



Middle Peninsula
All Hazards Mitigation Plan







2016

Participating Middle Peninsula localities include Essex, Middlesex, Mathews, Gloucester, King & Queen, and King William Counties, and the Towns of West Point, Urbanna, and Tappahannock.

MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Table of Contents

Section 1 – Introduction……1

Section 2 – Planning Process……...2

Section 3 – Community Profile……..….12

Section 4 – Hazard Identification……..….25

Section 5 – Hazus Assessment……186

Section 6 – Capability Assessment……..……266

Section 7 – Review of Strategies from the 2010 Middle Peninsula Natural Hazards Mitigation Plan (MPNHMP)……...……283

Section 8 – New Mitigation Goals, Objectives and Strategies……..……..…..298

Section 9 – Implementation Plan……323

Section 10- Plan Adoption……..……..……337

Section 11- Plan Maintenance……...…...338

Section 12 – Appendices……..…339

- Appendix A – Signed Memorandum of Understandings……...……...…340
- Appendix B - List of All Hazards Mitigation Plan Committee Members…….....367
- Appendix C - Steering Committee Agendas and Meeting Minutes……....…371
- Appendix D - Public Meeting Sign-in Sheet (January 6, 2016)……...…..405
- Appendix E - Public Comment Announcement on the MPPDC website……...…407
- Appendix F - Gazette Journal Press Releases……..……409
- Appendix G - Public Comments Received During Comment Period……...….....412
- Appendix H - Tornado History in the Middle Peninsula Region (1950-2014)……...…427
- Appendix I - Wildfires within the Middle Peninsula 2010 – June 2015 ……....…..429
- Appendix J - Hazus Methodology……..……..……..…433
- Appendix K - Nation Flood Insurance Program Survey……..……..…...453
- Appendix L - Gloucester County Stormwater Management Ordinance……...….481
- Appendix M - Drought Response Ordinances from all MPPDC Localities…….....500
- Appendix N - MOU amongst Rappahannock Fire Assoc. Participants….....543
- Appendix O - Resolutions and Other Information Adopting the Update……..….....549
- Appendix P - Strategy Evaluation Spreadsheet Sample……..……...…...550

Abbreviations

AHMP	All Hazard Mitigation Plan
AQI	Air Quality Index
BFE	Base Flood Elevation
CDT	Central Daylight Time
COA	Chief Administrative Officer
CO	Carbon monoxide
CO2	Carbon Dioxide
CRS	Community Rating System
DCR	Department of Conservation and Recreation
DEQ	Department of Environmental Quality
EM	Emergency Manager
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
ESC	Emergency Services Coordinator
DMA 2K	Disaster Mitigation Act of 2000
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
GIS	Geographic Information System
HIRA	Hazard Identification Risk Assessment
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HOI	Health Opportunity Index
HRSD	Hampton Roads Sanitary District
LPT	Local Planning Team
LiMWA	Limit and Moderate Wave Action
MCS	Mesoscale Convective System
MOU	Memorandum of Understanding
MPNHMP	Middle Peninsula Natural Hazards Mitigation Plan
MPPDC	Middle Peninsula Planning District Commission
MPRWSP	Middle Peninsula Regional Water Supply Plan
NCDC	National Climatic Data Center
NESIS	Northeast Snowfall Impact Scale
NFIP	National Flood Insurance Plan
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NWS	Nation Weather Service
O_3	Ozone
OSDS	Onsite Sewage Disposal Systems
PA	Peak acceleration
PM	Particulate Matter
PDM	Pre-Disaster Mitigation
RL	Repetitive Loss
RP	Regional Planner
RSL	Relative Sea Level
SLOSH	Sea, Lake, and Overland Surges from Hurricane
SO_2	Sulfur Dioxide
USGS	United States Geological Survey
VAC	Virginia Administrative Code
VDEM	Virginia Department of Emergency Management
VDGIF	Virginia Department of Game and Inland Fisheries
VDH	Virginia Department of Health
VDOF	Virginia Department of Forestry
VDOT	Virginia Department of Transportation
VFD	Volunteer Fire Departments
VRS	Volunteer Rescue Squads
VWP	Virginia Water Protection
WMO	World Meteorological Organization

Section 1: Introduction

The Disaster Mitigation Act of 2000 (DMA 2K) is a key component of the Federal government's commitment to reduce damages to private and public property through mitigation actions. This legislation established the Pre-Disaster Mitigation (PDM) Program and created requirements for the Post-Disaster Hazard Mitigation Grant Program (HMGP). This key piece of federal legislation is known as Public Law 106-390.

DMA 2K requires local governments to develop and submit mitigation plans to qualify for Hazard Mitigation Assistance (HMA) funds. The Act requires the plan to demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards." Upon completion, the final plan must be approved by the Virginia Department of Emergency Management (VDEM) as well as the Federal Emergency Management Agency (FEMA), and then adopted by each participating jurisdiction.

Therefore to meet such requirements Middle Peninsula Planning District Commission (MPPDC) staff guided the development of Regional Natural Hazard Mitigation Plans and Plan updates according to the requirements of DMA 2K. All nine (9) Middle Peninsula localities, including Essex, Gloucester, King and Queen, King William, Mathews, and Middlesex Counties and the Towns of Tappahannock, Urbanna, and West Point, participated in the plan's development and amendments. The region's plan will be adopted by local jurisdictions upon plan approval by FEMA.

This plan follows DMA 2K planning requirements and associated guidance documents for developing Natural Hazards Mitigation Plans. The guidance sets forth a four-step mitigation planning process that includes the following (FEMA, 2015):



The plan also utilizes the elements outlined in FEMA's Local Mitigation Plan review Crosswalk and Local Mitigation Plan Review tool, published in July 2008 and October 2011 respectively.

Since the adoption of the Middle Peninsula Natural Hazards Mitigation Plan (MPNHMP) in 2006, the nine (9) Middle Peninsula jurisdictions jointly participated in Revision #1 of the plan by developing detailed flood mitigation strategies to address the region's most critical natural hazards (i.e. flooding from severe storms). Then during the second revision, the plan's non-flood related natural hazards were reviewed and updated. Therefore, as FEMA requires hazard mitigation plan to be reviewed an updated every five years in order to remaining eligible for FEMA funding, MPPDC submitted a grant proposal to the VDEM to update the 2010 All Hazards Mitigation Plan (AHMP). Upon receipt of funding, Middle Peninsula localities signed a memorandum of understanding committing local funds and personnel to this endeavor.

Section 2: The Planning Process – Public Involvement and Community Partners

While the Middle Peninsula Planning District Commission hired a Regional Preparedness Planner to facilitate the 2016 update of the All Hazards Mitigation Plan, all nine localities participated and contributed substantial staff time to the development of this plan. In addition to time spent on this plan, each locality financially contributed in order to meet FEMA funding match requirements. Therefore to begin this project and to realize local commit, MPPDC staff drafted a Memorandum of Understanding (MOU) for each locality to sign. The MOU outlined the terms of agreement between the MPPDC and the County/Town concerning financial obligations of the local adoption of the 2016 Middle Peninsula PDC All Hazards Mitigation Plan Update. In response, each locality reviewed and signed the MOU (Appendix A).

