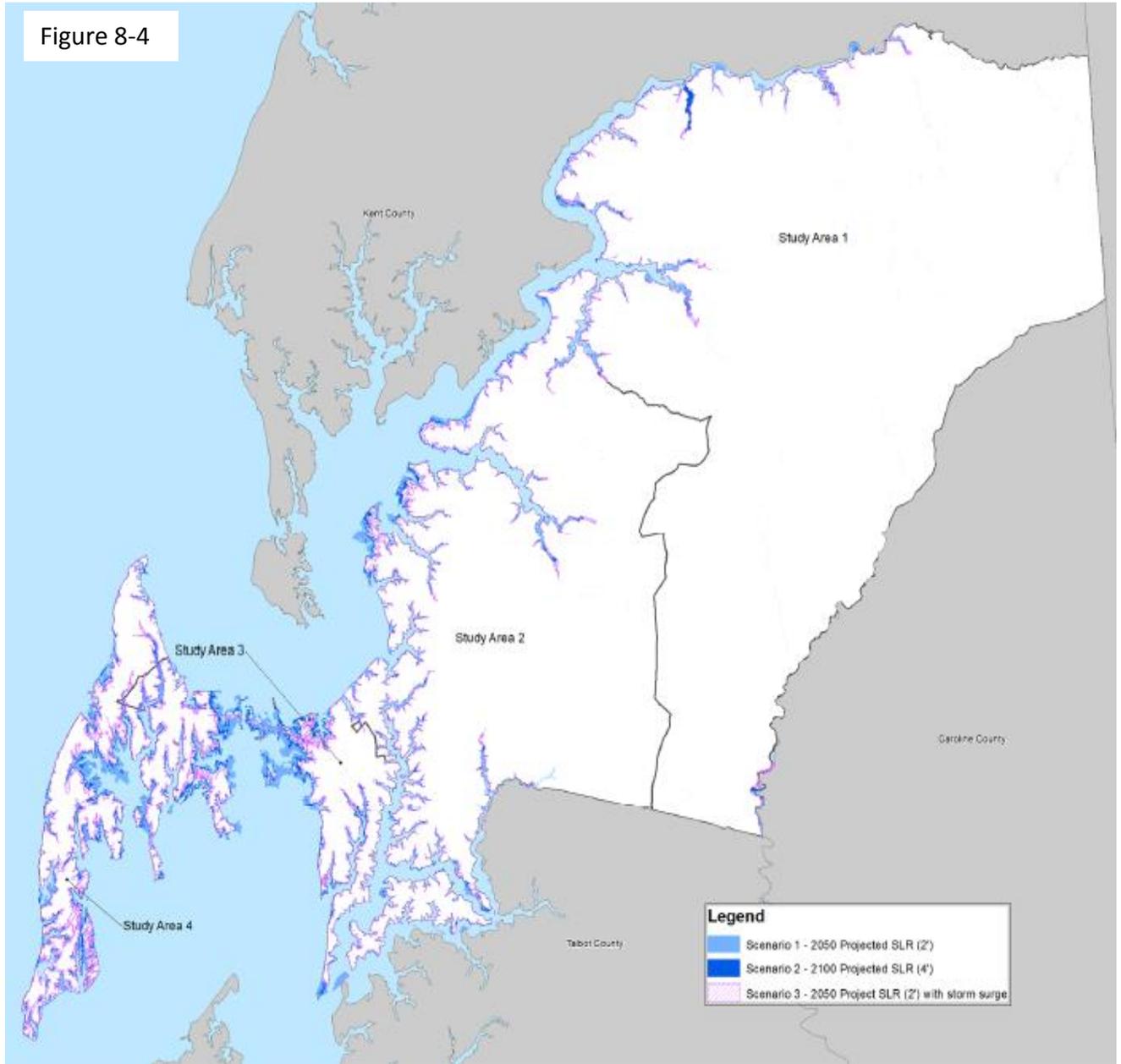
Study Area 4 is located in the far west portion of the County. It includes the western portion of Kent Island and covers approximately 21 square miles. Tidally-influenced coastline exists along reaches of the Chesapeake Bay, Chester River, Eastern Bay and their tributaries. Of the total land area in Study Area 4, 11.1% and 18.9% is vulnerable to SLR of 2 feet and 4 feet respectively.

Three SLR and storm surge scenarios were mapped to identify areas of vulnerability and risk in the County were utilized:

1. SLR of 2 feet plus Mean Higher High Water (MHHW)
2. SLR of 4 feet plus MHHW
3. SLR of 2 feet plus MHHW plus coastal storm surge

The three scenarios are displayed on Figure 8-4.

Between 2.6% and 4.1% of the County's land area could be impacted by a SLR of two feet (2') to four feet (4'), respectively and 6.3% of the County's land area could see increased temporary impacts by two feet of SLR plus coastal storm surge.



Source: Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018

**8.4.1 PUBLIC & CRITICAL FACILITIES**

Results of the SLR and Coastal Vulnerability Assessment indicated that inundation from SLR will affect a range of resources, including infrastructure, land use, and natural resources, as well as increase the risk to public safety. In addition to the three SRL and storm surge scenarios mapped in the *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018*, a comprehensive list of assessed countywide resources and their associated impacted were provided, shown on Figures 8-5 & 8-6.

Figure 8-5

Resource	Units	Total Number Countywide	Number Impacted by Coastal Vulnerability Scenarios			Concern
			Scenario 1	Scenario 2	Scenario 3 <sup>2</sup>	
Emergency Service Facilities	Properties <sup>1</sup>	52	5	9	18	High
Emergency Service Facilities	Buildings	52	0	1	5	High
Evacuation Routes	Miles	258.3	1.4	4.2	8.1	High
Roadways	Miles	1,077.4	3.6	22.7	62.0	Moderate
Schools	Properties <sup>1</sup>	38	1	4	9	Low
Schools	Buildings	38	0	0	0	Low
Wastewater Treatment Plants	Properties <sup>1</sup>	5	3	4	4	High
Sewer Stations	Stations	31	2	13	16	High
Water Treatment Plants	Properties <sup>1</sup>	11	1	3	3	Moderate
Fire Hydrants	Each	393	8	30	68	Low
Dams	Each	19	0	0	2	Low
Catch Basins	Each	652	18	56	113	High
Culverts	Each	784	76	142	272	High
Concrete Drains	Each	17,710	430	1,337	2,902	High
Storm Drains	Segment	345	8	17	51	High
Drop Inlets	Each	524	30	96	143	High
Manholes	Each	1,112	12	71	173	High
Pipes	Segment	117	4	11	28	High
Stormwater Ponds	Each	415	27	60	90	Moderate

Source: *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018*

Figure 8-6

Resource	Units	Total Number Countywide	Number Impacted by Coastal Vulnerability Scenarios			Concern
			Scenario 1	Scenario 2	Scenario 3 <sup>2</sup>	
Sub Stations	Each	8	0	0	0	Low
Transformers	Each	8	0	0	0	Low
Lamp Posts	Each	1269	18	132	304	Moderate
Light Poles	Each	2625	76	214	423	Moderate
Traffic Signal Poles	Each	21	0	0	0	Low
Utility Poles	Each	18,303	277	807	1,589	Moderate
Utility Boxes	Each	378	2	22	63	Moderate
Telecommunication Towers	Each	47	2	3	4	High
Private Residential Property	Properties <sup>1</sup>	21,316	1,412	4,732	6,538	High
Private Residential Property	Buildings	19,553	64	990	2,785	High
Commercial Development	Properties <sup>1</sup>	2,429	709	854	1,064	High
Commercial Development	Buildings	1,642	36	96	192	High
NWI Wetlands	Acres	27,337	3,606	4,211	4,780	High
DNR Wetlands	Acres	55,446	6,794	8,351	9,601	High
Critical Area	Acres	4,034	507	822	1,256	High
Agricultural Land	Acres	181,040	2,998	4,739	7,258	High

<sup>1</sup> Property impacts may only represent a portion of the property

<sup>2</sup> Scenario 3 may only represent a temporary impact of certain resources without long-term impacts

Source: *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018*

Emergency service facility data was obtained from QACO for the inclusion into the *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018*. There are no impacts to emergency service facility buildings or properties in Study Area 1.

In Study Area 2, the following facilities are affected:

- The Wye Research and Education Center property, which is designated as a temporary emergency shelter, is impacted by Scenarios 1 and 2; however, the building itself is not impacted by either SLR scenario.
- The Agriculture Center University of Maryland Research property, which is also designated as a temporary emergency shelter, is impacted by Scenarios 1 and 2; however, the impacts are located in a wooded section of the property. The building itself is not impacted by either SLR scenario.

In Study Area 3, the following facilities are affected:

- QACO Sheriff Kent Narrows Substation property is impacted by Scenarios 1 and 2; however, the building itself is not impacted by either SLR scenario.

- EMS Station 200 property will be impacted by Scenarios 1 and 2 and the building will be impacted by Scenario 2. In addition, the entrance to the facility and several surrounding roads are impacted.
- The Stevensville Middle School property, which is designated as a temporary emergency shelter, is impacted by Scenarios 1 and 2; however, the building itself is not impacted by either SLR scenario.
- The Bayside School and Grasonville Senior Center properties, which are designated as temporary emergency shelters, are impacted by Scenario 2; however, the buildings are not impacted by either SLR scenario.

In Study Area 4, the following facilities are affected:

- EMS Station 100 property is impacted by Scenario 2; however, the station is located on a large, County-owned parcel and the impacts are not in the proximity of the building.
- The Matapeake Elementary School and Middle School properties, which are designated as emergency shelters, are impacted by Scenario 2; however, the building itself is not impacted by either SLR scenario and the property impacts are limited to the northern periphery of the property.

#### 8.4.2 EVACUATION ROUTES

Evacuation routes have been identified throughout the County for the immediate and urgent movement of residents away from the threat or occurrence of a hazard such as an approaching weather system. The Delmarva Emergency Task Force (DETF) has determined primary and secondary emergency evacuation routes for the Delmarva Peninsula, including QACO. The identified routes within the County include Routes 8, 18, 19, 50, 213, 290, 300, 301, 302, 304, 309, 313, 405, 481, 544, and various connected local roads. The evacuation route dataset was obtained from the Maryland State Highway Administration (SHA).

Figure 8-7 provides a summary of impacted evacuation routes (both primary and secondary combined) by miles of roadway and percent of total resource. Evacuation route impacts are primarily located at bridges adjacent to tributaries of the Chester River as well as coastal waters of the Chesapeake Bay. It is difficult to determine the actual impacts to the bridge structures and roadway as the Light Detection and Ranging (LiDAR) data does not include bridge deck elevations.

Figure 8-7

Study Area	Total Miles	Miles Impacted by Coastal Vulnerability Scenarios		Percent of Total Impacted by Coastal Vulnerability Scenarios	
		Scenario 1	Scenario 2	Scenario 1	Scenario 2
1	139.6	0.22	0.25	0.16	0.18
2	69.7	0.02	0.14	0.03	0.20
3	27.8	1.02	3.06	3.67	11.02
4	21.3	0.12	0.73	0.56	3.43
Countywide	258.3	1.38	4.18	0.53	1.62

Source: Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018

The following describe known impacts to evacuation routes based on roadway elevations not associated with bridges.

In Study Area 2 roadway impacts occur at MD 213 in the Town of Centreville where Scenario 2 inundates a portion of the roadway near the Mill Stream Branch crossing. MD 18 is inundated by both SLR scenarios in the Town of Queenstown near Thompson Avenue.

In Study Area 3 portions of MD 18 are impacted near Gravel Run Road in Scenario 2 and much of the roadway near the Kent Narrows and Cox Creek areas to varying stages in both Scenarios 1 and 2.

In Study Area 4 significant impacts to MD 8 occur in Scenario 2 near Broad Creek, effectively cutting off transportation to the southern portion of Kent Island. Route 8 is also impacted at Carter Creek and Holligans Snooze Inlet in Scenario 2.

**8.4.3 RESIDENTIAL PROPERTY**

In addition to assessing vulnerability of public and critical facilities, the *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018*, Figure 8-8 summarizes the number and percent of private residential properties vulnerable to SLR & coastal storms.

Figure 8-8

Study Area	Total Number	Number Impacted <sup>1</sup> by Coastal Vulnerability Scenarios		Percent of Total Impacted <sup>1</sup> by Coastal Vulnerability Scenarios	
		Scenario 1	Scenario 2	Scenario 1	Scenario 2
1	5,082	407	438	8.0	8.6
2	4,304	398	454	9.2	10.5
3	5,688	1,509	1,839	25.2	30.7
4	45,942	1,412	2,001	23.8	33.7
Countywide	21,316	1,412	4,732	16.3	22.2

<sup>1</sup> Note that impacts may only represent a portion of the property

Source: *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018*

Note that the buildings dataset includes detached garages, sheds, and other out-buildings and multiple buildings may pertain to one parcel. Impacts to detached garages or other out buildings were not considered to be residential impacts, only building that intersected address points with a residential classification were considered for residential building impacts. Additionally, the impacts shown in Figure 8-8 are based on lateral extents of the buildings and SLR and storm surge inundation scenarios to show vulnerability. Elevations of the first floor of the buildings are not available and have not been evaluated. Buildings built on piers, or otherwise elevated, may not be impacted by the SLR and coastal storm surge scenarios.

**8.4.4 COMMERCIAL PROPERTY**

In addition to assessing vulnerability of residential property, the *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018*, Figure 8-9 summarizes the number and percent of commercial properties vulnerable to SLR.

Figure: 8-9

Study Area	Total Number	Number Impacted <sup>1</sup> by Coastal Vulnerability Scenarios		Percent of Total Impacted <sup>1</sup> by Coastal Vulnerability Scenarios	
		Scenario 1	Scenario 2	Scenario 1	Scenario 2
1	378	13	14	3.4	3.7
2	497	39	48	7.8	9.7
3	790	245	350	31.0	44.3
4	261	54	74	20.7	28.4
Countywide	1,926	351	486	18.2	25.2

<sup>1</sup> Note that impacts may only represent a portion of the property

Source: Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018

## 8.5 Sea Level Change Adaptive Strategies- Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018

Adaptive strategies specific to sea level change were developed and summarized within the *Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan-March 2018*. Avoid, accommodate, retreat, protect, and build adaptive capacity strategies can be undertaken simultaneously to meet the goals of reducing vulnerability to SLR and coastal flooding and increasing resiliency of County resources. These strategies were further categorized as short-term, mid-term, and long-term. Tables 8-3 thru 8-5 include these strategies.

TABLE 8-3: PUBLIC SAFETY & INFRASTRUCTURE SHORT-TERM ADAPTATION STRATEGIES	
<b>AVOID</b>	Increase building setback distances
	Identify opportunities for voluntary conservation easements
	Create elevated County review procedures for projects in vulnerable areas
	Evaluate process for transfer of development rights
	Coordinate with private utility companies to incorporate SLR
	Encourage FEMA to update Flood Insurance Rate Maps (FIRMs) to include SLR and re-map riverine flooding with SLR effects
	Encourage FEMA to update FIRMs to include storm surge modeling based on SLR
<b>ACCOMMODATE</b>	Improve emergency evacuation plans based on SLR projections
	Evaluate boat transportation emergency routes to areas isolated by inundation
	Flood-proof at-risk structures
	Evaluate regulatory incentives that encourage SLR and coastal flooding adaptation
	Evaluate mobile capabilities and mutual aid backup of emergency services
<b>PROTECT</b>	Evaluate feasibility of levees and other structural measures to protect vulnerable areas
	Identify targeted areas to be protected
	Evaluate and determine regulatory elevations for vulnerable areas
	Coordinate SLR adaptation with SHA
	Evaluate elevation of critical component elevations of WWTP & WTP transmission facilities
	Coordinate development and Capital Improvement plans to address as many affected resources as possible
<b>RETREAT</b>	Identify areas of high vulnerability
	Evaluate relocation potential of structures and infrastructure in vulnerable areas
	Evaluate feasibility of land acquisition of vulnerable parcels
	Purchase frequently flooded areas and remove structures
<b>BUILD ADAPTIVE CAPACITY</b>	Improve coordination with Federal, State, and Local officials
	Create new partnerships to increase resources for research and development of adaptation options
	Conduct comprehensive inventory of funding mechanisms, regulations, and policies to remove barriers to SLR adaptation
	Provide technical assistance to local governments, business owners, and residents
	Develop a prioritization plan of adaptation actions
	Evaluate socio-economic impact of SLR
	Participate in FEMA’s Community Rating System and employ CRS activities

TABLE 8-4: PUBLIC SAFETY & INFRASTRUCTURE MEDIUM-TERM ADAPTATION STRATEGIES	
<b>AVOID</b>	Implement conservation easements
	Monitor set-back requirements
	Limit or prohibit new infrastructure in vulnerable areas
	Implement transfer of development rights
	Require private utilities to build new infrastructure outside of vulnerable areas
	Incorporate new studies from FEMA and updated FIRMs
<b>ACCOMMODATE</b>	Develop plans for mobilization of emergency management services
	Require additional freeboard of new homes above the base flood elevation
	Incorporate regulatory incentives for innovative projects that adapt to SLR and coastal flooding
	Improve boat access for emergency evacuation services
<b>PROTECT</b>	Require roads to be elevated to provide access to new development and targeted protection areas
	Require new development to protect against regulatory elevations in vulnerable areas
	Evaluate impacts to adjacent properties from adaptation actions
	Coordinate elevation of evacuation routes/ bridges with SHA
	Retrofit wastewater and water treatment/ transmission facilities as needed
Elevate wastewater manholes above anticipated SLR and flood elevations to prevent inundation	
<b>RETREAT</b>	Create a special funding mechanism for purchase of frequently flooded structures
	Purchase frequently flooded areas and remove structures
	Implement rolling easements
<b>BUILD ADAPTIVE CAPACITY</b>	Engage public participation in adaptation decisions
	Implement cost-sharing projects with State and Federal agencies
	Update Multi-Jurisdictional Hazard Mitigation Plan, Floodplain Management Plan, Zoning Ordinance, Comprehensive Plan, and Capital Improvement Plan to address SLR
	Continue FEMA's CRS program and employ CRS activities
	Identify grant opportunities to incorporate SLR adaptation projects

TABLE 8-5: PUBLIC SAFETY & INFRASTRUCTURE LONG-TERM ADAPTATION STRATEGIES	
<b>AVOID</b>	Continue monitoring setback compliance & conservation easements
	Continue limiting or prohibiting new resources in vulnerable areas Construct new infrastructure projects above the vulnerable elevation areas
<b>ACCOMMODATE</b>	Continue monitoring regulatory incentives for projects incorporating SLR
	Construct new infrastructure projects above the vulnerable elevation
<b>PROTECT</b>	Elevate roadways in targeted protection areas
	Retrofit WWTP & WTP facilities, as needed
	Adjust adaptation actions to protect adjacent properties
<b>RETREAT</b>	Purchase frequently flooded areas and remove structures
	Monitor rolling easement compliance
	Remove structures that prevent shoreline movement
<b>BUILD ADAPTIVE CAPACITY</b>	Evaluate adaptive capacity and adapt as necessary
	Create new partnerships to increase resources for research and development of Develop framework for decision making regarding land protection and restoration strategies adaptation options
	Employ FEMA CRS activities

## 8.6 Sea Level Change Vulnerability- Eastern Shore Land Conservancy-Risk Management For The 21<sup>st</sup> Century Floodplain

Brian Ambrette, Eastern Shore Land Conservancy (ESLC), presented results of a recent planning initiative undertaken by the ESLC in coordination with the Eastern Shore Climate Adaptation Partnership (ESCAP) at the August 15, 2018 meeting of the Hazard Mitigation Planning Committee (HMPC). During the meeting, Mr. Ambrette provided information on flood risk planning scenarios and potential mitigation strategies. HMPC members were able to review and discuss this information during the meeting. Highlights from the presentation have been incorporated herein.

The Eastern Shore Climate Adaptation Partnership (ESCAP) was established in 2016 to assist vulnerable communities with preparing for climate change impacts. The partnership is an informal regional collaboration of staff from seven local governments, state agencies, academic institutions, and nonprofit organizations.

### 8.6.1 VULNERABILITY ANALYSIS: SEA LEVEL SCENARIOS

#### Planning for the next flood-not the last

The vulnerability analysis conducted included:

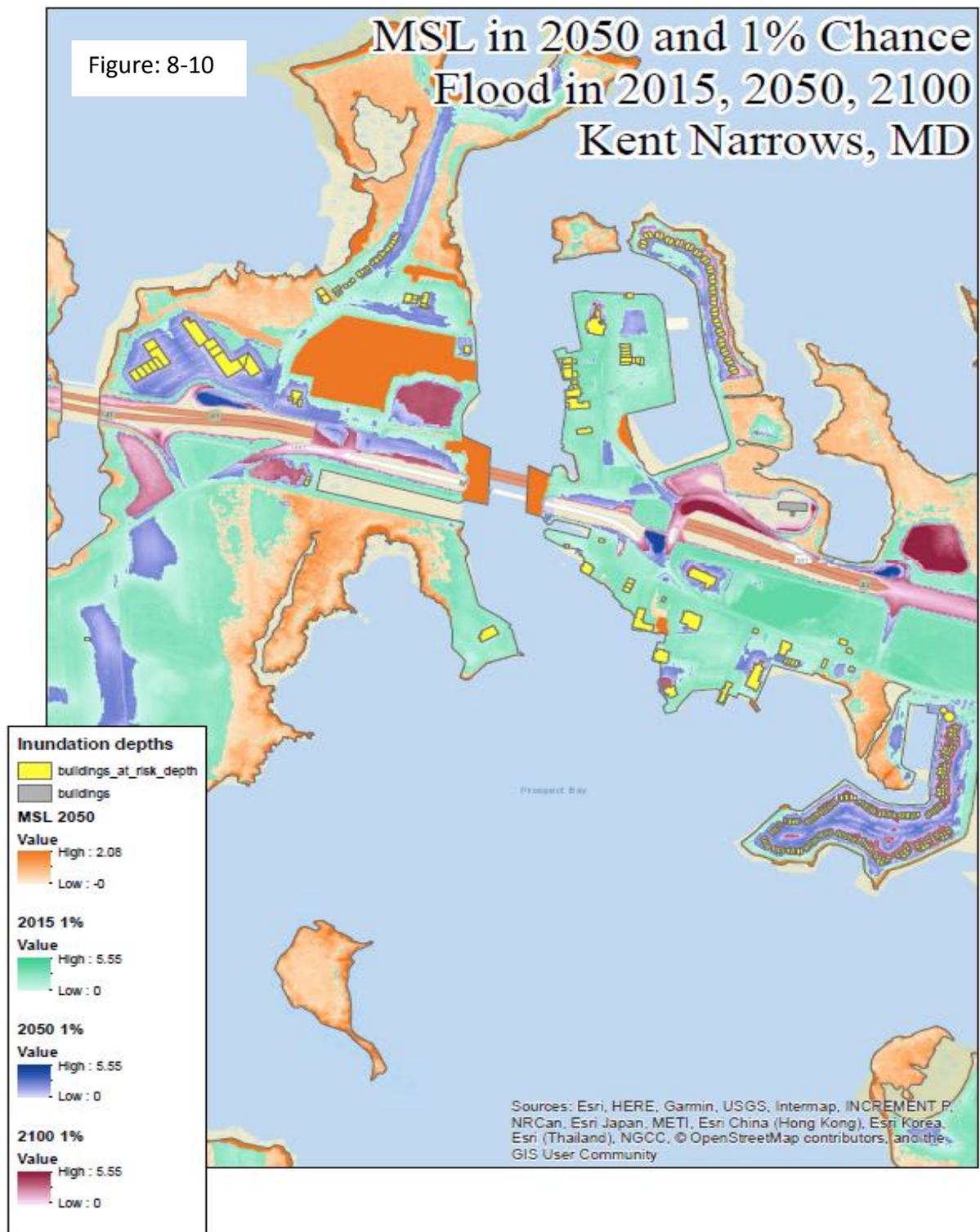
- 2015 (baseline, 1% chance (previously known as the 100-year flood event), and the 0.2% chance (previously known as the 500-year flood event); and,
- Maryland 2050 and 2100 Sea Level Rise (SRL) projections, plus 1% chance flood.

As shown on Figures 8-10 through 8-12, using Maryland Sea Level Rise Projections for both 2050 and 2100 and flood depth from the 1% chance flood event, shown in both blue and pink, respectively, the extent of flooding increases significantly from that of 2015 1% chance flood event, the current level of risk planning, shown in green. The extent of inland flooding is substantially increased in both scenarios. Note the additional buildings at-risk to these flood scenarios, as shown in yellow.

In addition, a comparison between structures at-risk presently to the 1% chance (previously known as the 100-year flood event) and those in 2050 are shown on Table 8-7.

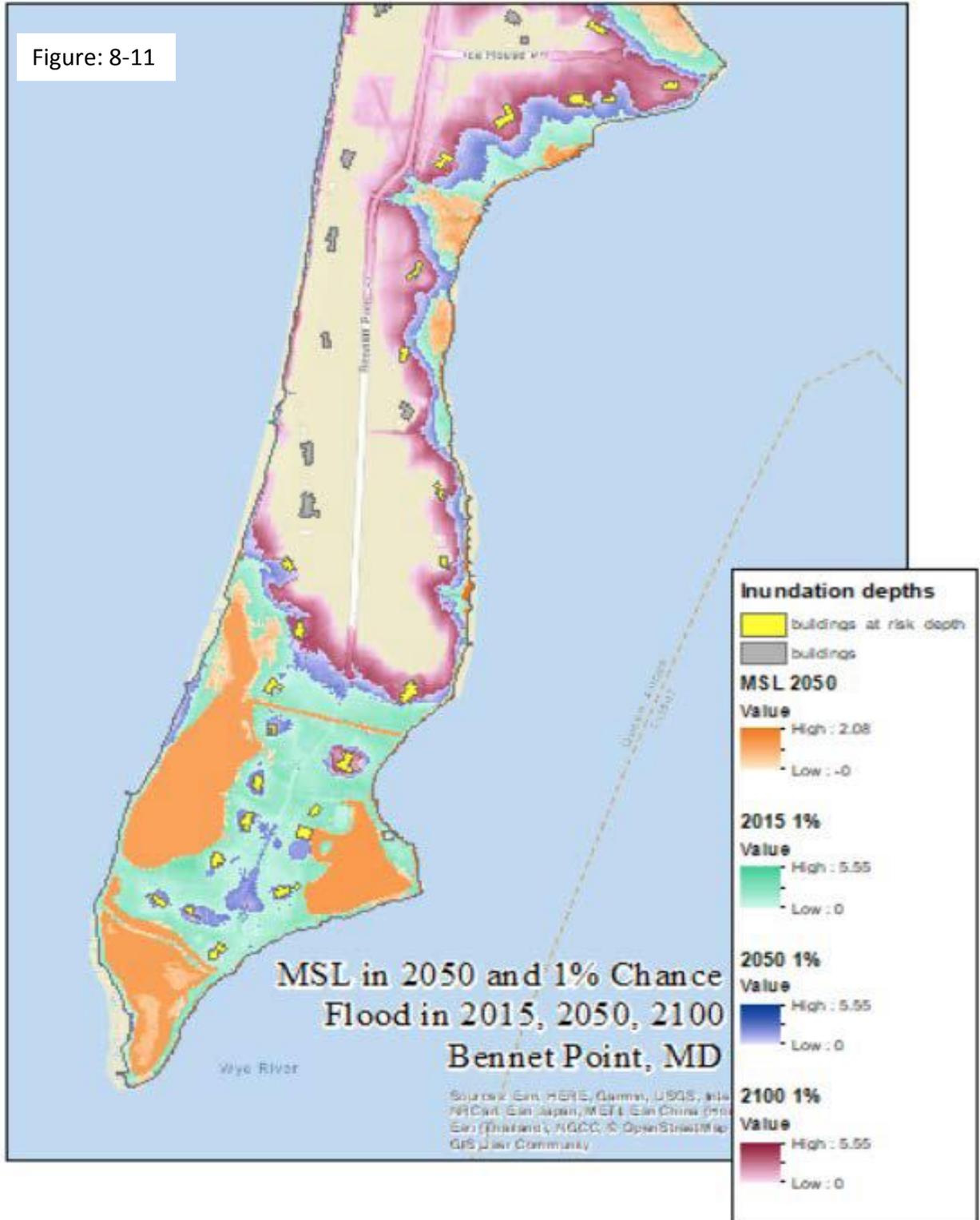
TABLE 8-6: VULNERABILITY ANALYSIS: SEA LEVEL SCENARIOS-STRUCTURE ANALYSIS		
	1% CHANCE FLOOD EVENT TODAY	1% CHANCE FLOOD EVENT PLUS 2050 SLR SCENARIO
# Buildings Flooded	751	2,135 (3x increase)
Cumulative Damage	\$20M	\$30 M (1.5x increase)
Residential	\$1.2M	\$24 M (20x increase)
Commercial	\$0.8M	\$5.6 M (7x increase)
<b>Damage estimates are for structures and contents. Excludes loss of revenues, etc.</b>		

Source: PowerPoint Presentation by Brian Ambrette, Eastern Shore Land Conservancy (ESLC) during the August 15, 2018 HMPC meeting.

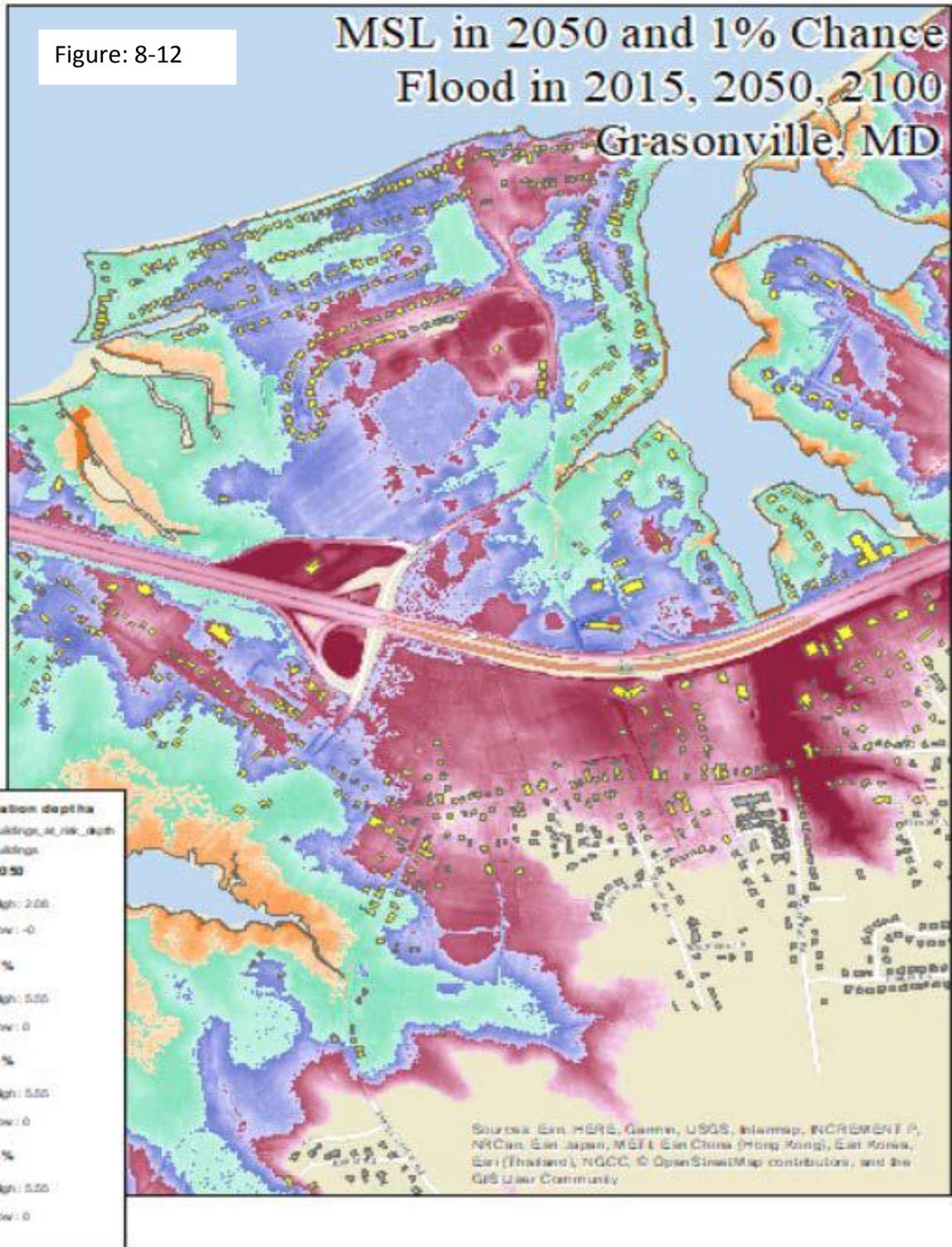


Source: PowerPoint Presentation by Brian Ambrette, Eastern Shore Land Conservancy (ESLC) during the August 15, 2018 HMPC meeting.

Figure: 8-11



Source: PowerPoint Presentation by Brian Ambrette, Eastern Shore Land Conservancy (ESLC) during the August 15, 2018 HMPC meeting.



Source: PowerPoint Presentation by Brian Ambrette, Eastern Shore Land Conservancy (ESLC) during the August 15, 2018 HMPC meeting.

## 8.7 Sea Level Change Mitigation Strategies- *Eastern Shore Land Conservancy-Risk Management For The 21<sup>st</sup> Century Floodplain*

Brian Ambrette, Eastern Shore Land Conservancy (ESLC), presented results of a recent planning initiative undertaken by the ESLC in coordination with the Eastern Shore Climate Adaptation Partnership (ESCAP) at the August 15, 2018 meeting of the Hazard Mitigation Planning Committee. In addition to the information provided on flood risk planning scenarios, potential mitigation strategies were reviewed and discussed.

### 8.7.1 MITIGATION STRATEGY #1: HIGHER FLOODPLAIN STANDARDS

- Regulate the height and extent of the 2050 SLR plus the 1% chance flood rather than the 1% chance flood only.
  - # of buildings within the FEMA 1% chance floodplain: approximately **750**
  - # of buildings within the FEMA 0.2% chance floodplain: approximately **1,400**
  - # of buildings within the modeled 1% chance floodplain and 2050 SLR risk area: approximately **2,100**
- Consider higher freeboard requirements, especially for critical and county/municipal –owned facilities.
- Map Coastal A Zones based on SLR models.

### 8.7.2 MITIGATION STRATEGY #2: NUISANCE FLOODING PLAN

By July 1, 2019, a local jurisdiction that experiences nuisance flooding shall:

- Develop a plan to address nuisance flooding.
- Update the plan at least once every 5 years.
- Publish the plan on the local jurisdiction’s website.
- Submit a copy of the plan to the Maryland Department of Planning.

Definition: “high-tide flooding that causes a public inconvenience”

*Note: ESLC and the ESCAP are developing guidance packages to assist communities with implementing higher floodplain standards and creating a nuisance flood plan. Both packages will be available in early 2019.*

Freeboard is a factor of safety usually expressed in feet above a flood level for purposes of floodplain management. "Freeboard" tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed. Freeboard is not required by NFIP standards, but communities are encouraged to adopt at least a one-foot freeboard to account for the one-foot rise built into the concept of designating a floodway and the encroachment requirements where floodways have not been designated. Freeboard results in significantly lower flood insurance rates due to lower flood risk.

**8.7.3 MITIGATION STRATEGY #3: POST DISASTER REDEVELOPMENT PLAN**

- A long-term rebuilding plan that guides smarter rebuilding after a disaster.
- Required for local governments in Florida.
- Benefits: Faster and More Efficient Recovery.
  - Plans are already in place.
  - Take advantage of disaster recovery funds quickly. Develop competitive grant proposals.
- Opportunities to Build Back Better Superstorm Sandy in NJ illustrated the rush to rebuild the same things in the same place, missed opportunity to build smarter.
- Local Control Over Recovery

Source: *Floridadisaster.org*

Figure: 8-13



# Chapter 9 Wildfire

This section of the Plan provides a wildfire profile, risk, and vulnerability for Queen Anne's County and participating municipalities:

- 9.1 WILDFIRE PROFILE
- 9.2 WILDFIRE RISK
- 9.3 WILDFIRE DATA
- 9.4 WILDFIRE VULNERABILITY
  - 9.4.1 Essential Facility Vulnerability

## 9.1 Wildfire Profile

Wildfires are a common occurrence in Maryland. In an average year, the Maryland Forest Service responds to an average of 325 wildfires that burn more than 3,200 acres of forest, brush, and grasses. Fire departments respond to over 5,000 wildfire incidents per year.

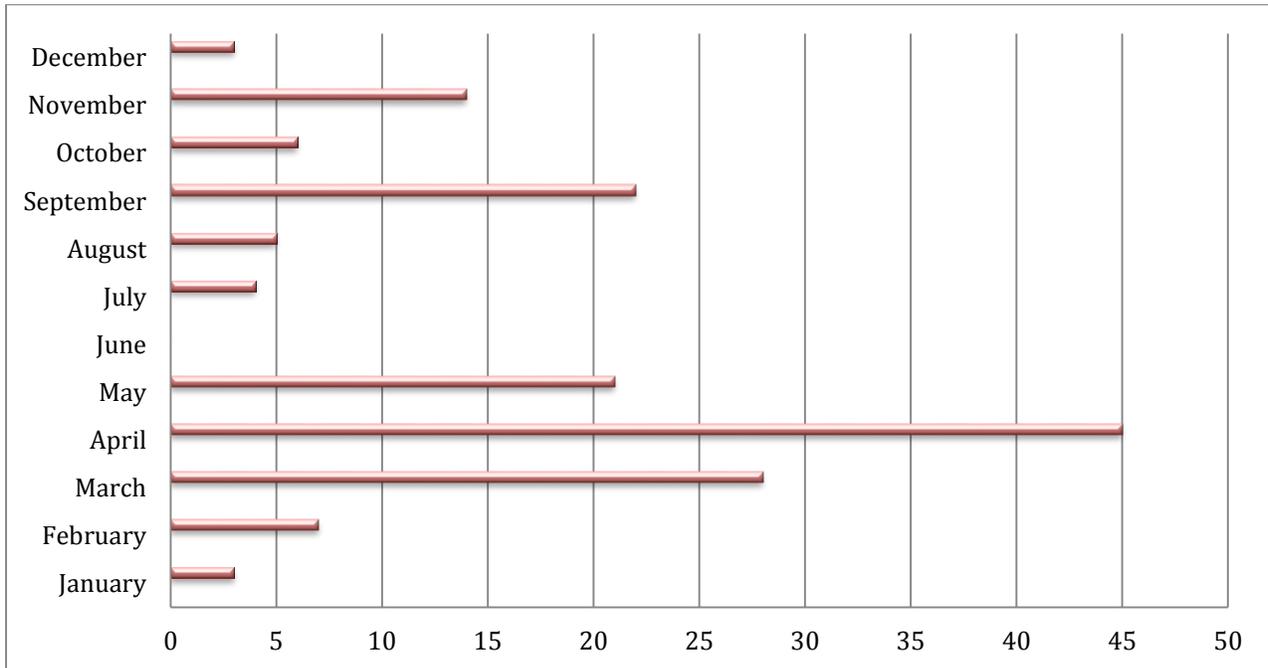
While some wildfires in Maryland can burn hundreds or even thousands of acres, most are smaller in size, burning less than 10 acres. Even these smaller wildfires can threaten lives, homes, other structures, and our natural resources. Each year hundreds of homes and structures are threatened, and dozens are damaged or destroyed by wildfires.

The Maryland Forest Service (MFS) is the primary fire control authority for fires affecting natural cover within the state. The Maryland Forest Service also assists local and rural fire companies that lack the resources needed to fight large wildfires.

## 9.2 Wildfire Risk

Wildfires occur in every month in Maryland, but peak in the spring and fall. During these seasons the leaves are off the deciduous trees, allowing sunlight and wind to reach the forest floor and dry the forest fuels. The relative humidity of the air is also drier and, combined with a breeze, creates the conditions for wildfires to spread rapidly.

**TABLE 9-1: 2015 ANNUAL WILDLAND FIRE REPORT-WILDFIRE STARTS**



Source: Maryland Department of Natural Resources; Maryland Forest Service

The only natural cause of wildfires is lightning, and this accounts for only 4% of the wildfire ignitions in Maryland. Humans caused the remaining 96% of wildfires. Maryland’s leading cause of wildfires is

improper debris or outdoor burning that ignites an average of 28% of the fires each year. Arson, the second leading cause, accounts for around 23% of ignitions. Other causes include: equipment use, children playing with fire, smoking, campfires, railroads, and other miscellaneous ignitions from sources such as downed power lines, discarded ashes, and fireworks.

### 9.3 Wildfire Data

According to the Maryland Forest Service, Department of Natural Resources, the acreage burned by wildfires in Queen Anne’s County has decreased since the 2012 high of 81.6 acres. The only year that exceeded 2012 in acreage burned on Table 9-2, was 2001, at 97.7 acres burned.