Key stakeholders from the Middle Peninsula planning area, including 6-county and 3-town, were invited to participate and actively engage in the 2016 AHMP update. Their participation helped to determine the plan's outcomes and substantive content. Those invited included the Chief Administrative Officers – County Administrators and Town Managers, Planning Directors, Emergency Service Coordinators (ESC), Virginia Department of Conservation and Recreation (DCR) – Floodplain Division Staff, VDEM Staff, Virginia Department of Transportation (VDOT) – Saluda Residency Administrator and our federal partners at the National Weather Service, U.S. Corps of Engineers and U.S. Coast Guard. Local, state and federal staff/officials on the Steering Committee were targeted for their direct experience and knowledge in natural hazard mitigation efforts and/or actively involved in one or more of the 4 phases of emergency management – preparedness, response, prevention/mitigation or recovery. Due to the rural nature of the Middle Peninsula area, there are no private not-for profit environmental organizations based in the region that were identified by the Steering Committee members at the onset of the planning phase of this project that could provide meaningful input. In conjunction with the Steering Committee, Middle Peninsula Planning District Commissioners, consisting of elected officials and citizen representatives were kept abreast of the progress made throughout the plan updating process through written staff report at monthly committee meetings.

In order to provide consistency and continuity to this regional planning process, MPPDC Regional Planners, Harrison Bresee and Jackie Rickards, served as the facilitators and leaders of the Steering Committee during the revisions of the update. A list of the Steering Committee members can be found in Appendix B. For meeting minutes please see Appendix C.

2.1. Project Timeline for Update

Financial support for the update was provided by FEMA and VDEM, as well as funds contributed by the nine member jurisdictions of the MPPDC. Table 1 provides a timeline of the project and associated tasks of this three year project.

Table 1: Project timeline and associated tasks				
Task	**Starting Point**	**Unit of Time**	**Duration**	**Work Completed By**
Grant Implementation and kickoff	1-60	Days	60 days	Regional Planner (RP)
Organize Resources: 1. Form a Mitigation Advisory and Planning Committee 2. Award HAZUS Contract 3. Inventory available resources/collect data 4. Begin Public Outreach Efforts	60-185	Days	124 days	RP and Team Members
Revise Hazard Identification and Risk Assessment 1. Compile and analyze data for HIRA analysis 2. Vulnerability assessment/ loss identification 3. Provide HIRA, vulnerability & loss estimation analysis to public 4. VDEM review of HIRA, vulnerability & loss estimation analysis	186-445	Days	259 days	RP and Team Members VDEM and FEMA
Community Assessment/Profile 1. Review current community profiles with each locality	446-565	Days	119 days	RP and Team Members
Revise Mitigation Plan 1. Update mitigation goals, strategies and actions 2. Solicit/incorporate public comments 3. Prepare implementation strategy 4. Compile/ review draft plan 5. Solicit / incorporate public comment on final draft 6. VDEM/FEMA review and final plan	566-825	Days	259 days	RP and Team Members VDEM and FEMA
Adoption and Implementation 1. Final VDEM/FEMA review and plan approval 2. Publish VDEM/FEMA approved HMP for public distribution 3. Each Locality adopts the plan	826-1005	Days	179 days	RP/VDEM/FEMA
Project Closeout with VDEM	1006-1095	Days	89 days	RP/VDEM

Beginning in January 2014, MPPDC staff hosted regular meeting of the AHMP Steering Committee. A lead Steering Committee Member from each of the nine jurisdictions in the Middle Peninsula was designated to coordinate the hazard identification, capability assessment, completed mitigation strategy reporting, strategy development, and plan adoption. The lead member was the jurisdiction's Emergency Services Coordinator/Emergency Manager. They undertook tasks within the guidelines and time-frames noted below:

Task 1 - Hazard Identification/Capability Assessment

AHMP Steering Committee completed a series of 5 tasks using the hazard worksheets provided by VDEM staff to:

1. Identify all natural hazards;
2. Compile a history detailing the nature of each identified hazard;
3. Develop an inventory of assets that are at risk from each identified natural hazard;
4. Write a narrative describing the vulnerability of the community's assets to these natural hazards; and
5. Assess their locality's capability to use the local regulatory tools and the jurisdiction's technical staff to implement hazard mitigation activities.

To gather the appropriate information, Steering Committee members were asked to complete hazard worksheets by June 30, 2014 in order to provide the Regional Emergency Preparedness Planner time to compile community assessments by the August 2014 Steering Committee meeting. However since several localities were late or did not complete the worksheets until December 2014, there was a delay in completing community assessments. Also as King William County had vacancies in its Emergency Coordinator and County Administrator positions for a large part of 2014, a completed worksheet was finally received in April 2015.

Next a Hazards Identification and Risk Assessment (HIRA) was conducted using the HAZUS version 2.2 software from FEMA. MPPDC staff contracted with Dewberry to have this assessment completed. Results anticipated damages from hurricanes and serve wind storms. Additionally a sea level rise assessment was added to the HAZUS analysis for this 2016 plan update.

In conjunction with HAZUS, the Natural Hazards ranking, developed by the Kaiser Permanente Model, from the 2010 MPAHMP was made available to the Steering Committee for reference and to update the 2016 plan. Upon review four new hazards were added to the list and regional hazards were re-ranked.

Task 2 - Review of the Strategies from the 2010 MPNHMP

At the August 13, 2015 meeting of Steering Committee, the Regional Emergency Preparedness Planner reviewed each strategy within the 2010 with members. They were able to see the strategies that they committed to in 2010 and had an opportunity to make changes as a reflection of their local priority changes. Additionally jurisdictions were given a spreadsheet to report the status - completed, deleted, not started, cancelled or in progress - of the mitigation strategies since 2010.

Steering Committee Members were asked to update this information on April 14, 2015 and return the updated spreads sheets by June 1, 2015 for inclusion into the plan.

Task 3 - Inform the Public – Hazard Identification/Assessment Phase

Once the natural hazards were identified and assessed, Steering Committee members solicited comments from residents. Two sets of public meetings were scheduled in the region. The first two meetings were scheduled for July 29, 2015 in King & Queen County and July 30, 2015 in Saluda, Virginia, while the second two meetings were scheduled for January 5, 2016 in Saluda, Virginia and January 6, 2016 in King & Queen County. Only one citizen attended the public meetings. The sign-in sheet can be found in Appendix D

To advertise for the public meetings, the MPPDC Regional Emergency Preparedness Planner wrote and sent a press release to the area newspapers that serve Middle Peninsula residents to solicit public input on the All Hazards Mitigation Plan and the hazards that affect them and/or their communities. The same press release was posted on the Middle Peninsula Planning District Commission's website (Appendix E) from June 29th to July 28, 2015 as well as December 16, 2015 to January 14, 2016 to solicit additional input from residents. A copy of this press release in the Gazette Journal can be found in Appendix F.

Resident's comments were collected and considered by the All Hazards Mitigation Plan Local Planning Team for incorporation into the AHMP update.

Task 4 - Develop Goals and Objectives

At the June 25, 2015 Steering Committee meeting, the group reviewed existing mitigation goals and decided no changes would be needed to the regional goals and objectives for the MPAHMP update. Also at their June meeting, the Committee members reviewed the criteria used to develop their mitigation strategies and again decided to make no changes..

The evaluation criteria used to develop the mitigation strategies included the following:

Social Considerations

1. Will the proposed strategy be considered acceptable to the residents?
2. Will the proposed strategy treat all residents of the locality equally?
3. Will the proposed strategy cause any social disruption in the community?

Technical Considerations

1. Will the proposed strategy work?
2. Will the proposed strategy create more problems than it solves?
3. Will the proposed strategy solve the problem or just mask a symptom?
4. Is the proposed action in line with other locality goals?

Administrative Factors

1. Does the locality have the capacity to implement the proposed strategy?
2. Who in the locality will spearhead the strategy?
3. Is there sufficient funding, staff and technical support to undertake this effort?

Political Considerations

1. Will members of the governing body accept and support the proposed strategy?
2. Is there support to implement and maintain the proposed strategy by members of the governing body?

Legal Issues

1. Is the locality legally authorized to undertake this proposed strategy?
2. Will the proposed strategy constitute a legal taking?
3. Is the proposed activity in compliance with the jurisdiction's comprehensive plan?
4. Will the locality face legal liability if the proposed strategy is not implemented or conversely, legally challenged if the strategy is implemented?

Economic Concerns

1. What are the costs and the benefits of implementing the proposed strategy?
2. Do the benefits outweigh the costs? Construction projects seeking FEMA financial assistance to mitigate the adverse affects of natural hazards will utilize FEMA's Benefit/Cost Formula to insure that the proposed project benefits exceed the anticipated project costs.
3. Are the capital, maintenance and administrative costs accounted for with the proposed strategy?
4. Has the funding been secured for this project?
5. What burden will this strategy place on the locality's tax base or local economy?
6. Does the proposed strategy contribute to other jurisdictional goals?

Environmental Factors

1. What affect will the action have on the environment?
2. Will this action need environmental regulatory approvals?
3. Approvals from whom and does this create any concerns about the feasibility of the proposed action?

Task 5 - Strategy Development

At the August 13, 2015 Steering Committee meeting, the members developed and updated mitigation strategies to address the hazards that they determined adversely affected their communities.

Task 6 - Inform the Public – Strategy Development Phase

The Steering updated and developed mitigation strategies. This task was completed at the August 13, 2015 Steering Committee Meeting. These mitigation strategies were included in the Plan and were available to the public comment during the second comment period during December 16, 2015 to January 14, 2016.

Task 7 - Draft Plan

The draft plan was completed by December 16, 2016 and submitted to VDEM/FEMA for their review and comments. The Steering Committee Members also received a copy of the draft plan to review and circulate amongst their communities for further input by their co-workers – who will be involved in the implementation phase of the plan - and residents affected by the proposed action items.

The draft plan was reviewed, revised and approved by the Steering Committee members on December 15, 2015.

Task 8 - Adoption

Once VDEM/FEMA staff gave conditional approval of the draft plan, jurisdictional staff presented the updated plan to their governing body and requested its adoption.

Once adopted, jurisdictional staff and others identified in the plan will begin with the implementation phase of the strategies based on the schedule outlined in Section 9 of the update.

Task 9 - Public Input during Plan Development

Most of the Steering Committee members that are listed in Appendix B are staff from the Middle Peninsula localities that either create or implement ordinances and policies that affect development in areas that are susceptible to damage from natural hazards. The Steering Committee members were able to provide community based information about specific flood hazards as well as determining what mitigation tools their communities could adopt and implement to decrease flood hazards. The local Building Officials and Planning Directors on the Committee have brought their experience working with local residents, businesses and non-government organizations by providing guidance on proposed development projects in flood prone areas during the development of the plan update. Overall all these steering committee members have the ability to incorporate mitigation strategies and goals into the locality's building regulations, zoning ordinance, environmental regulations and/or comprehensive plan and enforced by the county code compliance employees in their respective departments.

During this 2016 update the Gazette Journal published news releases about the plan on June 24, 2015, December 16, 2015 and December 30, 2015. A copy of the press releases is included in Appendix F.

A similar version of this news release was posted on the MPPDC website from June 29, 2015 to July 29, 2015 as well as December 16, 2015 to January 14, 2016 soliciting public comments. A copy of the MPPDC's website homepage is shown in Appendix E. As a result of the news releases the Regional Preparedness Planner collected a total of 10 public comments from Middle Peninsula citizens during the entire project period (Appendix G).

Steering Committee Members from the jurisdictions – more specifically the local Emergency Services Coordinators/Emergency Managers - solicited comments from residents within their network of community contacts.

The local newspapers were also utilized to announce public informational sessions surrounding the adoption of the updated plan. Public informational opportunities to view/comment on the draft of the update included the following:

1. Middlesex County and the Town of Urbanna posted a short description of the AHMP and a link to the draft plan for public comment on December 16, 2015. While Gloucester County and King William County reposted the news release on their county websites encouraging citizens to comment on the plan.
2. At the January 2016 Board of Supervisors Meeting, Middlesex County presented the plan and reviewed the remaining project timeline.

Summary of Steering Committee Actions
During the update process, the Steering Committee members were instrumental in reviewing and significantly improving the original natural mitigation plan. A brief summation of their contributions include:

1. Meetings: Throughout the course of this project the Steering Committee meet on 12 separate occasions to discuss the plan update. Meeting dates were:

March 13, 2014	November 13, 2014
April 10, 2014	April 16, 2015
May 8, 2014	June 25, 2015
August 14, 2014	August 13, 2015
September 18, 2014	January 26, 2016

   For meeting minutes visit Appendix C.

2. March 2014
    - Reviewed project timeline
    - Reviewed hazard ranking from the 2010 Plan and the Kaiser Permanente Hazard Vulnerability Tool.
    - Expressed interest in adding air quality to the 2010 hazards list.
3. April 2014
    - Discussed and added HAZMAT, ditch flooding, air quality, and summer storms to the list of hazards. Also agreed to not remove hazards from the hazards list presented in the 2010 AHMP.
4. May 2014
    - Finalized the public outreach process for this plan
5. August 2014
    - Gloucester County and the Towns of Urbanna and West Point completed the Kaiser Permanente Hazard Vulnerability Tool worksheet.
6. September 2014
    - Essex, King & Queen, and Middlesex Counties and the Town of Tappahannock completed the Kaiser Permanente Hazard Vulnerability Tool worksheet.
7. April 2015
    - Contracted with Dewberry to complete a regional HAZUS analysis (ie. flooding, hurricane winds, and sea level rise).
    - Reviewed 2010 Mitigation Strategies.
8. June 2015
    - Public comment period scheduled and advertised for.
    - Draft plans were sent to local libraries
    - Public meetings were scheduled.
9. July 2015
    - Public meetings were held on July 29, 2015 (King & Queen County Regional Library) and June 30, 2015 (Saluda, Va).

10. August 2015
    - Local Planning Team reviewed public comments received during the public comment period.
    - The Local Planning Team completed a National Flood Insurance Program Survey and a capability assessment survey.
11. December 2015
    - The Local Planning Team reviewed and approved the updated All Hazards Mitigation Plan on December 15, 2015.
    - Scheduled and advertised for the 2nd public comment period.
    - Final plans were sent to local region libraries for the public to review.
    - Sent the final plan to VDEM for review.
12. January 2016
    - Hosted two public meetings on January 5, 2016 (Saluda, VA) and January 6, 2016 (King & Queen Library Branch).
    - Reviewed public comments at the January 26, 2016 meeting.
    - Reviewed VDEM comments.

Summary of Primary Revisions of the 2010 MPNHMP

The below will list the sections of the plan and updates that the All Hazards Mitigation Plan Local Planning Team made to keep this plan current.

Section 1 – Introduction

- Added a visual of the four-step mitigation planning process (FEMA, 2015).