TABLE 9-2: QUEEN ANNE’S COUNTY – WILDFIRE RESPONSE BY COUNTY MD DNR FOREST SERVICE FIRE STATS 2000-2016		
YEAR	# OF INCIDENTS	ACRES
2000	11	14.8
2001	24	97.7
2002	21	37.7
2003	3	9.6
2004	7	15.9
2005	12	54.8
2006	31	12.7
2007	31	25.7
2008	32	48.9
2009	21	26.6
2010	6	18.1
2011	1	0.2
2012	7	81.6
2013	4	1.7
2014	3	2.1
2015	2	6.9
2016	1	0.1

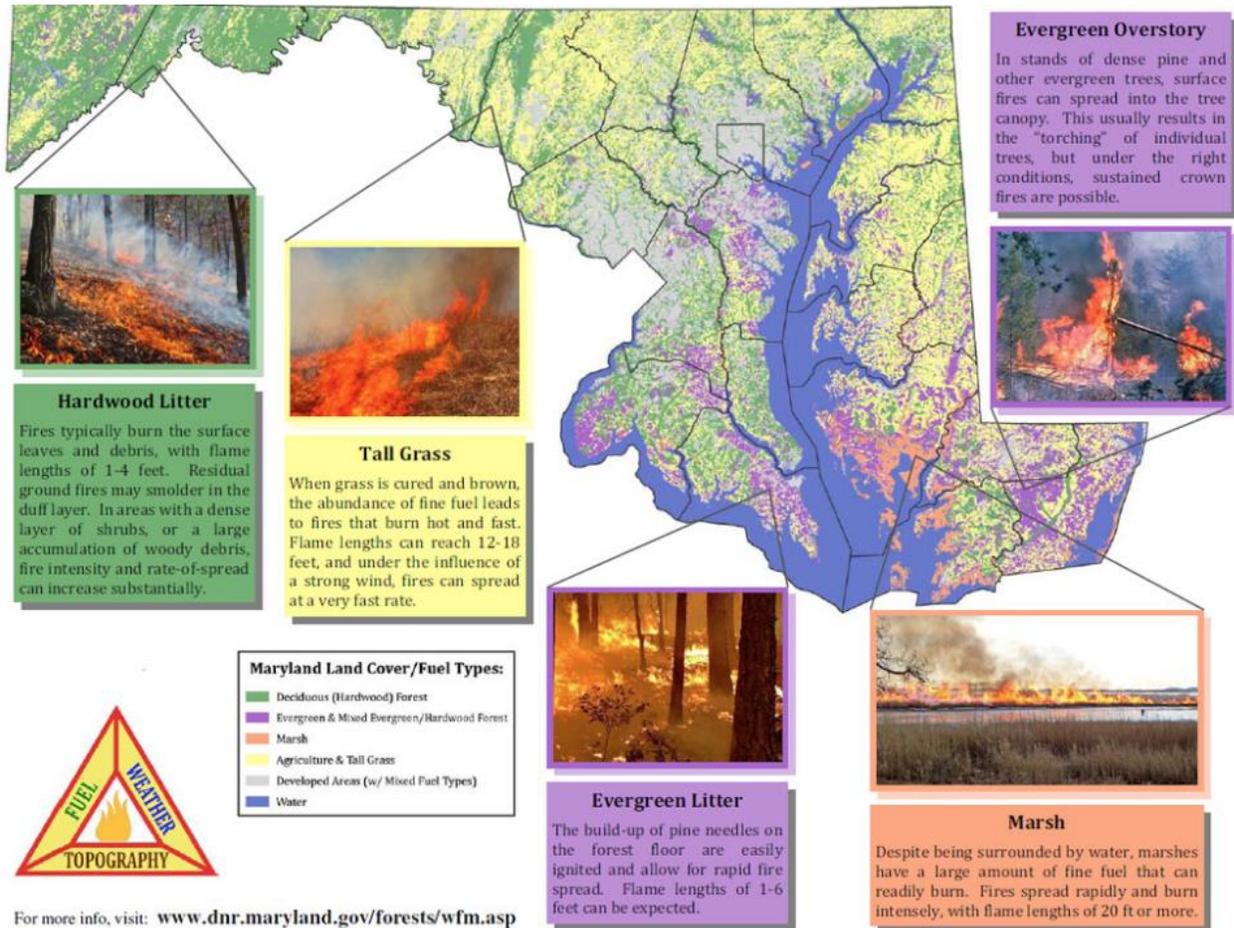
Source: Maryland Forest Service, Department of Natural Resources

### 9.4 Wildfire Vulnerability

Wildfires and brush fires have forced school closings, disrupted telephone services by burning fiber optic cables, damaged railroads and other infrastructure, and adversely affected tourism, outdoor recreation, and hunting. The likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response. Weather conditions, particularly drought events, increase the likelihood of wildfires occurring.

Most wildfires in Maryland are surface fires, which burn fallen leaves, twigs, and debris on the ground. Under this fallen debris is often a layer of partially decomposed leaves and humus, called “duff.” During dry periods, fires can burn underground in this duff layer, and be very difficult to extinguish. These duff fires can burn for weeks, or even months, and cause smoke issues.

Figure 9-1



Source: Maryland Forest Service; [www.dnr.maryland.gov/forest/wfm.asp](http://www.dnr.maryland.gov/forest/wfm.asp)

The intensity of wildfires increases greatly in areas of dense fine fuels, such as grasses, or dense resinous fuels, such as mountain laurel shrubs or evergreen trees. Queen Anne’s County has an abundance of tall grass, a dense fine fuel.

Wildfires pose serious threats to human safety and property in rural and suburban areas. They can destroy crops, timber resources, recreation areas, and habitat for wildlife. Wildfires are commonly perceived as hazards in the western part of the country; however, wildfires are a growing problem in the wildland/urban interface of the eastern United States, including Maryland and Queen Anne’s County.

A wildfire is an even greater challenge when it threatens homes and other structures. The zone where homes are built in or near the forest is called the Wildland-Urban Interface (WUI). The number of homes built in the WUI in Maryland has increased dramatically in recent years.

Since 97% of wildfires are caused by people, wildfire ignitions are also more common in these Wildland-Urban Interface zones. Considering all factors, wildfires can be a significant threat in Maryland. Homes and other structures intermixed with wildland fuels are at risk, and WUI residents need to take actions to protect themselves and their property.



Figure 9-2

Source: Maryland Forest Service; [www.dnr.maryland.gov/forest](http://www.dnr.maryland.gov/forest)

Fires can extensively impact the economy of an affected area, especially the logging, recreation, and tourism industries, upon which many counties depend. Major direct costs associated with forest fires or wildfires include the salvage and removal of downed timber and debris and the restoration of the burned area. If burned-out woodlands and grasslands are not replanted quickly to prevent widespread soil erosion, then landslides, mudflows, and floods could result, compounding the damage.

### 9.4.1 ESSENTIAL FACILITY VULNERABILITY

All essential facilities were assessed to determine which, if any, were located in a wildland/urban interface area. Those facilities include fire, emergency medical and police as shown on Table 9-3. Fifteen essential facilities are considered vulnerable to wildfire.

TABLE 9-3: ESSENTIAL FACILITIES WILDFIRE VULNERABILITY				
FACILITY TYPE	FACILITY NAME	ADDRESS	TOWN	WILDLAND/URBAN INTERFACE
EOC	QAC Department of Emergency Services	100 Communications Drive	Centreville	Yes
Fire	Queen Anne-Hillsboro VFC #8	13512 First Street	Queen Anne	No
Fire	Queenstown VFC #3	7110 Main Street	Queenstown	No
Fire	Church Hill VFC #5	316 Main Street	Church Hill	No
Fire	Sudlersville VFC #6	203 N Church Street	Sudlersville	No
Fire	Goodwill VFC #4	212 Broadway Street	Centreville	No
Fire	EMS Station 100	103 Davidson Road	Stevensville	No
Fire	EMS Station 400	302 Safety Drive	Centreville	No
Fire	EMS Station 300	7110 Main Street	Queenstown	No
Fire	EMS Station 600	203 N Church Street	Sudlersville	No
Fire	EMS Station 500	316 Main Street	Church Hill	No
Fire	Grasonville VFC #2	4128 Main Street	Grasonville	Yes

<b>Fire</b>	<b>Grasonville Vol Ambulance Dept. #20</b>	<b>4132 Main Street</b>	<b>Grasonville</b>	<b>Yes</b>
Fire	Crumpton VFC #7	300 3rd Street	Millington	No
Fire	United Communities VFC #9	9406 Romancoke Road	Stevensville	No
Fire	Kent Island VFC #1	1610 Main Street	Chester	No
Fire	EMS Station 200	101 Medic Drive	Chester	No
Medical	QAC Department of Health	206 N Commerce Street	Centreville	No
Medical	QAC Department of Health Annex	205 N Liberty Street	Centreville	No
Medical	Shore Emergency Center Queenstown	115 Shoreway Drive	Queenstown	No
Medical	UM Shore Medical Pavilion	125 Shoreway Drive	Queenstown	No
Medical	AAMC Kent Island Pavilion	1630 Main Street	Chester	No
Police	Queen Anne's County Sheriff's Office	505 Railroad Avenue	Centreville	No
Police	Maryland State Police - Barracks S	311 Safety Drive	Centreville	No
Police	Sheriff's Office - Sudlersville Substation	200 S Church Street	Sudlersville	No
<b>Police</b>	<b>Centreville Police Department</b>	<b>420 N Commerce Street</b>	<b>Centreville</b>	<b>Yes</b>
Police	Sheriff's Office - Kent Narrows Substation	425 Piney Narrows Road	Chester	No
<b>School-Private</b>	<b>The Gunston School</b>	<b>911 Gunston Road</b>	<b>Centreville</b>	<b>Yes</b>
<b>School-Private</b>	<b>Wye River Upper School</b>	<b>316 S Commerce Street</b>	<b>Centreville</b>	<b>Yes</b>
<b>School-Private</b>	<b>Lighthouse Christian Academy</b>	<b>931 Love Point Road</b>	<b>Stevensville</b>	<b>Yes</b>
<b>School-Private</b>	<b>Eastern Shore Jr. Academy</b>	<b>407 Dudley Corners Road</b>	<b>Sudlersville</b>	<b>Yes</b>
School-Private	Shore Up Head Start	5441 Main Street	Grasonville	No
School-Private	Kiddie Academy of Kent Island	113 St. Claire Place	Stevensville	No
<b>School-Public</b>	<b>Kennard Elementary School</b>	<b>420 Little Kidwell Avenue</b>	<b>Centreville</b>	<b>Yes</b>
School-Public	Church Hill Elementary School	631 Main Street	Church Hill	No
<b>School-Public</b>	<b>Anchor Points Academy</b>	<b>202 Chesterfield Avenue</b>	<b>Centreville</b>	<b>Yes</b>
School-Public	Sudlersville Elementary School	300 S Church Street	Sudlersville	No
<b>School-Public</b>	<b>Grasonville Elementary School</b>	<b>5435 Main Street</b>	<b>Grasonville</b>	<b>Yes</b>
<b>School-Public</b>	<b>Bayside Elementary School</b>	<b>301 Church Street</b>	<b>Stevensville</b>	<b>Yes</b>
School-Public	Queen Anne's County High School	125 Ruthsburg Road	Centreville	No
School-Public	Sudlersville Middle School	600 Charles Street	Sudlersville	No
School-Public	Centreville Elementary School	213 Homewood Avenue	Centreville	No
<b>School-Public</b>	<b>Centreville Middle School</b>	<b>231 Ruthsburg Road</b>	<b>Centreville</b>	<b>Yes</b>
School-Public	Wye Research & Education Center	124 Wye Narrows Drive	Queenstown	No
School-Public	Chesapeake College	1000 College Circle Drive	Queenstown	No
School-Public	Stevensville Middle School	610 Main Street	Stevensville	No
<b>School-Public</b>	<b>Kent Island Elementary School</b>	<b>110 Elementary Way</b>	<b>Stevensville</b>	<b>Yes</b>
<b>School-Public</b>	<b>Kent Island High School</b>	<b>900 Love Point Road</b>	<b>Stevensville</b>	<b>Yes</b>
School-Public	Matapeake Elementary School	651 Romancoke Road	Stevensville	No
School-Public	Matapeake Middle School & Kent Island 9th Grade Annex	671 Romancoke Road	Stevensville	No

Source: Queen Anne's County Essential Facility Database

# Chapter 10 Thunderstorm & Lightning

This section of the Plan provides a thunderstorm & lightning profile, risk, and vulnerability for Queen Anne's County and participating municipalities:

- 10.1 THUNDERSTORM & LIGHTNING PROFILE
- 10.2 THUNDERSTORM & LIGHTNING RISK
- 10.3 THUNDERSTORM & LIGHTNING DATA
- 10.4 THUNDERSTORM & LIGHTNING VULNERABILITY
  - 10.4.1 Essential Facility Vulnerability

## 10.1 Thunderstorm & Lightning Profile

Severe storms can occur during any season in Queen Anne’s County. Thunderstorms, associated with strong winds, heavy precipitation, and lightning strikes can all be hazardous under the right conditions and locations. Strong winds and tornadoes can take down trees, damage structures, tip high profile vehicles, and create high velocity flying debris. Large hail can damage crops, dent vehicles, break windows, and injure or kill livestock, pets, and people.

Thunderstorms affect relatively small areas when compared with hurricanes and winter storms. Despite their small size, all thunderstorms are dangerous. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Of the estimated 100,000 thunderstorms that occur each year in the United States, about 10 percent are classified as severe. The National Weather Service considers a thunderstorm severe if it produces hail at least 1 inch in diameter and/or winds that equal or exceed 58 miles an hour, and/or a tornado. Every thunderstorm needs three basic components: (1) moisture to form clouds and rain (2) unstable air which is warm air that rises rapidly and (3) lift, which is a cold or warm front capable of lifting air to help form thunderstorms.

Lightning, although not considered severe by the National Weather Service definition, can accompany heavy rain during thunderstorms. Lightning develops when ice particles in a cloud move around, colliding with other particles. These collisions cause a separation of electrical charges. Positively charged ice particles rise to the top of the cloud and negatively charged ones fall to the middle and lower sections of the cloud. The negative charges at the base of the cloud attract positive charges at the surface of the Earth. Invisible to the human eye, the negatively charged area of the cloud sends a charge called a stepped leader toward the ground. Once it gets close enough, a channel develops between the cloud and the ground. Lightning is the electrical transfer through this channel. The channel rapidly heats to 50,000 degrees Fahrenheit and contains approximately 100 million electrical volts. The rapid expansion of the heated air causes thunder.

Hail develops when a super cooled droplet collects a layer of ice and continues to grow, sustained by the updraft. Once the hail stone cannot be held up any longer by the updraft, it falls to the ground. Nationally, hailstorms cause nearly \$1 billion in property and crop damage annually, as peak activity



Figure 10-1

Source: YouTube-[Ephigenia Stamate](#); Published on Oct 30, 2014



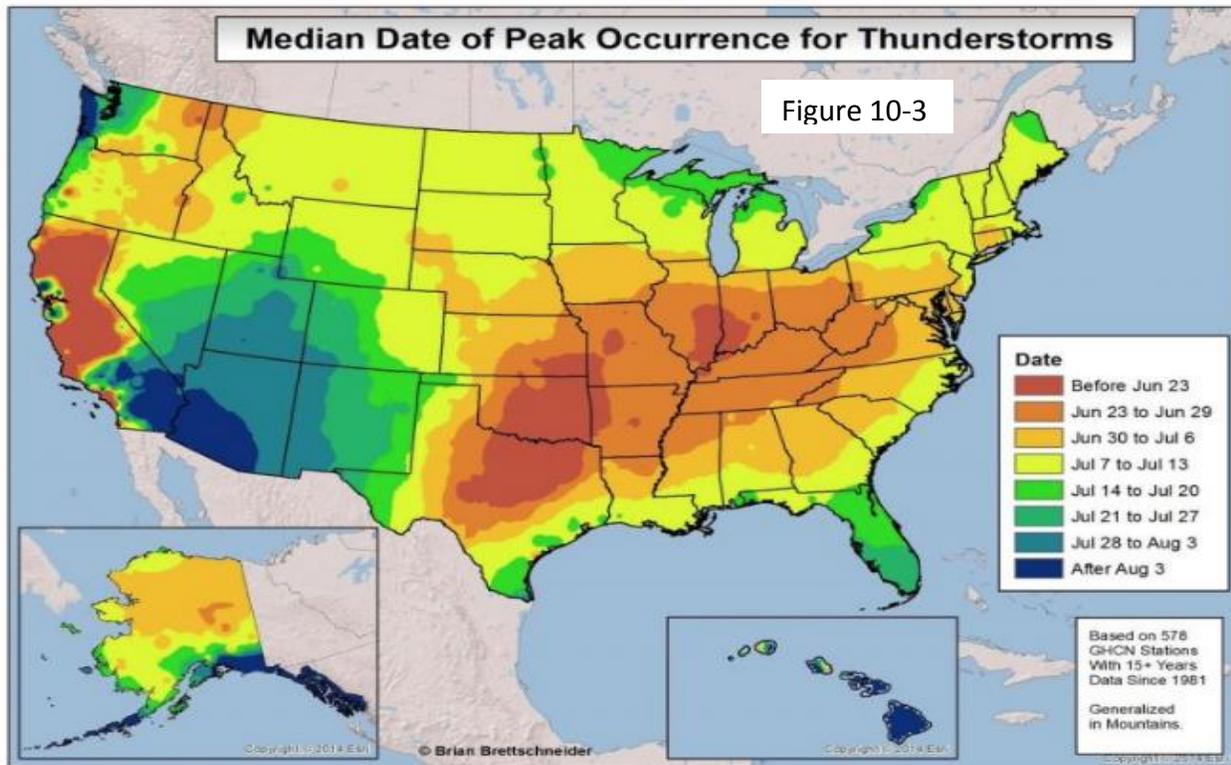
Figure 10-2

Source: [www.businessinsider.com](#), Kevin Loria, Published on August 24, 20118

coincides with peak agricultural seasons. Severe hailstorms also cause considerable damage to buildings and automobiles, but rarely result in loss of life.

## 10.2 Thunderstorm & Lightning Risk

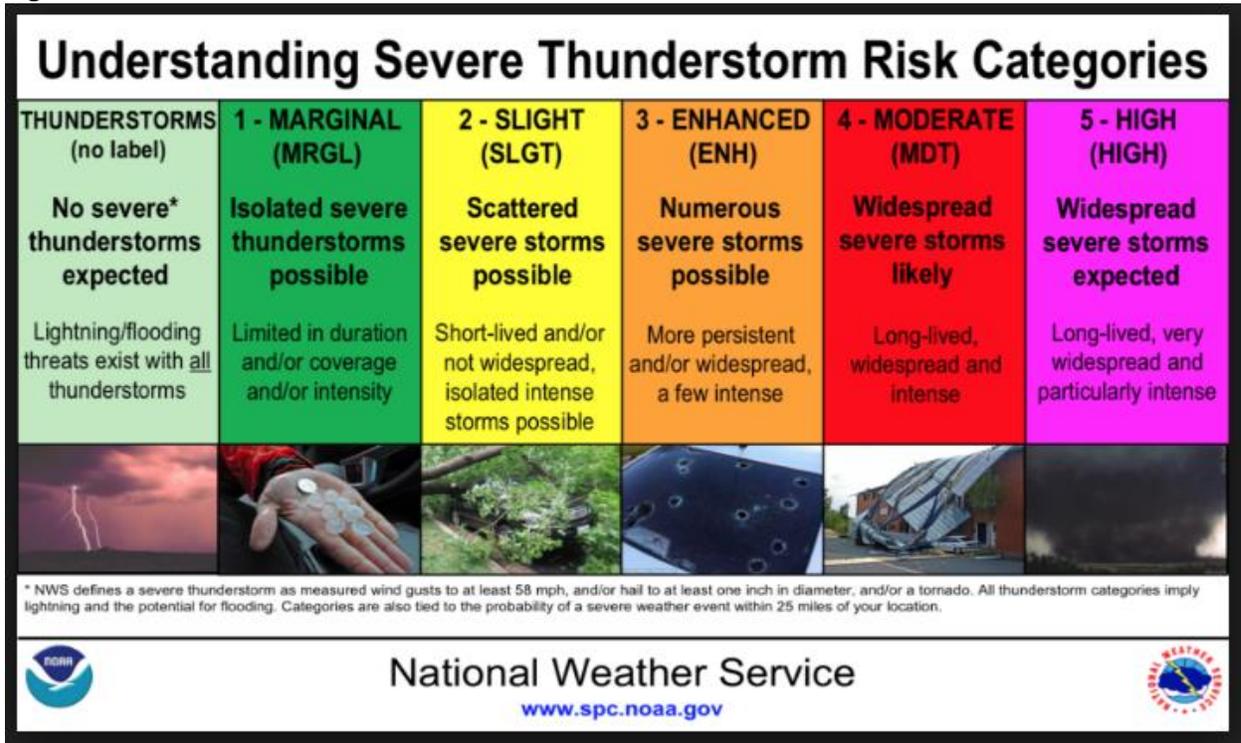
Peak times of year for thunderstorm activity vary across the country. The map image below, Figure 10-3, indicates that June 30 through July 6 is the peak thunderstorm occurrence for Maryland.



Source: <http://affinitylps.com/how-will-severe-weather-affect-your-property/>

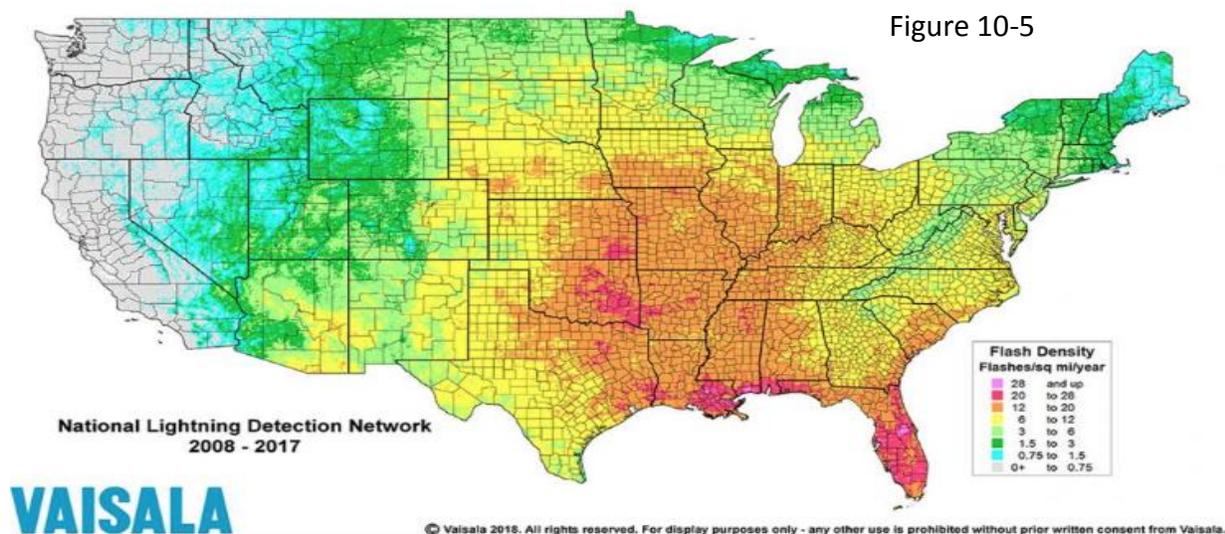
The National Weather Service categorizes thunderstorm severity as shown on the graphic below.

Figure 10-4



Source: NOAA-NSW Storm Prediction Center, [www.spc.noaa.gov](http://www.spc.noaa.gov)

The National Lightning Detection Network NLDN monitors all lightning activity across the U.S.



Queen Anne’s County is shown in yellow, indicating 6 to 12 flashes per square miles per year.

### 10.3 Thunderstorm & Lightning Data

According to National Centers for Environmental Information (NCEI) and local data, Queen Anne’s County has experienced 136 recorded thunderstorm events, 18 recorded hail events, and 9 recorded lightning events.

TABLE 10-1 THUNDERSTORM & LIGHTNING				
<b>HAIL – 1984-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
18	0	0	0	1.13
<b>THUNDERSTORM WIND – 1974-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
136	0	1	825.00K	3.09
<b>LIGHTNING – 1999-2017</b>				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
9	0	0	63.51K	0.47

Source: National Centers for Environmental Information (NCEI), Events through April 2018

### 10.4 Thunderstorm & Lightning Vulnerability

All assets located in Queen Anne’s County can be considered at risk from severe storms. This includes all of the County’s population and all buildings and infrastructure within the County. Damages primarily occur as a result of high winds, lightning strikes, hail, and flooding. Most structures, including the County’s essential facilities should be able to provide adequate protection from hail but the structures could suffer broken windows and dented exteriors. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out.

#### 10.4.1 ESSENTIAL FACILITY VULNERABILITY

As in Chapter 6: High Wind, it is important to assess essential facilities to determine their vulnerability to impacts from severe thunderstorm events. All essential facilities were assessed to determine which, if any, had installed impact resistant glass windows. It is important to note that most impact windows consist of several layers of glass or other synthetic materials that make shattering and penetration difficult. Impact resistant glass protects from flying debris during a high wind events. As shown on Table 6-3, two facilities have installed impact resistant glass, adding protection against damaging winds.

In addition, many essential facilities have communication antenna that are highly susceptible to high wind events and lightning strikes from severe thunderstorms. Lightning damage can be extensive and costly specially to radio and antenna systems. Damages to communications systems may lead to disruption of emergency communications. Those facilities include fire, emergency medical and police as shown on Table 10-2.

Table 10-2: ESSENTIAL FACILITIES SEVERE THUNDERSTORM VULNERABILITY					
FACILITY TYPE	FACILITY NAME	ADDRESS	TOWN	IMPACT RESISTENT GLASS	ANTENNA ON/AT FACILITY
EOC	QAC Department of Emergency Services	100 Communications Dr.	Centreville		
Fire	Queen Anne-Hillsboro VFC #8	13512 First Street	Queen Anne		✓
Fire	Queenstown VFC #3	7110 Main Street	Queenstown		
Fire	Church Hill VFC #5	316 Main Street	Church Hill		✓
Fire	Sudlersville VFC #6	203 N Church Street	Sudlersville		✓
Fire	Goodwill VFC #4	212 Broadway Street t	Centreville		✓
Fire	EMS Station 100	103 Davidson Road	Stevensville		
Fire	EMS Station 400	302 Safety Drive	Centreville		
Fire	EMS Station 300	7110 Main Street	Queenstown		
Fire	EMS Station 600	203 N Church Street	Sudlersville		✓
Fire	EMS Station 500	316 Main Street	Church Hill		✓
Fire	Grasonville VFC #2	4128 Main Street	Grasonville		✓
Fire	Grasonville Vol Ambulance Dept. #20	4132 Main Street	Grasonville		✓
Fire	Crumpton VFC #7	300 3rd Street	Millington		✓
Fire	United Communities VFC #9	9406 Romancoke Road	Stevensville		✓
Fire	Kent Island VFC #1	1610 Main Street	Chester		✓
Fire	EMS Station 200	101 Medic Drive	Chester		
Medical	QAC Department of Health	206 N Commerce Street	Centreville		
Medical	QAC Department of Health Annex	205 N Liberty Street	Centreville		
Medical	Shore Emergency Center Queenstown	115 Shoreway Drive	Queenstown		
Medical	UM Shore Medical Pavilion	125 Shoreway Drive	Queenstown		
Medical	AAMC Kent Island Pavilion	1630 Main Street	Chester		
Police	Queen Anne's County Sheriff's Office	505 Railroad Avenue	Centreville		
Police	Maryland State Police - Barracks S	311 Safety Drive	Centreville	✓	✓
Police	Sheriff's Office - Sudlersville Substation	200 S Church Street	Sudlersville		✓
Police	Centreville Police Department	420 N Commerce Street	Centreville		
Police	Sheriff's Office - Kent Narrows Substation	425 Piney Narrows Road	Chester		
School-Private	The Gunston School	911 Gunston Road	Centreville		
School-Private	Wye River Upper School	316 S Commerce Street	Centreville		
School-Private	Lighthouse Christian Academy	931 Love Point Road	Stevensville		
School-Private	Eastern Shore Jr. Academy	407 Dudley Corners Road	Sudlersville		
School-Private	Shore Up Head Start	5441 Main Street	Grasonville		
School-Private	Kiddie Academy of Kent Island	113 St. Claire Place	Stevensville		
School-Public	Kennard Elementary School	420 Little Kidwell Avenue	Centreville		
School-Public	Church Hill Elementary School	631 Main Street	Church Hill		
School-Public	Anchor Points Academy	202 Chesterfield Avenue	Centreville		
School-Public	Sudlersville Elementary School	300 S Church Street	Sudlersville		
School-Public	Grasonville Elementary School	5435 Main Street	Grasonville		
School-Public	Bayside Elementary School	301 Church Street	Stevensville		
School-Public	Queen Anne's County High School	125 Ruthsburg Road	Centreville		
School-Public	Sudlersville Middle School	600 Charles Street	Sudlersville		

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School-Public	Centreville Elementary School	213 Homewood Avenue	Centreville	✓	
School-Public	Centreville Middle School	231 Ruthsburg Road	Centreville		
School-Public	Wye Research & Education Center	124 Wye Narrows Drive	Queenstown		
School-Public	Chesapeake College	1000 College Circle Drive	Queenstown		
School-Public	Stevensville Middle School	610 Main Street	Stevensville		
School-Public	Kent Island Elementary School	110 Elementary Way	Stevensville		
School-Public	Kent Island High School	900 Love Point Road	Stevensville		
School-Public	Matapeake Elementary School	651 Romancoke Road	Stevensville		
School-Public	Matapeake Middle School & Kent Island 9th Grade Annex	671 Romancoke Road	Stevensville		

*Source: Queen Anne's County Essential Facility Database*

# Chapter 11 Earthquake

This section of the Plan describes the provides an earthquake profile, risk, and vulnerability for Queen Anne's County and participating municipalities:

- 11.1 EARTHQUAKE PROFILE
- 11.2 EARTHQUAKE RISK
- 11.3 EARTHQUAKE DATA
- 11.4 EARTHQUAKE VULNERABILITY

## 11.1 Earthquake Profile

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10-20 miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area.

Earthquake events can, and occasionally do, occur in Maryland; though of much less intensity than those that occur elsewhere in the region or on the west coast. Small magnitude and minimal economic damage of previous earthquake events have not warranted the need for considerable structural retrofits or similar mitigation programs in Maryland.

## 11.2 Earthquake Risk

Everyone is potentially at-risk to earthquake events from ground shaking. Regardless of the source of the earthquake, the associated energy travels in waves radiating outward from the point of release. When these waves travel along the surface, the ground shakes and rolls, fractures form, and water waves may be generated. Earthquakes generally last a matter of seconds but the waves may travel for long distances and cause damage well after the initial shaking at the point of origin has subsided.

Breaks in the crust associated with seismic activity are known as “faults” and are classified as either active or inactive. Faults may be expressed on the surface by sharp cliffs or scarps or may be buried below surface deposits.

“Foreshocks,” minor releases of pressure or slippage, may occur months or minutes before the actual onset of the earthquake. “Aftershocks,” which range from minor to major, may occur for months after the main earthquake. In some cases, strong aftershocks may cause significant additional damage, especially if the initial earthquake impacted emergency management and response functions or weakened structures.

Earthquake magnitude is often measured using the Richter Scale, which is a numerical scale for expressing the magnitude of an earthquake on the basis of seismograph oscillations. The more destructive earthquakes typically have magnitudes between about 5.5 and 8.9; the scale is logarithmic and a difference of one represents an approximate thirtyfold difference in magnitude.

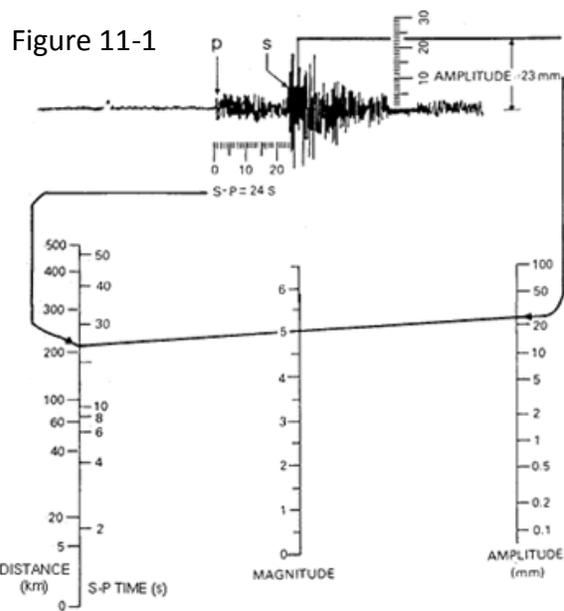


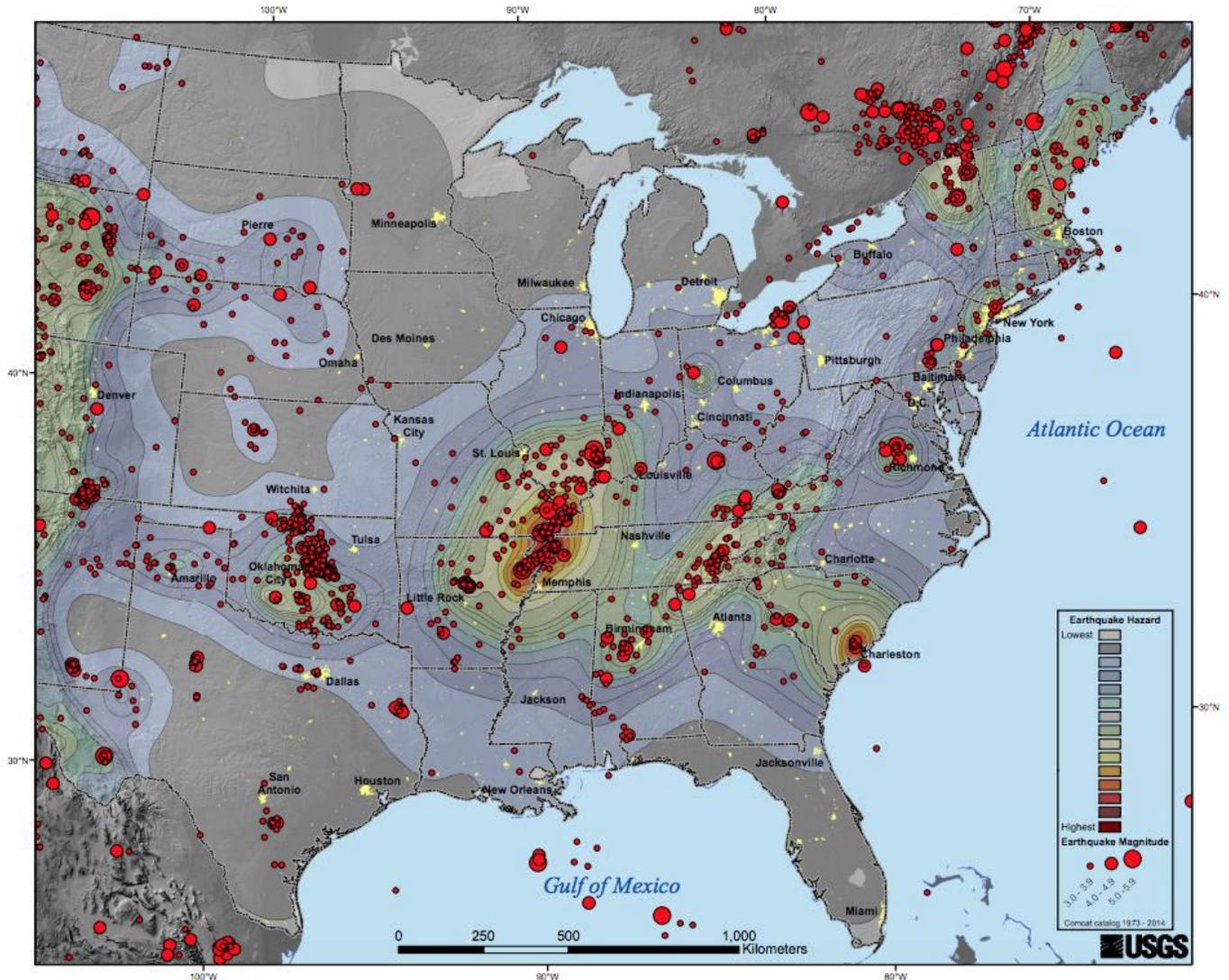
Image is from Richter's (1958) book *Elementary Seismology*.

Source: <https://earthquake.usgs.gov/learn/glossary/?term=Richter>

## 11.3 Earthquake Data

No earthquake epicenters have been recorded in Queen Anne’s County since 1960. Figure 10-2 indicates earthquakes (circles) greater than magnitude 3.0 since 1974 plotted on the [2014 USGS National Seismic Hazard Map for the central and eastern United States](#). Warmer colors on this map indicate areas of higher hazard. Larger earthquakes are represented by the larger red circles.

Figure 11-2



Source: <https://earthquake.usgs.gov/hazards/urban/images/ceus-seis-haz.pdf>

As shown, small red circles, indicated less magnitude earthquakes are near Maryland, however the region is not considered a higher hazard area. While earthquakes have affected Queen Anne’s County, the impacts have been minimal. Data collected from 1758-2017 has been compiled and presented in Table 11-1 on the following pages.

**TABLE 11-1: EARTHQUAKE CHRONOLOGY OF MARYLAND - 1758-2017**

NO.	DATE (UTC) <sup>1</sup> YEAR MO. DAY	TIME (UTC) <sup>1</sup> (HH:MM:SS)	EPICENTER <sup>2</sup>		GENERAL LOCATION	DEPTH (KM)	INTENSITY <sup>3</sup>	MAGNITUDE <sup>4</sup>
			N LAT (DEG.)	W LON (DEG.)				
1	1758 04 25	02:30	38.90	-76.50	Annapolis	...	V	(3.5, 3.7)
2	1828 02 24	...	38.90	-76.70	Bowie	...	...	...
3	1876 01 30	02:05	38.90	-76.50	Annapolis	...	...	...
4	1876 04 10	...	38.50	-76.60	Prince Frederick	...	III	(2.7)
5	1877 09 01	16:00	38.70	-76.80	Brandywine	...	III	(2.7)
6 <sub>5</sub>	1815 01 04	08:005	39.57	-77.00	Westminster	...	IV-V	(3.1)
7	1883 03 11	23:57	39.50	-76.40	Fallston	...	IV	(3.1, 3.3)
8	1883 03 12	05:00	39.50	-76.40	Fallston	...	III	(2.7, 2.9)
9	1902 03 10	05:00	39.60	-77.20	Union Bridge	...	III	(2.7)
10	1902 03 11	10:30	39.60	-77.20	Union Bridge	...	III	(2.7)
11	1903 01 01	17:30	39.60	-77.20	Union Bridge	...	III	(2.7)
12	1903 01 01	22:45	39.60	-77.20	Union Bridge	...	II	(2.4)
13	1906 10 13	15:00	39.20	-76.70	Catonsville	...	III	(2.7)
14	1910 01 24	02:20	39.60	-77.00	Westminster	...	II	(2.4)
15	1910 04 24	02:	39.20	-76.70	Catonsville	...	III	(2.7)
16	1928 10 15	...	38.30	-75.10	Ocean City	...	IV	(2.7, 3.3)
17	1930 11 01	06:34	39.10	-76.50	Round Bay - Severna Park	...	IV	(3.1, 3.3)
18	1930 11 01	07:02	39.10	-76.50	Round Bay - Severna Park	...	III	(2.7)
19	1939 06 22	23:10	39.50	-76.60	Phoenix	...	III	(2.7)
20	1939 11 18	02:33	39.50	-76.60	Phoenix	...	IV	(3.1)
21	1939 11 26	05:20	39.50	-76.60	Phoenix	...	V	(3.5, 3.7)
22	1962 09 07	14:00	39.70	-78.20	Hancock	38	IV	(3.3)
23	1978 04 26	19:30	39.7	-78.24	Hancock	15	...	3.10
24	1986 05 23	17:48	38.69	-77.04	Accocek - Piscataway	0.20	...	2.5
25	1990 01 13	20:48	39.36	-76.80	Randallstown (V), Eldersburg (IV), Ellicott City (IV),	3-5	V	2.6 2.5

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					Granite (IV), Owings Mills (III)			
26	1990 04 04	16:15	39.35	-76.78	Granite - Randallstown - Baltimore	7.0 10.0	II	1.7
27	1991 09 28	11:28	39.36	-76.83	Granite - Randallstown	5.0	III	2.4
28	1993 03 10	14:32	39.2	-76.8	Columbia (IV) - Ellicott City (II) - Fulton (II)	5.0	II-IV	2.5
29	1993 03 12	00:54:00	39.19	-76.87	Columbia - Allview Estates	5.0	II-III	2.0
30	1993 03 15	04:30	39.19	-76.87	Columbia - Allview Estates - Laurel	0.9	III-V	2.7
31	1993 03 16	07:59:00	39.19	-76.87	Columbia - Allview Estates	5.0	II-III	1.8
32	1993 03 16	16:59	39.19	-76.87	Columbia - Allview Estates	5.0	II-III	1.8
33	1993 03 17	11:54	39.19	-76.87	Columbia - Allview Estates	0.5	I-II	=/< 1.0
34	1993 03 19	05:50	39.19	-76.87	Columbia - Allview Estates	0.5	I-II	1.0
35	1993 03 19	19:26	39.19	-76.87	Columbia - Allview Estates	0.5	I	<1.0
36	1993 03 21	10:55	39.47	-76.30	Aberdeen - Bel Air	...	I-II	1.5
37	1993 03 22	10:26	39.19	-76.86	Columbia - Allview Estates	0.5	not felt	about 0.0
38	1993 03 26	14:03	39.28	-76.82	Ellicott City near jct US40 & 29	...	I-II	<1.5 (est.)
39	1993 04 04	17:32	39.19	-76.87	Columbia - Allview Estates	0.5	I-III	1.5
40	1993 04 04	17:33	39.19	-76.87	Columbia - Allview Estates	0.5	I-II	1.5
41	1993 04 08	09:10	39.19	-76.87	Columbia - Allview Estates	0.5	I-II	1-1.5
42	1993 07 09	06:31	39.19	-76.87	Columbia - Allview Estates	0.5 (est.)	II-III	1.9
43	1993 07 12	21:24	39.19	-76.87	Columbia - Allview Estates	0.5 (est.)	III-IV	2.1
44	1993 10 28	06:00	39.25	-76.77	Ilchester - Ellicott City	...	IV	2.1
45	1993 10 28	06:01	39.25	-76.77	Ilchester - Ellicott City	...	IV	1.8
46*	1993 11 17	16:35	39.19	-76.87	Columbia - Allview	0.5	III	1.7 (est.)