Section 2 – Planning Process

- Updated the planning process to reflect the activities that took place during the plan update.
- Included public comments received during the public comment periods of this plan (Appendix G).

Section 3 – Community Profiles

- Updated community profiles to include the 2010 Census data.
- Added information about Economic Resiliency within the Middle Peninsula as well as the Health Opportunity Index from Virginia Department of Health (VDH).

Section 4 – Hazard Assessment

- Added air quality, HAZMAT, Ditch Flooding and Summer Storms to the list of hazards impacting the Middle Peninsula region. The Local Planning Team also changed the plan from a natural hazards mitigation plan to an all hazards mitigation plan in order to include air quality, HAZMAT, and ditch flooding.
- Updated the prioritization worksheet for hazards impacting to include the new hazards listed above and the LPT reassessed and re-prioritized hazards. In 2010 the critical hazards included hurricanes, winter ice storms, tornadoes and coastal flooding where as in 2016 plan the most critical hazards included: Winter Storms (Ice), Coastal Flooding, Lightning, Hurricanes, and Summer Storms.
- Updated the Repetitive Loss and Severe Repetitive Loss data.

- Updated the flood plain maps with new Flood Insurance Rate Map GIS data.
- Added a description of the derecho to further the description of windstorms
- Updated wildfire data for 2010-2015 events
- Added Point Source Emissions Inventory and air quality index to describe air quality in the region

Section 5 – Hazus Assessment

- The flood, hurricane wind, and sea level rise analysis for the HIRA was completed using the FEMA Hazus – MH V2.2 software. In part it included updated data including:
    - new 2010 Census Data
    - new Hazus Dasymetric Census Geographies inventory (general building stock)
    - utilized stock Hazus inventory values (Version 2.2 – Census 2010)
    - All modeling utilized stock Hazus facilities
    - Utilized 1 square mile drainage runs instead of 10 square mile drainage runs used in the 2010 analysis
- Integrated and utilized new coastal elevation studies from FEMA
- Integrated and utilized coastal studies from the US Army Corps of Engineers. This included 1% depth grids.
- Developed hot spot maps that identified the location where the loss would be the highest
- Methodology of Hazus analysis has been added to the Appendices (Appendix J)

Section 6 – Capability Assessment

- Added capability assessment tables to this updated plan that focus on the planning and regulatory, administrative and technical, education and outreach, and financial capabilities of each Middle Peninsula localities.
- Included National Flood Insurance Program compliance tables to the report (Appendix K)
- Updated the Stormwater Management Ordinance paragraph to reflect Virginia's stormwater management regulations.

Section 7 – Review of Strategies from the 2010 Middle Peninsula Natural Hazards Mitigation Plan (MPNHMP)

- Updated the status of mitigation strategies.
- Color coated the tables of strategies to show those strategies that have been completed.
- Added multiple updated to goal 1: Prevent Future Hazard Related Losses, including:
    - Added dates of when localities adopted ordnances to implement the Drought Response and Contingency Plan which was a strategy from the 2010 plan.
    - Included dates of when localities adopted new Flood Insurance Rate Maps.

Section 8 - New Mitigation Goals, Objectives and Strategies

- Color coated the "Goals", "Objectives" and "Strategies"
- Updated repetitive loss properties and sever repetitive loss properties in the Middle Peninsula.
- Updated flood prone roads in Strategy 1.1.6
- Merged Strategy 1.1.6 and 1.1.16. The Local Planning Team believed that these strategies duplicated each other and could be merged into one.
- Added Strategies 1.1.19 and 1.3.1 and added Objective 1.3.

    - Strategy 1.1.19 focuses on integrating mitigation strategies into locality plans, policies, codes and programs across disciplines and departments.
    - Objective 1.3 focuses on localities supporting implementation of structural and nonstructural mitigation activities to reduce exposure to natural and man-made hazards
    - Strategy 1.3.1 focuses on specific mitigation projects to protect public and private property from natural hazards.
- Updated strategies with localities interested in participating:

Strategy	**Locality(ies added to the Strategy**
1.1.1	King William County
1.1.2	Town of Urbanna
1.1.4	Middlesex and King William Counties
1.1.5	Gloucester, Mathews, and Middlesex Counties and the Town of West Point
1.1.7	Gloucester and Mathews Counties and the Town of West Point
1.1.10	Middlesex County
1.1.11	King William County
1.1.18	Middlesex and Gloucester County
1.1.19	All nine Middle Peninsula Localities were added
1.3.1	Gloucester County
3.1.5	King William County
3.17	Middlesex and King William Counties

Section 9 – Implementation Plan

- Included how this plan will be integrated into locality plans, policies, codes and programs across disciplines and departments.
- Included information about how the Chesapeake Bay Nation Estuarine Research Reserve intents to educate students and teacher about climate science, which will assist in developing more resilient communities.

Section 10 – Plan Adoption

- The dates that Board of Supervisors and Town Councils adopt the 2016 All Hazards Mitigation Plan will be updated.

Section 11 – Plan Maintenance

- Developed a worksheet that will be used as an annual survey for localities to track progress and updates towards meeting mitigation strategies.

Section 3: Community Profile of Middle Peninsula Localities

The Middle Peninsula region encompasses six (6) counties and three (3) towns including Essex, Gloucester, King and Queen, King William, Mathews, and Middlesex Counties as well as the Towns of Tappahannock, Urbanna, and West Point (Figure 1). According to the 2010 Census, the total population of the Middle Peninsula is 90,826.

The Middle Peninsula is located on the western shore of the Chesapeake Bay, bound to the north by the Rappahannock River and to the south by the York River. As the region is located in the Virginia coastal plain, it has a relatively flat topography. The southeastern-most portions of the region are at sea level, while elevation rises to approximately 200 feet above sea level moving in a northwesterly direction.

Based on the regions low topography, 1200+ miles of coastline, and its proximity to waterways-broad rivers, meandering creeks, wide bays and tidal marshes, the Middle Peninsula is highly susceptible to floods and coastal storms. Additionally with a high water table in lower elevations of the Middle Peninsula, water cannot easily drain from land and thus exacerbates flooding from summer thunderstorms, hurricanes, nor'easters, as well as rising seas. Tidal surges associated with these severe storms often compound the flooding within this region.

While the Middle Peninsula region remains largely rural, it lies in close proximity to the metropolitan areas of Hampton Roads, Richmond and the Fredericksburg-Northern Virginia Metropolitan Areas. Suburban growth from these urban areas is spreading into the Middle Peninsula, affecting the region's natural resource-based industries and traditional rural lifestyle. For instance the region's traditional land use patterns can best be described as having:

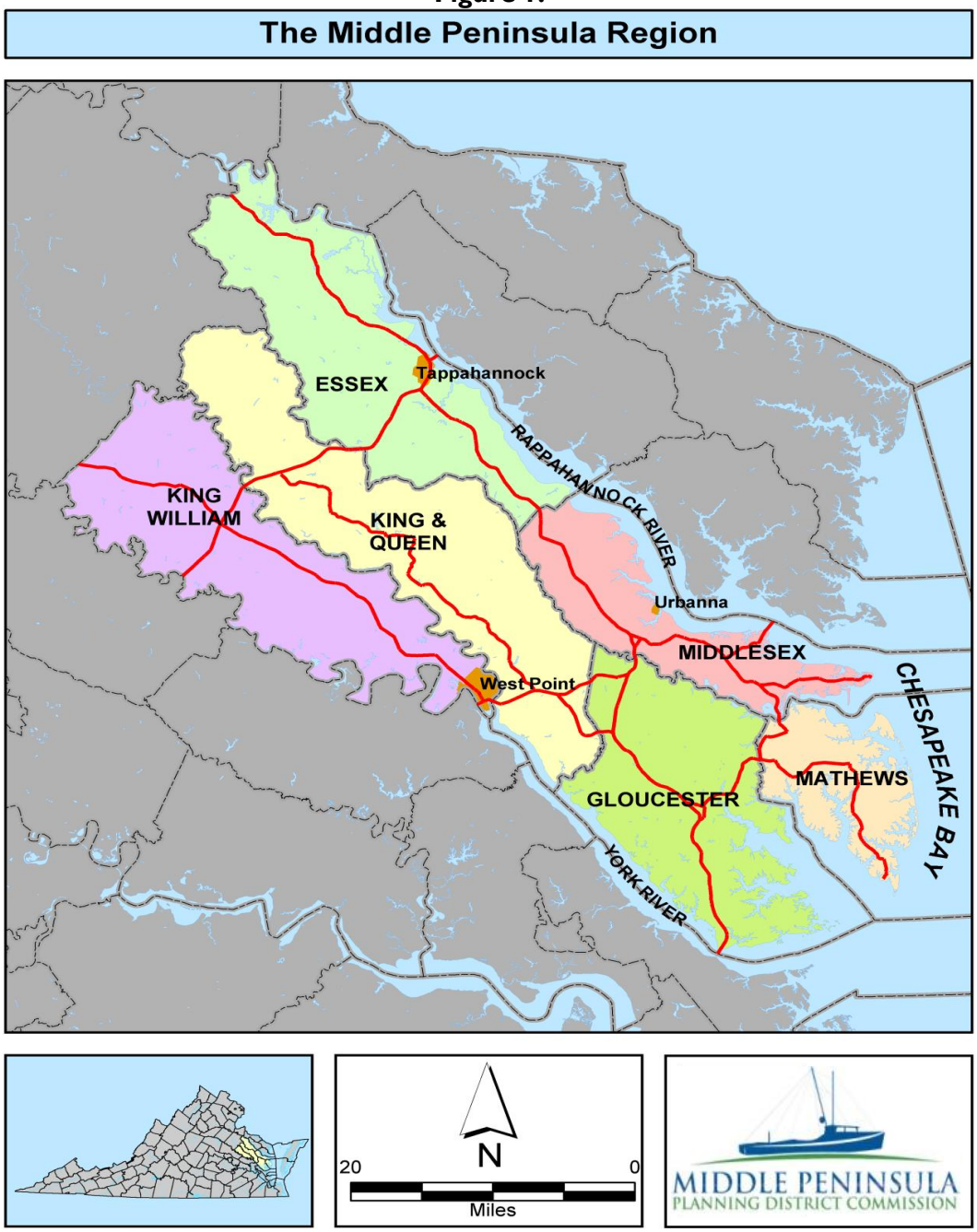
- A predominantly rural character with large, scattered farms and forested tracts;
- A number of closely-knit, small communities surrounded by working farms and forests;
- Small scale commercial fishing communities along the lower reaches of the watersheds;
- Three small towns that provide a focal point for commercial, industrial, and residential development at a modest scale; and
- Government operation centers that provide another focal point of local activity in the region.

However the last 20 to 30 years, the region has seen a slight shift to:

- Growing sectors in tourism, retiree housing and related retiree services;
- Large forested tracts are converting from woodlands to residential development;
- Waterfront communities transitioning from commercial fisheries with a reduced level of fisheries to an increasing number of marinas and residential developments; and
- Commercial development being located along Route 33 in Middlesex, Route 360 in King William, and Route 17 in southern Gloucester County between the Court House and the Coleman Bridge.

In summary, changes in land uses that concentrate development along the region's waterfront poses the greatest risk for hazard prevention and mitigation activities – particularly in the low-lying southeastern areas of Gloucester, Mathews, and Middlesex Counties.

Figure 1:



Essex County

Essex County is predominantly a rural county located at the northern end of the Middle Peninsula. It is bound on the north and east by the Rappahannock River, on the south by Middlesex County and on the west by Caroline and King and Queen Counties. The County comprises of approximately 261 square miles (Essex County Comprehensive Plan, 2015). Residential developments exist as small rural communities along the Rappahannock River or along the primary and many secondary roads. With a history of slow/gradual growth and strong land use control regulations, the County has remained mostly rural.

According to the 2010 Census figures, the population in Essex consists of 11,151 people, an increase of 1,162 (11.63%) from the 2000 Census. The population has 5,274 men and 5,877 women and is comprised of 6,370 whites, 4,247 African Americans, and 534 people of other races. The population aged somewhat during the period from 2000 to 2010 with a modest reduction in school age population. These trends suggest that County programs may require redirection to meet the specific needs (i.e. health care, transportation, etc.) of an older population. A low to moderate trend in growth in the County's population is expected to continue into the future.

Town of Tappahannock

Tappahannock is an incorporated town located along the shores of the Rappahannock River in the east-central portion of Essex County. The Town of Tappahannock is both the employment and population center of the County. Occupying less than three square miles of land, Tappahannock features an active waterfront, a historic downtown, residential subdivisions, schools, public buildings, an old airport and industrial center, a business corridor, and extensive wetland areas. Tappahannock serves as the county seat for Essex County.

According to the 2010 Census, the population in Tappahannock consists of 2,375 people, an increase of 307 (14.8%) from the 2000 Census. The population has 975 men and 1,400 women and is comprised of 1,076 whites, 1,128 African Americans, and 171 people of other races.

Gloucester County

Gloucester County's proximity to urban centers to the south, and the northwestward migration of suburban development from the greater Hampton Roads/Newport News area has transformed portions of the County into a suburban landscape. This is most pronounced at the southern reaches of the County from the Historic Court House Village and Gloucester Point. Residents from the Hampton Roads area and other areas of the urban crescent are lured to the County by the promise of lower taxes, lower housing costs, rural character, and relative freedom from the congestion evident in metropolitan areas. This has created increased traffic volumes on the limited collector roads not designed for such heavy use within the county. Commuters, travelers and trucks from the Middle Peninsula and points north use Route 17 as an alternative to interstate 64 to get to the Peninsula, Southside and the Outer Banks. Route 17 is the primary route through Gloucester and is also the heart of Gloucester's Development District where public water and sewer are available and where the county has expressed a desire to see continued economic development along this corridor. The need for alternative routes and connection to take local traffic off of Route 17 to reduce congestion is one of the goals expressed in the adopted Comprehensive Plan and the proposed update to the plan.

Despite the urban/suburban character of the County's Development District, the majority of the County remains relatively rural with low density development and active farm and timberlands. Much of the eastern portion of the County, east of Route 17 and South of Route 3/14 is characterized by low lying lands, low to moderate density housing and waterfront homes and communities. North of the Court House is very similar to other localities on the Middle Peninsula with a mixture of low and moderate density residential development and large tracts of farms and forests. Route 33, which runs along the northern portion of the County, provides convenient access from the interstate to upper Gloucester and Mathews County.

According to the 2010 Census, the population in Gloucester County consists of 36,858 people, an increase of 2,078 (5.97%) from the 2000 Census. The population has 18,239 men and 18,619 women, comprised of 32,149 whites, 3,197 African Americans, and 1,512 people of other races. A moderate trend in growth is expected to continue in the future (Virginia Employment Commission, 2013).