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					Estates	(est.)		
<b>47*</b>	1993 11 27	15:26	39.19	-76.87	Columbia - Allview Estates	...	I-II	<1.5 (est.)
<b>48*</b>	1993 11 27	18:43	39.19	-76.87	Columbia - Allview Estates	...	I-II	about 1.5 (est.)
<b>49</b>	1994 10 28	02:04	39.1	-76.60	Glen Burnie - Pasadena -Gambrills - Millersville	...	IV	2.7
<b>50</b>	1996 08 02	07:19	39.57	-76.08	Perryville	...	II-III	2.2
<b>51</b>	1996 10 17	11:43	39.7	-76.07	Rising Sun (epicenter may be in Pennsylvania)	5.4	IV	2.2, 2.3
<b>52-54</b>	1996 12 06	3 very small events in 35 min.	39.19	-76.87	Columbia - Allview Estates	...	II	<1.5 (est.)
<b>55-57</b>	1996 12 14	3 very small events in 75 min.	39.19	-76.87	Columbia - Allview Estates	...	II	<1.5 (est.)
<b>58<sub>g</sub></b>	1996 12 16	15:10	39.25	-76.77	Ilchester - Ellicott City	...	I	about 1 (est.)
<b>59</b>	1996 12 22	05:56	39.19	-76.87	Columbia - Allview Estates	5	III	2.0, 2.3
<b>60</b>	2001 12 18	...	39.19	-76.84	Columbia nr US29-Md32	...	II	1.5-2.0 (est)
<b>61</b>	2002 03 22	...	39.19	-76.84	Columbia nr US29-Md32	...	I	1-2 (est.)
<b>62</b>	2003 12 09	20:59:14	37.599	-77.900	28 miles west of Richmond in rural Powhatan County, VA	4.8	VI	4.5
<b>63</b>	2005 02 23	14:22:43	39.26	-76.58	SE Baltimore near Fort McHenry, Dundalk, Glen Burnie, Pasadena, Gambrills	...	VI	2.0-2.1
<b>64</b>	2008 12 27	05:04:34	40.114	-76.403	9 km (6 miles) W of Lancaster, PA.	4	IV	3.4
<b>65</b>	2009 07 01	13:44:43	39.64	-75.48	Southwestern New Jersey	5	III	2.8
<b>66</b>	2009 09 29	13:58:51	39.607	-76.342	7 km (4 miles) NNE (15°) from Bel Air North, MD	5	II	1.6
<b>67</b>	2010 07 16	09:04:47	39.17	-77.25	Potomac-Shenandoah Region, MD	5	V	3.4
<b>68</b>	2011 08 23	17:51:04	37.936	-77.933	8 km (5 miles) SSW (195°) from Mineral,	6	V-VI	5.8

					VA			
<b>69</b>	2017 10 30	00:34:31	39.279	-77.051	Glenelg, Maryland	2	I	1.52
<b>70</b>	2017 11 11	15:55:44	39.261	-77.039	0.8 km (0.5 mi) ESE of Roxbury, Maryland	4	I	1.5

Source: (Data for 1758-1979 compiled primarily by the U.S. Geological Survey (USGS);1990-1993 data from Delaware Geological Survey (DGS), Lamont-Doherty Earth Observatory (LDEO), and USGS; 1996 to 2002 data from DGS, LDEO, Virginia Polytechnic Institute (VPI)., and Maryland Geological Survey.

**NOTES:**

\* Probable, but not confirmed by seismographs in the region. Magnitude estimated from other events in the series.

Time (UTC): Coordinated Universal Time. For the Eastern time zone, subtract 5 hours from UTC time for Eastern Standard Time, 4 hours for Eastern Daylight-Saving Time. For example: 1200 UTC (noon) = 0800, or 8:00 am EDT = 0700, or 7 am EST. Note that 00:00-04:59 UTC converts to 1800-23:59 of the previous day.

Epicenter, as calculated from seismograph stations =data and/or estimated by the Maryland Geological Survey on the basis of felt reports; 1962 marked the first instrumentally determined epicenter.

Except for event #6 in 1881 (see note 5 below), pre-instrumental (pre-1962) intensity estimates are earthquake catalogs published by various seismograph networks.

Except for event #6 in 1881 (see note 5 below) pre-instrumental magnitude estimates (shown in parentheses) by L. Seeber and J. Armbruster (Lamont Doherty Earth Observatory of Columbia University) and/or M. Chapman (Virginia Tech Seismological Observatory); magnitude estimates for a large number of pre-instrumental earthquakes in the region were derived using the region-specific relationships between felt area, maximum intensity and mb (Lg) magnitude developed by Sibol et al. (1987). Subsequent magnitudes are from instrumental measurements.

Event #6 has not been listed in any previously published earthquake list. A rather detailed account of this event appeared in the January 8, 1881 edition of the American Sentinel newspaper. Estimates of the epicenter and intensity have been made on the basis of the newspaper descriptions; magnitude estimates based on Sibol et al. (1987).

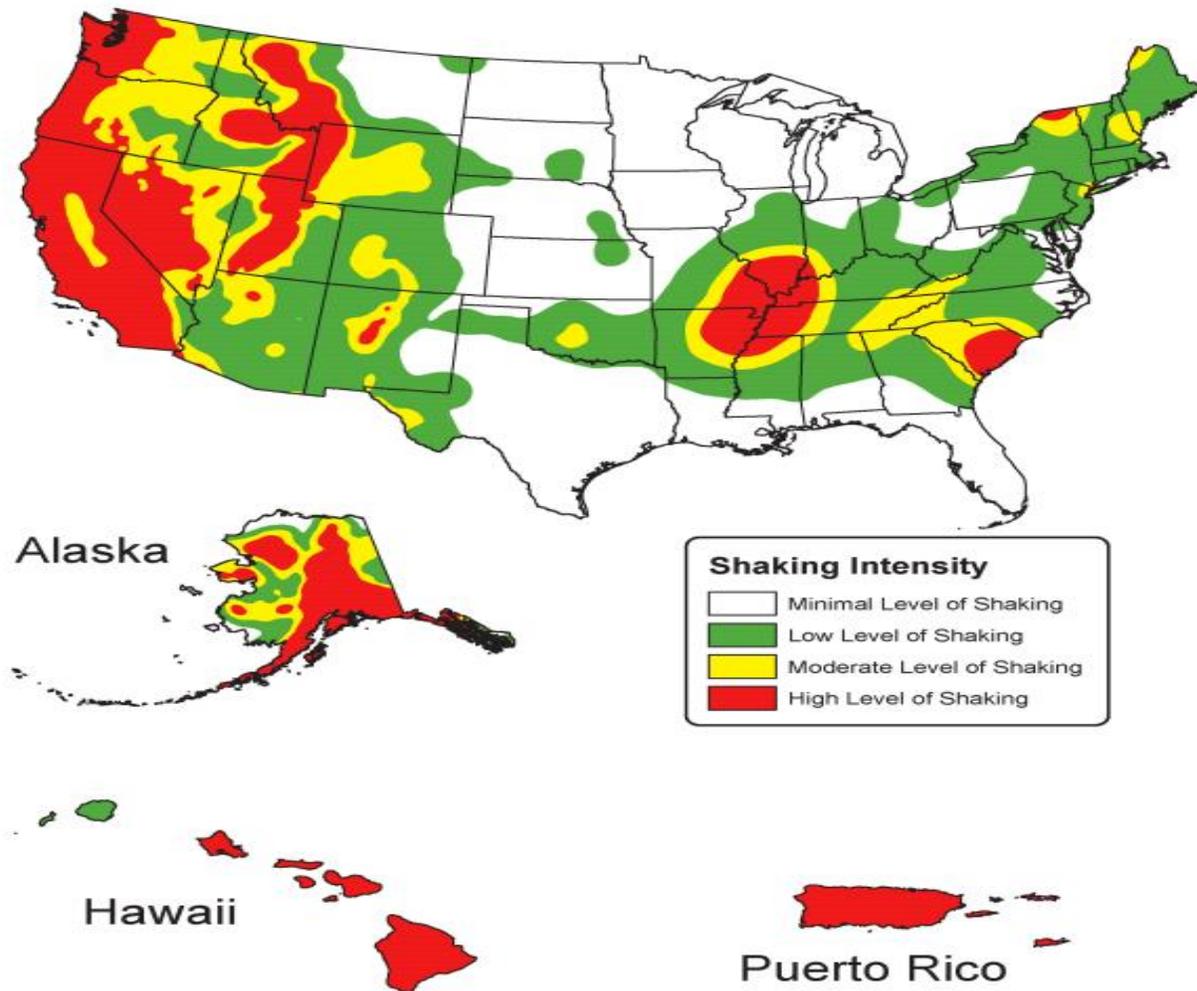
The Delaware Geological Survey states that this event may have been a sonic boom instead of an earthquake (S. Baxter, oral commun., Aug. 16, 2001).

## 11.4 Earthquake Vulnerability

Most earthquake-related property damage, injuries, and fatalities are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the amplitude and duration of the shaking —both of which are directly related to the earthquake size, its location and distance from the fault, and regional geology. Queen Anne’s County is located within the minimal level of shaking, shown in white on Figure 11-3: Map of Probable Shaking Intensity in the United States.

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 11-3 Map of Probable Shaking Intensity in the United States



The above figure was prepared by Ken Rukstales of the USGS and is based on the Figure R301.2(2) that was developed by the USGS for the 2006 International Residential Code where the Minimal Level = SDC A, Low Level = SDC B, Moderate Level = SDC C and the High Level = SDC D. Figure R301.2(2) was based on the MCE Design Value Maps prepared by the USGS for the 2003 NEHRP Recommended Provisions and presumes that the site soil classification is Site Class D and structure has Normal Occupancy (II).

# Chapter 12 Tornado

This section of the Plan describes the provides a tornado profile, risk, and vulnerability for Queen Anne's County and participating municipalities:

- 12.1 TORNADO PROFILE
- 12.2 TORNADO RISK
- 12.3 TORNADO DATA
- 12.4 TORNADO VULNERABILITY

While tornado was ranked as a low-risk hazard for Queen Anne's County based upon the risk factors used in the 2018 HIRA, as discussed in Chapter 2, and shown on Table 2-4, the county experienced a significant tornado event during the 2012-2018 planning cycle. The EF-2 tornado resulted in one injury and damages. In terms of impact, this most recent tornado was the highest. Detailed information has been added as part of the plan update process.

## 12.1 Tornado Profile

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

Service definitions of a tornado and associated terms:

- Tornado - A violently rotating column of air that is touching the ground. Funnel cloud - A rapidly rotating column of air that does not touch the ground.
- Downburst - A strong downdraft, initiated by a thunderstorm, which induces an outburst of straight-line winds on or near the ground. They may last anywhere from a few minutes in small-scale microbursts to periods of up to 20 minutes in larger, longer macro-bursts. Wind speeds in downbursts can reach 150 mph and, therefore, can result in damages similar to tornado damages.
- Waterspouts - Waterspouts are similar to tornadoes over water. Waterspouts are generally broken into two categories: fair weather waterspouts and tornadic waterspouts. Fair weather waterspouts usually form along dark flat bases of a line of developing cumulus clouds. This type of waterspout is generally not associated with thunderstorms whereas tornadic waterspouts develop in severe thunderstorms.

Tornadoes usually form from one of three types of thunderstorms:

- Squall-lines;
- Multi-cells; and
- Supercells.

Supercell thunderstorms are rotating storms containing what is known as a mesocyclone, or a rotating updraft (column of air) from which tornadoes sometimes form. Supercell thunderstorms have a greater potential than other thunderstorms for producing severe weather, including tornadoes.

Tornadoes can range from just several yards to over two miles in width. Tornadoes can destroy almost everything in their path. Although tornadoes normally travel on the ground for short distances, tornado tracks of 200 miles or more have been reported.

## 12.2 Tornado Risk

Previously, tornado damage was measured on the Fujita Scale, also called the F-Scale, named for Dr. Tetsuya Theodore Fujita. The operational Fujita scale ranges from an F0 to an F5. The strongest tornadoes observed to date have been F5 (winds between 261-318 mph). An Enhanced Fujita Scale (EF Scale) was developed and implemented operationally by the National Weather Service (NWS) in 2007. The EF Scale was developed to better align tornado wind speeds with associated damages.

TABLE 12-1: ENHANCED FUJITA SCALE (EF-SCALE) CATEGORIES WITH ASSOCIATED WIND SPEEDS AND DESCRIPTION OF DAMAGES			
EF-SCALE NUMBER	WIND SPEED (mph)	F-SCALE NUMBER	TYPE OF DAMAGE POSSIBLE
EF0	65–85	F0-F1	Minor damage: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	86-110	F1	Moderate damage: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111–135	F1-F2	Considerable damage: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136–165	F2-F3	Severe damage: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166–200	F3	Devastating damage: Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200	F3-F6	Extreme damage: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (300 ft); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

Source: National Weather Service, 2007

### 12.3 Tornado Data

According to the National Centers for Environmental Information (NCEI), eleven tornado events have been recorded. Both an injury and damages were reported within the database for this hazard. However, the county for the most recent, July 24, 2017 tornado event provided additional damage totals.

TABLE 12-2: TORNADO – 1965-2017				
# OF EVENTS	INJURIES	DEATHS	DAMAGES	FREQUENCY
11	1	0	\$3,520,000	0.21

Source: National Centers for Environmental Information (NCEI), Events through April 2018

Queen Anne’s County reported a total of 10 tornadoes in a 60-year timespan, as reported in the 2012 Hazard Mitigation Plan. However, the National Weather Service (NWS) confirmed that an EF-2 tornado touched down in Queen Anne’s County during this planning cycle, bringing the total of events to 11.

On June 1, 2012 an EF0 tornado struck Queen Anne’s County. This storm did not cause any injuries or deaths, but did result in \$100,000 in property damages. The tornado touched down in Queen Anne’s County, northeast of Centreville around 8:30 p.m. EDT. The tornado began just north of Shellcross Farm Lane and tracked about 5 miles northeast to between Route 19 and Route 302 before dissipating, remaining on the west side of Route 301. Near the beginning of the tornado’s path, in the 1200-block of White Marsh Road, the roof on one side of a large pole barn was torn off. Its debris was scattered for a quarter to a half-mile in all directions and damaged a nearby home. Minor to moderate structural damage also occurred to several homes, barns, and outbuildings along Granny Branch Road, Route 405, and Route 19. Damage to fencing and an overturned irrigation system was also observed along Route 405. In addition, numerous trees were either snapped or uprooted along the tornado’s 5-mile long path. The tornado’s maximum path width was about 50 yards, with a maximum estimated wind speed of 80 mph. No injuries were reported.

On July 24, 2017 an EF-2 tornado touched down in Queen Anne’s County. Emergency Management coordinated a multi-agency response, assisting with the initial emergency response through the recovery process. The tornado affected the communities of Stevensville, Chester and Queenstown. Resulting in 233 properties damaged, 12 of those destroyed, 9000 homes without power, 3.3 million dollars in private property losses and fortunately only one minor injury. Maximum winds were estimated at 125 mph.



Figure 12-1

Photo Source: Queen Anne’s County Commissioner’s 2017 Year In Review Report

TABLE 12-3: TORNADO EVENT				
DATE	MAGNITUDE	DEATH	INJURIES	PROPERTY DAMAGE
8/1/1965	F1	0	0	5,000
7/30/1971	F2	0	0	5,000
3/21/1976	F2	0	0	50,000
3/14/1978	F1	0	0	5,000
8/28/1992	F0	0	0	0
4/16/1993	F1	0	0	0
7/27/1994	F0	0	0	0
11/26/1996	F1	0	0	50,000
5/19/2011	F0	0	0	5,000
6/1/2012	F0	0	0	100,000
7/24/2017	EF2	0	1	\$3,300,000
<b>TOTALS:</b>		<b>0</b>	<b>0</b>	<b>\$3,520,000</b>

Source: National Centers for Environmental Information (NCEI), Events through April 2018, & Queen Anne's County Commissioner's 2017 Year In Review

Due to the nature of storms, it is extremely difficult to predict, but through identifying various indicators of weather systems, and tracking these indicators, it provides us with a crucial means of monitoring extreme weather. Understanding the historical frequency, duration, and spatial extent of high wind events assists in determining the likelihood and potential severity of future occurrences. The characteristics of past severe wind events provide benchmarks for projecting similar conditions into the future. The probability of Queen Anne's County and its municipalities experiencing a tornado hazard events can be difficult to quantify, but based on historical record of 11 tornado events since 1965, it can reasonably be assumed that this type of event has occurred less than once per year, with an average frequency of 0.21.

## 12.4 Tornado Vulnerability

Due to the nature of tornado and other high wind events, all jurisdictions within Queen Anne's County are expected to be impacted equally. Nearly 70 percent of the deaths from tornadoes happen to people located in residential structures. Of these, over 40 percent are located in mobile homes, which are easily overturned and destroyed due to the low wind resistance of the structure. As discussed in Chapter 6 High Wind, according to the most recent Maryland Property View, 2015, there are five hundred and ninety-one mobile homes located throughout Queen Anne's County. Even anchored mobile homes can be seriously damaged when winds gust reach over 80 mph.

Vulnerable to high winds are dependent on the age of the building, type, construction material used, and condition of the structure. Structures are susceptible to lateral loads, as the winds impact the flat surfaces of a building. In addition, uplift forces can impact structures, as the winds move not just in straight lines, but at angles as well.

Probably the greatest issue for critical facilities during significant winds is the inaccessibility of such facilities due to debris-covered roads, utility outages, or other debris-related issues. During periods of heavy winds, roads can become impassable, due to downed trees or power lines. Power and communication lines are susceptible to damage from falling limbs, as trees are rocked by strong winds. Possible losses to critical infrastructure include:

- Electric power disruption;
- Communication disruption; and,
- Road closures.

Depending on the season, downed power and communication lines can become very hazardous. These threats combined with extreme heat or cold can lead to significant threats to the population.

Finally, all essential facilities were assessed to determine which, if any, had installed impact resistant glass windows. It is important to note that most impact windows consist of several layers of glass or other synthetic materials that make shattering and penetration difficult. Impact resistant glass protects from flying debris during a high wind event. As shown in Chapter 6 High Wind, on Table 6-3, two facilities have installed impact resistant glass, adding protection against damaging winds.

In addition, many essential facilities have communication antenna that are highly susceptible to high wind events. Damages to communications systems may lead to disruption of emergency communications.

# Chapter 13

## Community Capabilities

This section of the Plan describes the mitigation planning process undertaken by Queen Anne's County and participating municipalities in the preparation of this Hazard Mitigation Plan update. This section consists of the following subsections:

- 13.1 CAPABILITIES OVERVIEW
- 13.2 DEPARTMENT OF EMERGENCY SERVICES
- 13.3 MUTUAL AID
- 13.4 LAND USE AND DEVELOPMENT
- 13.5 COMMUNITY EMERGENCY RESPONSE TEAM
- 13.6 EMERGENCY OPERATIONS PLAN
- 13.7 ESSENTIAL FACILITIES EMERGENCY BACK-UP POWER
- 13.8 CITIZEN ALERT NOTIFICATION SYSTEM
- 13.9 MATCHING FUNDS FOR HAZARD MITIGATION
- 13.10 FLOOD HAZARD CAPABILITIES
  - 13.10.1 2014 Floodplain Ordinance
  - 13.10.2 Environmental Site Design (ESD)
  - 13.10.3 National Flood Insurance Program Training
  - 13.10.4 Maryland Community Rating System (CRS) Users Group
  - 13.10.5 Flood Insurance Information
  - 13.10.6 County Flood Buy-Out Listing
  - 13.10.7 Water Tower Elevation Project
- 13.11 SEA LEVEL CHANGE
- 13.12 SEVERE WEATHER

## 13.1 Capabilities Overview

Assessing community capabilities is an essential part of the mitigation planning process. This assessment identifies, reviews, and analyzes Queen Anne’s County current resources for reducing the impacts of hazards. Capabilities include authorities, policies, programs, staff, funding, and other resources available to accomplish mitigation and long-term vulnerability reduction.

**Benefits of partnerships:** Mitigation benefits from partnerships, such as:

- **Emergency Management** agencies may lead hazard mitigation planning and usually have a leading role in mitigation grants management.
- **Economic Development** organizations may provide technical assistance to small business owners and link them to available loans and grants, and they may also have a role in understanding laws and policies related to development.
- **Land Use and Development** agencies may govern development regulations that can direct development away from hazardous areas through planning, ordinances, and building codes at both the local and state levels.
- **Housing** agencies assist in providing safe and affordable housing before, during, and after disasters; their capabilities can support resilience and recovery initiatives.
- **Health and Social Services** entities may add outreach and education capabilities, especially in encouraging individuals to implement small mitigation projects on their own properties.
- **Infrastructure** agencies may assist in funding and/or constructing projects that mitigate natural hazards and provide access to and from disaster areas.
- **Natural and Cultural Resources** agencies may have documented guidance or best practices for how to treat historic or culturally significant properties. They may also have access to funding streams that complement and implement mitigation projects.

### ***Increasing Resilience by Assessing and Improving Mitigation Capabilities***

*Resilience is the capacity of communities to survive, adapt, grow, and even transform when conditions require it in the face of stresses and shocks. Building resilience is about making communities better prepared to withstand hazard events and better able to bounce back quickly and emerge stronger from these events. Assessing mitigation capabilities is an essential step toward resilience; building resilience cannot effectively occur unless there has been an honest assessment of the communities’ capabilities to plan, manage, and assign resources toward long-term hazard risk reduction.*

*Source: FEMA. State Hazard Mitigation Planning Key Topics Bulletins: Mitigation Capabilities. September 2016*

## 13.2 Department of Emergency Services

Through its Department of Emergency Services, Queen Anne’s County has developed a network of trained agency and volunteer personnel through the Maryland Emergency Management Assistance (MEMAC). This network includes state agencies such as the Maryland State Police, Department of Natural Resources, Department of the Environment, Maryland Department of Health, Department of Transportation, State Highway Administration and the Maryland Emergency Management Agency.

In 2004 the County approved Title 21 Subtitle 3, thereby creating a department that brings together four closely tied yet distinct functions or divisions, operating under one umbrella. The Communications, Emergency Medical Services (EMS), Emergency Management, and Fire Marshal Service functions are led by Division Chiefs who oversee complex organizations, have equal rank, and manage their divisions as separate operations, while at that same time enjoying a close partnership with the other Chiefs sharing ideas and resources. This model creates a functioning team of emergency services providers under a common infrastructure. Administrative and support cost are shared across divisions providing for economies of scale. Division personnel are crossed trained to better serve the community.

The Department is served by the Advisory Council (DESAC) whose function it is to advise the Department on matters of policy regarding the provision of emergency services within Queen Anne’s County. In order to carry out this mission there are four standing committees; Law Enforcement, EMS and Public Health, Communications, and Public Information and Education. DESAC provides a forum for all public health and safety departments and agencies to discuss issues of mutual concern, as well as to advise the Department on how best to serve them.

### **13.3 Mutual Aid**

The County has mutual aid agreements with surrounding jurisdictions and has also developed working relationships with its volunteer fire and ambulance community as well as many other departments within County government. The county also has agreements to coordinate mitigation activities with private utility companies, and with private transportation companies, for rail transportation Hazmat events. In addition, the Maryland Emergency Management Assistance Compact (MEMAC) is a statewide mutual aid system within Maryland that allows any jurisdiction in Maryland to request and receive assets from another Maryland jurisdiction. All of the requesting procedures, and financial and liability issues are worked out through MEMAC ahead of time. When an incident surpasses the response capabilities of a local jurisdiction, the local jurisdiction may request state-level support through the Maryland Joint Operation Center and/or State Emergency Operations Center. Finally, if the needed assets are not available within the State or have been exhausted, and the Governor has declared a state of emergency, then MEMA can reach out to other states through the Emergency Management Assistance Compact (EMAC). Emergency Management Assistance Compact works in a similar manner to facilitate the sharing of resources within the region, but not on a state-to-state basis.

### **13.4 Land Use and Development**

Through its Planning and Zoning Office, Queen Anne’s County has developed a system to regulate land use in sensitive areas, including 100-year floodplains, stream buffer areas, wetlands and Critical Areas. The County also has subdivision regulations for the creation of new lots and a zoning ordinance. Each municipality has similar regulations that are administered through the county Department of Planning & Zoning. A *Safe Growth Audit* has been conducted as part of this planning process and has been included as Appendix C. The audit highlights and provides recommendations regarding existing and future plans, policies, and procedure specific to hazard mitigation.

## 13.5 Community Emergency Response Team (CERT)

According to the Queen Anne’s County website, its Community Emergency Response Team (CERT) educates volunteers on disaster preparedness and basic disaster response skills. CERT members are taught based on nationally recognized guidelines and the material is adapted to conform to the hazards that could be faced within Queen Anne’s County. CERT training teaches basic response skills ranging from fire safety, light search and rescue, to disaster psychology and how people typically react when disasters strike. In a disaster when Emergency Services personnel could be delayed in response, CERT members become the first to respond.



*Source: Queen Anne’s County Website*

C.E.R.T. training is spread out over seven days and is taught for 2-3 hours each day, usually in the evening.

Training includes:

- disaster preparedness;
- fire suppression;
- basic medical operations;
- light search and rescue operations;
- disaster psychology;
- team organization; and,
- disaster simulation to test the knowledge and skills taught during the training.

Once the C.E.R.T. training has been completed, members are given a backpack with the basic tools necessary to respond in a disaster. Queen Anne’s County Community Emergency Response Team (C.E.R.T.) members also can volunteer during numerous planned events throughout the year.

## 13.6 Emergency Operations Plan (EOP)

According to ShoreUpdate.com, on August 25, 2015, the Queen Anne’s County Department of Emergency Services and members from the University of Maryland Center for Health & Homeland Security (CHHS) presented the Queen Anne’s County Emergency Operations Plan (EOP) Review Report 2015. Center for Health & Homeland Security was contracted to review the County’s Emergency Operations Plan. The primary scope of work was to review the Queen Anne’s County Emergency Operations Plan and provide written recommendations for plan improvement based on National Plan Guidance and established best practices. The Department of Emergency Services is currently working on the implementation of the findings and recommendations. The EOP will be sent to the Maryland Emergency Management Agency (MEMA) for a final review. and the County Commissioners’ will formally adopt the EOP shortly after the review. The County Commissioners adopted the plan in 2015.

## 13.7 Essential Facilities Emergency Back-Up Power

All water and wastewater treatment facilities as well as pump stations have emergency back-up power generators. Most essential facilities within the county have emergency back-up power generators. Centreville Police Department has plans to install a generator sometime in 2018.

## 13.8 Citizen Alert Notification System

Queen Anne’s County Citizen Alert Notification System keeps its citizens informed about emergencies and other important community news. This system enables the county to provide critical information quickly in a variety of situations, such as severe weather, unexpected road closures, missing persons and evacuations of buildings or neighborhoods. The alert notification system will enable its citizens to receive time-sensitive messages wherever specified, such home, mobile or business phones, email address, text messages and more.

In addition to the citizen alert notification system, the county utilized Facebook and Twitter to keep citizens informed of critical information for personal and public safety.

## 13.9 Matching Funds for Hazard Mitigation

Grant matching funds are included within the Queen Anne’s County’s operating budget for hazard mitigation initiatives and projects. This maintains an ongoing hazard mitigation program at the local level.



## 13.10 Flood Hazard Capabilities

### 13.10.1 2014 FLOODPLAIN ORDINANCE

- Adopted by the Board of County Commissioners of Queen Anne's County September 9, 2014 by Ord. No. 14-12. [1] Amendments noted where applicable. Floodplain Ordinance can be found on-line at: <https://ecode360.com/7136065>

### 13.10.2 ENVIRONMENTAL SITE DESIGN (ESD)

As described by the Queen Anne’s County Department of Public Works, when it rains, a portion of that water soaks into the ground, and a portion runs off. Stormwater management is all about reducing the amount of runoff through three principles:

- slow it down;
- spread it out; and,
- and soak it in.



Designers have an array of stormwater practices at their disposal to achieve these goals and integrate them into a construction project. This process is referred to as "*Environmental Site Design*" (ESD). Queen Anne’s County has applied updated Environmental Design Standards to help mitigate impacts of flooding to the county.

### 13.10.3 NATIONAL FLOOD INSURANCE PROGRAM TRAINING

Training for both real estate and insurance agents in Queen Anne’s County has been conducted periodically. The most recent training occurred within the planning cycle.



#### *Training and Education – Flood Insurance Reform Act (FIRM) 2004*

According to the Federal Emergency Management Agency (FEMA), as required by Section 207 of the Flood Insurance Reform Act of 2004, on September 1, 2005, FEMA published a notice advising all insurance agents who sell flood insurance policies through the NFIP about training and education requirements. The notice included a flood insurance course outline. The state departments of insurance are taking various actions to establish training requirements in their states. The NFIP encourages states to implement minimum training in NFIP flood insurance as part of their general licensing standards and to assist states in improving their training and testing of agents on flood insurance matters. Additional information can be found on-line at: <https://www.fema.gov/national-flood-insurance-program-training-workshops-and-conferences>.

### 13.10.4 MARYLAND COMMUNITY RATING SYSTEM (CRS) USERS GROUP

County staff regularly attend the quarterly Maryland CRS Users Group meetings. Best practices and lessons learned across the State of Maryland are highlighted at the meeting.

### 13.10.5 FLOOD INSURANCE INFORMATION

Information pertaining to flood insurance and the National Flood Insurance Program is available on the County’s website. The County point of contact for assistance is listed, along with a direct telephone number and the extension. Various resources and website links are listed as follows:

1. [FEMA Flood Map Service Center](#) - Official Flood Maps- The FEMA Flood Map Service Center (MSC) is the official public source for flood hazard information produced in support of the National Flood Insurance Program (NFIP). Use the MSC to find your official flood map, access a range of other flood hazard products, and take advantage of tools for better understanding flood risk.
2. [DFIRM Outreach Program](#) - Guides citizens and communities through the process of determining their current and future flood risks.
3. [Flood Smart](#) - The official site of the National Flood Insurance Program, managed by FEMA.
4. [Ready.gov](#) - Provides helpful information on what to do before, during and after a flood.
5. Brochure: [Protect Your Home from Flooding- Low Cost Projects You Can Do Yourself](#)
6. [Association of State Floodplain Managers](#) - Professional Organization for flood plain managers which contains useful information and current events affecting outreach and legislation.
7. [QAC Property Viewer](#) - Mapping tool that allows user to zoom into a property. At the top of the screen click on "I want to ..." and pick search criteria. To see floodplain for property, click on "Layers" icon (bottom of screen), in Layers list check Environmental, then Floodplain.
8. [Homeowner's Guide to Elevation Certificates](#)- Elevation Certificate Fact Sheet
9. [Queen Anne's County - Department of Emergency Services](#)
10. [Queen Anne's County Chamber of Commerce](#)

Note: The Queen Anne’s County Chamber of Commerce provides information for local insurance companies.

#### **13.10.6 COUNTY FLOOD BUY-OUT LISTING**

The county maintains a listing of potential flood acquisition properties.

#### **13.10.7 WATER TOWER ELEVATION PROJECT**

The Kent Island Water Tower elevation project is slated for completion in the fall of 2018.

### **13.11 Sea Level Change**

In March 2018, the Sea Level Rise (SLR) and Coastal Vulnerability Assessment and Implementation Plan was completed. The county received a CoastSmart Grant from the Maryland Department of Natural Resources to fund the study. According to the article titled *Study on Sea Level Rise Assesses Impacts on Queen Anne's*, the study provides impacts and recommendation for future planning purposes.

### **13.12 Severe Weather**

According to the Queen Anne's County Roads Division, the County Roads Division maintains approximately 556 miles of roads, 32 bridges, and is divided into 22 snowplow routes. Maintenance includes repair of asphalt and gravel roads guardrails, drainage pipes, storm drains, inlets, side ditches, and maintains salt and abrasives. In addition, this department also performs tree and brush trimming and removal, routine maintenance, cleaning, painting, and minor repairs to bridges. The Roads Division responds to emergencies such as: road flooding, downed trees, snow, and other weather related events. Since the last plan update completed in 2012, the Department of Works replaced ten (10) dump trucks with snowplows. However, additional salt storage facilities are needed.

# Chapter 14

# Mitigation Status Report

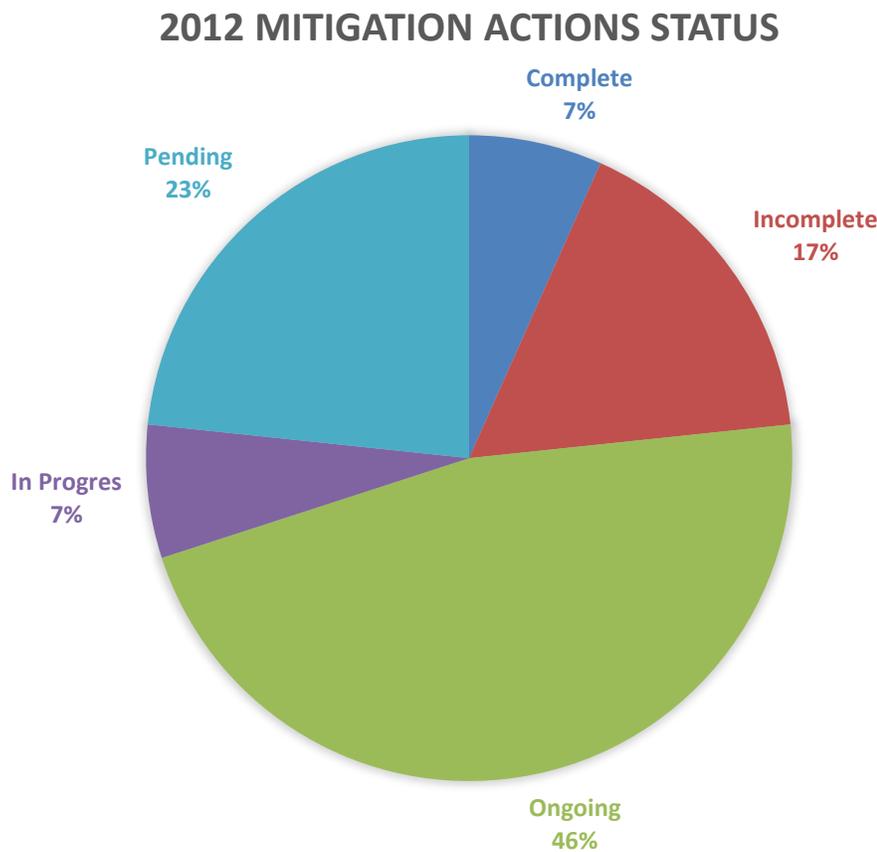
This section of the Plan provides information on mitigation strategies from the previous plan.

- 14.1 MITIGATION STATUS
- 14.2 2012 MITIGATION STATUS TABLE

## 14.1 Mitigation Status

In order to complete the mitigation status report, 2012 Mitigation Actions were assessed during the plan update process. Information was collected from various stakeholders. The 2012 mitigation actions were reviewed and a finalized status update was provided for each mitigation action item. Results indicated that of the 37 mitigation actions, 4 have been completed or are in progress, and 14 are ongoing, while 5 remain incomplete as shown on the chart below. Seven of the 2012 mitigation projects are pending.

Figure 14-1



## 14.2 2012 Mitigation Status Table

A mitigation status table was prepared and completed during this planning process. Each 2012 mitigation action status update provides details and indicates whether the mitigation action is complete, incomplete, ongoing, in progress, or pending.

**TABLE 14-1: 2012 MITIGATION ACTIONS STATUS**

PREVIOUS ACTION	RESPONSIBLE DEPARTMENT	STATUS					REMARKS
		COMPLETE	INCOMPLETE	ONGOING	IN-PROCESS	PENDING	
<b>Goal 1 Hurricane &amp; Coastal Erosion</b>							
Coordinate with the ESF (Emergency Support Function) 6 partners to upgrade all shelter resources with emphasis on resources for the elderly, particularly in the Kent Island-Queenstown corridor.	Emergency Services, Social Services, & QAC Dept. of Health				✓		Remodeling Centreville Middle to improve shelter capabilities.
Educate the public on hurricane wind awareness; the use of storm shutters and removing loose objects outdoors from becoming projectiles, the need for community and family planning, preparedness, and evacuation.	Emergency Services & All Municipalities			✓			Cert Program & Public Outreach
Further improve current methods for early warning protocol for special needs populations including the elderly, handicapped, and home-based daycares.	QAC Dept. of Health			✓			Outreach by Health Department
Identify coastal erosion areas of concern and conduct a benefit-cost analysis on best practices necessary to mitigate	Public Works			✓			
Evaluate the need for stream corridor restoration along Gravel Run	Centreville					✓	
<b>Goal 2 Flood</b>							
Review and where necessary revise and update local floodplain ordinances. Possible changes include vegetative buffers and increased freeboard requirements.	Public Works, All NFIP Participating Communities	✓					Completed 2014. Further enhancements may occur c. 2019 with CRS application.
Work with MDE to prepare the country to be eligible for CRS (Community Rating System) to reduce the cost of flood insurance within the country.	Public Works				✓		
Review existing network of Datum Markers and re-survey, replace, and add new Datum Markers in areas identified as high risk for flooding, particularly in the Kent Island- Queenstown	Emergency Services		✓				
Elevate or acquire residential properties affected by flooding in targeted areas as prioritized by the county, specifically particularly in the Category 1 Storm Surge area in the Kent Island-Queenstown corridor.	Emergency Services & Public Works			✓			
Work with representatives from the National Flood Insurance Program to hold courses in the County for real estate and flood insurance agents.	Emergency Services					✓	
Develop and administer outreach programs to identify business organizations that should prepare for flood events.	Emergency Services					✓	
Evaluate flood mitigation alternatives for repetitive flooding at Centreville Police Department located at 420 N. Commerce	Centreville						

PREVIOUS ACTION	RESPONSIBLE DEPARTMENT	STATUS					REMARKS
		COMPLETE	INCOMPLETE	ONGOING	IN-PROCESS	PENDING	
<b>Goal 2 Flood continued</b>							
Elevate or retrofit Wharf pump stations	Centreville						
Acquire 13 flood prone properties located on Sassafras St.	Millington						
Reconstruct and retrofit flood prone sections of the waste water treatment plant located at 272 Sassafras St.	Millington						
Contact the NFIP for outreach materials to distribute to homeowners	Millington						
Assist homeowners with questions and documentation to purchase flood insurance	Millington						
<b>Goal 3 Thunderstorms &amp; Lightning</b>							
Acquire emergency generators for placement at critical facilities	Emergency Services & Public Works		✓				Need to identify structures
Promote the use of special roofing shingles designed to interlock and resist uplift forces for both new construction and retrofits	Planning & Zoning		✓				
Contact insurance companies for wind damage insurance information	Sudlersville		✓				
Develop a public awareness campaign to notify citizens of the dangers of high wind damage and mitigation	Barclay		✓				
<b>Goal 4 Tornado</b>							
Continue to support and manage the tornado safety public awareness campaign in Queen Anne’s County	Emergency Services			✓			
Work with Sudlersville Fire Department to evaluate and assess warning systems & evacuation planning	Sudlersville & Emergency Services					✓	
Construct a community saferoom (Centreville)	Centreville						
<b>Goal 5 Winter Storm</b>							
Support tree trimming to prevent limb breakage and for safeguarding nearby utility lines during severe snow and ice events	Public Works			✓			
Purchase of generators to serve as backup power for heating centers	Public Works & Emergency Services			✓			
<b>Goal 6 Earthquake</b>							
Continue Community Emergency Response Training (CERT) classes to interested citizens to assist first responders at specified emergencies.	Emergency Services			✓			
Promote equipment fastening in county and municipal facilities	Emergency Services			✓			
<b>Goal 7 Wildfire</b>							
Work with partners to areas of high risk for wildfire in the Urban Wildland Interface, and monitor and warn residents of Wildfires dangers.	Emergency Services					✓	
Pursue vegetation and restoration practices that assist in enhancing and restoring the natural and beneficial functions of watersheds.	Public Works			✓			

PREVIOUS ACTION	RESPONSIBLE DEPARTMENT	STATUS					REMARKS
		Complete	Incomplete	Ongoing	In-Process	Pending	
<b>Goal 8 Temperature Extremes</b>							
Establish heating and cooling centers for at-risk populations and conduct outreach that encourages at-risk populations to use the facilities.	Emergency Services & All Municipalities	✓					
<b>Goal 9 Drought</b>							
Promote water saving techniques (such as low flow water saving showerheads and toilets)	Emergency Services & All Municipalities					✓	
<b>Goal 10 All Hazards</b>							
Distribute annual mitigation informational brochure or newsletter to residents and business owners.	Emergency Services					✓	
Work with the County Health Department to provide information to citizens on infectious diseases.	Emergency Services			✓			
Conduct natural hazards awareness programs in schools and community centers with emphasis on the at-risk population.	QAC Dept. of Health			✓			
Incorporate information about disaster preparedness and mitigation activities and opportunities on the County's website.	Emergency Services			✓			
Hold disaster exercises in various geographical and functional areas of the county. Types of exercises include: flooding, high winds, winter storms, hazardous materials spill, Weapons of Mass Destruction, and Bio-Terrorism.	Emergency Services			✓			

Source: 2012 QAC Hazard Mitigation Plan & 2018 HMPC

# Chapter 15

# New Mitigation Strategies & Implementation

This section of the Plan provides information on new mitigation strategies developed during the plan development.

- 15.1 DEVELOPMENT OF NEW MITIGATION ACTIONS
- 15.2 GOALS & OBJECTIVES
- 15.3 ACTIONS & PROJECTS
  - 15.3.1 2018 Mitigation Action Items
  - 15.3.2 Municipal 2018 Mitigation Action Items
  - 15.3.3 Mitigation Projects
- 15.4 IMPLEMENTATION
  - 15.4.1 Implementation Matrix
  - 15.4.2 Federal & State Grant Funding Sources

## 15.1 Development of New Mitigation Action Items

New mitigation action items were identified throughout the planning process. At each of the Hazard Mitigation Planning Committee (HMPC) actions items were identified and discussed. Two HMPC meeting were focused primarily on mitigation actions and strategies.

- At the Mitigation Strategies Meeting /Third Mitigation Planning Update Meeting held on August 16, 2018, incomplete mitigation actions from the previous plan were reviewed to determine whether or not those items should be carried over for inclusion within the new 2018 mitigation actions.

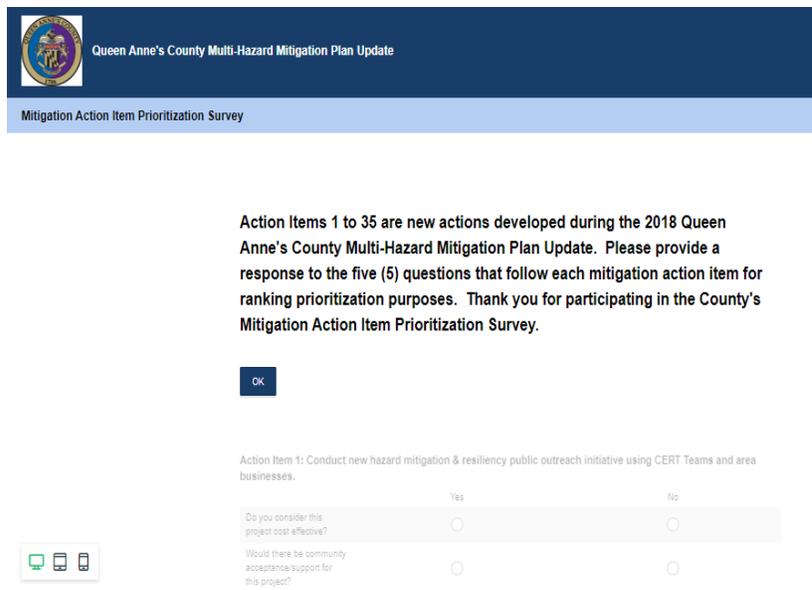
2012 Mitigation Actions Status					
Previous Action	Responsible Department	Status			Remarks
		Complete	Incomplete	Ongoing	

In addition, new mitigation items were developed. This process included the obtainment of additional information, such as, timeframe, and responsible agency, organization, or department.