King and Queen County

King and Queen County is located in the north-central portion of the Middle Peninsula and is bounded on the west by the York and Mattaponi Rivers which separate King and Queen from King William and New Kent Counties. The Dragon Swamp separates King and Queen County from Essex, Middlesex and Gloucester Counties on the east. Often called the "shoestring county", King and Queen County is about 65 miles long and less than 10 miles wide. Farming and logging continue to be the mainstays to the local economy.

King and Queen County is the least populous county of the Middle Peninsula and one of the most rural counties in Virginia today. In 1990, the population density was only 20 people per square mile. Nearly three-fourths of the County's 318.1 square miles of land area is timberland. Over the past four decades, King and Queen County has experienced slow, but steady population growth. In 2010 the population density was 22 people per square mile.

According to 2010 Census figures, the population in King and Queen County consist of 6,945 people, an increase of 315 (4.8%) from the 2000 Census. The population has 3,454 men and 3,491 women and is comprised of 4,663 whites, 1,975 African Americans, and 307 people of other races. A moderate trend in population growth is expected to continue in the future and the overall population distribution appears to be experiencing a gradual shift to the upper and lower ends of the County where transportation routes to jobs and retail markets are most favorable.

King William County

Located approximately 20 miles northeast of the City of Richmond, King William County is rapidly growing into a bedroom community of the metro-Richmond area. Much of the county's 286 square miles are made up of gently rolling farmland and scenic timberland located between the Pamunkey and Mattaponi Rivers. Farming and logging continue to be the mainstays of the local economy. King William is home to the only Native American Indian Reservations in the Commonwealth and to the oldest courthouse in continuous use in the United States. The Mattaponi and Pamunkey Tribes operate fish hatcheries on the rivers. Residents and visitors enjoy the numerous recreational opportunities that the rivers provide.

According to 2010 Census figures, the population in King William County consists of 15,935 people, an increase of 2,789 (21.2%) from the 2000 Census. The population has 7,759 men and 8,176 women and is comprised of 12,297 whites, 2,819 African Americans, and 819 people of other races. Projections indicate that King William County will continue to experience moderate to accelerated population growth. By the year 2020, it is estimated that the County's population will grow at a rate of 8.62%, increasing the population by 1,373 persons. Growth management will become more important as competing uses vie for space and facilities.

Town of West Point

The Town of West Point lies at the extreme southern end of King William County where the Mattaponi and Pamunkey Rivers join to form the York River. The town is relatively flat, with large sections comprised of tidal marshes, particularly along the Mattaponi River. The highest elevations occur at the northern end of town at a height of 30+ feet above sea level. Most of the Pamunkey River waterfront is on a bluff averaging 20 feet in height. Union forces destroyed the town and the railroad, completed in 1859, during the Civil War. Only four houses survived the torching and remain intact today. West Point became an incorporated town in 1870. During the late 19th and early 20th centuries, West Point was a popular tourist destination. After the decline of tourism, a shipyard, built in 1917, and a pulp mill, built in 1918, revitalized the town.

The river areas surrounding the town are primarily used for recreation and barge access to the WestRock, a Meadwestvaco and Rock Tenn Corporation, where pulping operations convert wood chips, sawdust and recyclable paper products into pulp for use in producing various types of paperboard. The Old Dominion Grain Corporation also benefits from barge access.

According to 2010 Census figures, the population in King William County consists of 3,306 people, an increase of 400 (15.4%) from the 2000 Census. The population has 1543 men and 1763 women and is comprised of 2618 whites, 509 African Americans, and 179 people of other races.

Mathews County

Mathews County is located at the eastern tip of the Middle Peninsula. The County is bordered mostly by water, with the Chesapeake Bay to the east, the Mobjack Bay to the south, the North River to the west, and the Piankatank River to the north. Except for approximately five miles that border Gloucester County, the County's perimeter is formed by its 217 mile shoreline. Mathews is predominantly a rural community that has attracted an increasing number of retirees and vacationers. More than half of the working residents earn their living outside the County. The mainstays of the local economy are agriculture, trade, seafood, and tourism.

Much of the housing in Mathews is traditional single family dwellings, but the County also has a growing number of manufactured homes and vacant seasonal housing (built typically for summer occupancy). Seasonal housing, in the form of cottages, recreational vehicles, rental mobile homes, and a few condominium units increased in number from 448 in 1970, to 583 in 1980, to 783 in 1990. Residents of seasonal housing are often not accounted for in the census counts because the units were not occupied during the census survey. It is estimated that only about 75% of the housing units in Mathews County are occupied year-round, adding significantly to the summer population of Mathews County.

According to 2010 Census figures, the population in Mathews County consists of 8,978 people, a decrease of 229 (-2.5%) from the 2000 census. The population has 4,363 men and 4,615 women and is comprised of 7,898 whites, 823 African Americans, and 257 people of other races. Projections indicate that Mathews County will continue to experience low population growth. By the year 2020, it is estimated that the County's population will grow at a rate of 3.41%, increasing the population by 9,284 persons. Mathews County's population changed little between 1840 and 1900. The population peaked in 1910 with 8,922 residents, but gradually declined over the next five decades to a low point of 7,121 in 1960. This was in keeping with a national trend of population shifts from rural to urban areas because of the increased job opportunities in the cities. The population began to grow in the 1970's and it took until the mid 1990's before the population reached the peak reported in 1910.

Middlesex County

Middlesex County, located at the eastern end of the Middle Peninsula, is comprised of 131 square miles of land and 135 linear miles of shoreline. The County is surrounded by three significant waterways; the Rappahannock River to the northeast, the Piankatank River to the southwest, the Chesapeake Bay to the east. The County is also bordered by Gloucester County to the southeast, King and Queen County to the West, and Essex County to the north. The geographic location of Middlesex County, particularly with the close proximity to two significant rivers, the Chesapeake Bay and the Atlantic Ocean, make Middlesex County communities much more vulnerable to tropical weather events, affecting the eastern seaboard of the United States. The county government operations are managed by a County Administrator, who is appointed by a five-person elected Board of Supervisors. The Government Seat, Board of Supervisors Meeting Room, and Courts Complex, are located in the area known as Saluda, Virginia. The Middlesex County School System is comprised of an elementary, middle and high school,

with the School Board Administration Offices located in the Cooks Corner Office Building, just east of Saluda.

Middlesex has remained largely rural over the years, with farming, forestry, and fin and shell fishing providing the principal elements of the economic base. The County's relatively remote geographical location adds to the community's rural character. The 2013 Census reports the county population to be 10,762 full-time residents, a decrease of 197 (2%), from the 2010 census of 10,959. The population is made up by 5,413 females, and 5,349 males, comprised of 8,545 Whites, 1,937 African-Americans, and 280 people of other races. A total of 3,056 residents, or 28.4% of the population of Middlesex, are over 65 years-of-age. With the population dropping 2% in the past three years, it is estimated that the county's population will not see any drastic fluctuations, up or down, throughout the next decade.

The county population lives in 7,184 dwellings, with only 3.5% of the occupancies being comprised of multi-family dwelling units, a figure significantly lower than the Commonwealth's average of 21.7%. County officials estimate that 30% of the housing units in the community are seasonal, increasing the population between May and October with an additional 20,000 residents. Middlesex, Virginia, is home to one of the top boating populations in the Commonwealth of Virginia, another factor which adds to the seasonal population of the county.