- At the Mitigation Strategies Prioritization/Fourth Mitigation Planning Update Meeting held on October 17, 2018 prioritization of mitigation actions was the main agenda topic. HMPC members participated in an online mitigation action items prioritization survey. In order to prioritize the projects, a survey was developed and distributed to 30 individuals. The survey contained the same five questions for each project and was limited to yes/no answers, along with a comment section for use by respondents. The five questions included:

Figure 15-1

- Do you consider this project cost effective?
- Would there be community acceptance/support for this project?
- Is this project technically feasible?
- Is this project consistent with the County’s environmental goals?
- Should this action be a “high” priority?



## 15.2 Goals & Objectives

The goals from previous plan were reviewed and retained for inclusion into the new hazard mitigation plan.

<b>TABLE 15-1: GOALS &amp; OBJECTIVES</b>	
<b>Goal 1 Minimize the losses of life and property due to Hurricane &amp; Coastal Erosion in Queen Anne’s County.</b>	<ul style="list-style-type: none"> <li><b>OBJECTIVE 1.1:</b> <i>Minimize the impact of hurricanes to life and property to include buildings, infrastructure, and critical infrastructure</i></li> <li><b>OBJECTIVE 1.2:</b> <i>Minimize the impact of coastal erosion along the shorelines of Queen Anne’s County</i></li> </ul>
<b>Goal 2 Minimize the losses of life and property due to Flooding in Queen Anne’s County.</b>	<ul style="list-style-type: none"> <li><b>OBJECTIVE 2.1:</b> <i>Increase the sustainability of public and private property as it relates to the effects of flooding and coastal flooding</i></li> <li><b>OBJECTIVE 2.2:</b> <i>Continue to promote public awareness to the dangers of flash flooding, storm surge and coastal flooding</i></li> </ul>
<b>Goal 3 Minimize the losses of life and property due to Thunderstorms &amp; Lightning in Queen Anne’s County.</b>	<ul style="list-style-type: none"> <li><b>OBJECTIVE 3.1:</b> <i>Minimize the effects of electrical storms to public and private property in Queen Anne’s County</i></li> </ul>
<b>Goal 4 Minimize the losses of life and property due to Tornado in Queen Anne’s County.</b>	<ul style="list-style-type: none"> <li><b>OBJECTIVE 4.1:</b> <i>Minimize the impact of tornadoes to life and property to include buildings, infrastructure, critical facilities and critical infrastructure</i></li> </ul>
<b>Goal 5 Minimize the losses of life and property due to Severe Winter Storm in Queen Anne’s County.</b>	<ul style="list-style-type: none"> <li><b>OBJECTIVE 5.1:</b> <i>Minimize the impact of severe winter storms to life and property to include buildings, infrastructure, critical facilities and critical infrastructure</i></li> </ul>
<b>Goal 6 Minimize the losses of life and property due to Earthquake in Queen Anne’s County.</b>	<ul style="list-style-type: none"> <li><b>OBJECTIVE 6.1:</b> <i>Minimize the effects of seismic activity to life and property to include buildings, infrastructure, critical facilities and critical infrastructure in Queen Anne’s County</i></li> </ul>
<b>Goal 7 Minimize the losses of life and property due to Wildfire in Queen Anne’s County.</b>	<ul style="list-style-type: none"> <li><b>OBJECTIVE 7.1:</b> <i>Minimize the effects of wildfire to life and property to include buildings, infrastructure, critical facilities and critical infrastructure in Queen Anne’s County</i></li> </ul>
<b>Goal 8 Minimize the losses of life and property due to Drought &amp; Extreme Heat in Queen Anne’s County.</b>	<ul style="list-style-type: none"> <li><b>OBJECTIVE 8.1:</b> <i>Minimize the effects of drought and extreme heat to life, public and private property in Queen Anne’s County</i></li> <li><b>Objective 8.2:</b> <i>To educate the citizens of Queen Anne’s County on methods to reduce the effects of drought</i></li> </ul>
<b>Goal 9 Minimize the potential losses of life and property due to Sea Level Change in Queen Anne’s County.</b>	<ul style="list-style-type: none"> <li><b>Objective 9.1:</b> <i>To educate the citizens of Queen Anne’s County on methods to reduce the effects of sea level change.</i></li> <li><b>Objective 9.2:</b> <i>Coordinate and partner with various agencies, department, and organizations to mitigate the effects of sea level change</i></li> </ul>
<b>Goal 10 Minimize the losses of life and property due to High Winds in Queen Anne’s County.</b>	<ul style="list-style-type: none"> <li><b>OBJECTIVE 10.1:</b> <i>Minimize the impact of damaging high wind events to life and property to include buildings, infrastructure, critical facilities and critical infrastructure</i></li> </ul>

## 15.3 Actions & Projects

Results of the mitigation action prioritization survey yielded nineteen (19) “High” priority action items. These action items were used to develop nine (9) mitigation projects. Project sheets detailing the project, associated action items, responsible entity(s), estimated cost, and potential grant funding sources are included in this plan chapter, following the 2018 Mitigation Action Item Table.

### 15.3.1 2018 MITIGATION ACTION ITEMS

A total of 35 mitigation action items were developed by the Hazard Mitigation Planning Committee (HMPC).

- High Priority Action Items: 19
- Medium Priority Action Items: 7
- Low Priority Action Items: 9

# NEW MITIGATION ACTION ITEMS

<b>Table 15-2: 2018 MITIGATION ACTION ITEMS</b>				
<b>NEW MITIGATION ACTION</b>	<b>HAZARD</b>	<b>RESPONSIBLE DEPARTMENT</b>	<b>TIMEFRAME 1-2 YRS. (SHORT-TERM) OR 3-5 YRS. (LONG-TERM)</b>	<b>PRIORITY RANKING</b>
1. Conduct new hazard mitigation & resiliency public outreach initiative using CERT Teams and area businesses.	All-Hazards	Emergency Services	1-2 Years	HIGH
2. Create warning, guidelines, and protocols for vulnerable populations in coordination with the Department Emergency Services.	All-Hazards	QAC Department of Health, Social Services	3-5 Years	HIGH
3. Finalize Debris Management Plan and incorporate debris generation Hazus (wind & flood) results.	Flood, High Wind, Tornado & Hurricane	Emergency Services	1-2 Years	HIGH
4. Establish emergency agreements with private utilities and transportation companies.	All-Hazards	Emergency Services	3-5 Years	HIGH
5. Emergency back-up power- Install generators at the following essential facilities: <ul style="list-style-type: none"> <li>▪ Health Department Annex</li> <li>▪ EMS Station 100</li> <li>▪ EMS Station 200</li> <li>▪ EMS Station 400</li> <li>▪ Centreville Police Department (CPD)</li> </ul>	All-Hazards	Public Works, Emergency Services, QAC Department of Health, CPD	3-5 Years	HIGH
6. Upgrade undersized generators at the following essential facilities: <ul style="list-style-type: none"> <li>▪ EOC –Dept. of Emergency Services Building</li> <li>▪ Queenstown Volunteer Fire Dept. #3 and EMS Station 300</li> <li>▪ Health Department-Main Building</li> </ul>	All-Hazards	Public Works, Emergency Services, QAC Department of Health, Queenstown VFD	3-5 Years	HIGH
7. Southern Kent Island Sanitary Improvement Project-slated for completion in 2021.	All-Hazards	Public Works	3-5 Years	HIGH
8. Main waterline connection in Kent Island and Grasonville – loss of essential service.	All-Hazards	Public Works	3-5 Years	HIGH
9. Add new and/or replace datum markers in high-risk flood areas.	Flood & Hurricane	Public Works	1-2 Years	HIGH
10. Review and where necessary revise and update local floodplain ordinances in conjunction with the development of the 2019 CRS application.	Flood	Public Works	3-5 Years	HIGH

NEW MITIGATION ACTION	HAZARD	RESPONSIBLE DEPARTMENT	TIMEFRAME 1-2 YRS. (SHORT-TERM) OR 3-5 YRS. (LONG-TERM)	PRIORITY RANKING
11. Individual departments should review their capital improvements to determine if they are in vulnerable areas. Potential worksheet to fill out by department for each project.	All-Hazards	All Depts.	1-2 Years	HIGH
12. Update Comprehensive Plan and community plans to include hazard mitigation, including sea level change and coastal hazards.	Sea Level Change, Flood, & Hurricane	Planning & Zoning	3-5 Years	HIGH
13. Consider the transportation network in relation to hazards and evacuation within <b>Section 8.0 – Community Facilities and Transportation</b> of the County Comprehensive Plan. Specifically flood related hazards and Sea Level Change ( <b>Include Millington</b> ).	Sea Level Change, Flood, & Hurricane	Planning & Zoning	1-2 Years	HIGH
14. Modify Capital Improvement project planning to determine projects that include hazard mitigation.	All-Hazards	Finance	1-2 Years	HIGH
15. Modify Capital Improvement funding to prioritize projects that are located in high risk areas.	All-Hazards	All Departments	1-2 Years	HIGH
16. Identify open space & conservation area mitigation strategies to reduce risk, specifically in high-risk flood hazard(s) areas.	Sea Level Change & Flood	Planning & Zoning & IT/GIS	3-5 Years	HIGH
17. Conduct annual outreach project targeted to properties within the designated RLP Areas.	Flood	Emergency Services & Public Works	1-2 Years	HIGH
18. Distribute annual mitigation & resiliency outreach material annually using various media to reach multiple demographic groups.	All-Hazards	Emergency Services	1-2 Years	HIGH
19. Prioritize for mitigation Repetitive Loss Properties (RPL) and those properties within the designated RLP Areas.	Flood	Emergency Services & Public Works	3-5 Years	HIGH
20. Integrate Hazus (wind) results and FEMA Coastal Risk Map Study for potential shelter needs into Emergency Operation Plan-ESF #6 Mass Care & Sheltering.	Flood, High Wind & Hurricane	Emergency Service, QAC Department of Health, Social Services	3-5 Years	MEDIUM
21. Develop a Sea Level Change and Evacuation Route(s) Study.	Sea Level Change	Emergency Services	3-5 Years	MEDIUM
22. Install a generator for the Department of Public Works’ main facility.	All-Hazards	Public Works	1-2 Years	MEDIUM

NEW MITIGATION ACTION	HAZARD	RESPONSIBLE DEPARTMENT	TIMEFRAME 1-2 YRS. (SHORT-TERM) OR 3-5 YRS. (LONG-TERM)	PRIORITY RANKING
23. Update 2014 Floodplain Management Ordinance-Refer to information on Sea Level Change. <i>Note: 2016 Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan proposes raising freeboard requirement from 2 feet to 4 feet above Base Flood Elevation (BFE) based on SLR 2050 and 2100 projections. (If we use 2050 projections, then we should use 2' not 4')</i>	Sea Level Change, Flood, & Hurricane	Planning & Zoning	3-5 Years	MEDIUM
24. Creation of special districts with restrictive zoning in high hazard vulnerability areas.	Sea Level Change, Flood, & Hurricane	Planning & Zoning	3-5 Years	MEDIUM
25. Modify setback requirements for tidal wetlands.	Sea Level Change, Flood, & Hurricane	Planning & Zoning	1-2 Years	MEDIUM
26. Develop a FEMA – approved and adopted Flood Mitigation Plan that complies with the requirements of 44 CFR Part 78.	Flood	Emergency Services & Public Works	1-2 Years	MEDIUM
27. Initiate countywide Firewise Program in coordination with volunteer fire departments.	Wildfire	Emergency Services	3-5 Years	LOW
28. Additional salt storage facilities at remote areas of County, specifically two (2) more in the North Kent Island area.	Severe Winter Weather	Public Works	3-5 Years	LOW
29. Water system pipe breaks- potential area identified along Route 18 from Kent Narrows to Stevensville.	Flood	Public Works	3-5 Years	LOW
30. Obtain funding to purchase four (4) Mobile Message Sign Boards for the County.	All-Hazards	Public Works	1-2 Years	LOW
31. Obtain funding to purchase and install Weather Stations and pavement sensors at: <ul style="list-style-type: none"> <li>▪ Matapeake</li> <li>▪ DES</li> <li>▪ Sudlersville</li> </ul>	All-Hazards	Public Works	3-5 Years	LOW

NEW MITIGATION ACTION	HAZARD	RESPONSIBLE DEPARTMENT	TIMEFRAME 1-2 YRS. (SHORT-TERM) OR 3-5 YRS. (LONG-TERM)	PRIORITY RANKING
32. Install a new Water Treatment Plant at the Four Seasons.	Flood	Public Works	3-5 Years	LOW
33. Review projects during the capital improvement planning process to determine which projects, if any, would encourage development in areas vulnerable to natural hazards. Specifically flood related hazards including Sea Level Change.	Sea Level Change, Flood, & Hurricane	All Depts.	1-2 Years	LOW
34. Adopt green building codes for commercial & residential structures.	All-Hazards	Planning & Zoning	3-5 Years	LOW
35. Conduct Flood Insurance training for real estate and insurance agencies.	Flood	Emergency Services & Public Works	1-2 Years	LOW

**15.3.2 MUNICIPAL 2018 MITIGATION ACTION ITEMS**

In addition to the action items provided in Table 15-2, each municipality developed mitigation action item(s) specific to their town.

<b>TABLE 15-3: MUNICIPAL 2018 MITIGATION ACTION ITEMS</b>		
<b>NEW MITIGATION ACTION</b>	<b>MUNICIPALITY</b>	<b>TIMEFRAME 1-2 YRS. (SHORT-TERM) OR 3-5 YRS. (LONG-TERM)</b>
Review and update flood buy-out listing, adding (2) properties in the Millington Area. (Information obtained from the Town of Millington)	Town of Millington	3-5 Years
Relocate or retrofit flood prone Millington Wastewater Treatment Plant. WWTP has been flooded numerous times.	Town of Millington	3-5 Years
Remove stream channel debris.	Town of Church Hill	1-2 Years
Extend MD SHA close system storm drain in Commerce Street to eliminate flooding on private property and roadway.	Town of Centreville	1-2 Years
Coordinate with MD SHA to re-profile both Liberty and Commerce Streets with a reduced crown and uniform cross-slope to permit the recovery of former curb containment heights.	Town of Centreville	1-2 Years
Coordinate with MD DNR and MD SHA to implement water quality best management practice for Commerce Street drainage to reduce the flows leading to Millstream.	Town of Centreville	1-2 Years
Upgrade Wharf Pumping Station-Incomplete mitigation action items from 2012.	Town of Centreville	1-2 Years
Flooding of Trap Hill Ditch causes septic tank overflows in the Town of Barclay. Work with the Town of Sudlersville to extend sewer service area using the Sudlersville Water Treatment facility. <i>Please Note: Town of Barclay has imposed a building moratorium within town limits until sewer facility/septic issues are resolved.</i>	Town of Barclay & Town of Sudlersville	1-2 Years
Install emergency generator at Town Office, which may be used as a shelter facility.	Town of Queenstown	1-2 Years
Purchase mobile message sign board for hazard warning and notification.	Town of Queenstown	1-2 Years

**15.3.3 MITIGATION PROJECTS**

The following nine (9) mitigation projects were developed from the high nineteen (19) “High” priority action items.

## NEW MITIGATION PROJECTS

**PROJECT 1: HAZARD MITIGATION & RESILIENCY PUBLIC OUTREACH**

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

**DISCUSSION:** Public outreach for hazard mitigation and resiliency is an ongoing effort for the Department of Emergency Services (DES). Finding new and improved methods to deliver hazard information is a primary goal of the DES.

Being prepared can reduce fear, anxiety, and losses that accompany disasters. Communities, families, and individuals should know what to do during a disaster event and where to seek shelter. They should be ready to evacuate their homes and take refuge in public shelters and know how to care for their basic medical needs. Effective messaging will mitigate the possibility of injury or loss of life and reduce panic during a disaster event.

Queen Anne’s County Community Emergency Response Team (C.E.R.T.) educates volunteers on disaster preparedness and basic disaster response skills. C.E.R.T. members are taught based on nationally recognized guidelines and the material is adapted to conform to the hazards that could be faced within the County. Queen Anne’s County Community Emergency Response Team (C.E.R.T.) members have the opportunity to volunteer during numerous planned events throughout the year. Partnering with various stakeholders, such as, area businesses, provides C.E.R.T. members the opportunity to educate and disseminate outreach materials on hazard mitigation and resiliency.

**PROJECT:** Utilize the C.E.R.T. team and a broad base of stakeholders, that may include local businesses, scout troops, sports clubs, home school organizations, and faith-based and disability communities, niche media outlets, and other community organizations to identify where information about the hazard mitigation and resiliency can be shared. The C.E.R.T. team should partner with groups that interact with a given population on a daily basis, since these groups/organizations already have an established relationship within the community and can act as liaisons to open up communication in order to provide necessary information. In addition, continue to utilize social media applications (e.g., Facebook, Instagram, and Twitter) to disseminate mitigation and resiliency outreach material annually.

<b>Hazards: All-Hazards</b>
<b>PROJECT 1 ACTIONS</b>
<b>Action #1:</b> Conduct new hazard mitigation & resiliency public outreach initiative using C.E.R.T. Teams and area businesses.
<b>Action #18:</b> Distribute annual mitigation & resiliency outreach material annually using various media to reach multiple demographic groups.

**Responsible Organizations:** Department of Emergency Services.  
**Estimated Costs:** \$1,500-\$3,000 annually for outreach materials; Staff Time  
**Possible Funding Sources:** FEMA Hazard Mitigation Grant Program (HMPG); Maryland’s Community Resilience Grant Program  
**Timeline for Implementation:** 1-2 Years

**PROJECT 2: VULNERABLE POPULATIONS WARNINGS, GUIDELINES & PROTOCOLS**

The action item is directly related to the vulnerable population warnings, guidelines, and protocols as discussed in the following project.

**DISCUSSION:** The severity of a disaster depends on both the physical nature of the extreme event and the social nature of the human populations affected by the event. Populations, specifically the aging population, the population living under the poverty level, and the population with a disability, are more vulnerable during a hazard event. According to Population Reference Bureau (PRB), poverty is a primary factor that affects how individuals perceive risk and how well they understand and respond to warnings. Widespread poverty has played a critical role in increasing population vulnerability to many disasters. According to PRB, other factors that affect vulnerability include age and disability. The effects of age and disability on disaster vulnerability were clearly seen among elderly individuals trapped in nursing facilities during Hurricane Katrina.

<b>Hazards: All-Hazards</b>
<b>PROJECT 2 ACTION</b>
<b>Action #2:</b> Create warning, guidelines, and protocols for vulnerable populations in coordination with the Department Emergency Services.

**Responsible Organizations:** QAC Department of Health and Social Services  
**Estimated Costs:** Staff Time  
**Possible Funding Sources:** N/A  
**Timeline for Implementation:** 3-5 Years

Within Chapter 2, the Vulnerable Population section, maps depict where the higher concentrations of vulnerable populations are located within Queen Anne’s County. These populations were analyzed at the census tract level. Knowing the location of vulnerable populations, staff can work with patient care facilities, and state and local public health and emergency management in developing necessary warning, guidelines, and protocols to be utilized during a hazard event. This will not only aid vulnerable populations with preparedness, but also enable effective response from responsible agencies and/or organizations.

**PROJECT:** Create warning, guidelines, and protocols for vulnerable populations in coordination with the Department Emergency Services. Utilize the maps provided in Chapter 2 to assist in prioritizing and targeting communities with at-risk vulnerable populations.

**PROJECT 3: PLAN INTEGRATION**

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

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

For all capital investment projects, develop guidelines that ensure projects are adequately designed for the environmental conditions they will encounter during their full lifetimes.

Furthermore, during the preparation of the *2018 Queen Anne’s Hazard Mitigation Plan*, a Safe Growth Audit was conducted (Appendix C). Performing a Safe Growth Audit is a way to assess how well the existing planning tools address hazard risks and community resiliency. Safe Growth Audit questions provide a systematic way to review local planning tools and identify the presence of, or need for, hazard-related actions.

The development of a more in-depth inventory will enable the county to identify further gaps and overlaps between the current hazard mitigation plan and the larger planning framework including the County’s future Comprehensive Plan. Identifying existing tools may lead to opportunities for integration. The identification of gaps will lead to the consideration of capacity specific to county and municipal staffing and resources. Finally, the systematic planning process will yield a roadmap displaying steps that are available to, and achievable by, Queen Anne’s County.

During the development of the new Queen Anne’s County Comprehensive Plan, a list of recommendations to be included in the Plan are as follows:

- Include and reference the 2018 Queen Anne’s County Hazard Mitigation Plan in existing and future planning documents, specifically updates to the County Comprehensive Plan, Municipal Growth

<b>Hazards: All-Hazards</b>
<b>PROJECT 3 ACTIONS</b>
<b>Action #3:</b> Finalize Debris Management Plan and incorporate debris generation Hazus (wind & flood) results.
<b>Action #11:</b> Individual departments should review their capital improvements to determine if they are in vulnerable areas. Potential worksheet to fill out by department for each project.
<b>Action #12:</b> Update Comprehensive Plan and community plans to include hazard mitigation, including sea level change and coastal hazards.
<b>Action #13:</b> Consider the transportation network in relation to hazards and evacuation within <b>Section 8.0 – Community Facilities and Transportation</b> of the County Comprehensive Plan. Specifically flood related hazards and Sea Level Change ( <b>Include Millington</b> ).
<b>Action #14:</b> Modify Capital Improvement project planning to determine projects that include hazard mitigation.
<b>Action #15:</b> Modify Capital Improvement funding to prioritize projects that are located in high risk areas.

**Responsible Organizations:** Planning & Codes  
**Estimated Costs:** Staff Time  
**Possible Funding Sources:** N/A  
**Timeline for Implementation:** 1-2 Years

Plans and the Water & Sewer Plan.

- Review Hazard Areas of Concern identified in 2018 Queen Anne’s County Hazard Mitigation Plan in relation to potential hazard overlay zones. These areas have been identified as “high-risk” and special consideration should be undertaken in terms of future growth and development.
- Consider the transportation network in relation to hazards and evacuation within **Section 8.0 – Community Facilities and Transportation** of the County Comprehensive Plan. Specifically flood related hazards and Sea Level Change.
- Consider subdivision regulations that limits or places special site design considerations on the subdivision of land within or adjacent to natural hazard areas, as appropriate. Specifically, those areas that have been designated as “high-risk” Hazard Areas of Concern in the County Hazard Mitigation Plan.
- Review projects during the capital improvement planning process to determine which projects, if any, would encourage development in areas vulnerable to natural hazards. Specifically flood related hazards including Sea Level Change.
- Identify Open Space and/or Conservation area mitigation strategies for reducing areas of risk.
- Consider the adoption of Green Building Codes for commercial and residential structures.

**PROJECT:** Integrate hazard planning into the County’s planning framework. This will lead to development patterns and redevelopment that decreases hazard risk and vulnerability. To achieve and facilitate integration, Queen Anne’s County should review the safe growth audit and conduct an evaluation on how planning documents, policies, codes and programs are maintained and implemented, and the roles of people, agencies, and departments in evaluating and updating them. This depth of review will enable the County to identify opportunities for plan integration, resulting in effective ways to reduce hazard vulnerability in Queen Anne’s County.

Incorporate debris generation from the Hazus results into the Debris Management Plan before finalizing the plan. Debris generation estimates are provided in Chapter 4, Section 4.4 Hurricane Vulnerability. The eligible tree debris columns (Eligible Tree Weight and Eligible Tree Volume) provide estimates of the weight and volume of downed trees that would likely be collected and disposed of at public expense. The eligible tree debris estimates produced by the Hurricane Model tends to underestimate reported volumes of debris brought to landfills. The underestimate suggests that there are sources of vegetative and non-vegetative debris that are not modeled in Hazus. For landfill estimation purposes, it is recommended that the Hazus debris volume estimate be treated as an approximate lower bound. Based on actual reported debris volumes, it is recommended that the Hazus results be multiplied by three to obtain an approximate upper bound estimate.

Modify the Capital Improvement Program to include hazard mitigation principles into project identification, prioritization, and design, and to leverage mitigation or recovery funds. The Federal Emergency Management Agency (FEMA) describes four key benefits to the integration of hazard mitigation into Capital Improvement Program:

- Leverages funding to implement hazard mitigation measures;
- Helps ensure that public expenditures for capital improvements are consistent with hazard mitigation goals, objectives, and policies;

- Provides the opportunity to review and consider the impact of proposed improvements on hazard vulnerability, either directly or indirectly, through supporting private investment in land development; and,
- Can help guide new growth to safer areas.

At a minimum, FEMA recommends that communities review their CIPs in regards to their connection to hazard mitigation during their regular hazard mitigation plan update. Federal regulations (Title 44 Code of Federal Regulations (CFR) §201.6(c)(4)(ii), Local Mitigation Plans) require that hazard mitigation plans “describe a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans,” when appropriate. FEMA further suggests that CIPs emphasize projects that mitigate the impact of natural hazards by elevating them to high priority.

**PROJECT 4: EMERGENCY AGREEMENTS**

The action item is directly related to the emergency agreements as discussed in the following project.

**DISCUSSION:** An emergency agreement, similar to a mutual aid agreement, are intended for those unprecedented man-made or natural disasters that require response resources from private utility and transportation companies. The incorporation of an emergency agreement into the private companies’ emergency planning enhances advanced planning and prompt response efforts in time of extenuating circumstances.

When a hazard event occurs, local officials and energy companies must first ensure that critical infrastructure facilities like power plants are operating, and that emergency responders, medical professionals, and critical care facilities have the energy supplies they need to operate. Additionally, an emergency agreement is necessary to have with transportation agencies. Resources for facilitating transportation planning, coordination, and operations across all modes for disasters, emergencies, and significant events is vital during a hazard event. Participating in emergency agreements provides all stakeholders the flexibility in evaluating the most effective and efficient means of obtaining resources during an emergency.

**PROJECT:** Establish emergency agreements with private utilities and transportation companies. This will assist private utilities and transportation companies to participate in coordinated disaster response with local government officials and will ensure rapid response times during a hazard event.

<b>Hazards: All-Hazards</b>
<b>PROJECT 4 ACTION</b>
<b>Action #4:</b> Establish emergency agreements with private utilities and transportation companies.

**Responsible Organizations:** Department of Emergency Services  
**Estimated Costs:** Staff Time  
**Possible Funding Sources:** N/A  
**Timeline for Implementation:** 3-5 Years

**PROJECT 5: ESSENTIAL FACILITIES - GENERATORS**

Action items are directly related to generators for essential facilities and may be implemented separately or concurrently as discussed in the following project.

**DISCUSSION:** During a hazard event, essential facilities are critical factors for aiding residents within their respective vicinity. Therefore, it is crucial that these facilities be operational at all times in order to assist during a hazard event. The essential facility assessment conducted during the planning process revealed several facilities lacked generators or had generators in need of an upgrade. Essential facilities that are in need of a generator included:

- Health Department Annex
- EMS Station 100
- EMS Station 200
- EMS Station 400
- Centreville Police Department (CPD)

The following essential facilities currently have undersized generators that need to be upgraded:

- EOC –Dept. of Emergency Services Building
- Queenstown Volunteer Fire Dept. #3 and EMS Station 300
- Health Department-Main Building

These facilities are critical to the health and welfare of the population and that are especially important following hazard events. Therefore, it is necessary to ensure services can continue to be provided to Queen Anne’s County citizens.

**PROJECT:** Assess each facility for vulnerability, capacity, facility resources, and the necessary sized generator needed for back-up power. The project deliverable would include a final technical report based on FEMA 361 guidelines. Based upon this report, apply for grant funding to purchase and install or upgrade emergency generators at the facilities listed above.

Hazards: All-Hazards
PROJECT ACTIONS
<p><b>Action #5:</b> Emergency back-up power- Install generators at the following essential facilities:</p> <ul style="list-style-type: none"> <li>▪ Health Department Annex</li> <li>▪ EMS Station 100</li> <li>▪ EMS Station 200</li> <li>▪ EMS Station 400</li> <li>▪ Centreville Police Department (CPD)</li> </ul>
<p><b>Action #6:</b> Upgrade undersized generators at the following essential facilities:</p> <ul style="list-style-type: none"> <li>▪ EOC –Dept. of Emergency Services Building</li> <li>▪ Queenstown Volunteer Fire Dept. #3 and EMS Station 300</li> <li>▪ Health Department-Main Building</li> </ul>

**Responsible Organizations:** Department of Emergency Services, Public Works, QAC Department of Health, Centreville Police Department, and Queenstown Volunteer Fire Department  
**Estimated Costs:** Project Dependent  
**Possible Funding Sources:** FEMA Hazard Mitigation Grant Program (HMPG)  
**Timeline for Implementation:** 3-5 Years

**PROJECT 6: SANITARY IMPROVEMENT**

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

**DISCUSSION:** Failing septic systems not only cause issues for property owners, but for the environment as well. When a septic system fails, sewage could flow into groundwater, surface water, or marine water without being detected. The sewage carries pathogens and other dangerous contaminants. Exposure to these pathogens and contaminants can make people sick. They can also contaminate water sources and make them unsafe for drinking, swimming, shellfish harvesting, and agricultural uses.

Queen Anne’s County Sanitary District is working to correct a longstanding issue with the failing septic systems in South Kent Island (SKI). In 1990, a county Health Department Sanitary Survey documented that “70% to 90% of the septic systems on SKI were directly discharging into groundwater.” Then in 2007, health officials stated septic systems were still failing and a permanent solution was warranted. Therefore, in 2013, the County proposed to extend public sewer service to the communities in South Kent Island.

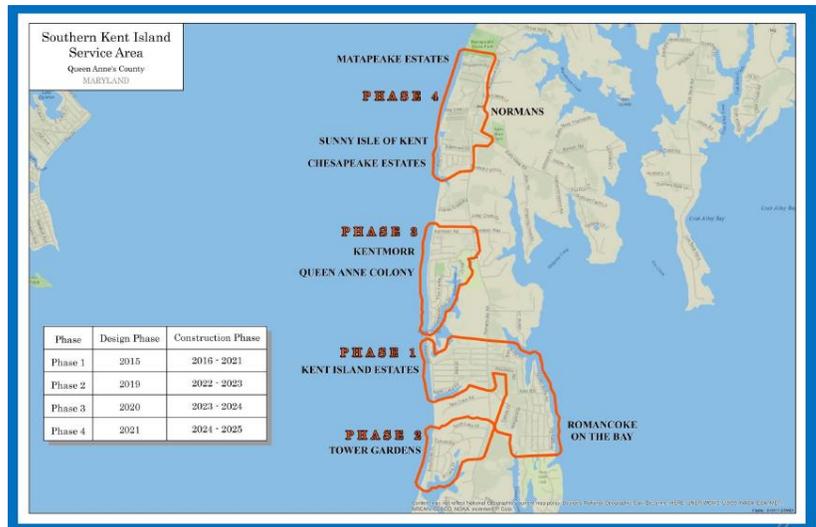
The Queen Anne’s County Sanitary Commission has established the South Kent Island Wastewater Sub-district of the Queen Anne’s County Sanitary District to provide sanitary service (public sewer) to nine (9) exclusive communities on South Kent Island (SKI).

The collective SKI communities include 1,518 existing single family residential homes, 8 non-residential uses and a maximum of 632 vacant infill lots. The project will be implemented in four phases over a 10-year period. Phase 1 of the project is estimated to be complete by February 2021.

The next step to resolve issues with failing septic tanks and mitigate further contamination into water sources is to continue with the remaining Phases of the SKI project. The design phase for Phase 2 is projected to begin in 2019.

<b>Hazards: All-Hazards</b>
<b>PROJECT ACTIONS</b>
<b>Action #7:</b> Southern Kent Island Sanitary Improvement Project-slated for completion in 2021.
<b>Action #8:</b> Main waterline connection in Kent Island and Grasonville – loss of essential service.

**Responsible Organizations:** Public Works  
**Estimated Costs:** ~\$35,000 - \$45,000  
**Possible Funding Sources:** FEMA Hazard Mitigation Grant Program (HMPG)  
**Timeline for Implementation:** 3-5 Years



**PROJECT:** Improve infrastructure such as water and sewer, to ensure waters are not with failing septic systems and well heads. Upgrade water main line connection in Kent Island and Grasonville to ensure service will not be lost during a hazard event and to mitigation contamination due to septic system issues.

**PROJECT 7: HIGH-RISK FLOOD AREAS**

Action items are directly related to high-risk flood areas and may be implemented separately or concurrently as discussed in the following project.

**DISCUSSION:** Datum markers are objects that are placed in marking survey points on the earth’s surface. These markers are placed for current and future surveying and consist of durable material since they are intended to be permanent. There are two common types of datum markers, vertical elevation markers and horizontal position markers. Vertical elevation markers are also known as benchmarks and are illegal to remove or damage. Additionally, with the installation of datum markers, flood insurance fees could potentially be reduced considering benchmark locations would already be identified and further surveying would not be necessary. Therefore, datum markers should be installed in high-flood risk areas in order to monitor current and future conditions.



<b>Hazards: Sea Level Change, Flood, &amp; Hurricane</b>
<b>PROJECT ACTIONS</b>
<b>Action #9:</b> Add new and/or replace datum markers in high-risk flood areas.
<b>Action #16:</b> Identify open space & conservation area mitigation strategies to reduce risk, specifically in high-risk flood hazard(s) areas.

**Responsible Organizations:** Public Works, Planning & Zoning, and IT/GIS  
**Estimated Costs:** Project Dependent – Surveyor Cost, Acquisition Cost  
**Possible Funding Sources:** FEMA Hazard Mitigation Grant Program (HMPG); Program Open Space; MDE Comprehensive Flood Management Grant Program; Pre-Disaster Mitigation Fund  
**Timeline for Implementation:** 3-5 Years

In addition, areas susceptible to flooding can be more effectively managed by combining open space or conservation easements in or around the floodplain.

When preserving open space throughout a watershed, communities may want to target areas with water-absorbing soils in regions experiencing high growth. Protecting this type of land could reduce future flows and contaminants into receiving rivers, mitigating future flooding. Acquiring land for open space and conservation purposes can also assist in protecting critical habitats and marsh migration zone, which could provide future protection against flooding and erosion as well.

**PROJECT:** Resurvey, replace, and add new datum markers primarily in the high-risk flood areas. This will enable the County to monitor current and future conditions within these areas. This will also enable the County to track high water marks following a flood event and incorporate findings into emergency response plans.

Identify priority shoreline parcels for acquisition or easement to improve flood storage and wave buffering utilizing open space preservation funding or pre-disaster/flood risk mitigation funding. Obtaining and preserving natural areas and vegetation benefits natural resources while also mitigating potential flood losses.

**PROJECT 8: NATIONAL FLOOD INSURANCE PROGRAM (NFIP) & COMMUNITY RATING SYSTEM (CRS)**

Action items are directly related to the National Flood Insurance Program (NFIP) and Community Rating System (CRS) and may be implemented separately or concurrently as discussed in the following project.

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

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

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

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

In addition, the Queen Anne’s County *2014 Floodplain Management Ordinance* identified the flood protection elevation as the base flood elevation plus two (2) feet of freeboard, which is more stringent than FEMA’s minimum requirement of one (1) foot of freeboard. However, this regulation applies to the current special flood hazard areas, it does not take into account futures conditions, such as Sea Level Change. The *2016 Sea Level Rise and Coastal Vulnerability Assessment and Implementation Plan*, proposes raising freeboard requirement from 2 feet to 4 feet above Base Flood Elevation (BFE) based on the Sea Level Change 2050 and 2100 projections.

**PROJECT:** Review current floodplain regulations and revise, where necessary, to ensure future conditions are taken into consideration. Requirements should be evaluated as each relates not only to the special flood hazard areas, but also to tidal elevations and projected sea level change elevations. More-stringent regulations will help the County accumulate points towards the Community Rating System (CRS).

<b>Hazard: Flood</b>
<b>PROJECT ACTIONS</b>
<b>Action #10:</b> Review and where necessary revise and update local floodplain ordinances in conjunction with the development of the 2019 CRS application.
<b>Action #17:</b> Conduct annual outreach project targeted to properties within the designated RLP Areas.
<b>Action #19:</b> Prioritize for mitigation Repetitive Loss Properties (RPL) and those properties within the designated RLP Areas.

**Responsible Organizations:** and Public Works Emergency Services  
**Estimated Costs:** \$1,500-\$3,000 annually for outreach materials; Staff Time  
**Possible Funding Sources:** MDE Technical Assistance; CoastSmart Communities Grant  
**Timeline for Implementation:** 3-5 Years

Prepare a CRS application to reduce insurance costs for Queen Anne’s County residents. Currently, Queen Anne’s County is rated as a “10” CRS community, meaning that the County is compliant with the NFIP, however does not qualify for flood insurance discounts. As of August 31, 2017, there are 2,325 NFIP policy holders in the county, including municipalities, with \$1,409,174 being paid in insurance premiums. Completion of a CRS application detailing floodplain management and mitigation efforts could result in a rating adjustment. For example, changing Queen Anne’s County’s rating from a 10 to a 9 would result in a 5% reduction. A 5% reduction for those in the Special Flood Hazard Area (SFHA) and for those in the non-SFHA would reduce the Flood Insurance Premiums for Queen Anne’s County policy holders including municipalities to \$1,338,715 dollars annually, a savings of \$70,459. A rating of 8 would result in a 10% reduction, which would reduce the Flood Insurance Premiums to \$1,304,257 dollars annually, a savings of \$104,917. The effort to undertake new CRS activities is extremely beneficial to Queen Anne’s County flood insurance policy holders.

Prioritized for flood mitigation Repetitive Loss Properties listed in Appendix A, Table A-3. Rising seas and increased storm surge, increase the flood vulnerability of on structures that are already considered flood prone. The FEMA Flood Zone AE and VE flood depths coupled with hurricane storm surge inundation areas and the projected Sea Level Change not only increases the flood inundation depths for all flood prone structures, but increase the risk to structures currently not affected by flood in this Repetitive Loss Area. Based on the various types of flood sources analyzed, those properties subjected to multiple types of flood hazards should be prioritized for mitigation as listed in Tables A-7 and A-11.

In addition, a public outreach campaign targeting flood prone properties in Repetitive Loss Area 1 and Repetitive Loss Area 2 should be undertaken by the County. According to the *National Flood Insurance Program Community Rating System Coordinator’s Manual FIA-15/2017*, in order to receive CRS credit for Activity 504, a Category B community must implement an annual outreach project to the properties in the mapped repetitive loss areas that have insurable buildings, and include a copy of the project with its application and annual recertification.

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

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

This outreach project could be targeted at the flood prone properties located within the Federal Emergency Management Agency (FEMA) Special Flood Hazard Areas, Flood Zones AE and VE and listed on Tables A-8 and A-12. **An example of the outreach project is as follows:**

*Dear Resident:*

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

- 1. Check with the Building Department on the extent of past flooding in your area. Department staff can tell you about the causes of repetitive flooding, what the City is doing about it, and what would be an appropriate flood protection level. The staff can visit your property to discuss flood protection alternatives.*
- 2. Prepare for flooding by doing the following:*
  - Know how to shut off the electricity and gas to your house when a flood comes.*
  - Make a list of emergency numbers and identify a safe place to go.*
  - Make a household inventory, especially of basement contents.*
  - Put insurance policies, valuable papers, medicine, etc., in a safe place.*
  - Collect and put cleaning supplies, camera, waterproof boots, etc., in a handy place.*
  - Develop a disaster response plan. See the Red Cross' website at [www.redcross.org](http://www.redcross.org) for information about preparing your home and family for a disaster.*
  - Get a copy of *Repairing Your Flooded Home*. We have copies at the Public Works Department or it can be found on the Red Cross' website, too.*
- 3. Consider some permanent flood protection measures.*
  - Mark your fuse or breaker box to show the circuits to the floodable areas. Turning off the power to the basement before a flood can reduce property damage and save lives.*
  - Consider elevating your house above flood levels.*
  - Check your building for water entry points, such as basement windows, the basement stairwell, doors, and dryer vents. These can be protected with low walls or temporary shields.*
  - Install a floor drain plug, standpipe, overhead sewer, or sewer backup valve to prevent sewer backup flooding.*
  - More information can be found at FEMA's website, [www.ready.gov/floods](http://www.ready.gov/floods).*
  - Note that some flood protection measures may need a building permit and others may not be safe for your type of building, so be sure to talk to the Building Department.*

**PROJECT 9: REPETITIVE ROADWAY FLOODING**

**DISCUSSION:** During the 2018 planning process, the Department of Public Works and municipalities were asked to identify roadways that experience frequent flooding. Subsequently, Table 15-3: Repetitive Roadway Flooding was developed. This table provides the roadway location, agency responsible for the roadway, what is the source of flooding, if the roadway is an evacuation route, and additional comments. Eleven (11) locations were identified, with heavy rain being the main cause of flooding. Two (2) of the roadways listed are evacuation routes, Route 8 and Route 213. 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.

**Hazard: Flood, Hurricane, & Sea Level Change**

**PROJECT:** Form a committee to review and prioritize the listing of repetitive roadway flooding provided on Table 15-4. When prioritization is completed, conduct engineering studies for roadways prioritized as “high,” to determine the most effective mitigation measures to ensure the prevention of future flooding to these roadways. After the study is complete, use available grant funding sources to implement the construction phase. These projects should be included within the County’s Capital Improvement Plan.

**Responsible Organizations:** Public Works and Emergency Services  
**Estimated Costs:** Project Dependent  
**Possible Funding Sources:** FEMA Hazard Mitigation Grant Program (HMPG); Maryland Department of Natural Resources Grant Programs for Stormwater and Flooding Improvements; Pre-Disaster Mitigation Grant Program; Emergency Advance Measures for Flood Prevention  
**Timeline for Implementation:** 3-5 Years

Figure 15-1



Photo: Arrington Road – 10/29/2012, Source: Departments of Emergency Services & Public Works

TABLE 15-4: REPETITIVE ROADWAY FLOODING				
LOCATION	OWNER	SOURCE OF FLOODING	EVACUATION ROUTE (Y/N)	COMMENTS
Main Street North & South Town of Church Hill	State	Heavy Rain/Run-off	N	North-Taylor Mill Run South-Southeast Creek Branch
Sassafras Street-Route 313 Town of Millington	State & Municipal	Chester River (Storm Surge, Heavy Rain, Hurricane, or Lunar Tidal Effects)	N	Southern portion of Millington along Sassafras Street
Nichols Manor	County	Tidal	N	Between Kimberly Way & Petinot Place-Stevensville <i>Note: RL Property on Kimberly Way and (4) RL's on Petinot Place.</i>
MD 18/Main Street	State	Tidal/Rain	N	@Kent Narrows/Wells Cove Vicinity Also, @Melvin and Skipjack Cove Lane
Arrington Road	County	Heavy Rain/Run-off	N	
MD 213 Centreville	State & Municipal	Heavy Rain/Run-off	Y	@Gravel Run (N) and @Mills Stream (S)
MD 19	State	Heavy Rain/Run-off	N	@Southeast Creek
John Powell Road	County	Heavy Rain/Run-off	N	Between MD 300 & Pinder Hill Rd.
MD 8	State	Heavy Rain with Tidal Surge	Y	@Broad Creek
Rolling Bridge	County	Heavy Rain	N	Between 304 & 301
Rhodes Avenue @ Queenstown Boundary	Municipal	Heavy Rain/Tidal Surge	N	@sewer lift station

## 15.4 Implementation

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

Implementation of the plan includes the completion of nine (9) mitigation projects that were identified by stakeholders and prioritized. An extensive listing of potential funding sources available to assist in the implementation of the identified mitigation projects has been included at the end of this chapter for reference.

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

The Department of Emergency Services (DES) has been designated as the main entity responsible for maintaining and monitoring the plan. DES will continue to work with stakeholders during the next five-year planning cycle. DES will oversee the progress made on the implementation of the identified mitigation actions and update the plan, as needed, to reflect changing conditions. DES will therefore serve as the focal point for coordinating countywide hazard mitigation efforts.

The Department of Emergency Services (DES) in cooperation with community stakeholders will involve the public during the evaluation and update of the plan, as appropriate, through annual public education activities, public workshops, and public hearings. The County’s website will serve as a means of communication by providing information specific to hazard mitigation and preparedness initiatives.

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

### 15.4.1 IMPLEMENTATION MATRIX

In order to facilitate and capture the review and status of the nine (9) mitigation projects, an Implementation Matrix has been developed. At a glance, the Department of Emergency Services will be able to view the mitigation project number and title, along with the associated hazards, responsible agency, timeframe, and costs. In addition, the matrix includes a yearly status completion box to be populated, as appropriate, during the annual review process.

# IMPLEMENTATION MATRIX

TABLE 15-5: IMPLEMENTATION MATRIX																				
Project #	Project Title	Hazard										Responsible Agency	Timeframe		Cost	Project Completion Yearly Review (Yes/No)				
		Flood	Hurricane	Drought &	High Wind	Severe Winter	Sea Level Change	Wildfire	Thunderstorm	Earthquake	Tornado		1-2 years	3-5 years		Year 1	Year 2	Year 3	Year 4	Year 5
1	Hazard Mitigation & Resiliency Public Outreach	X	X	X	X	X	X	X	X	X	X	Emergency Services	X		\$1,500-\$3,000; Staff Time					
2	Vulnerable Populations Warnings, Guidelines & Protocols	X	X	X	X	X	X	X	X	X	X	QAC Department of Health and Social Services		X	Staff Time					
3	Plan Integration	X	X	X	X	X	X	X	X	X	X	All Departments		X	Staff Time					
4	Emergency Agreements	X	X	X	X	X	X	X	X	X	X	Emergency Services		X	Staff Time					
5	Essential Facilities – Generator	X	X	X	X	X	X	X	X	X	X	Emergency Services, Public Works, QAC Department of Health, Centreville Police Department, and Queenstown Volunteer Fire Department		X	Project Dependent					
6	Sanitary Improvement	X	X	X	X	X	X	X	X	X	X	Public Works		X	~\$35,000 - \$45,000					
7	High-Risk Flood Risk	X	X				X					Public Works, Planning & Zoning, and IT/GIS		X	Project Dependent					
8	National Flood Insurance Program (NFIP) & Community Rating System (CRS)	X										Public Works and Emergency Services		X	\$1,500-\$3,000; Staff Time					
9	Repetitive Roadway Flooding	X	X				X					Public Works and Emergency Services		X	Project Dependent					

#### **15.4.2 FEDERAL & STATE GRANT FUNDING SOURCES**

The following is a list of Federal and State Grants that may assist in implementing local All Hazard Mitigation Plans. This information is subject to change at any time; contact the federal or state agency for current grant status. (Last Updated: November 2018)

# FEDERAL & STATE GRANT FUNDING SOURCES

TABLE 15-6: FEDERAL & STATE GRANT FUNDING					
GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
Federal Emergency Management Agency, Hazard Mitigation Grant Program (HMGP)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	All Hazards Mitigation Planning. Acquisition, relocation, elevation and flood-proofing of flood-prone insured properties, flood mitigation planning, wind retrofit, stormwater improvements, education and awareness.	Federal - 75% State - 25%	Local government must be in compliance with the National Flood Insurance Program to be eligible. Projects must be cost effective, environmentally sound and solve a problem. Repetitive loss properties are a high priority.	After a Presidential Disaster Declaration
Federal Emergency Management Agency, Pre-Disaster Mitigation Grant Program (PDM)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations.	Federal - 75% Non-Federal - 25%	PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.	Annual Spring/Summer
Federal Emergency Management Agency, Flood Mitigation Assistance Program (FMA)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	Assist States and communities to implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program.	RL: Federal - 90% Non-Federal - 10% SRL: Federal - 100% Non-Federal - 0%	Available once a Flood Mitigation Plan has been developed and approved by FEMA.	Annual Spring/Summer
National Flood Insurance Program (NFIP)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	Provides financial protection by enabling persons to purchase insurance against floods, mudslide or flood related erosion.	Varies	Includes Federally backed insurance against flooding, available to individuals and businesses that participate in the NFIP.	Anytime

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
Increased Cost of Compliance	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21136	ICC coverage provides payment to help cover the cost of mitigation activities that will reduce the risk of future flood damage to a building. If a Flood Insurance Policy Holder suffers a flood loss and is declared to be substantially or repetitively damaged, ICC will pay up to 30,000 to bring the building into compliance with State or community floodplain management laws or ordinances. Usually this means elevating or relocating the building so that it is above the base flood elevation (BFE).	Varies	Once the local jurisdiction determines the building is substantially or repetitively damaged, the policy holder can contact insurance agent to file an ICC claim.	Anytime
U.S. Economic Development Administration, Economic Adjustment Program	U.S. Department of Commerce Economic Development Administration Curtis Center, 601 Walnut Street, Ste. 140 South Philadelphia, PA 19106-3323 215-597-4603	Improvements and reconstruction of public facilities after a disaster or industry closing. Research studies designed to facilitate economic development.	Federal - 50%-70% Local- 30%-50%	Documenting economic distress, job impact and proposing a project that is consistent with a Comprehensive Economic Development Strategy are important funding selection criteria.	Anytime

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
U.S. Economic Development Administration, Public Works and Development Facilities	U.S. Department of Commerce Economic Development Administration Curtis Center, 601 Walnut Street, Ste 140 South Philadelphia, PA 19106-3323 215-597-4603	Water and sewer, Industrial access roads, rail spurs, port improvements technological and related infrastructure	Federal - 50%-70% Local- 30%-50%	Documenting economic distress, job impact and projects that is consistency with a Comprehensive Economic Development Strategy are important funding selection criteria.	Quarterly Basis
Small Business Administration (SBA) Pre-disaster Mitigation Loan Program	James Rivera, Office of Disaster Assistance, Small Business Administration, 409 3rd Street, SW, STE 6050 Washington, DC 20416;202-205-6734	Activities done for the purpose of protecting real and personal property against disaster related damage.	No information	The mitigation measures must protect property or contents from damage that may be caused by future disasters and must conform to the priorities and goals of the state or local government's mitigation plan.	
Community Development Block Grants / States Program	U.S Department of Housing and Urban Development, Office of Block Grant Assistance, 451 7th Street SW., Washington, DC 20410-7000;202-708-1112	Used for long-term recovery needs, such as: rehabilitation residential and commercial building; homeownership assistance, including down-payment assistance and interest rate subsidies; building new replacement housing; code enforcement; acquiring, construction, or reconstructing public facilities.	No information	Citizen participation procedures must be followed. At least 70 percent of funds must be used for activities that principally benefit persons of low and moderate income. Formula grants to States for non-entitlement communities.	After a Presidential Disaster Declaration

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
Fire Suppression Assistance Program	Infrastructure Division, Response and Recovery Directorate, FEMA, 500 C Street SW., Washington DC 20024; 202-646-2500.	Provides real-time assistance for the suppression of any fire on public (non-Federal) or privately-owned forest or grassland that threatens to become a major disaster.	Federal - 70% Local - 30%	The State must first meet annual floor cost (f percent of average fiscal year fire costs) on a single declared fire. After the State's out-of-pocket expenses exceed twice the average fiscal year costs, funds are made available for 100 percent of all costs for each declared fire.	Funds from President's Disaster Relief Fund for use in a designated emergency or major disaster area.
Historic Preservation: Repair and Restoration of Disaster-Damaged Historic Properties	Infrastructure Division, Response and Recovery Directorate, FEMA, 500 C Street SW., Washington DC 20024; 202-646-4621.	To evaluate the effects of repairs to, restoration of, or mitigation hazards to disaster-damaged historic structures working in concert with the requirements of the Stafford Act.	Federal - 75% Local - 25%	Eligible to State and local governments, and any political subdivision of a State. Also, eligible are private non-profit organizations that operate educational, utility, emergency, or medical facilities.	After a Presidential Disaster Declaration
Transportation: Emergency Relief Program	Federal Transit Authority, FHWA, DOT, 1200 New Jersey Avenue Washington, DC 20590; 202-366-4043	Provides aid for the repair of Federal-aid roads and roads on Federal lands.	Federal - 100%	Application is submitted by the State department of transportation for damages to Federal-aid highway routes, and by the applicable Federal agency for damages to roads on Federal lands.	After serious damage to Federal-aid roads or roads on Federal lands caused by a natural disaster or by catastrophic failure.

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
Animals: Emergency Haying and Grazing	Emergency and Non-insured Assistance Programs, FSA, USDA, 1400 Independence Ave, SW, Washington, DC 20013; 202-720-4053	To help livestock producers in approved counties when the growth and yield of hay and pasture have been substantially reduced because of a widespread natural disaster.	No information	Assistance is provided by the Secretary of Agriculture to harvest hay or graze cropland or other commercial use of forage devoted to the Conservation Reserve Program (CRPO in response to a drought or other similar emergency).	Anytime
Emergency Watershed Protection Program	Natural Resources Conservation Service 1400 Independence Avenue, SW Washington, DC 20250	Implementing emergency recovery measures for runoff retardation and erosion prevention to relieve imminent hazards to life and property created by a natural disaster that causes a sudden impairment of a watershed.	Federal - 75% Local - 25%	It cannot fund operation and maintenance work or repair private or public transportation facilities or utilities. The work cannot adversely affect downstream water rights and funds cannot be used to install measures not essential to the reduction of hazards.	TBD
Watershed Protection and Flood Prevention Program	Natural Resources Conservation Service 1400 Independence Avenue, SW Washington, DC 20250	To provide technical and financial assistance in carrying out works of improvement to protect, develop, and utilize the land and water resources in watersheds.	Varies due to project type.	Watershed area must not exceed 250,000 acres. Capacity of a single structure is limited to 25,000 acre-feet of total capacity and 12,500 acre-feet of floodwater detention capacity.	TBD

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
Watershed Surveys and Planning	Natural Resources Conservation Service 1400 Independence Avenue, SW Washington, DC 20250	To provide planning assistance to Federal, State, and local agencies for the development of coordinated water and related programs in watersheds and river basins. Emphasis is on flood damage reduction, erosion control, water conservation, preservation of wetlands and water quality improvements.	No information	These watershed plans form the basis for installing needed works of improvement and include estimated benefits and costs, cost-sharing, operation and maintenance arrangements, and other information necessary to justify the need for Federal assistance in carrying out the plan.	Anytime
Emergency Advance Measures for Flood Prevention (Public Law 84-99 (Section 5 of the Flood Control Act of 1941))	USACE, Baltimore District Emergency Management 2 Hopkins Plaza, Baltimore, MD 21202 410-962-2013	Assistance may be provided in order to prevent or reduce damages when there is an imminent threat of unusual flooding. Technical Assistance may be provided when there is a significant potential that an imminent threat of unusual flooding will develop	No information	Advance Measures projects are temporary projects that provide measures necessary to prevent or reduce impacts of floods that (1) pose a significant threat to life and/or improved property, and (2) are beyond the technical capability of Tribe/State/local interests to perform in a timely manner. Advance Measures projects must be engineering- feasible and capable of being constructed in time to meet the anticipated threat	Governor of State must request assistance

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
Continuing Authorities Program (CAP) Section 14 - Emergency Streambank and Shoreline Protection	USACE, Baltimore District Emergency Management 2 Hopkins Plaza, Baltimore, MD 21202 410-962-2013	Authorizes the construction of emergency streambank protection measures to prevent damage to highways, bridge approaches, municipal water supply systems, sewage disposal plants, and other essential public works facilities endangered by floods or storms due to bank erosion.	Feasibility: 100%/0% Fed/Local for initial \$100,000; 50%/50% remaining cost; Implementation: 65%/35% Fed/Local; Federal Project Limit: \$5M	Churches, hospitals, schools, and other non-profit service facilities may also be protected under this program. This authority does not apply to privately-owned property or structures.	Anytime
Continuing Authorities Program (CAP) Section 205 - Flood Damage Reduction	USACE, Baltimore District Emergency Management 2 Hopkins Plaza, Baltimore, MD 21202 410-962-2013	Authorizes the construction of small flood control projects that have not already been specifically authorized by Congress	Feasibility: 100%/0% Fed/Local for initial \$100,000; 50%/50% remaining cost; Implementation: 65%/35% Fed/Local; Federal Project Limit: \$10M	There are two general categories of projects: structural and nonstructural. Structural projects may include levees, floodwalls, diversion channels, pumping plants, and bridge modifications. Nonstructural projects may include flood proofing, the relocation of structures, and flood warning systems.	Anytime
Continuing Authorities Program (CAP) Section 103- Hurricane and Storm Damage Reduction (Beach Erosion)	USACE, Baltimore District Emergency Management 2 Hopkins Plaza, Baltimore, MD 21202 410-962-2013	Development and construction small beach erosion control projects. A potential project must provide benefits other than for the purposes of recreation, such as beach stabilization to reduce flooding or to provide protection to public facilities	Feasibility: 100%/0% Fed/Local for initial \$100,000; 50%/50% remaining cost; Implementation: 65%/35% Fed/Local; Federal Project Limit: \$10M	Protection of privately owned shorelines which offer no benefits to the public are not eligible for Federal cost sharing	Anytime

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
USACE Rehabilitation and Inspection Program (RIP) & Inspection of Completed Works (ICW) Program)	USACE, Baltimore District Emergency Management 2 Hopkins Plaza, Baltimore, MD 21202 410-962-2013	Provides for inspection of flood control projects, rehabilitation of damaged flood control projects, and the rehabilitation of federally authorized and constructed hurricane or shore protection projects	100% Federal for projects built by USACE and properly maintained; 80%/20% Fed/Sponsor for projects rehabbed by USACE	Projects initially constructed by the Corps, including hurricane and shore protection projects, and turned over to the local sponsor for maintenance are inspected under authority of the Inspection of Completed Works (ICW) program	After flood or storm event
USACE General Investigation (GI)	USACE, Baltimore District Emergency Management 2 Hopkins Plaza, Baltimore, MD 21202 410-962-2013	Congress can authorize USACE to study, design and construct major flood risk management projects	Feasibility: 50%/50%Fed/Local; Implementation 65%/35%	Generally large scale projects that cost more than \$10 million	Anytime
USACE Flood Plain Management Services Program (FPMS)	USACE, Baltimore District Emergency Management 2 Hopkins Plaza, Baltimore, MD 21202 410-962-2013	The program allows USACE to compile and disseminate information on floods and flood damages, including identification of areas subject to inundation by floods, and general criteria for guidance in the use of floodplain areas.	Upon request, program services are provided to the State, regional, and local governments, Native American Tribes, and other non-federal public agencies without charge. Per Section 202 of WRDA 1999, USACE may accept funds voluntarily contributed by sponsor with the purpose of expanding the scope of services.	USACE can provide engineering advice to local interests in planning to reduce flood hazard.	Anytime

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
Hazardous Materials: State Access to the Oil Spill Liability Trust Fund	Director, USCG National Pollution Funds Center, U.S. Coast Guard Stop 7605 2703 Martin Luther King Jr. Avenue, SE Washington, DC 20593-7605 202-795-6000	To encourage greater State participation in response to actual or threatened discharges of oil.	No information	Eligible to States and U.S. Trust Territories and possessions.	Anytime
Emergency Management Assistance (EMA)	Maryland Emergency Management Agency 5401Rue Saint Lo Drive Reisterstown, MD 21401	Funds may be used for salaries, travel expenses, and other administrative cost essential to the day-to-day operations of State and Local emergency management agencies. Program also includes management processes that ensure coordinated planning, accountability for progress, and trained qualified staffing.	Federal - 50%	EMA funded activities may include specific mitigation management efforts not otherwise eligible for Federal funding. Management Assistance program funds may not be used for construction, repairs, equipment, materials or physical operations required for damage mitigation projects for public or private buildings, roads, bridges, or other facilities.	Anytime
Assistant to Firefighters Grant	Source: U.S. Fire Administration CFDA Number: 97.044	Vehicles, safety equipment, protective equipment, etc.	Federal Grant Funds match depended upon population served by Fire Departments and nonaffiliated EMS organizations	Provides assistance to local fire department to protect citizens and firefighters against the effects of fire and fire-related incidents.	Annually in September projects are due.

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
Maryland Program Open Space	Department of Natural Resources 580 Taylor Ave. Annapolis, MD 21401 410-260-8445	Local provides financial and technical assistance to local subdivisions for the planning, acquisition, and/or development of recreation land or open space areas.	A local governing body may use up to \$25,000 annually from its 100% (Acquisition) money to fund planning projects that update the Local Land Preservation and Recreation Plans.	Acquires outdoor recreation and open space areas for public use. Administers funds made available to local communities for open and recreational space by the Outdoor Recreation Land Loan of 1969 and from the Land and Water Conservation Fund of the National Park Service, U.S. Department of the Interior.	July 1 <sup>st</sup>

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
Maryland Recreational Trails Program	Maryland Scenic Byways /Recreational Trails Program* Office of Planning & Preliminary Engineering State Highway Administration 707 N Calvert Street Baltimore, MD 21201 (p) 410.545.8637 (f) 410.209-5012 <a href="mailto:tmaxwell@sha.state.md.us">tmaxwell@sha.state.md.us</a>	Maintenance and restoration of existing recreational trail; Development and rehabilitation of trailside facilities and trail linkages; Purchase and lease of trail construction equipment; Construction of new trails; Acquisition of easements or property for recreational trails or recreational trail corridors; and Implementation of interpretive/educational programs to promote intrinsic qualities, safety, and environmental protection, as those objectives relate to the use of recreational trails.	Administered by the State Highway Administration (SHA), this program matches federal funds with local funds or in-kind contributions to implement trail projects. Projects can be sponsored by a county or municipal government, a private non-profit agency, a community group or an individual (non-governmental agencies must secure an appropriate government agency as a co-sponsor). Federal funds administered by the State Highway Administration are available for up to 80% of the project cost, matched by at least 20% funding from the project sponsor. Matching funds must be committed and documented in the local jurisdiction's budget.	Projects must meet state and federal environmental regulatory requirements (NEPA, MEPA, Section 106, Section 4(f)). SHA will provide assistance to the project sponsor to acquire these approvals.	July 1 <sup>st</sup>

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
CoastSmart Communities Grant (CCG) Program	Maryland Department of Natural Resources Chesapeake and Coastal Service (p) 410.260.8718 (f) 410.260.8739 <a href="mailto:sasha.land@maryland.gov">sasha.land@maryland.gov</a>	Municipalities and counties in the coastal zone are eligible to apply for and receive funds: Anne Arundel, Baltimore, Calvert, Caroline, Cecil, Charles, Dorchester, Harford, Kent, Prince George’s, Queen Anne’s, St. Mary’s, Somerset, Talbot, Wicomico, and Worcester counties and Baltimore City. Funding for a one-year project that contributes to understanding, planning for, or implementing planning and outreach measures to address coastal hazard issues.	Up to \$75,000 annually	Track A can fund flood vulnerability and risk assessments, updates to planning documents (e.g. hazard mitigation plans, zoning ordinances, building codes, floodplain ordinances, comprehensive plans), education and outreach campaigns and materials, applications to FEMA’s Community Rating System in concert with other task outcomes, support for adopting an updated plan and integrating the plan into day-to-day existing planning processes that reduce overall flood risk due to tidal events or stormwater and rain events.	TBD

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
Green Infrastructure Resiliency Grant Program	Maryland Department of Natural Resources Chesapeake and Coastal Service (p) 410.260.8799 (f) 410.260.8739 (e) <a href="mailto:megan.granato@maryland.gov">megan.granato@maryland.gov</a>	<p>Municipalities and counties within the Maryland portion of the Chesapeake Bay watershed are eligible to apply for and receive funds. Please note that projects proposed in Cecil, Garrett and Worcester counties must be located within the portions of those counties that are within the watershed in order to be eligible.</p> <p>Funding for one year for Phase 1 and Phase 2 projects and up to 2 years for Phase 3 projects that will assess stormwater management needs associated with localized flooding and design or construct targeted green infrastructure practices to address those needs.</p>	Up to \$100,000 per project	Track B can fund watershed assessments that focus on determining local flood risks and how green infrastructure can be used to address those risks, site or watershed-level green infrastructure implementation plans, and green infrastructure project designs. This track can also fund construction of green infrastructure projects. In order to apply for construction funding, all applicable permit preapplication meetings must be complete.	TBD

GRANT PROGRAM NAME	ADDRESS AND TELEPHONE CONTACT INFORMATION	ELIGIBLE ACTIVITIES	FEDERAL, STATE AND LOCAL COST SHARE REQUIREMENTS	OTHER PROGRAM CHARACTERISTICS	GRANT APPLICATION DUE DATE
Maryland Community Parks and Playgrounds Program	Department of Natural Resources 580 Taylor Ave. Annapolis, MD 21401 410-260-8445	<ol style="list-style-type: none"> <li>1) development of new parks</li> <li>2) rehabilitation of existing parks</li> <li>3) expansion or improvement of existing parks</li> <li>4) purchase and installation of playground equipment</li> <li>5) development of environmentally oriented parks and recreation projects</li> <li>6) development of new trails or extension of existing trails</li> <li>7) creation of access points to water recreation resources</li> <li>8) acquisition of land to create new parks.</li> </ol>	The source of funds for this program is primarily State General Obligation Bonds, which may be authorized on an annual basis. The Community Parks and Playgrounds Program provides funding to incorporated municipalities and Baltimore City. Grants may be for up to 100% of the project cost and are selected on a competitive basis. Each applicant will be limited to one (1) Grant Proposal List submission package, which may contain several prioritized projects, per award cycle.	The Department of Natural Resources works to provide opportunities for Marylanders, especially our children, to experience nature. The Department has developed a website that provides information about Nature Play Spaces. Nature Play Spaces are one of the many types of public recreation projects eligible for consideration for Community Parks and Playgrounds grant funding. While land acquisition costs may be considered for project funding, the highest priority will be placed on capital costs associated with park development and improvement.	TBD

# Appendix A NFIP & CRS

## NATIONAL FLOOD INSURANCE PROGRAM & COMMUNITY RATING SYSTEM

Please note the Privacy Act protects the information within this plan appendix.

### THE PRIVACY ACT

*Flood insurance data about private property, including repetitive loss properties, are protected under the Privacy Act. Personally identifiable Information such as the names or addresses of specific properties, whether they are covered by flood insurance or not, whether they have received flood insurance claims, or the amounts of such claims may not be released outside of local government agencies or to the public or used for solicitation or other purposes. Such information should be marked "For internal use only. Protected by the Privacy Act of 1974."*

*General or aggregated information, such as total claims paid for a community or an area or data not connected to a particular property may be made public.*

*For example, a community may publish a map showing a repetitive loss area or a list of addresses in that area, provided that it does not show which individual addresses or parcels received flood insurance claim payments.*

**FOR OFFICIAL USE ONLY**

# Appendix B

## Essential Facilities & Sanitary Facilities

This Appendix provides information on Essential Facilities and Sanitary Facilities analyzed for vulnerability within the Plan. Each matrix provides the results of the vulnerability assessment for each facility.

- Essential Facilities
  - Essential Facility Matrix
  - Essential Facility Forms
- Sanitary Facilities
  - Sanitary Facility Inventory
  - Sanitary Facility Matrix

# Essential Facilities

## Essential Facilities

A new inventory of essential facilities for the Queen Anne’s County Hazard Mitigation Plan. Essential facilities data collection sheets were developed for each essential facility. These sheets include facility and multi-hazard specific information. A total of 54 essential facility sheets were developed during the planning process. The following table, Essential Facilities Matrix, provides the composite of information obtained from each data collection sheet. This matrix should be viewed in a large format and printed on ledger paper, 11X17. Following the Essential Facilities Matrix are data collection sheets for each essential facility.

Appendix B Essential Facilities & Sanitary Facilities

TABLE B-1: ESSENTIAL FACILITIES MATRIX																	
NAME	ADDRESS	CITY	ZIP CODE	FEMA 100 YR FLOOD-PLAIN	STORM SURGE	SLR	GENERATOR	ADEQUATE SIZE	EVAC ROUTE	IMPACT RESISTANT GLASS	ANTENNA ON/AT FACILITY	FLAT ROOF	WILDLAND/ URBAN INTERFACE	WATER DEFICIENCY ISSUES	EXTREME HEAT	EXTREME COLD	PREVIOUS DAMAGE
Department of Emergency Services	100 Communications Dr	Centreville	21617	No	No	No	Yes	No	Rt 301 N	No	Yes	Yes	Yes	No	No	No	Yes
Queen Anne-Hillsboro VFC #8	13512 First St	Queen Anne	21657	No	No	No	No	N/A	Rt 303	No	Yes	No	No	No	No	No	No
Queenstown VFC #3	7110 Main St	Queenstown	21658	No	No	No	Yes	No	Rt 18	No	No	No	No	No	No	No	No
Church Hill VFC #5	316 Main St	Church Hill	21623	No	No	No	Yes	Yes	Rt 19	No	Yes	No	No	No	No	No	No
Sudlersville VFC #6	203 N Church St	Sudlersville	21668	No	No	No	Yes	Yes	Rt 313	No	No	No	No	No	No	No	No
Goodwill VFC #4	212 Broadway St	Centreville	21617	No	No	No	Yes	Yes	Rt 213/ Rt 304	No	No	Yes	No	No	No	No	No
EMS Station 100	103 Davidson Rd	Stevensville	21666	No	No	No	No	N/A	Rt 8	No	No	No	No	No	No	No	No
EMS Station 400	302 Safety Dr	Centreville	21617	No	No	No	No	N/A	Rt 301 N	No	No	No	No	No	No	No	No
EMS Station 300	7110 Main St	Queenstown	21658	No	No	No	Yes	No	Rt 18	No	No	No	No	No	No	No	No
EMS Station 600	203 N Church St	Sudlersville	21668	No	No	No	Yes	Yes	Rt 313	No	No	No	No	No	No	No	No
EMS Station 500	316 Main St	Church Hill	21623	No	No	No	Yes	Yes	Rt 19	No	Yes	No	No	No	No	No	No
Grasonville VFC #2	4128 Main St	Grasonville	21638	No	Yes	No	Yes	Yes	Rt 18	No	Yes	No	Yes	No	No	No	No
Grasonville Vol Ambulance Dept. #20	4132 Main St	Grasonville	21638	No	Yes	No	No	N/A	Rt 18	No	No	No	Yes	No	No	No	No
Crumpton VFC #7	300 3rd St	Millington	21651	No	Yes	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes
United Communities VFC #9	9406 Romancoke Rd	Stevensville	21666	No	Yes	No	Yes	Yes	Rt 18	No	Yes	No	No	No	No	No	No
Kent Island VFC #1	1610 Main St	Chester	21619	No	Yes	No	Yes	Yes	Rt 18	No	No	No	No	No	No	No	No
EMS Station 200	101 Medic Drive	Chester	21619	No	Yes	Yes	No	N/A	Rt 50	No	No	No	No	No	No	No	Yes
QAC Department of Health	206 N Commerce St	Centreville	21617	No	No	No	Yes	No	Rt 213	No	Yes	Yes	No	No	No	No	No
QAC Department of Health Annex	205 N Liberty St	Centreville	21617	No	No	No	No	N/A	Rt 213	No	No	No	No	No	No	No	No
Shore Emergency Center Queenstown	115 Shoreway Dr	Queenstown	21658	No	No	No	-	-	Rt 50	-	No	No	No	-	-	-	-
UM Shore Medical Pavilion	125 Shoreway Dr	Queenstown	21658	No	No	No	-	-	Rt 50	-	No	No	No	-	-	-	-
AAMC Kent Island Pavilion	1630 Main St	Chester	21619	No	Yes	No	Yes	Yes	Rt 18	-	No	No	No	-	-	-	-
Queen Anne's County Sheriff's Office	505 Railroad Ave	Centreville	21617	No	No	No	Yes	Yes	Rt 304	No	No	No	Yes	No	No	No	No
Maryland State Police - Barracks S	311 Safety Dr	Centreville	21617	No	No	No	Yes	Yes	Rt 301	Yes	Yes	Yes	No	No	No	No	No
Sheriff's Office - Sudlersville Substation	200 S Church St	Sudlersville	21668	No	No	No	-	-	No	-	No	No	No	-	-	-	-
Centreville Police Department	420 N Commerce St	Centreville	21617	Yes	Yes	No	No	No	Rt 213	No	No	Yes	Yes	No	No	No	No
Sheriff's Office - Kent Narrows Substation	425 Piney Narrows Rd	Chester	21619	Yes	Yes	Yes	-	-	No	-	No	No	No	-	-	-	-
The Gunston School	911 Gunston Rd	Centreville	21617	No	No	No	-	-	No	-	No	Yes	Yes	-	-	-	-

Appendix B Essential Facilities & Sanitary Facilities

NAME	ADDRESS	CITY	ZIP CODE	FEMA 100 YR FLOOD-PLAIN	STORM SURGE	SLR	GENERATOR	ADEQUATE SIZE	EVAC ROUTE	IMPACT RESISTANT GLASS	ANTENNA ON/AT FACILITY	FLAT ROOF	WILDLAND/ URBAN INTERFACE	WATER DEFICIENCY ISSUES	EXTREME HEAT	EXTREME COLD	PREVIOUS DAMAGE
Wye River Upper School	316 S Commerce St	Centreville	21617	No	No	No	-	-	Rt 213	-	No	Yes	Yes	-	-	-	-
Lighthouse Christian Academy	931 Love Point Rd	Stevensville	21666	No	No	No	-	-	Rt 18	-	No	No	Yes	-	-	-	-
Eastern Shore Jr. Academy	407 Dudley Corners Rd	Sudlersville	21668	No	No	No	-	-	Rt 209	-	No	Yes	Yes	-	-	-	-
Shore Up Head Start	5441 Main Street	Grasonville	21638	No	No	No	-	-	Rt 18	-	No	Yes	No	-	-	-	-
Kiddie Academy of Kent Island	113 St. Claire Place	Stevensville	21666	No	Yes	No	-	-	Rt 18	-	o	No	No	-	-	-	-
Kennard Elementary School	420 Little Kidwell Ave	Centreville	21617	No	No	No	Yes	Yes	No	No	No	Yes	Yes	No	No	No	N/A
Church Hill Elementary School	631 Main St	Church Hill	21623	No	No	No	Yes	Yes	Rt 219	No	No	No	No	No	No	No	N/A
Anchor Points Academy	202 Chesterfield Ave	Centreville	21617	No	No	No	Yes	Yes	Rt 304	No	No	No	Yes	No	No	-	N/A
Sudlersville Elementary School	300 S Church St	Sudlersville	21668	No	No	No	No	No	Rt 313	No	No	No	No	No	No	No	N/A
Grasonville Elementary School	5435 Main St	Grasonville	21638	No	No	No	Yes	Yes	Rt 18	No	No	No	Yes	No	No	No	N/A
Bayside Elementary School	301 Church St	Stevensville	21666	No	No	No	Yes	Yes	No	No	No	Yes	Yes	No	No	No	N/A
Queen Anne's County High School	125 Ruthsburg Rd	Centreville	21617	No	No	No	No	N/A	Rt 304	No	No	Yes	No	No	No	No	N/A
Sudlersville Middle School	600 Charles St	Sudlersville	21668	No	No	No	Yes	Yes	Rt 313	No	No	No	No	No	No	No	N/A
Centreville Elementary School	213 Homewood Ave	Centreville	21617	No	No	No	Yes	Yes	Rt 304	Yes	No	Yes	Yes	No	No	No	N/A
Centreville Middle School	231 Ruthsburg Rd	Centreville	21617	No	No	No	Yes	Yes	Rt 304	No	No	Yes	No	No	No	No	N/A
Wye Research & Education Center	124 Wye Narrows Dr	Queenstown	21658	No	No	No	-	-	No	-	No	No	No	-	-	-	-
Chesapeake College	1000 College Circle Dr	Queenstown	21658	No	No	No	-	-	Rt 213	-	No	Yes	No	-	-	-	-
Stevensville Middle School	610 Main St	Stevensville	21666	No	Yes	No	Yes	Yes	Rt 18	No	No	Yes	No	No	No	No	N/A
Kent Island Elementary School	110 Elementary Way	Stevensville	21666	No	Yes	No	Yes	Yes	Rt 18	No	No	Yes	Yes	No	No	No	N/A
Kent Island High School	900 Love Point Road	Stevensville	21666	No	Yes	No	Yes	Yes	Rt 18	No	No	Yes	Yes	No	No	No	N/A
Matapeake Elementary School	651 Romancoke Rd	Stevensville	21666	No	Yes	No	Yes	Yes	Rt 8	No	No	No	No	No	No	No	N/A
Matapeake Middle School & Kent Island 9th Grade Annex	671 Romancoke Rd	Stevensville	21666	No	Yes	No	Yes	Yes	Rt 8	No	No	No	No	No	No	No	N/A

General Information				
<b>Facility Type</b>	Emergency Operations Center (EOC)			
<b>Name of Facility</b>	Department of Emergency Services Office			
<b>Physical Address</b>	100 Communications Drive Centreville, MD 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 01' 52.04" N		
	<b>Long.</b>	76° 01' 07.95" W		
<b>Year Built</b>	1988	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	✓	<b>Yes</b>	<b># of Floors?</b>	N/A
				
Hazard Information				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>		<b>No</b> ✓
<b>Hurricane Category (1-4)</b>		<b>1</b>	<b>2</b> ✓	<b>3</b> <b>4</b>
<i>Comments:</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b> <b>2100</b>	<b>No</b> ✓
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b>	✓	<b>No</b>	<b>Adequately Sized?</b> <b>Yes</b> <b>No</b> ✓
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	✓	<b>No</b>
<b>If so, name of route?</b>		Route 301 North		
<i>Comments: Located just off Routes 304 &amp; 301 Intersection</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>	✓	<b>No</b>
<i>Comments: Communication tower collocated on parcel</i>				
<b>Flat roof?</b>		<b>Yes</b>	✓	<b>No</b>
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>	✓	<b>No</b>
<i>Comments: Forested area behind building</i>				
<b>Any past water deficiency issues?</b>		<b>Yes</b>		<b>No</b> ✓
<b>Drought Susceptibility</b>				
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				
<b>If so, what hazards?</b>				
<i>Extent of Damages/Comments? Yes, flood due to construction</i>				

General Information				
<b>Facility Type</b>	Fire			
<b>Name of Facility</b>	Church Hill Volunteer Fire Department #5			
<b>Physical Address</b>	316 Main Street Church Hill, 21623			
<b>Coordinates</b>	<b>Lat.</b>	39° 08' 28.94" N		
	<b>Long.</b>	75° 59' 08.35" W		
<b>Year Built</b>	1960	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information									
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Storm Surge Inundation Area</b>				<b>Yes</b>		<b>No</b>	✓		
<b>Hurricane Category (1-4) None</b>				<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments:</i>									
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
					<b>2100</b>				
<i>Comments:</i>									
<b>Generator</b>	<b>Yes</b>	✓	<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>	✓	<b>No</b>	
<i>Comments:</i>									
<b>Located along evacuation route?</b>				<b>Yes</b>		✓	<b>No</b>		
<b>If so, name of route?</b>				Route 19					
<i>Comments: Route 19 intersects with Route 300, which leads to Route 301 North</i>									
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Antennae on/at facility?</b>				<b>Yes</b>		✓	<b>No</b>		
<i>Comments: Antenna located on facility</i>									
<b>Flat roof?</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>	✓		
<b>Drought Susceptibility</b>									
<i>Comments: Well Water</i>									
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Has the facility suffered previous damage from hazard events? No</b>									
<b>If so, what hazards?</b>									
<i>Extent of Damages/Comments?</i>									

General Information				
<b>Facility Type</b>	Fire Department			
<b>Name of Facility</b>	Crumpton Volunteer Fire Department #7			
<b>Physical Address</b>	300 3 <sup>rd</sup> Street Millington, 21651			
<b>Coordinates</b>	<b>Lat.</b>	39° 14' 20.72" N		
	<b>Long.</b>	75° 55' 32.73" W		
<b>Year Built</b>	1961	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information												
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments: Chester River is located in close proximity to the building.</i>												
<b>Storm Surge Inundation Area</b>				<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>					
<b>Hurricane Category (1-4) No</b>				<b>1</b>	<input type="checkbox"/>	<b>2</b>	<input type="checkbox"/>	<b>3</b>	<input type="checkbox"/>	<b>4</b>	<input type="checkbox"/>	<b>Yes</b>
<i>Comments: Only the northeast corner of the building intersections with the Category 4 inundation area. Less than a foot of storm surge is projected to inundate Pine Street, which is along the right side of the building.</i>												
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>				
					<b>2100</b>	<input type="checkbox"/>						
<i>Comments:</i>												
<b>Generator</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>	<b>Adequately Sized?</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>	
<i>Comments:</i>												
<b>Located along evacuation route?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<b>If so, name of route?</b>												
<i>Comments:</i>												
<b>Impact resistant glass?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Antennae on/at facility?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Flat roof?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Wildland/Urban Interface</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Any past water deficiency issues?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<b>Drought Susceptibility</b>												
<i>Comments:</i>												
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Has the facility suffered previous damage from hazard events? Yes</b>												
<b>If so, what hazards?</b> Roof damage from snow storm.												
<i>Extent of Damages/Comments?</i>												

General Information				
<b>Facility Type</b>	Fire/EMS			
<b>Name of Facility</b>	EMS Station 500			
<b>Physical Address</b>	316 Main Street Church Hill, 21623			
<b>Coordinates</b>	<b>Lat.</b>	39° 08' 28.94" N		
	<b>Long.</b>	75° 59' 08.35" W		
<b>Year Built</b>	1960	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Storm Surge Inundation Area</b>				<b>Yes</b>		<b>No</b>	✓			
<b>Hurricane Category (1-4) None</b>				<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>	
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>		<b>No</b>	✓		
					<b>2100</b>					
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>	✓	<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>	✓	<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>				<b>Yes</b>		✓	<b>No</b>			
<b>If so, name of route?</b>				Route 19						
<i>Comments: Route 19 intersects with Route 3300, which leads to Route 301 North</i>										
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>				<b>Yes</b>		✓	<b>No</b>			
<i>Comments: Antenna located on facility</i>										
<b>Flat roof?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>	✓			
<b>Drought Susceptibility</b>										
<i>Comments: Well water</i>										
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b> No										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	Fire/EMS			
<b>Name of Facility</b>	EMS Station 100			
<b>Physical Address</b>	103 Davidson Road Stevensville, 21666			
<b>Coordinates</b>	<b>Lat.</b>	38° 57' 33.66" N		
	<b>Long.</b>	76° 20' 12.60" W		
<b>Year Built</b>	2008	<b>Material</b>	Wood	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments: The building is in close proximity to Warehouse Creek.</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<b>Hurricane Category (1-4) No</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	<input checked="" type="checkbox"/>	
						<b>2100</b>				
<i>Comments: The Category 4 storm surge inundation area surrounds the structure and therefore potentially prevents passage to and from this facility.</i>										
<b>Generator</b>	<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>	<b>Adequately Sized?</b>	<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>			
<b>If so, name of route?</b>					Route 8					
<i>Comments:</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>										
<b>Any past water deficiency issues? Drought Susceptibility</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events? No</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