Public Safety Services in Middlesex County are provided by the Office of the Sheriff, four individual volunteer fire companies, Deltaville, Hartfield, Urbanna, and Waterview; two volunteer rescue squads, Deltaville and Urbanna. The collective departments work hand-in-hand responding to law enforcement situations, fires, medical emergencies, and all-hazards incidents throughout the community. All Emergency Management activities, including operations of the Emergency Operations Center as well as maintenance and oversight of the Emergency Operations Plan, are managed by a county appointed Emergency Services Coordinator. This individual works in conjunction with the Middlesex Emergency Management Director, who is an appointed member, from the Board of Supervisors. The Emergency Services Coordinator also works in conjunction with the leadership and members of the volunteer fire departments and volunteer rescue squads.

Town of Urbanna

The Town of Urbanna is located in Middlesex County on the Rappahannock River on a finger of land bounded by Perkins Creek and Urbanna Creek. The Town is one of America's original harbor towns and is located approximately five miles from Saluda, VA. Incorporated in 1902, the present town boundary comprises an area of about one-half square mile. The town operates an active boat harbor which is a major gateway for the fishing and recreational boating industries serving the area.

According to 2010 Census figures, the population in the Town of Urbanna consists of 476 people, a decrease of 67 (-12.3%) from the 2000 Census. The population has 204 men and 272 women and is comprised of 431 whites, 35 African Americans, and 10 people of other races. The Town of Urbanna experiences a seasonal swelling of the population to well above 2,000 people within the town and at the nearby Bethpage Campground due to seasonal use of vacation homes and campsites. This influx of tourists brings in much needed revenue and helps support the service industry and the tax base for the county. Also, the Town is the location of an annual Urbanna Oyster Festal. Since 1958, this event features oyster specialties and other Chesapeake Bay seafood, a parade, a fine arts exhibit and visiting tall ships. Crowds for the two-day event reach approximately 75,000 people.

Regional – Health Opportunity Index

The Health Opportunity Index (HOI) is a measure of social determinants of health at the census tract level. It is a composite measure comprising of 13 indices that may impact social conditions thought to

influence an individual's ability to live a long and health life. It does not, however, include data on disease incidence. Indices taken into account include:

Affordability: Measures how affordable an area is

- The affordability index is developed to measure the proportion of income spent on housing and transportation. The index of affordability is calculated by combining housing and transportation costs in a neighborhood and dividing that number by income

Towsend Material Deprivation Index ("Towsend Index"):

- Townsend deprivation index is a measure of material deprivation. According to Townsend, "Material deprivation entails the lack of goods, services, resources, amenities and physical environment which are customary, or at least widely approved in the society under consideration
- 4 indicators make up Towsend:
    - overcrowding (>2 persons per room),
    - unemployment,
    - % of persons no vehicle or car,
    - % of person who rent

Job Participation Index: Information about the workforce

- Job Participation Rate is the percentage of individuals 16-64 years of age in the active labor force. The job participation rate is often used by economics as an indicator for economic development and growth

Employment accessibility index: you may have a workforce but how accessible are

- Poor job access leads to difficulties in job search or job retention and, consequently, to poverty and socioeconomic disadvantages
- Employment accessibility index: you may have a workforce but how accessible are they to the potential jobs --- how far are you (distance) from a potential job. In other words, the index is based on jobs and distance decay function
- Ownership of a vehicle plays a function

EPA (Air quality Index):

- Measures air pollution from road, off-road, non point (fertilizer, farming, erosion)
- Areas of high concentration are more vulnerable to environmental pollution

***Population Weighted Density (Dasymetric)**

- Weighted density is to capture the density at which the average person lives

- Example Craig County has 1 census tract which is large, however there is a concentration of people live in a small area; we weighted the density of the population by subtracting the census tracts that had no population to better predict where the concentration of people reside

Population Churning: how mobile the people are what is the turnover of the people

- Population churning rates relate the combined inflow and outflow for an area to the resident population.
- The rates can provide a useful measure of the potential disruption to local services caused by migration into and out of the Census tract.

Food Accessibility Index

- Low access was measured as living far from a supermarket, where 1 mile was used in urban areas and 10 miles was used in rural areas to demarcate those who are far from a supermarket.

Access to Care

- HRSA definition based on distance. Look at the population at the center of the census tract and look at the number of FTEs within a 30 mile radius
- Combined with the proportion of insured.

Walkability is accessed using 4 concepts:

- ***Density – Residential and employment***
  - Indicator: Total acidity units per acre of land
  - Measures the concentration of activity types within a walkable area
- ***Diversity – Land use and destinations***
  - Indicator: Range of land uses by census tract
  - Measures the mix of activities available within a walkable area
- ***Design – Built environment and safety features***
  - Indicator: Number of street crossings by census tract
  - Measures the degree of connectivity to support safe pedestrian travel
- ***Distance – Transit accessibility***
  - Indicator: Aggregate frequency of transit service per square mile
  - Measures level of accessibility for pedestrian to reach a transit stop

Education Index

- Average years of schooling
- Preschool through doctorate (this index is weighted based upon how far you have advanced in education
- Higher the number the higher average number of schooling

Income Inequality Index (GINI coefficient): Measures inequality of income

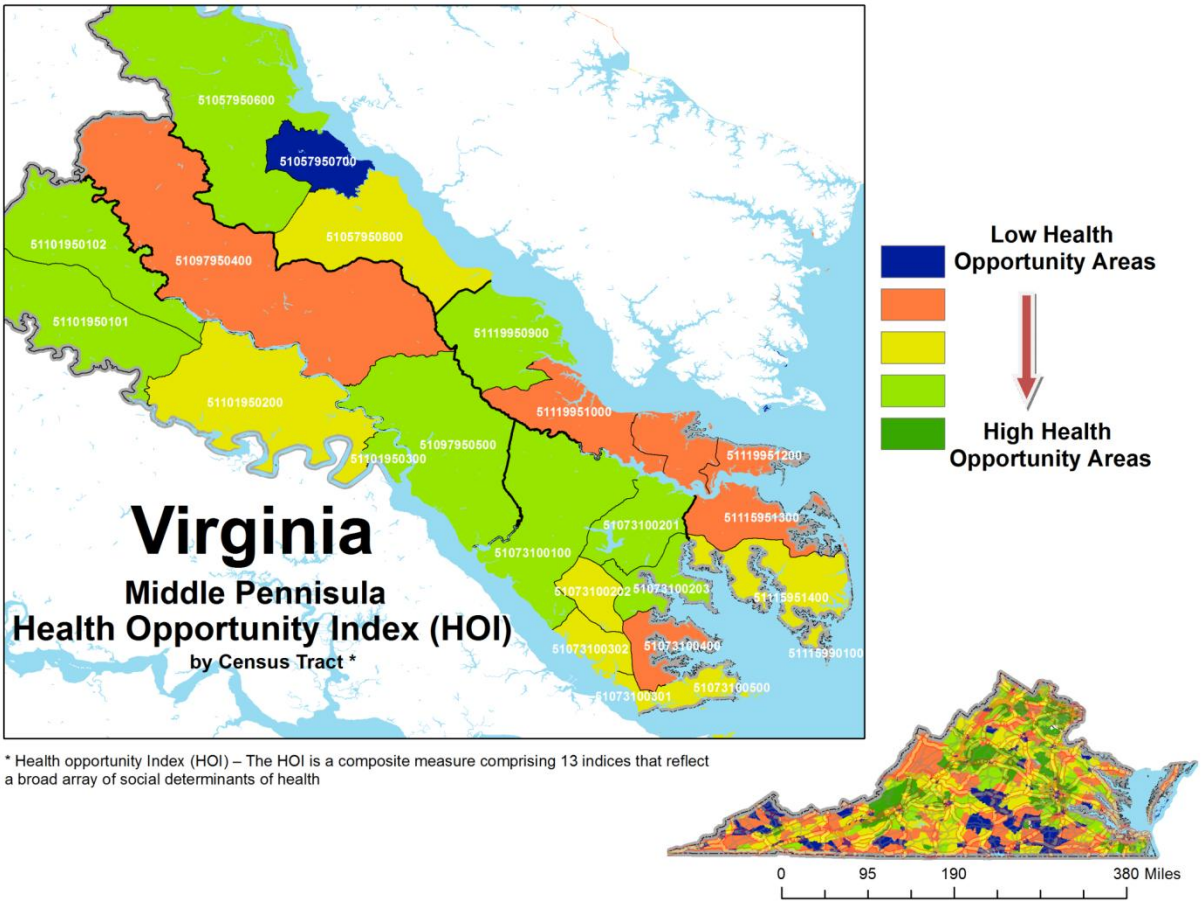
- The GINI coefficient (also known as the index of income concentration).
- Measures inequality of income.
- Measures how homogeneous or diversity of actual earned income by neighborhood