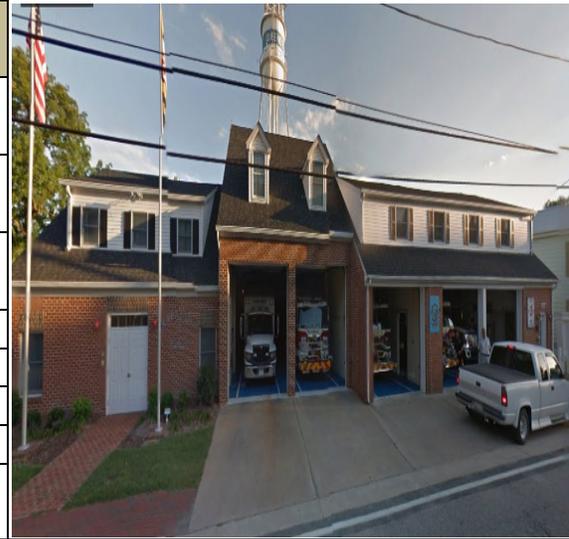
General Information				
<b>Facility Type</b>	Fire/EMS			
<b>Name of Facility</b>	EMS Station 200			
<b>Physical Address</b>	101 Medic Drive Chester, 21619			
<b>Coordinates</b>	<b>Lat.</b>	38° 58' 15.00" N		
	<b>Long.</b>	76° 15' 09.15" W		
<b>Year Built</b>	1983	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	✓	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments: This facility is in close proximity to Kent Narrows. The 100-year inundation area, a depth of flood at 1.6, is less than 20 feet away from the front of this structure. The inundation area affects the road access to Route 18, therefore making passage to and from limited.</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>	✓	<b>No</b>			
<b>Hurricane Category (1-4) No</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments: This facility will be isolated in a Category 1 storm surge inundation area and completely inundated by a Category 4 storm surge. A Category 2 storm surge will inundate the facility with a depth of flooding projected at less than 1 foot, however a Category 4 storm surge depth of flood is projected to be over 6 feet.</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>		
						<b>2100</b>	✓			
<i>Comments: The 2100 Sea Level Rise inundation area is projected to be 5.7 feet.</i>										
<b>Generator</b>	<b>Yes</b>		<b>No</b>	✓	<b>Adequately Sized?</b>	<b>Yes</b>	✓	<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>	✓	<b>No</b>			
<b>If so, name of route?</b>					Route 50					
<i>Comments: Located off of Route 18 which intersects with Route 50/301.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Any past water deficiency issues? Drought Susceptibility</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										

<b>Susceptible to Extreme Cold?</b>	<b>Yes</b>		<b>No</b>	✓
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events? Yes, 2003</b>				
<b>If so, what hazards?</b> Flooded in 03. Road access floods often.				
<i>Extent of Damages/Comments?</i>				

General Information				
<b>Facility Type</b>	Fire/EMS			
<b>Name of Facility</b>	EMS Station 300			
<b>Physical Address</b>	7110 Main Street Queenstown, 21658			
<b>Coordinates</b>	<b>Lat.</b>	38° 59' 25.96" N		
	<b>Long.</b>	76° 09' 24.38" W		
<b>Year Built</b>	1950	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information									
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>		✓	
<i>Comments:</i>									
<b>Storm Surge Inundation Area</b>				<b>Yes</b>		<b>No</b>		✓	
<b>Hurricane Category (1-4) No</b>				<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>		
<i>Comments:</i>									
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>	<b>2100</b>	<b>No</b>		✓
<i>Comments:</i>									
<b>Generator</b>		<b>Yes</b>	✓	<b>No</b>	<b>Adequately Sized?</b>		<b>Yes</b>	<b>No</b>	✓
<i>Comments:</i>									
<b>Located along evacuation route?</b>				<b>Yes</b>		✓	<b>No</b>		
<b>If so, name of route?</b>				Route 18					
<i>Comments: Located along Route 18, which intersects with Route 50.</i>									
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>		✓	
<i>Comments:</i>									
<b>Antennae on/at facility?</b>				<b>Yes</b>		<b>No</b>		✓	
<i>Comments:</i>									
<b>Flat roof?</b>				<b>Yes</b>		<b>No</b>		✓	
<i>Comments:</i>									
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>		✓	
<i>Comments:</i>									
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>		✓	
<b>Drought Susceptibility</b>									
<i>Comments:</i>									
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>		✓	
<i>Comments:</i>									
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>		✓	
<i>Comments:</i>									
<b>Has the facility suffered previous damage from hazard events?</b>									
<b>If so, what hazards?</b>									
<i>Extent of Damages/Comments?</i>									

General Information				
<b>Facility Type</b>	Fire/EMS			
<b>Name of Facility</b>	EMS Station 400			
<b>Physical Address</b>	302 Safety Drive Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 01' 59.83" N		
	<b>Long.</b>	76° 01' 07.05" W		
<b>Year Built</b>	2010	<b>Material</b>	Siding	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Storm Surge Inundation Area</b>				<b>Yes</b>		<b>No</b>	✓			
<b>Hurricane Category (1-4) No</b>				<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>	
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>		<b>No</b>	✓		
					<b>2100</b>					
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>		<b>No</b>	✓	<b>Adequately Sized?</b>	<b>Yes</b>	✓	<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>				<b>Yes</b>	✓	<b>No</b>				
<b>If so, name of route?</b>				Route 301 North						
<i>Comments: Located just off Routes 304 and 301 intersection.</i>										
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Flat roof?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>	✓			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events? No</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	Fire/EMS			
<b>Name of Facility</b>	EMS Station 600			
<b>Physical Address</b>	203 N Church Street Sudlersville, 21668			
<b>Coordinates</b>	<b>Lat.</b>	39° 11' 21.53" N		
	<b>Long.</b>	75° 51' 36.25" W		
<b>Year Built</b>	1960	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Storm Surge Inundation Area</b>				<b>Yes</b>		<b>No</b>	✓			
<b>Hurricane Category (1-4) No</b>				<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>	
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>		<b>No</b>	✓		
					<b>2100</b>					
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>	✓	<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>	✓	<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>				<b>Yes</b>		✓	<b>No</b>			
<b>If so, name of route?</b>				Route 313						
<i>Comments: Facility fronts Route 313.</i>										
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Flat roof?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>	✓			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events? No</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	Fire			
<b>Name of Facility</b>	Goodwill Volunteer Fire Department #4			
<b>Physical Address</b>	212 Broadway Street Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 46.14" N		
	<b>Long.</b>	76° 03' 58.57" W		
<b>Year Built</b>	1946	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>		<b>No</b>	✓		
<b>Hurricane Category (1-4) No</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
						<b>2100</b>				
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>	✓	<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>	✓	<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>	✓	<b>No</b>			
<b>If so, name of route?</b>					Route 213 or Route 304					
<i>Comments: Facility is located on Broadway Street, which intersects with Route 213 and Route 304 West.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Any past water deficiency issues? Drought Susceptibility</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events? No</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	Fire/EMS			
<b>Name of Facility</b>	Grasonville Volunteer Ambulance Dept. #20			
<b>Physical Address</b>	4132 Main Street Grasonville, 21638			
<b>Coordinates</b>	<b>Lat.</b>	38° 57' 28.65" N		
	<b>Long.</b>	76° 12' 40.38" W		
<b>Year Built</b>	2005	<b>Material</b>	Wood	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information												
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓				
<i>Comments: Marshy Creek is located behind the facility; therefore, the 100-year inundation area is within close proximity to the building.</i>												
<b>Storm Surge Inundation Area</b>					<b>Yes</b>	✓	<b>No</b>					
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>	Yes	<b>3</b>	Yes	<b>4</b>	Yes
<i>Comments: The Category 2 storm surge impacts the facility with a flood depth of less than one foot, however Category 3 or 4 have projected flood depths of 3 feet and 6 feet, respectively.</i>												
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓			
						<b>2100</b>						
<i>Comments:</i>												
<b>Generator</b>	<b>Yes</b>		<b>No</b>	✓	<b>Adequately Sized?</b>	<b>Yes</b>	✓	<b>No</b>				
<i>Comments:</i>												
<b>Located along evacuation route?</b>					<b>Yes</b>	✓	<b>No</b>					
<b>If so, name of route?</b>					Route 18							
<i>Comments: Facility fronts Route 18, which intersects with Route 50/301.</i>												
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>	✓				
<i>Comments:</i>												
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	✓				
<i>Comments:</i>												
<b>Flat roof?</b>					<b>Yes</b>		<b>No</b>	✓				
<i>Comments:</i>												
<b>Wildland/Urban Interface</b>					<b>Yes</b>	✓	<b>No</b>					
<i>Comments: Forested area behind the building</i>												
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>	✓				
<b>Drought Susceptibility</b>												
<i>Comments:</i>												
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>	✓				
<i>Comments:</i>												
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>	✓				
<i>Comments:</i>												
<b>Has the facility suffered previous damage from hazard events?</b>												

<b>If so, what hazards?</b>
<i>Extent of Damages/Comments?</i>

General Information				
<b>Facility Type</b>	Fire Department			
<b>Name of Facility</b>	Grasonville Volunteer Fire Department #2			
<b>Physical Address</b>	4128 Main Street Grasonville, 21638			
<b>Coordinates</b>	<b>Lat.</b>	38° 57' 29.35" N		
	<b>Long.</b>	76° 12' 41.60" W		
<b>Year Built</b>	1961	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	✓	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments: Marshy Creek is located behind the facility; therefore, the 100-year inundation area is within close proximity to the building.</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>	✓	<b>No</b>			
<b>Hurricane Category (1-4)</b>					<b>No</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	
<i>Comments: The Category 2 storm surge impacts the facility with a flood depth of less than one foot, however Category 3 or 4 have projected flood depths of 3.2 feet and 6.7 feet, respectively.</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
						<b>2100</b>				
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>	✓	<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>	✓	<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>	✓	<b>No</b>			
<b>If so, name of route?</b>					Route 18					
<i>Comments: Facility fronts Route 18, which intersects with Route 50/301.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments: Communication tower collocated on parcel</i>										
<b>Flat roof?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments: Forested area behind the building</i>										
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>	✓		
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										

<b>If so, what hazards?</b>
<i>Extent of Damages/Comments?</i>

General Information				
<b>Facility Type</b>	Fire			
<b>Name of Facility</b>	Kent Island Volunteer Fire Department #1			
<b>Physical Address</b>	1610 Main Street Chester, 21619			
<b>Coordinates</b>	<b>Lat.</b>	38° 58' 39.15" N		
	<b>Long.</b>	76° 17' 17.33" W		
<b>Year Built</b>	2007	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information												
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Storm Surge Inundation Area</b>				<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>					
<b>Hurricane Category (1-4)</b>				<b>1</b>	<input type="checkbox"/>	<b>2</b>	<input type="checkbox"/>	<b>3</b>	<input type="checkbox"/>	<b>4</b>	<input type="checkbox"/>	<b>Yes</b>
<i>Comments: The Category 4 storm surge inundation area has a projected flood depth of less than at foot at the facility.</i>												
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>				
					<b>2100</b>	<input type="checkbox"/>						
<i>Comments:</i>												
<b>Generator</b>	<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>	<b>Adequately Sized?</b>	<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>			
<i>Comments:</i>												
<b>Located along evacuation route?</b>				<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>					
<b>If so, name of route?</b>				Route 18								
<i>Comments: Facility fronts Route 18, which intersects with Route 50/301.</i>												
<b>Impact resistant glass?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>					
<i>Comments:</i>												
<b>Antennae on/at facility?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Flat roof?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Wildland/Urban Interface</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Any past water deficiency issues?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<b>Drought Susceptibility</b>												
<i>Comments:</i>												
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>					
<i>Comments:</i>												
<b>Has the facility suffered previous damage from hazard events?</b>												
<b>If so, what hazards?</b>												
<i>Extent of Damages/Comments?</i>												

General Information				
<b>Facility Type</b>	Fire			
<b>Name of Facility</b>	Queen Anne-Hillsboro Volunteer Fire Dept. #8			
<b>Physical Address</b>	13512 First Street Queen Anne, 21657			
<b>Coordinates</b>	<b>Lat.</b>	38° 55' 09.82" N		
	<b>Long.</b>	75° 57' 11.29" W		
<b>Year Built</b>	1945	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	✓	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>		✓		
<i>Comments:</i>										
<b>Storm Surge Inundation Area</b>				<b>Yes</b>		<b>No</b>		✓		
<b>Hurricane Category (1-4)</b>				1	2	3	4			
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>				<b>Yes</b>		2050	2100	<b>No</b>		✓
<i>Comments:</i>										
<b>Generator</b>		<b>Yes</b>	<b>No</b>	✓	<b>Adequately Sized?</b>		<b>Yes</b>	<b>No</b>	✓	
<i>Comments:</i>										
<b>Located along evacuation route?</b>				<b>Yes</b>		✓		<b>No</b>		
<b>If so, name of route?</b>				Route 303						
<i>Comments: Facility is located on First Street, which intersects Route 303.</i>										
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>		✓		
<i>Comments:</i>										
<b>Antennae on/at facility?</b>				<b>Yes</b>		✓		<b>No</b>		
<i>Comments: Communication Tower collocated on the parcel</i>										
<b>Flat roof?</b>				<b>Yes</b>		<b>No</b>		✓		
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>		✓		
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>		✓		
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>		✓		
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>		✓		
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	Fire Department			
<b>Name of Facility</b>	Queenstown Volunteer Fire Department #3			
<b>Physical Address</b>	7110 Main Street Queenstown, 21658			
<b>Coordinates</b>	<b>Lat.</b>	38° 59' 25.96" N		
	<b>Long.</b>	76° 09' 24.38" W		
<b>Year Built</b>	1950	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Storm Surge Inundation Area</b>				<b>Yes</b>		<b>No</b>	✓			
<b>Hurricane Category (1-4) No</b>				<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>	
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>		<b>No</b>	✓		
					<b>2100</b>					
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>	✓	<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>	✓	
<i>Comments:</i>										
<b>Located along evacuation route?</b>				<b>Yes</b>		✓	<b>No</b>			
<b>If so, name of route?</b>				Route 18						
<i>Comments: Located along Route 18, which intersects with Route 50.</i>										
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Flat roof?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>	✓			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	Fire			
<b>Name of Facility</b>	Sudlersville Volunteer Fire Department #6			
<b>Physical Address</b>	203 N Church Street Sudlersville, 21668			
<b>Coordinates</b>	<b>Lat.</b>	39° 11' 21.53" N		
	<b>Long.</b>	75° 51' 36.25" W		
<b>Year Built</b>	1960	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2
<b>Hazard Information</b>				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>		<b>No</b> ✓
<b>Hurricane Category (1-4) No</b>		<b>1</b>	<b>2</b>	<b>3</b> <b>4</b>
<i>Comments:</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b> <b>2100</b>	<b>No</b> ✓
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b>	✓	<b>No</b>	<b>Adequately Sized?</b> <b>Yes</b> ✓ <b>No</b>
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	✓	<b>No</b>
<b>If so, name of route?</b>		Route 313		
<i>Comments: Facility fronts Route 313.</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Flat roof?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Any past water deficiency issues?</b>		<b>Yes</b>		<b>No</b> ✓
<b><i>Drought Susceptibility</i></b>				
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events? No</b>				
<b>If so, what hazards?</b>				
<i>Extent of Damages/Comments?</i>				



General Information				
<b>Facility Type</b>	Fire			
<b>Name of Facility</b>	United Communities Volunteer Fire Dept. #9			
<b>Physical Address</b>	9406 Romancoke Road Stevensville, 21666			
<b>Coordinates</b>	<b>Lat.</b>	38° 52' 52.71" N		
	<b>Long.</b>	76° 20' 18.09" W		
<b>Year Built</b>	1979	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	✓	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>			<b>Yes</b>		<b>No</b>	✓				
<i>Comments: This facility is in close proximity to Eastern Bay.</i>										
<b>Storm Surge Inundation Area</b>			<b>Yes</b>	✓	<b>No</b>					
<b>Hurricane Category (1-4)</b>			<b>1</b>		<b>2</b>		<b>3</b>	Yes	<b>4</b>	
<i>Comments: A Category 2 storm surge surrounds the structure, however a Category 3 storm surge completely inundates the building with projected flood depths of 1.35 feet.</i>										
<b>Sea Level Inundation Area</b>			<b>Yes</b>	<b>2050</b>		<b>No</b>	✓			
				<b>2100</b>						
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>	✓	<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>	✓	<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>			<b>Yes</b>	✓	<b>No</b>					
<b>If so, name of route?</b>			Route 18							
<i>Comments: Facility fronts Route 18.</i>										
<b>Impact resistant glass?</b>			<b>Yes</b>		<b>No</b>	✓				
<i>Comments:</i>										
<b>Antennae on/at facility?</b>			<b>Yes</b>	✓	<b>No</b>					
<i>Comments: Communication Tower collocated on the parcel</i>										
<b>Flat roof?</b>			<b>Yes</b>		<b>No</b>	✓				
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>			<b>Yes</b>		<b>No</b>	✓				
<i>Comments:</i>										
<b>Any past water deficiency issues? Drought Susceptibility</b>			<b>Yes</b>		<b>No</b>	✓				
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>			<b>Yes</b>		<b>No</b>	✓				
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>			<b>Yes</b>		<b>No</b>	✓				
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events? No</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information			
<b>Facility Type</b>	Medical		
<b>Name of Facility</b>	Anne Arundel Medical Center (AAMC) – Kent Island Pavilion		
<b>Physical Address</b>	1630 Main Street Chester, 21619		
<b>Coordinates</b>	<b>Lat.</b>	38° 58' 36.46" N	
	<b>Long.</b>	76° 17' 10.85" W	
<b>Year Built</b>	2008	<b>Material</b>	Brick
<b>Multi-Story Structure</b>			
<b>No</b>		<b>Yes</b>	<b># of Floors?</b> 2



Hazard Information									
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Storm Surge Inundation Area</b>				<b>Yes</b>	✓	<b>No</b>			
<b>Hurricane Category (1-4)</b>				<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b> Yes
<i>Comments: The Category 4 storm surge inundation area has a projected flood depth of less than at foot at the facility.</i>									
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
<i>Comments:</i>									
<b>Generator</b>	<b>Yes</b>	✓	<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>	
<i>Comments:</i>									
<b>Located along evacuation route?</b>				<b>Yes</b>	✓	<b>No</b>			
<b>If so, name of route?</b>				Route 18					
<i>Comments: Facility fronts Route 18, which intersects Route 50/301.</i>									
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>			
<i>Comments:</i>									
<b>Antennae on/at facility?</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Flat roof?</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>			
<b>Drought Susceptibility</b>									
<i>Comments:</i>									
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>			
<i>Comments:</i>									
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>			
<i>Comments:</i>									
<b>Has the facility suffered previous damage from hazard events?</b>									
<b>If so, what hazards?</b>									
<i>Extent of Damages/Comments?</i>									

General Information				
<b>Facility Type</b>	Medical			
<b>Name of Facility</b>	QAC Department of Health			
<b>Physical Address</b>	206 N Commerce Street Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 43.49" N		
	<b>Long.</b>	76° 03' 50.55" W		
<b>Year Built</b>	1958	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2
<b>Hazard Information</b>				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>		<b>No</b> ✓
<b>Hurricane Category (1-4)</b>		<b>1</b>	<b>2</b>	<b>3</b> <b>4</b>
<i>Comments:</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b> <b>2100</b>	<b>No</b> ✓
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b> ✓	<b>No</b>	<b>Adequately Sized?</b>	<b>Yes</b> <b>No</b> ✓
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	✓	<b>No</b>
<b>If so, name of route?</b>		Route 213		
<i>Comments: Facility fronts Route 213.</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>	✓	<b>No</b>
<i>Comments:</i>				
<b>Flat roof?</b>		<b>Yes</b>	✓	<b>No</b>
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Any past water deficiency issues?</b>		<b>Yes</b>		<b>No</b> ✓
<b><i>Drought Susceptibility</i></b>				
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				
<b>If so, what hazards?</b>				
<i>Extent of Damages/Comments?</i>				



General Information				
<b>Facility Type</b>	Medical			
<b>Name of Facility</b>	QAC Department of Health Annex			
<b>Physical Address</b>	205 N Liberty Street Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 46.49" N		
	<b>Long.</b>	76° 03' 56.13" W		
<b>Year Built</b>	1979	<b>Material</b>	Wood	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>										
<b>Storm Surge Inundation Area</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<b>Hurricane Category (1-4)</b>				<b>1</b>	<input type="checkbox"/>	<b>2</b>	<input type="checkbox"/>	<b>3</b>	<input type="checkbox"/>	<b>4</b>
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
					<b>2100</b>	<input type="checkbox"/>				
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>	<b>Adequately Sized?</b>	<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>	
<i>Comments:</i>										
<b>Located along evacuation route?</b>				<b>Yes</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>		
<b>If so, name of route?</b>				Route 213						
<i>Comments: Facility fronts Route 213.</i>										
<b>Impact resistant glass?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>										
<b>Flat roof?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	Medical			
<b>Name of Facility</b>	UM Shore Emergency Center at Queenstown			
<b>Physical Address</b>	115 Shoreway Drive Queenstown, 21658			
<b>Coordinates</b>	<b>Lat.</b>	38° 58' 00.70" N		
	<b>Long.</b>	76° 10' 57.71" W		
<b>Year Built</b>	2010	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments: Walsey Creek is located on the other side of Route 50/301 from the facility.</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	<input checked="" type="checkbox"/>	
						<b>2100</b>				
<i>Comments:</i>										
<b>Generator</b>		<b>Yes</b>		<b>No</b>	<b>Adequately Sized?</b>		<b>Yes</b>		<b>No</b>	
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>		<input checked="" type="checkbox"/>	<b>No</b>		
<b>If so, name of route?</b>					Route 50					
<i>Comments: Located off of Route 835, which has direct access to Route 50/301.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	Medical			
<b>Name of Facility</b>	UM Shore Medical Pavilion			
<b>Physical Address</b>	125 Shoreway Drive Queenstown, 21658			
<b>Coordinates</b>	<b>Lat.</b>	38° 58' 03.23" N		
	<b>Long.</b>	76° 10' 54.98" W		
<b>Year Built</b>	2011	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	3



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments: Walsey Creek is located on the other side of Route 50/301 from the facility.</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>		<b>No</b>	✓		
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments: The facility is not directly impacted by storm surge; however, all storm surge categories affect the area adjacent to the building.</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
						<b>2100</b>				
<i>Comments:</i>										
<b>Generator</b>		<b>Yes</b>		<b>No</b>	<b>Adequately Sized?</b>		<b>Yes</b>		<b>No</b>	
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>		✓	<b>No</b>		
<b>If so, name of route?</b>					Route 50					
<i>Comments: Located off of Route 835, which has direct access to Route 50/301.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>			<b>No</b>		
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>			<b>No</b>	✓	
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>			<b>No</b>	✓	
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>			<b>No</b>	✓	
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>					<b>Yes</b>			<b>No</b>		
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>			<b>No</b>		
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>			<b>No</b>		
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	Police			
<b>Name of Facility</b>	Centreville Police Department			
<b>Physical Address</b>	420 Commerce Street Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 51.65" N		
	<b>Long.</b>	76° 03' 43.22" W		
<b>Year Built</b>	1982	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments: Gravel Run is located adjacent to the facility. The projected flood depth for this facility is 0.5 feet.</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>	✓	<b>No</b>			
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments: The Category 2 storm surge inundation area is in close proximity of the facility, however, a Category 3 storm surge completely inundates the facility with projected flood depths of 3.9 feet. A Category 4 storm surge has projected flood depths of 9.4 feet at this location.</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
						<b>2100</b>				
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>		<b>No</b>	✓	<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>		
<i>Comments: In Progress</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>	✓	<b>No</b>			
<b>If so, name of route?</b>					Route 213					
<i>Comments: This facility fronts Route 213.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments: At one location on interior.</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments: Forested area adjacent to the building.</i>										
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>	✓		
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										

<b>Has the facility suffered previous damage from hazard events?</b>
<b>If so, what hazards?</b>
<i>Extent of Damages/Comments?</i>

General Information				
<b>Facility Type</b>	Police			
<b>Name of Facility</b>	Maryland State Police - Barrack S			
<b>Physical Address</b>	311 Safety Drive Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 01' 59.24" N		
	<b>Long.</b>	76° 01' 12.16" W		
<b>Year Built</b>	1986	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	N/A
<b>Hazard Information</b>				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<b>Hurricane Category (1-4)</b>		<b>1</b>	<input type="checkbox"/>	<b>2</b>
		<input type="checkbox"/>	<input type="checkbox"/>	<b>3</b>
		<input type="checkbox"/>	<input type="checkbox"/>	<b>4</b>
<i>Comments:</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b>	<input type="checkbox"/>
			<b>2100</b>	<input type="checkbox"/>
		<b>No</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>
	<b>Adequately Sized?</b>	<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>
<b>If so, name of route?</b>		Route 301 North		
<i>Comments: Located along Route 301 North.</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>
<i>Comments: Communication tower located behind facility.</i>				
<b>Flat roof?</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Any past water deficiency issues?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<b>Drought Susceptibility</b>		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				
<b>If so, what hazards?</b>				
<i>Extent of Damages/Comments?</i>				



General Information				
<b>Facility Type</b>	Police			
<b>Name of Facility</b>	Queen Anne's County Sheriff's Office			
<b>Physical Address</b>	505 Railroad Avenue Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 32.40" N		
	<b>Long.</b>	76° 03' 38.47" W		
<b>Year Built</b>	1977	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	✓	<b>Yes</b>	<b># of Floors?</b>	N/A
Hazard Information				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>		<b>No</b> ✓
<b>Hurricane Category (1-4)</b>		<b>1</b>	<b>2</b>	<b>3</b> <b>4</b>
<i>Comments:</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b> <b>2100</b>	<b>No</b> ✓
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b>	✓	<b>No</b>	<b>Adequately Sized?</b> <b>Yes</b> ✓ <b>No</b>
<i>Comments</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	✓	<b>No</b>
<b>If so, name of route?</b>		Route 304		
<i>Comments: Facility fronts Route 304.</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Flat roof?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>	✓	<b>No</b>
<i>Comments: Forested area located behind building</i>				
<b>Any past water deficiency issues?</b>		<b>Yes</b>		<b>No</b> ✓
<b>Drought Susceptibility</b>				
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				
<b>If so, what hazards?</b>				
<i>Extent of Damages/Comments?</i>				



General Information				
<b>Facility Type</b>	Police			
<b>Name of Facility</b>	Sheriff's Office - Kent Narrows Substation			
<b>Physical Address</b>	425 Piney Narrows Road Chester, MD 21619			
<b>Coordinates</b>	<b>Lat.</b>	38° 58' 29.76" N		
	<b>Long.</b>	76° 14' 57.73" W		
<b>Year Built</b>	1986	<b>Material</b>	Siding	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information									
<b>FEMA 100 yr. Floodplain</b>			<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>				
<i>Comments: This facility is located between Kent Island Narrows and Piney Creek. The projected flood depth for this facility is 1.7 feet.</i>									
<b>Storm Surge Inundation Area</b>			<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>				
<b>Hurricane Category (1-4)</b>			<b>1</b>	<b>Yes</b>	<b>2</b>	<b>3</b>	<b>4</b>		
<i>Comments: A Category 1 storm surge inundates a portion of the facility with projected flood depths of 1.2 feet. A Category 2 storm surge would completely inundate the facility with project flood depths as high as 4.3 feet.</i>									
<b>Sea Level Inundation Area</b>			<b>Yes</b>	<b>2050</b>		<b>No</b>			
				<b>2100</b>	<input checked="" type="checkbox"/>				
<i>Comments:</i>									
<b>Generator</b>	<b>Yes</b>		<b>No</b>	<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>		
<i>Comments</i>									
<b>Located along evacuation route?</b>			<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>			
<b>If so, name of route?</b>									
<i>Comments:</i>									
<b>Impact resistant glass?</b>			<b>Yes</b>		<b>No</b>				
<i>Comments:</i>									
<b>Antennae on/at facility?</b>			<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>									
<b>Flat roof?</b>			<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>									
<b>Wildland/Urban Interface</b>			<b>Yes</b>		<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>									
<b>Any past water deficiency issues? Drought Susceptibility</b>			<b>Yes</b>		<b>No</b>				
<i>Comments:</i>									
<b>Susceptible to Extreme Heat?</b>			<b>Yes</b>		<b>No</b>				
<i>Comments:</i>									
<b>Susceptible to Extreme Cold?</b>			<b>Yes</b>		<b>No</b>				
<i>Comments:</i>									
<b>Has the facility suffered previous damage from hazard events?</b>									

<b>If so, what hazards?</b>
<i>Extent of Damages/Comments?</i>

General Information				
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<b>Facility Type</b>	Police			
<b>Name of Facility</b>	Sheriff's Office – Sudlersville Substation			
<b>Physical Address</b>	200 S. Church Street Sudlersville, MD 21668			
<b>Coordinates</b>	<b>Lat.</b>	39° 11' 05.90" N		
	<b>Long.</b>	75° 51' 31.28" W		
<b>Year Built</b>	1950	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information									
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<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>									
<b>Storm Surge Inundation Area</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<b>Hurricane Category (1-4)</b>				<b>1</b>	<input type="checkbox"/>	<b>2</b>	<input type="checkbox"/>	<b>3</b>	<input type="checkbox"/>
<i>Comments:</i>									
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>	
					<b>2100</b>	<input type="checkbox"/>			
<i>Comments:</i>									
<b>Generator</b>	<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>	<b>Adequately Sized?</b>	<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>
<i>Comments</i>									
<b>Located along evacuation route?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<b>If so, name of route?</b>									
<i>Comments:</i>									
<b>Impact resistant glass?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>		
<i>Comments:</i>									
<b>Antennae on/at facility?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>									
<b>Flat roof?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>									
<b>Wildland/Urban Interface</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>									
<b>Any past water deficiency issues?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>		
<b>Drought Susceptibility</b>									
<i>Comments:</i>									
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>		
<i>Comments:</i>									
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>		
<i>Comments:</i>									
<b>Has the facility suffered previous damage from hazard events?</b>									
<b>If so, what hazards?</b>									
<i>Extent of Damages/Comments?</i>									

General Information				
<b>Facility Type</b>	School - Private			
<b>Name of Facility</b>	Eastern Shores Jr. Academy			
<b>Physical Address</b>	407 Dudley Corners Road Sudlersville, 21668			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 51.95" N		
	<b>Long.</b>	76° 04' 03.99" W		
<b>Year Built</b>	1975	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>		<b>No</b>	✓		
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
						<b>2100</b>				
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>		<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>	✓	<b>No</b>			
<b>If so, name of route?</b>					Route 290					
<i>Comments: Located on Route 290 which intersects with Route 301.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments: Forested area located behind the building.</i>										
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	School - Private			
<b>Name of Facility</b>	Kiddie Academy of Kent Island			
<b>Physical Address</b>	113 St. Claire Place Stevensville, 21666			
<b>Coordinates</b>	<b>Lat.</b>	38° 58' 49.88" N		
	<b>Long.</b>	76° 19' 06.45" W		
<b>Year Built</b>	1988	<b>Material</b>	Wood	
<b>Multi-Story Structure</b>				
<b>No</b>	✓	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information									
<b>FEMA 100 yr. Floodplain</b>			<b>Yes</b>		<b>No</b>	✓			
<i>Comments: Tributary of Thompson Creek is located in close proximity to the facility.</i>									
<b>Storm Surge Inundation Area</b>			<b>Yes</b>	✓	<b>No</b>				
<b>Hurricane Category (1-4)</b>			<b>1</b>		<b>2</b>		<b>3</b>		<b>4</b>   Yes
<i>Comments: A Category 4 storm surge inundates the facility with a flood depth of 1.5 feet.</i>									
<b>Sea Level Inundation Area</b>			<b>Yes</b>	<b>2050</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Generator</b>	<b>Yes</b>		<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>	
<i>Comments:</i>									
<b>Located along evacuation route?</b>			<b>Yes</b>	✓	<b>No</b>				
<b>If so, name of route?</b>			Route 18						
<i>Comments: Located along Route 18.</i>									
<b>Impact resistant glass?</b>			<b>Yes</b>		<b>No</b>				
<i>Comments:</i>									
<b>Antennae on/at facility?</b>			<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>									
<b>Flat roof?</b>			<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>									
<b>Wildland/Urban Interface</b>			<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>									
<b>Any past water deficiency issues? Drought Susceptibility</b>			<b>Yes</b>		<b>No</b>				
<i>Comments:</i>									
<b>Susceptible to Extreme Heat?</b>			<b>Yes</b>		<b>No</b>				
<i>Comments:</i>									
<b>Susceptible to Extreme Cold?</b>			<b>Yes</b>		<b>No</b>				
<i>Comments:</i>									
<b>Has the facility suffered previous damage from hazard events?</b>									
<b>If so, what hazards?</b>									
<i>Extent of Damages/Comments?</i>									

General Information				
<b>Facility Type</b>	School - Private			
<b>Name of Facility</b>	Lighthouse Christian Academy			
<b>Physical Address</b>	931 Love Point Road Stevensville, 21666			
<b>Coordinates</b>	<b>Lat.</b>	38° 59' 35.81" N		
	<b>Long.</b>	76° 18' 47.75" W		
<b>Year Built</b>	2003	<b>Material</b>	Wood	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>		<b>No</b>	✓		
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments: A Category 4 intersects with land across from the facility and Route 18, which may prohibit evacuation of this facility.</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
						<b>2100</b>				
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>		<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>	✓	<b>No</b>			
<b>If so, name of route?</b>					Route 18					
<i>Comments: Located along Route 18.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments: Forested area located around the building.</i>										
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	School - Private			
<b>Name of Facility</b>	Shore Up – Head Start			
<b>Physical Address</b>	5441 Main Street Grasonville, 21638			
<b>Coordinates</b>	<b>Lat.</b>	38° 57' 42.58" N		
	<b>Long.</b>	76° 11' 11.01" W		
<b>Year Built</b>	1954	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	N/A
<b>Hazard Information</b>				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input checked="" type="checkbox"/>
<i>Comments:</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input checked="" type="checkbox"/>
<b>Hurricane Category (1-4)</b>		<b>1</b> <input type="checkbox"/>	<b>2</b> <input type="checkbox"/>	<b>3</b> <input type="checkbox"/> <b>4</b> <input type="checkbox"/>
<i>Comments:</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b> <input type="checkbox"/> <b>2100</b> <input type="checkbox"/>	<b>No</b> <input checked="" type="checkbox"/>
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b> <input type="checkbox"/>	<b>No</b> <input type="checkbox"/>	<b>Adequately Sized?</b>	<b>Yes</b> <input type="checkbox"/> <b>No</b> <input type="checkbox"/>
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<b>If so, name of route?</b>		Route 18		
<i>Comments: Facility fronts Route 18.</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input checked="" type="checkbox"/>
<i>Comments:</i>				
<b>Flat roof?</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input checked="" type="checkbox"/>
<i>Comments:</i>				
<b>Any past water deficiency issues?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<b><i>Drought Susceptibility</i></b>				
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				
<b>If so, what hazards?</b>				
<i>Extent of Damages/Comments?</i>				



General Information				
<b>Facility Type</b>	School - Private			
<b>Name of Facility</b>	The Gunston School			
<b>Physical Address</b>	911 Gunston Road Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 04' 15.89" N		
	<b>Long.</b>	76° 05' 37.89" W		
<b>Year Built</b>	1950	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	3



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments: Corsica River does border the backside of the property.</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>		<b>No</b>	✓		
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
						<b>2100</b>				
<i>Comments: A Category 4 storm surge inundation area is in close proximity to the facilities.</i>										
<b>Generator</b>	<b>Yes</b>		<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>		<b>No</b>	✓		
<b>If so, name of route?</b>										
<i>Comments:</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments: Forested area located around the building.</i>										
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	School - Private			
<b>Name of Facility</b>	Wye River Upper School			
<b>Physical Address</b>	316 S Commerce Street Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 30.54" N		
	<b>Long.</b>	76° 04' 03.79" W		
<b>Year Built</b>	1926	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2
<b>Hazard Information</b>				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments: Mill Stream Branch is located west of the facility.</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>		<b>No</b> ✓
<b>Hurricane Category (1-4)</b>		<b>1</b>	<b>2</b>	<b>3</b> <b>4</b>
<i>Comments: The Category 4 storm surge inundation area is less than 100 feet of the facility.</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b>	<b>No</b> ✓
			<b>2100</b>	
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b>		<b>No</b>	<b>Adequately Sized?</b> <b>Yes</b> <b>No</b>
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	✓	<b>No</b>
<b>If so, name of route?</b>		Route 213		
<i>Comments: Facility fronts Route 213.</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Flat roof?</b>		<b>Yes</b>	✓	<b>No</b>
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>	✓	<b>No</b>
<i>Comments: Forested area located around the building.</i>				
<b>Any past water deficiency issues?</b>		<b>Yes</b>		<b>No</b>
<b>Drought Susceptibility</b>				
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				
<b>If so, what hazards?</b>				
<i>Extent of Damages/Comments?</i>				



General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Anchor Points Academy			
<b>Physical Address</b>	202 Chesterfield Avenue Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 51.95" N		
	<b>Long.</b>	76° 04' 03.99" W		
<b>Year Built</b>	1901	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2
Hazard Information				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments: Corsica River is located in close proximity to the facility.</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>		<b>No</b> ✓
<b>Hurricane Category (1-4)</b>		<b>1</b>	<b>2</b>	<b>3</b> <b>4</b>
<i>Comments:</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b> <b>2100</b>	<b>No</b> ✓
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b>	<b>No</b>	<b>Adequately Sized?</b>	<b>Yes</b> <b>No</b>
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	✓	<b>No</b>
<b>If so, name of route?</b>		Route 304		
<i>Comments: Facility fronts Route 304.</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Flat roof?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>	✓	<b>No</b>
<i>Comments: Forested area located behind the building.</i>				
<b>Any past water deficiency issues?</b>		<b>Yes</b>		<b>No</b>
<b>Drought Susceptibility</b>				
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				
<b>If so, what hazards?</b>				
<i>Extent of Damages/Comments?</i>				



General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Bayside Elementary School			
<b>Physical Address</b>	301 Church Street Stevensville, 21666			
<b>Coordinates</b>	<b>Lat.</b>	38° 58' 55.03" N		
	<b>Long.</b>	76° 18' 26.30" W		
<b>Year Built</b>	1991	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	N/A
<b>Hazard Information</b>				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<i>Comments: Tributary from Cox Creek is adjacent to the facility.</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<b>Hurricane Category (1-4)</b>		<b>1</b>	<input type="checkbox"/>	<b>2</b>
		<input type="checkbox"/>	<input type="checkbox"/>	<b>3</b>
		<input type="checkbox"/>	<input type="checkbox"/>	<b>4</b>
<i>Comments: A Category 4 storm surge inundates the facility with a flood depth of less than one foot.</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b>	<input type="checkbox"/>
			<b>2100</b>	<input type="checkbox"/>
		<b>No</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>
		<b>Adequately Sized?</b>	<b>Yes</b>	<input type="checkbox"/>
			<b>No</b>	<input type="checkbox"/>
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<b>If so, name of route?</b>				
<i>Comments:</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Flat roof?</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>
<i>Comments: Forested area adjacent to the building</i>				
<b>Any past water deficiency issues?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<b>Drought Susceptibility</b>				
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				
<b>If so, what hazards?</b>				
<i>Extent of Damages/Comments?</i>				



General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Centreville Elementary School			
<b>Physical Address</b>	213 Homewood Avenue Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 54.96" N		
	<b>Long.</b>	76° 04' 12.88" W		
<b>Year Built</b>	1950	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	✓	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments: Facility is in close proximity to the Corsica River.</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>		<b>No</b>	✓		
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments: Categories 1 to 4 inundation areas do not intersect with the building however intersect with the land behind the building.</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
						<b>2100</b>				
<i>Comments:</i>										
<b>Generator</b>		<b>Yes</b>		<b>No</b>	<b>Adequately Sized?</b>		<b>Yes</b>		<b>No</b>	
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>	✓	<b>No</b>			
<b>If so, name of route?</b>					Route 304					
<i>Comments: Homewood Avenue leads directly to Route 304.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments: Forested area located adjacent to the building</i>										
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Centreville Middle School			
<b>Physical Address</b>	231 Ruthsburg Road Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 02.71" N		
	<b>Long.</b>	76° 03' 00.44" W		
<b>Year Built</b>	1978	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information									
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Storm Surge Inundation Area</b>				<b>Yes</b>		<b>No</b>	✓		
<b>Hurricane Category (1-4)</b>				<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments:</i>									
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
					<b>2100</b>				
<i>Comments:</i>									
<b>Generator</b>	<b>Yes</b>		<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>	
<i>Comments:</i>									
<b>Located along evacuation route?</b>				<b>Yes</b>		✓	<b>No</b>		
<b>If so, name of route?</b>				Route 304					
<i>Comments: Facility fronts Route 304.</i>									
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>			
<i>Comments:</i>									
<b>Antennae on/at facility?</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Flat roof?</b>				<b>Yes</b>		✓	<b>No</b>		
<i>Comments:</i>									
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>									
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>			
<b>Drought Susceptibility</b>									
<i>Comments:</i>									
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>			
<i>Comments:</i>									
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>			
<i>Comments:</i>									
<b>Has the facility suffered previous damage from hazard events?</b>									
<b>If so, what hazards?</b>									
<i>Extent of Damages/Comments?</i>									

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Chesapeake College			
<b>Physical Address</b>	1000 College Circle Drive Queenstown, 21658			
<b>Coordinates</b>	<b>Lat.</b>	38° 57' 09.99" N		
	<b>Long.</b>	76° 05' 00.99" W		
<b>Year Built</b>	1979	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information									
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>		✓	
<i>Comments:</i>									
<b>Storm Surge Inundation Area</b>				<b>Yes</b>		<b>No</b>		✓	
<b>Hurricane Category (1-4)</b>				<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>		
<i>Comments:</i>									
<b>Sea Level Inundation Area</b>				<b>Yes</b>		<b>No</b>		✓	
				2050	2100				
<i>Comments:</i>									
<b>Generator</b>		<b>Yes</b>	<b>No</b>	<b>Adequately Sized?</b>		<b>Yes</b>	<b>No</b>		
<i>Comments:</i>									
<b>Located along evacuation route?</b>				<b>Yes</b>		✓		<b>No</b>	
<b>If so, name of route?</b>				Route 213					
<i>Comments: Located between Routes 213 and 662 both of which intersect with Route 50.</i>									
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>			
<i>Comments:</i>									
<b>Antennae on/at facility?</b>				<b>Yes</b>		<b>No</b>		✓	
<i>Comments:</i>									
<b>Flat roof?</b>				<b>Yes</b>		✓		<b>No</b>	
<i>Comments:</i>									
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>		✓	
<i>Comments:</i>									
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>			
<b>Drought Susceptibility</b>									
<i>Comments:</i>									
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>			
<i>Comments:</i>									
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>			
<i>Comments:</i>									
<b>Has the facility suffered previous damage from hazard events?</b>									
<b>If so, what hazards?</b>									
<i>Extent of Damages/Comments?</i>									

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Church Hill Elementary School			
<b>Physical Address</b>	631 Main Street Church Hill, 21623			
<b>Coordinates</b>	<b>Lat.</b>	39° 08' 50.99" N		
	<b>Long.</b>	75° 58' 50.69" W		
<b>Year Built</b>	1916	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments: Facility is in close proximity to Southeast Creek.</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>		<b>No</b>	✓		
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments: Category 4 inundation area does not intersect with the building however intersect with the land approximately 1,000 feet south of the building.</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
						<b>2100</b>				
<i>Comments:</i>										
<b>Generator</b>		<b>Yes</b>		<b>No</b>	<b>Adequately Sized?</b>		<b>Yes</b>		<b>No</b>	
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>		✓	<b>No</b>		
<b>If so, name of route?</b>					Route 219					
<i>Comments: Facility fronts Route 219.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Grasonville Elementary School			
<b>Physical Address</b>	5435 Main Street Grasonville, 21638			
<b>Coordinates</b>	<b>Lat.</b>	38° 57' 43.22" N		
	<b>Long.</b>	76° 11' 19.29" W		
<b>Year Built</b>	1987	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments: Winchester Creek is located northwest of this facility.</i>										
<b>Storm Surge Inundation Area</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<b>Hurricane Category (1-4)</b>				<b>1</b>	<input type="checkbox"/>	<b>2</b>	<input type="checkbox"/>	<b>3</b>	<input type="checkbox"/>	<b>4</b>
<i>Comments: Category 4 storm surge inundation area intersects with the land adjacent to the facility.</i>										
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
					<b>2100</b>	<input type="checkbox"/>				
<i>Comments:</i>										
<b>Generator</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>	<b>Adequately Sized?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>
<i>Comments:</i>										
<b>Located along evacuation route?</b>				<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>			
<b>If so, name of route?</b>				Route 18						
<i>Comments: Facility fronts Route 18.</i>										
<b>Impact resistant glass?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>										
<b>Flat roof?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>				<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b>	<input type="checkbox"/>			
<i>Comments: Forested area adjacent to the building</i>										
<b>Any past water deficiency issues?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Kennard Elementary School			
<b>Physical Address</b>	420 Little Kidwell Avenue Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 14.29" N		
	<b>Long.</b>	76° 03' 51.76" W		
<b>Year Built</b>	1952	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	N/A
				
Hazard Information				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input checked="" type="checkbox"/>
<i>Comments: Facility is in close proximity to Millstream Branch.</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input checked="" type="checkbox"/>
<b>Hurricane Category (1-4)</b>		<b>1</b> <input type="checkbox"/>	<b>2</b> <input type="checkbox"/>	<b>3</b> <input type="checkbox"/> <b>4</b> <input type="checkbox"/>
<i>Comments: Categories 1 to 4 inundation areas do not intersect with the building however intersect with the land behind the building.</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b> <input type="checkbox"/>	<b>No</b> <input checked="" type="checkbox"/>
			<b>2100</b> <input type="checkbox"/>	
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b> <input type="checkbox"/>	<b>No</b> <input type="checkbox"/>	<b>Adequately Sized?</b>	<b>Yes</b> <input type="checkbox"/> <b>No</b> <input type="checkbox"/>
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input checked="" type="checkbox"/>
<b>If so, name of route?</b>				
<i>Comments:</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input checked="" type="checkbox"/>
<i>Comments:</i>				
<b>Flat roof?</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>	<input checked="" type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<i>Comments: Forested area located adjacent to the building</i>				
<b>Any past water deficiency issues?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<b>Drought Susceptibility</b>				
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b> <input type="checkbox"/>
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				
<b>If so, what hazards?</b>				
<i>Extent of Damages/Comments?</i>				

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Kent Island Elementary School			
<b>Physical Address</b>	110 Elementary Way Stevensville, 21666			
<b>Coordinates</b>	<b>Lat.</b>	38° 58' 46.78" N		
	<b>Long.</b>	76° 18' 29.55" W		
<b>Year Built</b>	1955	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	✓	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments: Tributary from Cox Creek is adjacent to the facility.</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>	✓	<b>No</b>			
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b> Yes
<i>Comments: A Category 4 storm surge inundates the facility with a flood depth of less than one foot.</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
						<b>2100</b>				
<i>Comments:</i>										
<b>Generator</b>		<b>Yes</b>		<b>No</b>	<b>Adequately Sized?</b>		<b>Yes</b>		<b>No</b>	
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>	✓	<b>No</b>			
<b>If so, name of route?</b>					Route 18					
<i>Comments: Elementary Way leads directly to Route 18.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments: Forested area adjacent to the building</i>										
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>			
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Kent Island High School			
<b>Physical Address</b>	900 Love Point Road Stevensville, 21666			
<b>Coordinates</b>	<b>Lat.</b>	38° 59' 26.47" N		
	<b>Long.</b>	76° 18' 33.73" W		
<b>Year Built</b>	1998	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2
<b>Hazard Information</b>				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments: A Thompson Creek tributary is in close proximity.</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>	✓	<b>No</b>
<b>Hurricane Category (1-4)</b>		<b>1</b>	<b>2</b>	<b>3</b> <b>4</b> Yes
<i>Comments: The Category 3 storm surge inundations the area in front of the facility, while the Category 4 storm surge inundation area completely surrounds the facility. The Category 4 storm surge does not direct impact the facility but does have flood depths of 1.5 surrounding it.</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b> <b>2100</b>	<b>No</b> ✓
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b>	<b>No</b>	<b>Adequately Sized?</b>	<b>Yes</b> <b>No</b>
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	✓	<b>No</b>
<b>If so, name of route?</b>		Route 18		
<i>Comments: Facility fronts Route 18.</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Flat roof?</b>		<b>Yes</b>	✓	<b>No</b>
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>	✓	<b>No</b>
<i>Comments: Forested area located adjacent to the building.</i>				
<b>Any past water deficiency issues? Drought Susceptibility</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				



<b>If so, what hazards?</b>
<i>Extent of Damages/Comments?</i>

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Matapeake Elementary School			
<b>Physical Address</b>	651 Romancoke Road Stevensville, 21666			
<b>Coordinates</b>	<b>Lat.</b>	38° 57' 44.21" N		
	<b>Long.</b>	76° 20' 06.85" W		
<b>Year Built</b>	1983	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	✓	<b>Yes</b>	<b># of Floors?</b>	N/A
<b>Hazard Information</b>				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments: Warehouse Creek is located just south of this facility.</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>	✓	<b>No</b>
<b>Hurricane Category (1-4)</b>		<b>1</b>	<b>2</b>	<b>3</b> Yes <b>4</b>
<i>Comments: The Category 2 storm surge inundation area fronts the facility while the Category 3 storm surge impacts the facility with flood depths of less than one foot. The Category 4 storm surge impacts the facility with flood depths of 2.5 feet.</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b> <b>2100</b>	<b>No</b> ✓
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b>		<b>No</b>	<b>Adequately Sized?</b> <b>Yes</b> <b>No</b>
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	✓	<b>No</b>
<b>If so, name of route?</b>		Route 8		
<i>Comments: Romancoke Road leads to Route 8.</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Flat roof?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Any past water deficiency issues? Drought Susceptibility</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				
<b>If so, what hazards?</b>				



*Extent of Damages/Comments?*

General Information			
<b>Facility Type</b>	School		
<b>Name of Facility</b>	Matapeake Middle School & Kent Island 9 <sup>th</sup> Grade Annex		
<b>Physical Address</b>	671 Romancoke Road Stevensville, 21666		
<b>Coordinates</b>	<b>Lat.</b>	38° 57' 38.22" N	
	<b>Long.</b>	76° 20' 04.25" W	
<b>Year Built</b>	1983	<b>Material</b>	Brick
<b>Multi-Story Structure</b>			
<b>No</b>		<b>Yes</b>	<b># of Floors?</b> 2



Hazard Information									
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>		✓
<i>Comments: Warehouse Creek is located just south of this facility.</i>									
<b>Storm Surge Inundation Area</b>					<b>Yes</b>	✓	<b>No</b>		
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>		<b>3</b> Yes <b>4</b>
<i>Comments: The Category 2 storm surge inundation area is adjacent the facility while the Category 3 storm surge impacts the facility with flood depths of less than one foot. The Category 4 storm surge impacts the facility with flood depths of 3 feet.</i>									
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓
						<b>2100</b>			
<i>Comments:</i>									
<b>Generator</b>		<b>Yes</b>		<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>
<i>Comments:</i>									
<b>Located along evacuation route?</b>					<b>Yes</b>	✓	<b>No</b>		
<b>If so, name of route?</b>					Route 8				
<i>Comments: Romancoke Road leads to Route 8.</i>									
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>		
<i>Comments:</i>									
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>		✓
<i>Comments:</i>									
<b>Flat roof?</b>					<b>Yes</b>		<b>No</b>		✓
<i>Comments:</i>									
<b>Wildland/Urban Interface</b>					<b>Yes</b>		<b>No</b>		✓
<i>Comments:</i>									
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>		
<b>Drought Susceptibility</b>									
<i>Comments:</i>									
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>		
<i>Comments:</i>									
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>		
<i>Comments:</i>									
<b>Has the facility suffered previous damage from hazard events?</b>									

<b>If so, what hazards?</b>
<i>Extent of Damages/Comments?</i>

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Queen Anne's High School			
<b>Physical Address</b>	125 Ruthsburg Road Centreville, 21617			
<b>Coordinates</b>	<b>Lat.</b>	39° 02' 14.84" N		
	<b>Long.</b>	76° 03' 10.90" W		
<b>Year Built</b>	1978	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



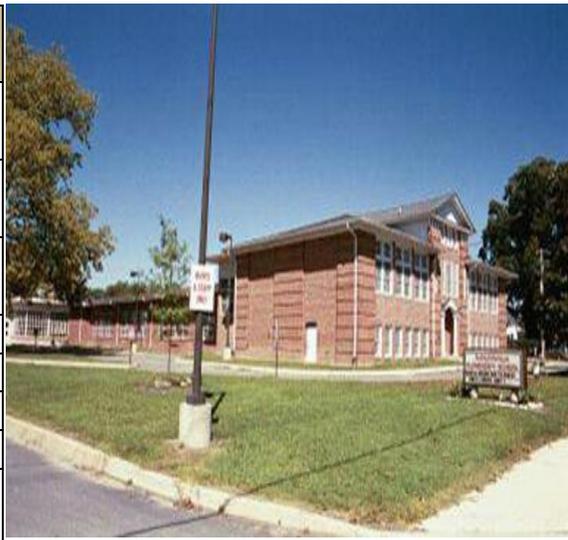
Hazard Information										
<b>FEMA 100 yr. Floodplain</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Storm Surge Inundation Area</b>					<b>Yes</b>		<b>No</b>	✓		
<b>Hurricane Category (1-4)</b>					<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>					<b>Yes</b>	<b>2050</b>		<b>No</b>	✓	
						<b>2100</b>				
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>		<b>No</b>		<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>		
<i>Comments:</i>										
<b>Located along evacuation route?</b>					<b>Yes</b>	✓	<b>No</b>			
<b>If so, name of route?</b>					Route 304					
<i>Comments: Facility fronts Route 304.</i>										
<b>Impact resistant glass?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Antennae on/at facility?</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Flat roof?</b>					<b>Yes</b>	✓	<b>No</b>			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>					<b>Yes</b>		<b>No</b>	✓		
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>					<b>Yes</b>		<b>No</b>			
<b><i>Drought Susceptibility</i></b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>					<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Stevensville Middle School			
<b>Physical Address</b>	610 Main Street Stevensville, 21666			
<b>Coordinates</b>	<b>Lat.</b>	38° 58' 39.02" N		
	<b>Long.</b>	76° 18' 31.23" W		
<b>Year Built</b>	1961	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments: Facility is in close proximity to Cox Creek.</i>										
<b>Storm Surge Inundation Area</b>				<b>Yes</b>	✓	<b>No</b>				
<b>Hurricane Category (1-4)</b>				<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>	Yes
<i>Comments: A Category 4 storm surge inundates the facility with a flood depth of one foot.</i>										
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>		<b>No</b>	✓		
					<b>2100</b>					
<i>Comments:</i>										
<b>Generator</b>		<b>Yes</b>		<b>No</b>	<b>Adequately Sized?</b>		<b>Yes</b>		<b>No</b>	
<i>Comments:</i>										
<b>Located along evacuation route?</b>				<b>Yes</b>	✓	<b>No</b>				
<b>If so, name of route?</b>				Route 18						
<i>Comments: Facility fronts Route 18.</i>										
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>				
<i>Comments:</i>										
<b>Antennae on/at facility?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Flat roof?</b>				<b>Yes</b>	✓	<b>No</b>				
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>				
<b>Drought Susceptibility</b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>				
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>				
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Sudlersville Elementary School			
<b>Physical Address</b>	300 S Church Street Sudlersville, 21668			
<b>Coordinates</b>	<b>Lat.</b>	39° 11' 01.13" N		
	<b>Long.</b>	75° 51' 31.02" W		
<b>Year Built</b>	1920	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2
<b>Hazard Information</b>				
<b>FEMA 100 yr. Floodplain</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Storm Surge Inundation Area</b>		<b>Yes</b>		<b>No</b> ✓
<b>Hurricane Category (1-4)</b>		<b>1</b>	<b>2</b>	<b>3</b> <b>4</b>
<i>Comments:</i>				
<b>Sea Level Inundation Area</b>		<b>Yes</b>	<b>2050</b> <b>2100</b>	<b>No</b> ✓
<i>Comments:</i>				
<b>Generator</b>	<b>Yes</b>	<b>No</b>	<b>Adequately Sized?</b>	<b>Yes</b> <b>No</b>
<i>Comments:</i>				
<b>Located along evacuation route?</b>		<b>Yes</b>	✓	<b>No</b>
<b>If so, name of route?</b>		Route 313		
<i>Comments: Facility fronts Route 313.</i>				
<b>Impact resistant glass?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Antennae on/at facility?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Flat roof?</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Wildland/Urban Interface</b>		<b>Yes</b>		<b>No</b> ✓
<i>Comments:</i>				
<b>Any past water deficiency issues? Drought Susceptibility</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Susceptible to Extreme Heat?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Susceptible to Extreme Cold?</b>		<b>Yes</b>		<b>No</b>
<i>Comments:</i>				
<b>Has the facility suffered previous damage from hazard events?</b>				
<b>If so, what hazards?</b>				
<i>Extent of Damages/Comments?</i>				



General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Sudlersville Middle School			
<b>Physical Address</b>	600 Charles Street Sudlersville, 21668			
<b>Coordinates</b>	<b>Lat.</b>	39° 10' 56.64" N		
	<b>Long.</b>	75° 51' 08.87" W		
<b>Year Built</b>	2012	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>		<b>Yes</b>	<b># of Floors?</b>	2



Hazard Information										
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Storm Surge Inundation Area</b>				<b>Yes</b>		<b>No</b>	✓			
<b>Hurricane Category (1-4)</b>				<b>1</b>		<b>2</b>		<b>3</b>	<b>4</b>	
<i>Comments:</i>										
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>		<b>No</b>	✓		
					<b>2100</b>					
<i>Comments:</i>										
<b>Generator</b>	<b>Yes</b>		<b>No</b>	<b>Adequately Sized?</b>	<b>Yes</b>		<b>No</b>			
<i>Comments:</i>										
<b>Located along evacuation route?</b>				<b>Yes</b>	✓	<b>No</b>				
<b>If so, name of route?</b>				Route 313						
<i>Comments: Charles Street leads to Route 313.</i>										
<b>Impact resistant glass?</b>				<b>Yes</b>		<b>No</b>				
<i>Comments:</i>										
<b>Antennae on/at facility?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Flat roof?</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Wildland/Urban Interface</b>				<b>Yes</b>		<b>No</b>	✓			
<i>Comments:</i>										
<b>Any past water deficiency issues?</b>				<b>Yes</b>		<b>No</b>				
<b><i>Drought Susceptibility</i></b>										
<i>Comments:</i>										
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>		<b>No</b>				
<i>Comments:</i>										
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>		<b>No</b>				
<i>Comments:</i>										
<b>Has the facility suffered previous damage from hazard events?</b>										
<b>If so, what hazards?</b>										
<i>Extent of Damages/Comments?</i>										

General Information				
<b>Facility Type</b>	School			
<b>Name of Facility</b>	Wye Research & Education Center			
<b>Physical Address</b>	124 Wye Narrows Drive Queenstown, 21658			
<b>Coordinates</b>	<b>Lat.</b>	38° 54' 45.67" N		
	<b>Long.</b>	76° 09' 02.47" W		
<b>Year Built</b>	1991	<b>Material</b>	Brick	
<b>Multi-Story Structure</b>				
<b>No</b>	<input checked="" type="checkbox"/>	<b>Yes</b>	<b># of Floors?</b>	N/A



Hazard Information									
<b>FEMA 100 yr. Floodplain</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments: DeCoursey Cove is adjacent to the facility.</i>									
<b>Storm Surge Inundation Area</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<b>Hurricane Category (1-4)</b>				<b>1</b>	<input type="checkbox"/>	<b>2</b>	<input type="checkbox"/>	<b>3</b>	<input type="checkbox"/>
<i>Comments: A Category 2 storm surge inundates the area in front of the facility while a Category 3 storm surge impacts the facility with flood depths ranging from 1.5 to 3 feet of water. The Category 4 storm surge completely inundates the facility with flood depths from 5 to 8 feet of water.</i>									
<b>Sea Level Inundation Area</b>				<b>Yes</b>	<b>2050</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>	
					<b>2100</b>	<input type="checkbox"/>			
<i>Comments:</i>									
<b>Generator</b>		<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>	<b>Adequately Sized?</b>		<b>Yes</b>	<input type="checkbox"/>
								<b>No</b>	<input type="checkbox"/>
<i>Comments:</i>									
<b>Located along evacuation route?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<b>If so, name of route?</b>									
<i>Comments:</i>									
<b>Impact resistant glass?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>		
<i>Comments:</i>									
<b>Antennae on/at facility?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>									
<b>Flat roof?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>									
<b>Wildland/Urban Interface</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input checked="" type="checkbox"/>		
<i>Comments:</i>									
<b>Any past water deficiency issues?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>		
<b>Drought Susceptibility</b>									
<i>Comments:</i>									
<b>Susceptible to Extreme Heat?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>		
<i>Comments:</i>									
<b>Susceptible to Extreme Cold?</b>				<b>Yes</b>	<input type="checkbox"/>	<b>No</b>	<input type="checkbox"/>		
<i>Comments:</i>									
<b>Has the facility suffered previous damage from hazard events?</b>									

<b>If so, what hazards?</b>
<i>Extent of Damages/Comments?</i>

# Sanitary Facilities

## Sanitary Facilities

The Queen Anne’s County Sanitary District currently operates and maintains 1 wastewater treatment plant divided into 4 wastewater sub-districts. The Sanitary District also operates the Kent Narrows / Stevensville / Grasonville Sub-district water treatment plants, which service approximately 2,900 water accounts, including 3,300 dwellings.

The Kent Narrows / Stevensville / Grasonville (KNSG) facility inventory includes:

- Wastewater Treatment
  - 1 Wastewater Treatment Plant
  - 11 Sewage Pump Stations
  - 48.12 Miles of Force Main
  - 14 Vacuum Collection Stations
  - 71.98 Miles of Vacuum Sewer Main
  - 2466 Vacuum Valves
  - 7 Sewage Lift Stations
  - 16.26 Miles of Gravity Sewer
  - 315 Sewer Manholes
  - 58 Air Vacuum Relief Valve Manholes
  - 85 STEP tanks & pumps
  
- Water Treatment
  - 11 Water Treatment Plants
  - 1 Well Houses
  - 2 Water Booster Pump Stations
  - 4 Water Towers
  - 6 Ground Storage Tanks
  - 64.53 Miles of Water Main
  - 4315 Water Meters
  - 497 Fire Hydrants
  - 1 Air Relief Manholes

Table B-2: Sanitary Facility Matrix provides the vulnerability assessment results. Each facility was analyzed to assess their vulnerability to:

- FEMA Regulated Flood Zones;
- Hurricane Storm Surge Inundation Area;
- 2050 Mean Sea Level Change Projected Inundation Area; and
- 2100 Mean Sea Level Change Projected Inundation Area.

TABLE B-2: SANITARY FACILITY MATRIX							
FACILITY TYPE	NAME	ADDRESS	FLOOD ZONE	FLOOD DEPTH	HURRICANE CATEGORY	SLC 2050	SLC 2100
Vacuum Collection Stations	Collection Station F	625 Dominion Rd	AE	1.2	Yes	No	Yes
Vacuum Collection Stations	Collection Station G	2510 Main St	AE	2.9	Yes	No	Yes
Vacuum Collection Stations	Collection Station A	828 Main St	AE	2.4	Yes	No	Yes
Vacuum Collection Stations	Collection Station B	746 Thompson Creek Rd	AE	3.2	Yes	No	Yes
Vacuum Collection Stations	Collection Station J	311 Long Point Rd	AE	0.5	Yes	No	No
Vacuum Collection Stations	Collection Station R	301 Chenowith Dr	AE	1.3	Yes	No	Yes
Vacuum Collection Stations	Collection Station Q	774 Kimberly Way	AE	3.4	Yes	No	Yes
Vacuum Collection Stations	Collection Station H	3232 Main St	AE	1.1	Yes	No	Yes
Vacuum Collection Stations	Parks - Collection Station K	301 Perrys Corner Rd	AE	0.5	Yes	No	No
WTP	Oyster Cove Water Treatment Plant	3230 Main St	AE	0.5	Yes	No	Yes
Ground Storage Tanks	Pump Station 1	3232 Main St	AE	1.8	Yes	No	Yes
Ground Storage Tanks	Collection Station H	3232 Main St	AE	0.5	Yes	No	Yes
Pump Stations	Pump Station 1	3232 Main St	AE	1.8	Yes	No	Yes
Pump Stations	Parks – Pump Station 4	301 Perrys Corner Rd	AE	0.8	Yes	No	Yes
Vacuum Collection Stations	Collection Station D	201 Benton Pleasure Rd	X (Shaded)	-	Yes	No	Yes
Vacuum Collection Stations	Collection Station L	617 Chester River Beach Rd	X (Shaded)	-	Yes	No	No
Vacuum Collection Stations	Collection Station C	1825 Sherman Dr	X (Shaded)	-	Yes	No	Yes
WTP	Thompson Creek Water Treatment Plant	610 Marion Quimby Dr	X (Shaded)	-	Yes	No	No
Ground Storage Tanks	Thompson Creek Water Treatment Plant	610 Marion Quimby Dr	X (Shaded)	-	Yes	No	No
Pump Stations	Pump Station 2	1825 Sherman Dr	X (Shaded)	-	Yes	No	Yes
Vacuum Collection Stations	Collection Station M	600 Grasonville Cemetery Rd	X (Unshaded)	-	No	No	No
Vacuum Collection Stations	Collection Station E	105 Tackle Cir	X (Unshaded)	-	Yes	No	No
WTP	Queenstown Sewage Treatment Plant	120 Skipjack Cove Ln	X (Unshaded)	-	Yes	No	No

**Appendix B Essential Facilities & Sanitary Facilities**

FACILITY TYPE	NAME	ADDRESS	FLOOD ZONE	FLOOD DEPTH	HURRICANE CATEGORY	SLC 2050	SLC 2100
WTP	Cbbp Water Treatment Plant	232 Bateau Dr	X (Unshaded)	-	Yes	No	No
WTP	Bayside Water Treatment Plant	103 Tackle Cir	X (Unshaded)	-	Yes	No	No
WTP	Prospect Bay Water Treatment Plant	101 Golf Cart Dr	X (Unshaded)	-	No	No	No
WTP	Kent Island Village Water Treatment Plant	1839 Anchorage Dr	X (Unshaded)	-	Yes	No	No
WTP	Bridge Pointe Water Treatment Plant	9025 Bridgepointe Dr	X (Unshaded)	-	Yes	No	No
WTP	Grasonville Water Treatment Plant	5439 Main St	X (Unshaded)	-	No	No	No
WTP	Riverside Water Treatment Plant	206 Riverside Dr	X (Unshaded)	-	Yes	No	No
WTP	Stevensville Water Treatment Plant	208 Church St	X (Unshaded)	-	Yes	No	No
WTP	Queens Landing Water Treatment Plant	131 Queen Landing Dr	X (Unshaded)	-	Yes	No	No
Water Booster Pump Stations	Stevensville Water Treatment Plant	208 Church St	X (Unshaded)	-	Yes	No	No
Water Booster Pump Stations	Thompson Creek Rd Booster Pump Station	115 Thompson Creek Rd	X (Unshaded)	-	Yes	No	No
Water Towers	Qac Sanitary Cbbp Water Tower	230 Bateau Dr	X (Unshaded)	-	Yes	No	No
Water Towers	Prospect Bay Water Tower	200 Golf Cart Dr	X (Unshaded)	-	No	No	No
Water Towers	Matapeake Water Tower	180 Marine Academy Dr	X (Unshaded)	-	Yes	No	No
Water Towers	Queens Landing Water Tower	101 Captains Way	X (Unshaded)	-	Yes	No	No
Ground Storage Tanks	Bridge Pointe Water Treatment Plant	9025 Bridgepointe Dr	X (Unshaded)	-	Yes	No	No
Ground Storage Tanks	Grasonville Water Treatment Plant	5439 Main St	X (Unshaded)	-	No	No	No
Ground Storage Tanks	Stevensville Water Treatment Plant	208 Church St	X (Unshaded)	-	Yes	No	No
WWTP	Knsg Sewage Treatment Plant	310 Bateau Dr	X (Unshaded)	-	Yes	No	No
Sewage Lift Stations	Lift Station #8	257 Prospect Bay Dr W	X (Unshaded)	-	Yes	No	No
Sewage Lift Stations	Lift Station #3	2 Prospect Bay Dr W	X (Unshaded)	-	No	No	No
Sewage Lift Stations	Lift Station #5	66 Prospect Bay Dr W	X (Unshaded)	-	Yes	No	No
Sewage Lift Stations	Lift Station #7	216 Prospect Bay Dr W	X (Unshaded)	-	Yes	No	No

Appendix B Essential Facilities & Sanitary Facilities

FACILITY TYPE	NAME	ADDRESS	FLOOD ZONE	FLOOD DEPTH	HURRICANE CATEGORY	SLC 2050	SLC 2100
Sewage Lift Stations	Lift Station #1	345 Prospect Bay Dr W	X (Unshaded)	-	Yes	No	No
Sewage Lift Stations	Lift Station #6	122 Prospect Bay Dr W	X (Unshaded)	-	Yes	No	No
Sewage Lift Stations	Lift Station #9	205 Piney Point Lndg	X (Unshaded)	-	Yes	No	No
Well House	Prospect Wellhouse #2 / Inactive	35 Greenwood Shls	X (Unshaded)	-	Yes	No	No
Pump Stations	Pump Station 7	3 Greenwood Shls	X (Unshaded)	-	Yes	No	No
Pump Stations	Pump Station 8	40 Prospect Bay Dr W	X (Unshaded)	-	Yes	No	No
Pump Stations	Pump Station 10	439 Conor Dr	X (Unshaded)	-	Yes	No	No
Pump Stations	Pump Station 9	308 Carriage Heath	X (Unshaded)	-	Yes	No	No
Pump Stations	Pump Station 3	146 Romancoke Rd	X (Unshaded)	-	Yes	No	No
Pump Stations	Pump Station 6	131 Golf Cart Dr	X (Unshaded)	-	No	No	No
Pump Stations	Pump Station 11	735 Moorings Cir	X (Unshaded)	-	Yes	No	No
Pump Stations	Pump Station 5	232 Bateau Dr	X (Unshaded)	-	Yes	No	No

Source: QAC Department of Public Works – Sanitary District

# Appendix C

# Safe Growth Audit

This Appendix provides information on Safe Growth Audit that was conducted during the planning cycle.

- Introduction
- Safe Growth Audit
- Conclusion
- Recommendations

## Introduction

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

## Safe Growth Audit

During the preparation of the 2018 Queen Anne’s Hazard Mitigation Plan, a Safe Growth Audit was conducted. Performing a Safe Growth Audit is a way to assess how well the existing planning tools address hazard risks and community resiliency. Safe Growth Audit questions provide a systematic way to review local planning tools and identify the presence of, or need for, hazard-related actions.

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

Local documents reviewed during the Safe Growth Audit include:

- 2010 Queen Anne’s County Comprehensive Plan,
- 2010 Water Resource Element,
- Zoning Ordinance;
- Chesapeake Critical Area Act and Flood Plain Ordinance;
- Subdivision of Land; and,
- 2012 Hazard Mitigation Plan.

There are eight (8) municipalities within Queen Anne’s County.

TABLE C-1: COMPREHENSIVE PLANS	
MUNICIPALITIES	CURRENT PLAN/ADOPTION DATE
Barclay	CMP-2009 & 2017 Update
Centreville	CMP-2009
Church Hill	CMP-2010
Queen Anne	CMP-2002
Queenstown	CMP-2010
Sudlersville	CMP-2014
Templeville	CMP-2009
Millington	CMP -2018

TABLE C-2: SAFE GROWTH AUDIT	
PLAN	LOCATION
<b>COMPREHENSIVE PLAN</b>	
<b>LAND USE</b>	
Does the future land-use map clearly identify natural hazard areas?	<p>Yes.</p> <p><i>2010 Queen Anne’s County Comprehensive Plan</i> Appendix 3: Water Resources Analysis and Best Management Practices Toolkit Section 11.1 thru 11.17 Assessment of Land Use Impacts on Watersheds -preferred future land use allocations:</p> <ul style="list-style-type: none"> <li>• Page 74 – Corsica River Watershed</li> <li>• Page 79 – Centreville Planning Area</li> <li>• Page 84 – Eastern Bay Watershed</li> <li>• Page 89 – Kent Island Bay Watershed</li> <li>• Page 94 – Kent Narrows Watershed</li> <li>• Page 99 – Islands Growth Area</li> <li>• Page 104 – Lower Chester River Watershed</li> <li>• Page 109 – Middle Chester River Watershed</li> <li>• Page 114 – Southeast Creek Watershed</li> <li>• Page 119 – Church Hill Proposed Grow Area</li> <li>• Page 124 – Tuckahoe Creek Watershed</li> <li>• Page 129 – Upper Chester River Watershed</li> <li>• Page 134 – Barclay Proposed Growth Area</li> <li>• Page 138 – Sudlersville Proposed Growth Area</li> <li>• Page 143 – Upper Choptank Watershed</li> <li>• Page 148 – Wye River Watershed</li> <li>• Page 153 – Queenstown Planning Area</li> <li>• Page 156 – Queen Anne’s County Water Resource Element Future Land Use</li> </ul>
Do the land-use policies discourage development or redevelopment within hazard areas?	<p>Yes.</p> <p><i>2010 Queen Anne’s County Comprehensive Plan</i> <b>Section 1.0 - Land Use Element</b> The Land Use Element emphasizes sustainable smart growth management in the context of the natural environment while continuing the County’s ethic of maintaining a quintessential rural community by preserving agricultural lands and environmentally sensitive areas. Land use policies impact all other aspects of community development addressed in the various Plan elements and as articulated through the Twelve Visions of Article 66B of the Annotated Code of Maryland. <b>Section 1.0 – Land Use Element</b> <b>Section 1.6.7 Assessment of Capacity to Manage Growth</b> The dwelling unit capacity analysis is detailed in Appendix 6: Capacity Analysis for the Defined Planning Path. This analysis supports achieving the goal of encouraging land uses and infrastructure improvements that will protect our waterways,</p>

	<p>conserve our natural resources and support sustainable and responsible agriculture as identified on Map LU-7A: Comprehensive Plan Map: Countywide Land Use and quantified in Table 1-4. This analysis provides the basis for land use policies contained in this Plan Element and that are further supported by policies contained in other Elements.</p> <p><b>Section 2.0 – Sensitive Areas</b></p> <p><b>Section 2.9.1 Legislative &amp; Regulatory Background</b></p> <p>Article 66B requires inclusion of a mineral resources element that identifies undeveloped land that should be kept in its undeveloped state until the land can be used to or assist in providing a continuous supply of minerals, that identifies appropriate post excavation uses for the land, and incorporates land use policies and recommendations for regulations.</p> <p><b>Section 8.0 – Community Facilities and Transportation</b></p> <p><b>Section 8.11.4 Transportation and Land Preservation</b></p> <p>Transportation decisions need to work in unity with land use policies and programs to preserve rural, agricultural and natural resource lands. For Queen Anne’s County, roadways are the core component of the County’s transportation infrastructure. Thus, their location, design and function are factors in decisions affecting community development and agricultural and natural resource protection.</p> <p><b>Section 8.13 Transportation Network Issues &amp; Opportunities</b></p> <p>Land use policies promote directing growth to the County and Town Planning Areas for purposes of minimizing the cost of infrastructure, preserving rural agricultural lands, and reducing sprawl.</p>
<p>Does the Plan provide adequate space for expected future growth in areas located outside natural hazard areas?</p>	<p>Yes.</p> <p><i>2010 Queen Anne’s County Comprehensive Plan</i></p> <p><b>Section 1.0 Land Use</b></p> <p><b>Section 1.2.1 Overarching Goals</b></p> <p><i>The VISION is that Queen Anne’s County will be a rural County that plans for orderly growth to protect and sustain a primarily agricultural, forested and maritime community within the limits of natural resources by concentrated future growth in existing towns and population centers and preserves the County’s natural beauty and resources for future generations. The County will emphasize preservation of the rural character of Queen Anne’s County through the support of agriculture as an industry and to preserve the equity that exists in the agricultural lands. Queen Anne’s County is also a County that values and protects its water resources and is conscientious of its stewardship to the land and other natural assets and resources that make this a great place to live, work and play</i></p> <p><b>Appendix 6: Analysis for Defined Planning Path</b></p>

	<p><b>Section 1.2 Capacity Analysis Summary</b>                  Table 1 on page 4 of Appendix 6 summarizes development capacity when applying the Sustainable Smart Growth Management Strategy outlined in Section 1.0: Land Use Element. Development capacity on undeveloped land has been based on the assumptions and maximum development densities outlined previously in Section 1.1.2 of this appendix. This analysis is supported by growth management and preservation policies as outlined in the Assessment of Capacity Analysis for Preservation and Assessment of Capacity for Growth Management contained in subsequent sections of this appendix (Sections 1.3 and 1.4). The results of this analysis clearly indicate that there is sufficient land to accommodate reasonable future growth in Queen Anne’s County with the ability to achieve desired levels of preservation of rural lands.</p>
<p><b>TRANSPORTATION</b></p>	
<p>Does the transportation plan limit access to hazard areas?</p>	<p>Yes  <i>2010 Queen Anne’s County Comprehensive Plan</i>  <b>Section 8.0 – Community Facilities and Transportation</b>  <b>Section 8.11.1 Transportation Plan Element Relationships</b>                  Maryland’s 2009 Smart, Green &amp; Growing Planning Legislation to protect the environment and natural resources and to promote sustainable growth provides the framework for the relationship between policies, decisions and actions associated with land use including environmental stewardship, economic development and transportation. Smart, Green &amp; Growing concepts that support community sustainability are based upon the following:</p> <ul style="list-style-type: none"> <li>• Strengthening the linkages and coordination between land use and transportation planning; Transportation investments to provide better access to employment and commercial centers supporting economic development;</li> <li>• Managing infrastructure investments to ensure that they can meet the intended need;</li> <li>• Targeting investments for enhanced transit access, bicycle and pedestrian accessibility and to enhance the Towns and County Planning Areas; and</li> <li>• Preserving natural resource and rural agricultural lands as responsible stewards of the land.</li> </ul>
<p>Is the transportation policy used to guide growth to safe locations?</p>	<p>Yes.  <i>2010 Queen Anne’s County Comprehensive Plan</i>  <b>Section 3.0: Priority Preservation Areas, and Section 6.0: Economic Development and Tourism</b>, along with the programs and public services described in this Section will shape the County’s transportation policies.  <b>Section 8.0 – Community Facilities and Transportation</b>  <b>Section 8.11 Transportation Element</b></p>

	<p>The ability for the County to provide a safe and efficient transportation system is important to maintaining a high quality of life, providing for economic expansion as well as maintaining acceptable levels of community sustainability throughout the County.</p> <p><b>Section 8.12 Transportation Guiding Principles, Vision, Goals and Objectives</b></p> <ul style="list-style-type: none"> <li>Promote environmentally-friendly transportation policies.</li> </ul> <p><b>Section 8.14 Transportation Policies, Programs and Regulations</b> The Federal, State and County governments play an important role with respect to transportation funding, regulation and programming.</p> <p><b>Section 8.14.1 Federal and State Policies and Programs</b></p> <ul style="list-style-type: none"> <li>Consolidated Transportation Program (CTP)</li> <li>Community Transportation and Urban Reconstruction Programs</li> <li>Sidewalk Retrofit Program</li> <li>Retrofit Bicycle Program</li> <li>National Recreational Trails Program</li> <li>Partnership Planting Program</li> <li>Ridesharing Program</li> <li>Access Management Program</li> <li>Scenic Byways Program</li> <li>Transportation Enhancement Program</li> <li>Complete Streets Initiative</li> </ul> <p><b>Section 8.14.2 County Transportation Policies and Regulations</b></p> <ul style="list-style-type: none"> <li>Roads Design and Construction Standards Manual</li> <li>Adequate Public Facilities Ordinance</li> </ul>
<p>Are movement systems designed to function under disaster conditions (e.g., evacuation)?</p>	<p>No, movement systems designed to function under disaster conditions are not captured in Section 8.</p>
<p><b>ENVIRONMENTAL MANAGEMENT</b></p>	
<p>Are environmental systems that protect development from hazard identified and mapped?</p>	<p>Yes.</p> <p><i>2010 Queen Anne’s County Comprehensive Plan</i></p> <p><b>Section 1.0 – Land Use</b></p> <p>Protection of Sensitive Areas (including water resources) The strategy for protection of sensitive areas including water resources focuses on:</p> <ul style="list-style-type: none"> <li>Protection and preservation of sensitive lands such as: streams, wetlands and their buffers; 100-year floodplains; habitats of threatened and endangered species; steep slopes; agricultural and forest lands intended for resource protection or conservation; and other areas in need of special protection.</li> </ul>

	<ul style="list-style-type: none"> <li>• Directing growth to the County and Town Planning Areas in order to minimize impacts on undisturbed sensitive areas contained with the rural agricultural areas and Critical Areas.</li> <li>• Applying agricultural best management practices, land management and design tools and techniques to protect sensitive lands and to reduce impacts on water resources.</li> <li>• Utilize low-impact design or Environmental Site Design (ESD) standards for development occurring in all landscapes across the County.</li> </ul> <p><b>Section 2.0 – Sensitive Areas, Water Resource and Mineral Resources Elements</b></p> <p>Sensitive areas, water resources and mineral resources are key components of the County’s natural environment as well as a part of the natural-resource based economy. The County contains 495 miles of shoreline with wildlife and aquatic habitats, and considerable acreage preserved as County and State parkland, natural areas or open space, agricultural lands, woodlands, wetlands and a variety of water resources. The land use ethic to preserve natural resources applies sustainable smart growth management strategies which contribute to the success of maintaining the County as a quintessential rural community through:</p> <ul style="list-style-type: none"> <li>• Protection and preservation of sensitive areas and water resources using a variety of land use management tools and techniques; Reduction of stormwater runoff by using best management practices and best agricultural practices;</li> <li>• Reduction of environmental impacts by using innovative technology for on-lot septic systems and public sanitary sewer systems; and</li> <li>• Protection of quality and quantity of drinking water supplies and through watershed planning.</li> </ul> <p><b>Maps:</b></p> <p><b>Section 2.4.1 Map ESA-1:</b> Critical Areas  <b>Section 2.4.2 Maps ESA-2 and ESA-3:</b> Sensitive Areas &amp; DNR Targeted Ecological Areas (Greenprint Area)  <b>Section 2.4.3 Map ESA-4:</b> Watersheds</p>
<p>Do environmental policies maintain and restore protective ecosystems?</p>	<p>Yes.  <i>2010 Queen Anne’s County Comprehensive Plan</i>  <b>Introduction</b>  Queen Anne’s County manages growth using a variety of land use regulations, tools and techniques based upon Article 66B, judicial precedent, past and present planning policies and decisions. Historically, the following State of Maryland planning directives have shaped planning goals and have provided a framework for developing and implementing growth management policies and regulations for the County.</p>

	<ul style="list-style-type: none"> <li>• <i>1992 Economic Growth, Resource Protection and Planning Act</i> – In 1992, the Maryland General Assembly adopted the Economic Growth, Resource Protection and Planning Act (the 1992 Planning Act) as an amendment to Article 66B of the Annotated Code of Maryland. This Act required the County and other local governments across the State to reduce sprawl, concentrate growth in and around existing development areas, promote economic development and protect sensitive natural resources.</li> <li>• <i>1997 Maryland’s Smart Growth Initiative</i> – In 1997, the State of Maryland enacted Smart Growth legislation. This legislation gave the State programmatic and fiscal authority to encourage local jurisdictions to implement “smart growth” planning. This was accomplished through the State’s directed programs and funding to support locally-designated growth areas and to protect rural areas. Subsequent to this legislation there were several initiatives defined by the Maryland Department of Planning (MDP) and various State agencies to provide resources, incentives and programs for the County and the development community to achieve Smart Growth.</li> <li>• <i>2009 Smart, Green &amp; Growing Planning Legislation</i> – The Smart, Green &amp; Growing planning legislation was designed to protect the environment and natural resources and to promote sustainable growth across Maryland. As part of this package of legislation, three planning bills were passed and signed into law on May 7, 2009.</li> </ul> <p><b>Section 2.0 Sensitive Areas</b>  <b>Section 2.7 Environmental Policies, Programs and Regulations</b>          There are a variety of regulatory, review and permitting processes designed to protect and regulate activity associated with environmentally sensitive areas and water resources.  <b>Section 2.7.1 Federal and State Preservation Programs</b>          Several key regulations and programs are described as follows:</p> <ul style="list-style-type: none"> <li>• Clean Water Act, Section 404</li> <li>• Maryland Non-tidal Wetlands Protection Act</li> <li>• Maryland Tidal Wetlands Act</li> <li>• Chesapeake Bay Restoration Act</li> <li>• Maryland’s Stormwater Management Act of 2007</li> <li>• Policy for Nutrient Cap Management and Trading</li> <li>• Water Quality Infrastructure Program</li> <li>• Maryland Department of the Environment, Land Management Administration (LMA)</li> <li>• Sediment and Erosion Control Plans</li> </ul>
<p>Do environmental policies provide incentives to development that is</p>	<p>Yes.  <i>2010 Queen Anne’s County Comprehensive Plan</i>  <b>Introduction</b></p>

<p>located outside of protective ecosystems?</p>	<p>1997 Maryland’s Smart Growth Initiative – In 1997, the State of Maryland enacted Smart Growth legislation. This legislation gave the State programmatic and fiscal authority to encourage local jurisdictions to implement “smart growth” planning. This was accomplished through the State’s directed programs and funding to support locally-designated growth areas and to protect rural areas. Subsequent to this legislation there were several initiatives defined by the Maryland Department of Planning (MDP) and various State agencies to provide resources, <b>incentives</b> and programs for the County and the development community to achieve Smart Growth.</p>
<p><b>PUBLIC SAFETY</b></p>	
<p>Are the goals and policies of the comprehensive plan related to the FEMA Local Hazard Mitigation Plan?</p>	<p>However, there was no clear reference to the County Hazard Mitigation Plan. Information regarding existing goals and policies within the Comprehensive Plan will be included within the Hazard Mitigation Plan Update.</p>
<p>Is safety explicitly included in the plan’s growth and development policies?</p>	<p>Yes.  <i>2010 Queen Anne’s County Comprehensive Plan</i>  <b>Section 1.0 Land Use</b>  <b>Section 1.6.1 Rural Agricultural Area Strategy</b>                      Floodplain Regulations that restrict development within the 100-year floodplain for the purpose of public safety as well as to reduce impacts on water quality and for improved stormwater management.  <b>Section 1.8 Goals, Objectives and Recommendations</b>                      Goal 1: Growth Management, Regulations, Design/Land Use                      Objective 1: Review current site design standards to further promote environmental protection, landscaping and aesthetics as well as seeking to preserve scenic beauty, vistas, viewscapes, and un-fragmented forestland and farmland through compact residential design.</p> <ul style="list-style-type: none"> <li>• Develop conservation-by-design standards consistent with public safety standards.</li> </ul> <b>Section 2.0 Sensitive Areas</b> <b>Section 2.5.4 Point and Nonpoint Sources Impacts</b> There are multiple variables that need to be factored into land use planning policy and decisions, including the amount of impervious coverage within a watershed as well as social, historical, cultural and economic considerations, the impact to public facilities and public safety, opportunities to preserve open space and farmland, to provide recreation and that new development needs to fit with the character and context of the existing community in its design. <b>Section 8.0 Community Facilities and Transportation</b> <b>Section 8.10 Police Protection &amp; Emergency Services</b> The County’s Department of Public Safety provides ambulance services throughout the County. In 2004, the County created the

	<p>Emergency Services Advisory Council to advise on emergency services policies, equipment, standard operating procedures, medications, emergency services personnel, education and training, educational information and status reporting. The Council has 15 voting and 6 non-voting members whom meet regularly to review monthly issues and tasks.</p> <p><b>Section 8.16 Community Facilities Goals, Objectives and Recommendations</b></p> <p>Objective 4: Support and encourage the maintenance and enhancement of public safety services.</p> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>• Strengthen and expand public safety services. a. Support and encourage the establishment of benchmarks for providing acceptable public safety services. b. Support and encourage the development and implementation strategies to meet the established benchmarks.</li> <li>• Support and encourage appropriate studies to determine the impact fees necessary to support public safety consistent with the inherent risk for an associated use.</li> </ul>
<p>Does the monitoring and implementation section of the plan cover safe growth objectives??</p>	<p>Yes.</p> <p><i>2010 Queen Anne’s County Comprehensive Plan</i></p> <p><b>Appendix I: Plan Implementation and Streamlining</b></p> <p><b>Section 1: Implementation and Streamlining</b></p> <p>The goals, objectives and recommendations from each of the Plan Element sections provide the basis for implementation and streamlining. This section contains actions consisting of strategies, projects, programs and services identified for implementation to realize plan goals, objectives and recommendations.</p> <p><b>Section 1.1 Implementation Matrix</b></p> <p>The following Implementation Matrix is organized to correspond in color and section number with Plan Elements.</p> <ul style="list-style-type: none"> <li>• Section 1.0 Land Use Element</li> <li>• Section 2.0 Sensitive Areas, Water Resources and Mineral Recovery Element</li> <li>• Section 3.0 Priority Preservation Area Element</li> <li>• Section 4.0 Historic &amp; Cultural Preservation Element</li> <li>• Section 5.0 County/Town Planning Framework Element</li> <li>• Section 6.0 Economic Development &amp; Tourism Element</li> <li>• Section 7.0 Workforce Housing Element</li> <li>• Section 8.0 Community Facilities &amp; Transportation Element</li> </ul>

ZONING ORDINANCE	
<p>Does the zoning ordinance conform to the comprehensive plan in terms of discouraging development or redevelopment within natural hazard areas?</p>	<p>Yes.</p> <p><i>2010 Queen Anne’s County Comprehensive Plan</i></p> <p><b>Section 2.0 Sensitive Areas</b></p> <p><b>Section 2.7.2 County Environmental Policies, Programs and Regulations</b></p> <p>The following is a listing of key County Ordinances adopted since 2004, when the County’s Zoning and Subdivision Regulations codified in Chapters 14 and 18 of the County Code where comprehensively revised, to further minimize environmental impacts and to define regulatory activities with the potential to protect environmentally sensitive areas and water resources. Some of the ordinances listed below pertain to the Chesapeake Bay Critical Area Act and the County’s Environmental Protection Code and other chapters of the County Code.</p> <ul style="list-style-type: none"> <li>• County Ordinance No. 08-15 – The ordinance makes minor extraction and dredging disposal uses requiring a permit from the Maryland Department of the Environment permitted as a conditional use.</li> <li>• County Ordinance No. 08-13 – The ordinance incorporates the County’s Environmental Site Design Manual into Chapter 14:4 of the Code of Public Local Laws and established a preference for nonstructural practices for stormwater management plans.</li> <li>• County Ordinance No. 08-10 – The ordinance prohibits application of commercial or chemical fertilizer within the Critical Area Buffer during certain times of the year.</li> <li>• County Ordinance No. 08-09 – The ordinance requires mandatory pump-out of on-site septic systems at least once every five years.</li> <li>• County Ordinance No. 08-08 – The ordinance provides the right-to-conduct seafood industry operations.</li> <li>• County Ordinance No. 08-04 – The ordinance defines setbacks of 100 feet from Tidal and Nontidal Waters and Wetlands for principal residential structures in the Waterfront Village Center Zoning District.</li> <li>• County Ordinance No. 04-07 – The ordinance establishes setback from stream buffers for certain uses.</li> <li>• County Ordinance No. 04-06 – The ordinance adds provisions requiring vegetative improvements to stream buffers when development activity occurs on adjacent land.</li> </ul>

<p>Does the ordinance contain natural hazard overlay zones that set conditions for land use within such zones?</p>	<p>No.</p>
<p>Do rezoning procedures recognize natural hazard areas as limits on zoning changes that allow greater intensity or density use?</p>	<p>Yes.</p> <p>Chapter 18:1 Zoning and Subdivision Regulations</p> <p><b>14:1 Chesapeake Bay Critical Area Act</b></p> <p><b>14:1-37 Use and Development Regulation in Intensely Developed Areas</b></p> <ul style="list-style-type: none"> <li>• The density of development and minimum lot sizes permitted within the IDA development shall be governed by applicable provisions of the Queen Anne's County Zoning Ordinance.</li> <li>• The density of an individual parcel of IDA land may be increased under the transfer of development rights (TDR) provisions of the Queen Anne's County Zoning Ordinance, provided a minimum of 20 acres of RCA land is permanently deed restricted as open space for each development right transferred from the RCA.</li> </ul> <p><b>14:1-38 Development Standards in Limited Development Areas Density.</b></p> <ul style="list-style-type: none"> <li>• The density of development and minimum lot sizes permitted within LDA development areas shall be governed by applicable provisions of the Queen Anne's County Zoning Ordinance.</li> <li>• The density on an individual parcel of LDA land may be increased under the transfer of development rights (TDR) provisions of the Queen Anne's County Zoning Ordinance, provided a minimum of 20 acres of RCA land is permanently deed restricted as open space for each development right transferred from the RCA.</li> </ul> <p><b>14:1-39 Development Standards in Resource Conservation Areas Density.</b></p> <ul style="list-style-type: none"> <li>• Land within RCA development areas may be developed for residential uses at a density not to exceed one dwelling unit per 20 acres. For purposes of computing site capacity, the underlying zoning classification shall apply; however, no more than one unit per 20 acres may be located in an RCA development area unless critical area transfer of development rights (TDRs) or intrafamily transfers are used.</li> <li>• In calculating the one-dwelling-unit-per-twenty-acre density, the area of private tidal wetlands located in the property may be included, provided the density of development on the upland portion of the parcel does not exceed one dwelling unit per eight acres. The area of tidal wetlands must be based on state wetland maps.</li> </ul>

	<ul style="list-style-type: none"> <li>When TDRs are used, private tidal wetlands on either the transferor or the transferee parcel may be included in the density calculations. The acreage of upland on the transferor parcel shall not affect the density of development on the transferee parcel.</li> </ul>
<b>SUBDIVISION REGULATIONS</b>	
<p>Do the subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas?</p>	<p>No.</p>
<p>Do the regulations provide for conservation subdivision or cluster subdivisions in order to conserve environmental resources?</p>	<p>Yes.  <b>Chapter 18:1 Zoning and Subdivision Regulations</b>  <b>Subdivisions</b>  <b>§ 18:1-174 Design guidelines for major cluster subdivisions in AG, CS, NC, E, SE, SR and VC Districts</b>  A. Purpose. The purpose of this section is to encourage: <ul style="list-style-type: none"> <li>The conservation of natural resources to the extent possible;</li> <li>Good <i>site</i> design for <i>residential developments</i>;</li> <li>The conservation of energy, aesthetic values, and privacy; and,</li> <li>Good <i>site</i> design and layout for <i>subdivisions</i> that maximizes views, maintains natural resources, and minimizes the number of <i>flag lots</i> and <i>double-frontage lots</i> to the extent possible.</li> </ul> </p>
<p>Do the regulations allow density transfer where hazard areas exist?</p>	<p>Yes.  <b>Chapter 18:1 Zoning and Subdivision Regulations</b>  <b>18:1-100 Right of Transfer</b>  In general, <i>A development</i> right of a <i>transferor parcel</i> may be transferred and used to increase <i>residential or nonresidential development</i> on a <i>receiving parcel</i> in accordance with the provisions of this article.  For approved <i>transfer of development</i> rights prior to the 1994 Zoning Ordinance Update refer to <b>§ 18:1-7G</b>.  Limitations. <ul style="list-style-type: none"> <li><i>A development</i> right may not be used in any manner inconsistent with the provisions set forth in this subsection.</li> <li><i>A development</i> right may not be used to increase residential <i>density</i> or nonresidential <i>floor area</i> or impervious area within the critical area unless the <i>development</i> right is derived from a portion of a <i>transferor parcel</i> that is located within the Critical Area Resource Conservation Area (RCA).</li> <li>The use of a <i>development</i> right may result in the reduction of natural resource protection land required under this Chapter 18:1 on the <i>receiving parcel</i>, provided that natural resources are protected on the combined parcels overall based on the requirements set forth in Chapter 18:1, Part 4, Article XI.</li> </ul> </p>

	<ul style="list-style-type: none"> <li>• A <i>development</i> right may not be used to increase <i>density</i> for <i>receiving parcels</i> located within the Critical Area Resource Conservation Area beyond the <i>density</i> allowed within the parcel's zoning district.</li> <li>• TDRs used on <i>receiving parcels</i> within the CMPD and TC Districts must be derived from eligible <i>transferor parcels</i> located within the Fourth (Kent Island) Election District.</li> <li>• TDRs used on <i>receiving parcels</i> within the Stevensville Growth Area must be derived from eligible <i>transferor parcels</i> located within the Fourth Election District of Queen Anne's County.</li> </ul> <p>Intermediate <i>transfer</i>. Subject to the provisions of this section, a <i>development</i> right may be transferred to a <i>transferee</i> prior to the time when its <i>use</i> for a specific <i>receiving parcel</i> has been finally approved in accordance with this article.</p>
<b>CAPITAL IMPROVEMENT PROGRAM AND INFRASTRUCTURE POLICIES</b>	
Does the capital improvement program provide funding for hazard mitigation projects identified in the FEMA Mitigation Plan?	Need -Agreed
Does the capital improvement program limit expenditures on projects that would encourage development in areas vulnerable to natural hazards?	Need — Finance directs the Capital Improvement Program (CIP) and a consideration for the county’s investment in areas that may have be vulnerable – this would need to be added to the form used for CIP requests.

Source: 2010 Queen Anne’s County Comprehensive Plan and Queen Anne’s County Zoning and Subdivision Regulations

## Conclusion

Integrating hazard planning into the County’s planning framework will lead to development patterns and redevelopment that decreases hazard risk and vulnerability. To achieve and facilitate integration, Queen Anne’s County should review the safe growth audit and conduct an evaluation on how planning documents, policies, codes and programs are maintained and implemented, and the roles of people, agencies, and departments in evaluating and updating them. This depth of review will enable the County to identify opportunities for plan integration, resulting in effective ways to reduce hazard vulnerability in Queen Anne’s County.

The development of a more in-depth inventory will enable the county to identify further gaps and overlaps between the current hazard mitigation plan and the larger planning framework including the County’s future Comprehensive Plan. Identifying existing tools may lead to opportunities for integration. The identification of gaps will lead to the consideration of capacity specific to county and municipal staffing and resources. Finally, the systematic planning process will yield a roadmap displaying steps that are available to, and achievable by, Queen Anne’s County.

## Recommendations

During the development of the new Queen Anne’s County Comprehensive Plan, a list of recommendations to be included in the Plan are as follow:

- Include and reference the 2018 Queen Anne’s County Hazard Mitigation Plan in existing and future planning documents, specifically updates to the County Comprehensive Plan, Municipal Growth Plans and the Water & Sewer Plan.
- Review Hazard Areas of Concern identified in 2018 Queen Anne’s County Hazard Mitigation Plan in relation to potential hazard overlay zones. These areas have been identified as “high-risk” and special consideration should be undertaken in terms of future growth and development.
- Consider the transportation network in relation to hazards and evacuation within **Section 8.0 – Community Facilities and Transportation** of the County Comprehensive Plan. Specifically flood related hazards and Sea Level Change.
- Consider subdivision regulations that limits or places special site design considerations on the subdivision of land within or adjacent to natural hazard areas, as appropriate. Specifically, those areas that have been designated as “high-risk” Hazard Areas of Concern in the County Hazard Mitigation Plan.
- Review projects during the capital improvement planning process to determine which projects, if any, would encourage development in areas vulnerable to natural hazards. Specifically flood related hazards including Sea Level Change.
- Identify Open Space and/or Conservation area mitigation strategies for reducing areas of risk.
- Consider the adoption of Green Building Codes for commercial and residential structures.

# Appendix D Acronyms

This Appendix provides a listing of all acronyms used throughout the Plan document.

- List of Acronyms

## List of Acronyms

- American Community Survey (ACS)
- Bank Erosion Hazard Index (BAHI)
- Center for Health & Homeland Security (CHHS)
- Coast Smart Communities Grant (CSCG)
- Community Commissioner Districts (CCD)
- Community Emergency Response Team (CERT)
- Community Rating System (CRS)
- Council of Governments (GOG)
- Delmarva Emergency Task Force (DETF)
- Department of Emergency Services Advisory Committee (DESAC)
- Department of Natural Resources (DNR)
- Digital Flood Insurance Rate Maps (DFIRMs)
- Eastern Shore Climate Adaptation Partnership (ESCAP)
- Eastern Shore Land Conservancy (ESLC)
- Emergency Medical Services (EMS)
- Emergency Operations Plan (EOP)
- Environmental Protection Agency (EPA)
- Environmental Site Design (ESD)
- Federal Emergency Management Agency (FEMA)
- Flood Insurance Rate Maps (FIRMs)
- Flood Insurance Study (FIS)
- Flood Risk Map (FRM)
- General Building Stock (GBS)
- Hazard Identification Risk Assessment (HIRA)
- Hazard Mitigation Grant Program (HMGP)
- Hazard Mitigation Plan (HMP)
- Hazard Mitigation Planning Committee (HMPC)
- Integrated Surface Data (ISD)
- Light Detection and Ranging (LiDAR)
- Map Service Center (MSC)
- Maryland Commission on Climate Change (MCCC)
- Maryland Emergency Management Agency (MEMA)
- Maryland Emergency Management Assistance Compact (MEMAC)
- Maryland Forest Service (MFS)
- Maryland Geological Survey (MGS)
- Mean Higher Higher Water (MHHW)
- National Center for Environmental Information (NCEI)
- National Flood Insurance Program (NFIP)
- National Integrated Drought Information System (NIDIS)
- National Weather Service (NWS)
- Near Bank Stress (NBS)

# Appendix E Sources

This Appendix provides each source utilized during the planning process. Sources are provided per chapter.

- Sources
  - Chapter 1 Plan Development
  - Chapter 2 Hazard Identification & Risk Assessment (HIRA)
  - Chapter 3 Flood Hazard
  - Chapter 4 Hurricane & Coastal Erosion
  - Chapter 5 Drought & Extreme Heat
  - Chapter 6 High Wind
  - Chapter 7 Severe Winter Weather
  - Chapter 8 Sea Level Change
  - Chapter 9 Wildfire
  - Chapter 10 Thunderstorm & Lightning
  - Chapter 11 Earthquake
  - Chapter 12 Tornado
  - Chapter 13 Community Capabilities
  - Chapter 15 New Mitigation Strategies & Implementation
  - Mapping Data

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# Appendix F

# HMPC Meeting Minutes & Public Outreach

This Appendix includes minutes from each Hazard Mitigation Planning Committee (HMPC) meeting and minutes from public meetings.

- HMPC Meeting Minutes
- Public Meeting Minutes

# HMPC Meeting Minutes



# Queen Anne's County Hazard Mitigation Plan Committee

## Minutes

<b>Meeting:</b>	<b>Kick-Off Meeting</b>		
<b>Date of Meeting:</b>	April 12, 2018	<b>Time:</b>	10 am-12 pm
<b>Meeting Facilitator:</b>	Virginia Smith – Smith Planning & Design	<b>Location:</b>	Queen Anne's County Emergency Operations Center

### Meeting Topics Discussed

#### Agenda Topics

- ✓ Project Schedule
- ✓ Hazard Mitigation Planning Committee
- ✓ Meeting Schedule
- ✓ THIRA
- ✓ Hazard Identification/Ranking Updates
- ✓ Questionnaires

### Attendees

Name	Organization	Name	Organization
Scott Haas	Department of Emergency Services	John Kling	Department of Public Works
Lori Morris	Department of Emergency Services	Lee Edgar	Department of Public Works
Geneva Harrison	Department of Emergency Services	David Remaniak	Department of Public Works
Mike Wisnosky	Department of Planning & Zoning	Todd Mohn	Department of Public Works
Vivian Swinson	Department of Planning & Zoning	Virginia Smith	Smith Planning & Design
Helen Spinelli	Department of Planning & Zoning	Michele King	Smith Planning & Design
Jaleesa Tate	MEMA	Bill Hildebrand	MEMA

### Project Schedule

Virginia Smith, meeting facilitator, reviewed the project schedule with the Committee. The schedule was modified slightly to reflect the actual project start date. The project schedule was divided into 2 phases. Phase I includes the Hazard Mitigation Plan Update and Phase II includes

the Threat and Hazard Identification and Risk Assessment (THIRA). Both Phases are projected to be completed by January 2019. Project schedules are attached.

### Hazard Mitigation Planning Committee

The group discussed the gathering resources and composition of the Hazard Mitigation Planning Committee (HMPC). The following agencies, departments, and/or organizations will be represented on the HMPC:

- Department of Emergency Services
- Department of Planning & Zoning
- Department of Public Works
- Department of Information Technology
- Department of Economic Development
- Department of Budget & Finance
- Board of Education
- Health Department
- Social Services
- Police
- Maryland Emergency Management Agency

Members also agreed the Council of Government Meetings held the 2<sup>nd</sup> Wednesday of every month will be utilized to ensure municipal participation. A letter will also be sent to the municipalities' elected officials informing them about the hazard mitigation plan update process. In order for municipalities to be covered under the County plan, participation in the planning process is necessary.

### Meeting Schedule

The HMPC will meet the 3<sup>rd</sup> Wednesday of every other month from 12 pm to 2 pm. The next HMPC meeting will be June 20, 2018.

### THIRA

Threat and Hazard Identification and Risk Assessment (THIRA) was discussed. This is a new component included in the 2018-2019 Plan Update. The THIRA will provide a comprehensive hazard catalogue for identified threats and hazards a risk overview and gap analysis. The completed THIRA results will enable the County to allocate resources, identify gaps and inform preparedness activities, including opportunities for mitigation. A maximum of five (5) priority hazards and threats identified for THIRA process will be integrated into the Hazard Mitigation Plan Update. During the Kick-off meeting, Hazardous Materials was identified as a potential hazard for the THIRA. Further discussion on the THIRA will occur during Phase II project schedule.

### Hazard Identification/Ranking Updates

The 2012 hazard listing was reviewed and an additional hazard has been included. As required in the local hazard mitigation plan guidance from the state, the **Wind** hazard will be included as an identified hazard in the 2018-2019 Plan.

In regards to ranking, the 2012 Plan provided a hazard ranking based on a Risk Factor (RF) approach. The RF approach combines historical data, local knowledge, and consensus opinions to produce numerical values that allow identified hazards to be ranked against one another. RF values are obtained

by assigning varying degrees of risk to five categories for each hazard: probability, impact, spatial extent, warning time, and duration. As a result of the RF analysis, all hazards with the except of tornado were ranked as a moderate risk. Tornado was ranked as a low risk.

As part of the 2018-2019 Plan Update, a local perspective was sought for inclusion as an additional element to the hazard ranking. Member were asked to provide their local perspective by selecting the top 3 hazards that have the highest impact to the County. As a result, Flood, Hurricane & Coastal Erosion, and Wind were ranked “High.” These results will be incorporated into the Plan Update.

### Questionnaires

In order to obtain information on past hazard mitigation related plans, policies, and projects, a questionnaire was developed. The questionnaire consisted of questions regarding the agency’s 2012 mitigation action status, current capabilities and possible new mitigation actions to be included in the Plan Update. Questionnaires were developed for:

- Public Works
- Planning & Zoning
- Emergency Services
- Economic Development
- Budget & Finance
- GIS
- Police
- Health Department
- Mass Care & Sheltering

For those departments present, questionnaires were provided for completion. Uncompleted questionnaires will be provided to the following agencies:

- Economic Development
- Budget & Finance
- GIS
- Police
- Health Department
- Mass Care & Sheltering

### Next Steps

- Obtain, Review & Incorporate New Data
- Update Hazard Identification & Risk Assessment
- Add 2012 Mitigation Strategies Status Information
- Add New Capabilities
- Identify New Mitigation Action & Projects – Ongoing
- Letter to Municipalities
- Obtain Time Slot for Presentation on the Council of Government Meeting
- Provide Incomplete Questionnaires to Agencies



# Queen Anne's County Hazard Mitigation Plan Committee

## Minutes

<b>Meeting:</b>	<b>HMPC Meeting #2</b>		
<b>Date of Meeting:</b>	June 20, 2018	<b>Time:</b>	12 pm-2 pm
<b>Meeting Facilitator:</b>	Virginia Smith – Smith Planning & Design	<b>Location:</b>	Liberty Building - Commissioner's Meeting Room

Meeting Topics Discussed	
<b>Agenda Topics</b>	
✓	<b>Hazard Mitigation Planning</b>
✓	<b>Coastal Flood Risk Report</b>
✓	<b>Where We Are</b>
✓	<b>Group Session</b>
✓	<b>Next Steps</b>

Attendees			
Name	Organization	Name	Organization
Scott Haas	Department of Emergency Services	Megan DelGaudio	GIS/IT
Lori Morris	Department of Emergency Services	Teresa Ward	Finance
Geneva Harrison	Department of Emergency Services	John Brockman, Cpl.	Sheriff's Office
Michael Richardson	Department of Emergency Services	Kenneth Rhodes	Centreville Police Department
Mike Wisnosky	Department of Planning & Zoning	Stacey Woodworth	Health Department
Vivian Swinson	Department of Planning & Zoning	Jim Bass	Eastern Shore Land Conservancy
Helen Spinelli	Department of Planning & Zoning	Virginia Smith	Smith Planning & Design (SP&D)
Todd Mohn	Department of Public Works	Michele King	Smith Planning & Design (SP&D)
Lee Edgar	Department of Public Works		

### Hazard Mitigation Planning

Virginia Smith, meeting facilitator, provided a brief overview of the hazard mitigation planning process for those committee members that were unable to attend the Kickoff Meeting.

Emphasis was placed on the following guiding principles:

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

### Coastal Flood Risk Report

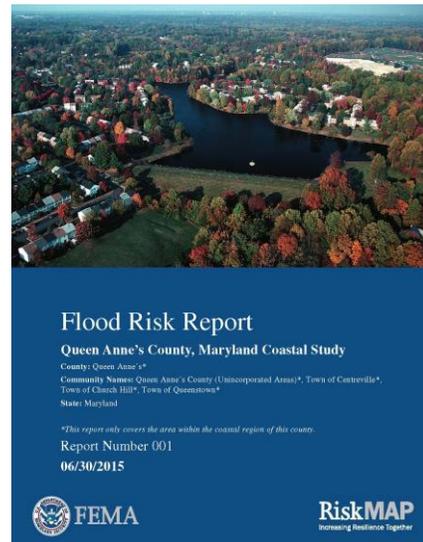
Highlights and risk data from the Queen Anne’s County Coastal Flood Risk Report were introduced to the group. Plan Update will include User Defined Facilities (UDFs) rather than 2010 Census Tracts to obtain refined loss estimations for coastal flood hazard.

Information can be obtained from the FEMA Map Service:  
Search All Products:

<https://msc.fema.gov/portal/advanceSearch>.

In the portal, select State, County, and Community, then press Search. Search Results include:

- Effective Products
- Historic Products
- Flood Risk Products.



The Flood Risk Products section includes the Flood Risk Report, Maps, and GIS Database.

### Where We Are

#### Capabilities

Committee members were introduced to a new chapter that has been developed for the plan. The Capabilities & Plan Integration chapter discusses the County’s current resources for reducing the

impacts of hazards. Capabilities include authorities, policies, programs, staff, funding, and other resources available to accomplish mitigation and long-term vulnerability reduction.

**Safe Growth Audit**

As part of the plan update process a Safe Growth Audit was conducted by SP&D staff. Performing a Safe Growth Audit (SGA) is a way to assess how well the existing planning tools address hazard risks and community resiliency. Safe Growth Audit questions provide a systematic way to review local planning tools and identify the presence of, or need for, hazard-related actions.

During the group session, planning and finance committee members reviewed the SGA. Comments will be provided to SP&D, with special attention given to the listing of recommendations. This assessment will be included as a new chapter within the plan, ensuring that hazard mitigation is integrated into other County planning documents, policies, and programs, as appropriate.

**Essential Facilities**

SP&D developed an Essential Facilities data collection sheets. Essential Facilities include:

- EOC/Back-up 9-1-1
- Fire/EMS
- Medical
- Police
- School (K-12 & College)

Each facility data collection sheet included facility and hazard specific information. These sheets were multi-hazard in scope. A total of 54 essential facility sheets were developed as part of the plan update process. These sheets were reviewed by HMPC members and additional information was requested during the group session portion of the meeting.

**Municipal Perspective**

In terms of municipal perspective, a municipal questionnaire was distributed in June of 2018. Questionnaires included hazard identification and risk, areas of concern, mitigation projects completed during the planning cycle and new mitigation ideas. Smith Planning & Design is scheduled to discuss the Plan Update and obtain additional municipal input at the September 12, 2018 Council of Governments (COG) Meeting.

**Group Session**

Committee members in attendance were divided into six (6) groups, as follows:

- Group 1: Emergency Services, Fire & EMS
- Group 2: Police & Roads
- Group 3: Medical & Health
- Group 4: Schools & Shelters
- Group 5: Planning & Finance
- Group 6: Economic Development

Five (5) of the six (6) groups were able to meet and discuss the information within the packets. Economic Development committee members were unable to attend the meeting. Materials will be distributed to those committee members not in attendance and feedback will be sought.

**Next Steps**

**Next Steps**

- Complete Vulnerability Assessment
- 2012 Mitigation Status Report
- New Mitigation Actions & Projects
- Threat & Hazard Identification & Risk Assessment (THIRA)
- HMPC Meeting #3
  - Date: August 15, 2018
  - Time: 12 pm-2 pm
  - Location: TBD



# Queen Anne's County Hazard Mitigation Plan Committee

## Minutes

<b>Meeting:</b>	<b>HMPC Meeting #3</b>		
<b>Date of Meeting:</b>	August 16, 2018	<b>Time:</b>	12 pm-2 pm
<b>Meeting Facilitator:</b>	Virginia Smith – Smith Planning & Design	<b>Location:</b>	Vincit Building - Meeting Room #2

Meeting Topics Discussed
<p><b>Agenda Topics</b></p> <ul style="list-style-type: none"> <li>✓ <b>SP&amp;D Presentation: Wind Analysis &amp; Results</b></li> <li>✓ <b>ESLC Presentation: Risk Management for the 21<sup>st</sup> Century Floodplain</b></li> <li>✓ <b>Group Session</b></li> <li>✓ <b>Next Steps</b></li> </ul>

Attendees			
Name	Organization	Name	Organization
Scott Haas	Department of Emergency Services	John Brockman, Cpl.	Sheriff's Office
Lori Morris	Department of Emergency Services	Stacey Woodworth	Health Department
Joe Cichocki	Department of Emergency Services	Brian Ambrette	Eastern Shore Land Conservancy
Mike Wisnosky	Department of Planning & Zoning	Jim Bass	Eastern Shore Land Conservancy
Lee Edgar	Department of Public Works	Virginia Smith	Smith Planning & Design (SP&D)
John Kling	Department of Public Works	Michele King	Smith Planning & Design (SP&D)
Megan DelGaudio	GIS/IT		

SP&D Presentation: Wind Analysis & Results
<p>Michele King provided an overview of the preliminary Hazus wind analysis and results. The Hazus wind analysis is a new addition to the Plan Update. The Hazus Hurricane Model addresses only one major source of wind damage (hurricanes), however damaging winds may also result from tornadoes, thunderstorms, extra-tropical storms, and hail events. Previous wind events were reviewed and discussed in order to provide an explanation for modeling a</p>

wind event similar to a Category 1 Hurricane. The Hazus Wind Analysis was based on wind speeds ranging between 79 mph - 94 mph. Preliminary results for overall structural damage, debris generation and projected shelter needs were provided. Ms. King also explained the Hazus tool can run a combined hurricane and flood hazard analysis for coastal areas. This determines the extent of flooding due to a wind-driven storm and estimates flood loss associated with the hurricane storm surge. Preliminary analysis and results from the storm surge model were discussed. A few examples of possible mitigation actions from the preliminary Hazus results were provided:

- The development of hurricane hazard mitigation strategies that outline policies and programs for reducing the hurricane losses and disruptions. The strategies may involve upgrading existing buildings (e.g., addition of hurricane shutters and/or impact resistant glass).
- Anticipation of the nature and scope of response and recovery efforts including identifying short-term shelters and debris management requirements for planning purposes.

#### ESLC Presentation: Risk Management for the 21st Century Floodplain

Brian Ambrette provided background information on the Eastern Shore Land Conservancy's Coastal Resilience Program. Mr. Ambrette explained how the program provides assistance and resources to communities for mainstreaming climate preparedness, increases regional capacity for adaptation, and raises the visibility of rural communities and need for assistance and resources. Committee members were also informed about the Eastern Shore Climate Adaption Partnership (ESCAP). Mr. Ambrette explained that the ESCAP promotes learning and collaboration among Eastern Shore communities to prepare for changes in weather patterns, flooding, and other environmental conditions. Next, the mainstreaming of sea level preparedness into local planning was reviewed. A vulnerability analysis utilizing different sea level scenarios for Queen Anne's County and the results were presented. To conclude the presentation, three (3) mitigation strategies were provided to the committee for consideration as an inclusion into the plan:

- Higher Floodplain Standards
- Nuisance Flooding Plan
- Post Disaster Redevelopment Plan

#### Group Session

Committee members in attendance were provided the 2012 mitigation actions. Members were asked to review, provide a status (complete, incomplete, ongoing, in-process or pending) and include any additional information for each action item. **2012 Mitigation Status Results – Attached.**

Next, new mitigation actions developed during the plan update process were provided to the committee for review. Members were asked to indicate if the mitigation action items should be included into the

plan, and if so, provide additional agencies and/or department responsible for the completion of the action. Finally, members were asked to provide an approximate timeframe for completion (short-term or long-term). **2018 Proposed Mitigation Action Items – Attached.**

**Next Steps**

**Next Steps**

- Prioritization of New Mitigation Strategies
- Municipal Input – COG Meeting September 12<sup>th</sup>
- Meeting with Floodplain Manager and Public Works – September 12<sup>th</sup>
- Draft Plan – End of September
- Threat & Hazard Identification & Risk Assessment (THIRA) - October



# Queen Anne's County Hazard Mitigation Plan Committee

## Minutes

<b>Meeting:</b>	<b>HMPC Meeting #4</b>		
<b>Date of Meeting:</b>	October 18, 2018	<b>Time:</b>	12 pm-2 pm
<b>Meeting Facilitator:</b>	Virginia Smith – Smith Planning & Design	<b>Location:</b>	Vincit Building - Meeting Room #2

Meeting Topics Discussed
<p><b>Agenda Topics</b></p> <ul style="list-style-type: none"> <li>✓ <b>Public Opinion Survey</b></li> <li>✓ <b>Group Session</b></li> <li>✓ <b>Next Steps</b></li> </ul>

Attendees			
Name	Organization	Name	Organization
Joe Cichocki	Department of Emergency Services	Kenneth Rhodes	Centerville Police Department
Helen Spinelli	Department of Planning & Zoning	Virginia Smith	Smith Planning & Design (SP&D)
Lee Edgar	Department of Public Works	Michele King	Smith Planning & Design (SP&D)
Megan DelGaudio	GIS/IT		

Public Opinion Survey
<p>As of October 16, 2018, a total of 59 Queen Anne's County residents participated in the Public Opinion Survey. The participant demographics include:</p> <ul style="list-style-type: none"> <li>• 59 Participants – 100% QAC Residents                             <ul style="list-style-type: none"> <li>○ 49% Kent Island/Grasonville Area</li> <li>○ 35% Town of Centerville</li> <li>○ 8.5% North Queen Anne's County</li> </ul> </li> <li>• Age                             <ul style="list-style-type: none"> <li>○ 40% - 45-64 age range</li> <li>○ 38% - 65 and older</li> </ul> </li> </ul> <p>Participants were asked to indicate their level of concern for each hazard identified within the 2018 Hazard Mitigation Plan. Results were:</p> <ul style="list-style-type: none"> <li>• <b>Flooding – Concerned</b></li> </ul>

- Sea Level Change – Somewhat Concerned
- Hurricane & Coastal Erosion – Concerned
- Drought – Somewhat Concerned
- Severe Winter Weather – Concerned
- Wildfire – Somewhat Concerned
- Thunderstorm & Lightning – Somewhat Concerned
- High Wind – Concerned
- Earthquake – Not Concerned
- Tornado – Somewhat Concerned

The preliminary results of the Public Opinion Survey are consistent with those of the Hazard Mitigation Planning Committee (denoted in red text).

The participants were provided a list of hazards other than natural hazards and asked to select those of most concern. The order of priority for other hazards selected is:

- Active Shooter
- Opioid Crisis
- Transportation (e.g. congestion, traffic accidents)
- Cyber Attack
- Terrorism
- Environmental Emergency (e.g. oil spill, hazardous material)
- Disease Outbreak (e.g. seasonal flu, Zika)

Participants were asked to select hazard events that affected their area of the County or Town. The top five hazards selected were:

1. Flooding
2. High Wind
3. Thunderstorm & Lightning
4. Transportation
5. Hurricane & Coastal Erosion

Finally, participants were asked to select the population that was most vulnerable to hazards. The result (denoted in red text below) by majority was the aging population.

- Race/Ethnic Group
- Age Group – 57%
- Gender
- Disability or Access Needs

At the end of the survey, participants were asked if they would like to be contacted when additional information is available about the Hazard Mitigation Plan. A total of 17 respondents replied “yes” and requested to be contacted via email.

During the meeting, members discussed forwarding the survey link to various social media outlets, Planning Commission, Fire Commission, and Town representatives. Currently the link can be found on the Department of Emergency Services' Hazard Mitigation webpage: <https://www.qac.org/1328/Hazard-Mitigation>.



The direct link to the Public Opinion Survey is: <https://www.surveymonkey.com/r/VYM779K>.

For purposes of finalizing the Hazard Mitigation Plan and incorporating results, the survey will be closed COB October 26, 2018.

### Group Session

Results of the **Mitigation Action Item Prioritization Survey** were reviewed. There was a total of 35 mitigation action item and ranking results listed below:

- 18 mitigation action items ranked "High"
- 8 mitigation action items ranked "Medium"
- 9 mitigation action items ranked "Low"

The Hazard Mitigation Planning Committee (HMPC) members were asked to reviewed the rankings for consensus on the result and provide any modifications. **2018 Mitigation Action Items Rankings– Attached.**

### Next Steps

#### Next Steps

- Add Sea Level Rise Data obtained on October 16, 2018
- Add Mitigation Ranking Results finalized October 17<sup>th</sup> HMPC Meeting and Develop Projects
- Provide Dropbox link to DRAFT HMP for Local Review
- MEMA Review
- FEMA Review
- Adoption
- THIRA Workshop

# Public Outreach

## Hazard Mitigation

Queen Anne's County, Maryland has initiated the process of updating the *Queen Anne's County Hazard Mitigation Plan*. Federal grant funding provided by FEMA has been obtained to complete this planning project.

We need your help with this project. Please answer a few quick questions about what hazards in your community are a concern. Please take our survey before October 26, 2018

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

A graphic for a survey titled "QAC Hazard Mitigation Plan Survey". The background is a blurred image of a residential street with houses and trees. The text is overlaid in white. At the top, it says "QAC Hazard Mitigation Plan Survey" in a large, bold font. Below that, it says "QAC is working on an update to the Hazard Mitigation Plan. We need your input about local hazards." At the bottom left, it says "CLICK HERE TO TAKE SURVEY" in a bold font. At the bottom right, there is a circular logo for the "DEPARTMENT OF EMERGENCY SERVICES • QUEEN ANNE'S COUNTY". The logo features a red Maltese cross with a yellow and orange flame in the center, set against a blue background with a white border containing the text.

**QAC Hazard Mitigation  
Plan Survey**

QAC is working on an update to the Hazard Mitigation Plan. We need your input about local hazards.

**CLICK HERE TO TAKE  
SURVEY**



Source: <https://www.qac.org/1328/Hazard-Mitigation>

Queen Anne's County, Maryland has initiated the process of updating the *Queen Anne's County Hazard Mitigation Plan*. Federal grant funding provided by FEMA has been obtained to complete this planning project.

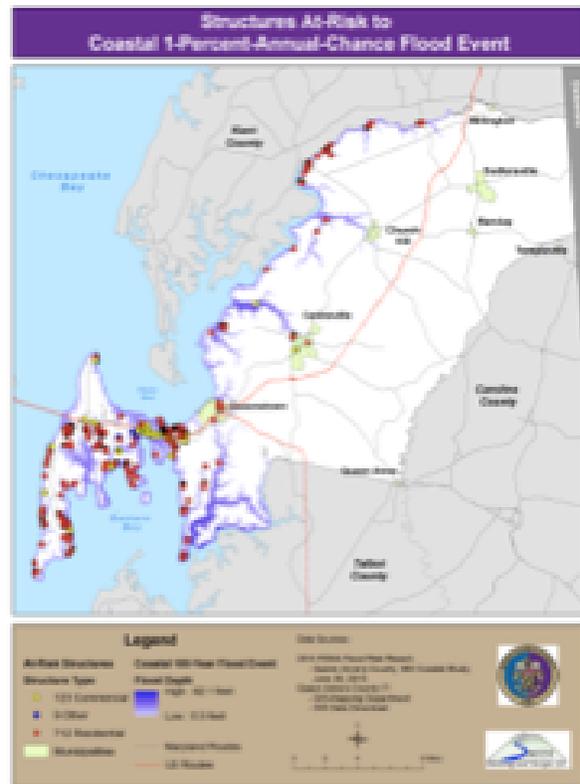
*Hazard mitigation is sustained action taken to reduce or eliminate the long-term risk to human life and property from hazard.*



Hazard Mitigation Planning Committee
<b>Organizations</b>
Department of Emergency Services
Department of Planning & Zoning
Department of Public Works
Department of Finance
GIS/IT Department
Sheriff's Office
Health Department
Eastern Shore Land Conservancy
Centreville Police Department
Maryland Emergency Management Agency

The first step in the process involved the identification of key stakeholders, which resulted in the formation of a planning committee.

A main component of the plan update includes the identification of hazard areas. Special emphasis has been placed on the identification of structures at-risk to flood hazards including: riverine, coastal, storm surge, and sea level-rise. The results will aid in determining ideas to eliminate and/or reduce the affects of hazard events to Queen Anne's County.



Source: <https://www.qac.org/1328/Hazard-Mitigation>

Appendix F HMPC Meeting Minutes & Public Outreach



Source: <https://twitter.com/visitqueenannes?lang=en>



Source: <https://www.facebook.com/qacdes/>

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- Flood Preparedness
- Hurricane Preparedness
- Phone Numbers & Resources
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- CERT
- Hazard Mitigation
- CERT/RACES Application

Online introduction course to CERT is available for FREE through FEMA.

Click [HERE](#) for to start the online course.

**CERT Documents**

To be used by CERT Members

- [CERT Forms](#)
- [CERT-Trifold-Cheat-Sheet](#)

## Community Emergency Response Team (CERT)




Scott Haas  
Director  
[Email](#)

Department of Emergency Services  
100 Communications Drive  
Centreville, MD 21617

Phone: 410-758-4500  
Fax: 410-758-2086  
Emergency: 911



Source: <https://www.qac.org/1313/CERT>