Spatial Segregation Index

- Measures how (whether the racial composition of the population of the census tract has the same composition as the state).
- It also measures the influence of those census tracts that are adjacent

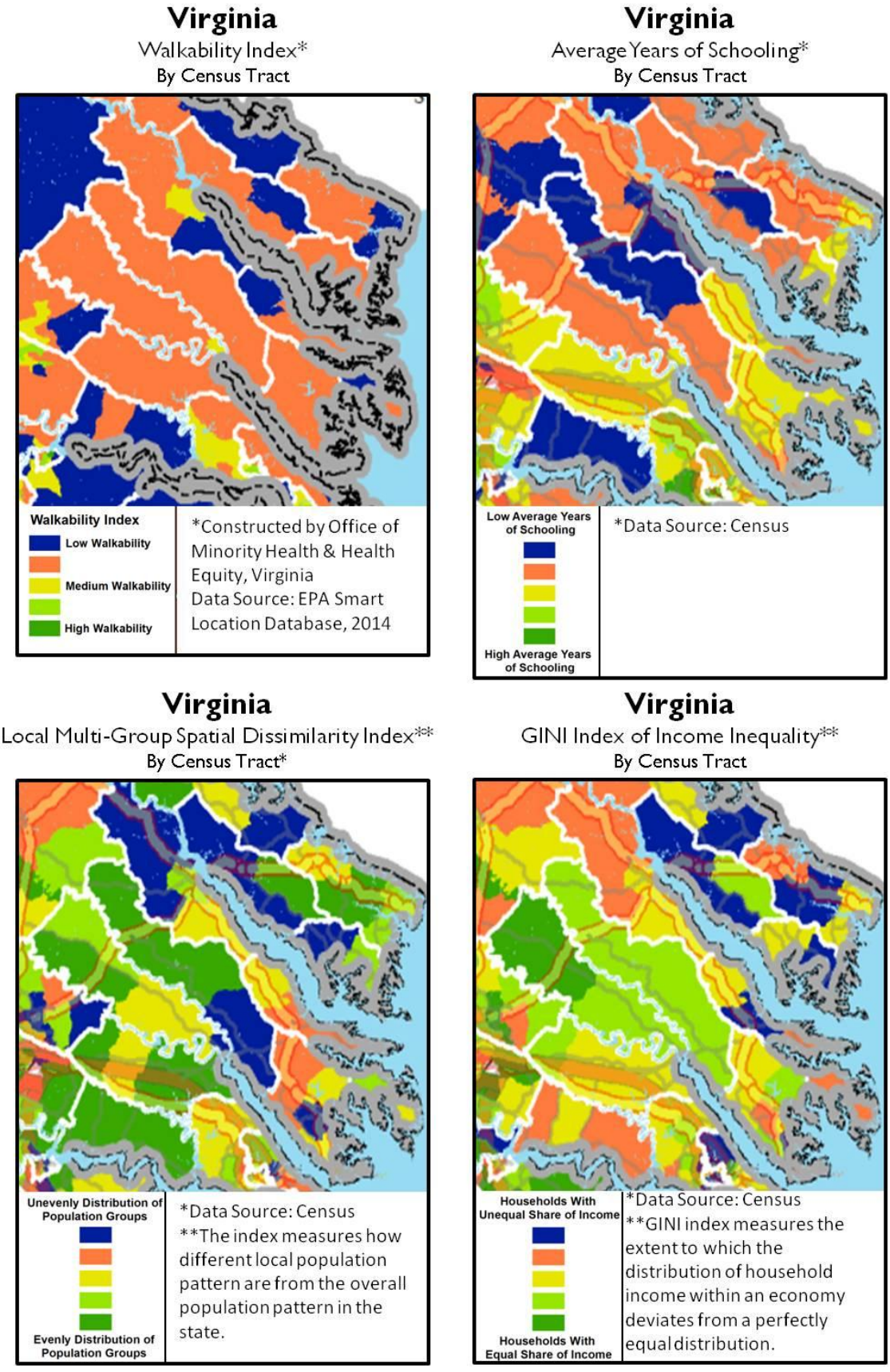
The following images provide visuals of the entire region's HOI (Figure 2) and the results from the walkability index, average years in schooling, local multi-Group Spacial Dissimilarty Indx and the GINI Index of Income Inequality (Firgure 3).

Figure 2: Middle Peninsula Region's Health opportunity index (Virginia Department of Health, 2015)



* Health opportunity Index (HOI) – The HOI is a composite measure comprising 13 indices that reflect a broad array of social determinants of health

Figure 3: Middle Peninsula Region's walkability index, average years in schooling, local multi-Group Spacial Dissimilarty Indx and the GINI Index of Income Inequality (VDH, 2015).



Economic Resiliency

In 2013, the MPPDC adopted a Regional Comprehensive Economic Development Strategy (CEDS) that sets forth goals and objects necessary to improve the regional economy. As hazards pose threats to the local and regional economy, economic resiliency of the region is critical to the regions long term success. The three primary attributes of economic resiliency include: the ability to recover quickly from a shock, the ability to withstand a shock, and the ability to avoid the shock altogether.

Based on mapping efforts by the Bureau of Labor Statistics (BLS) in 2012, maps of Employment in Hurricane Storm Surge Flood Zones were developed that provide an example of impacts to employment in hurricane storm surge flood zones in Gloucester, Mathews, and Middlesex Counties (Figures 4-6). These maps show that in Mathew County 61% of all business establishments would be impacted by hurricane storm surge that would reduce quarterly revenues by at least 54%. In Middlesex County 7.8% of all business establishments would be impacted by hurricane storm surge that would reduce quarterly revenues by at least 6%. In Gloucester County 17% of all business establishments would impacted by hurricane storm surge that would reduce quarterly revenues by at least 8%. Needless to say this will have economic consequences to the overall region.

Figure 4: Employment in Hurricane Storm Surge Flood Zones in Mathews County (BLS, 2012).

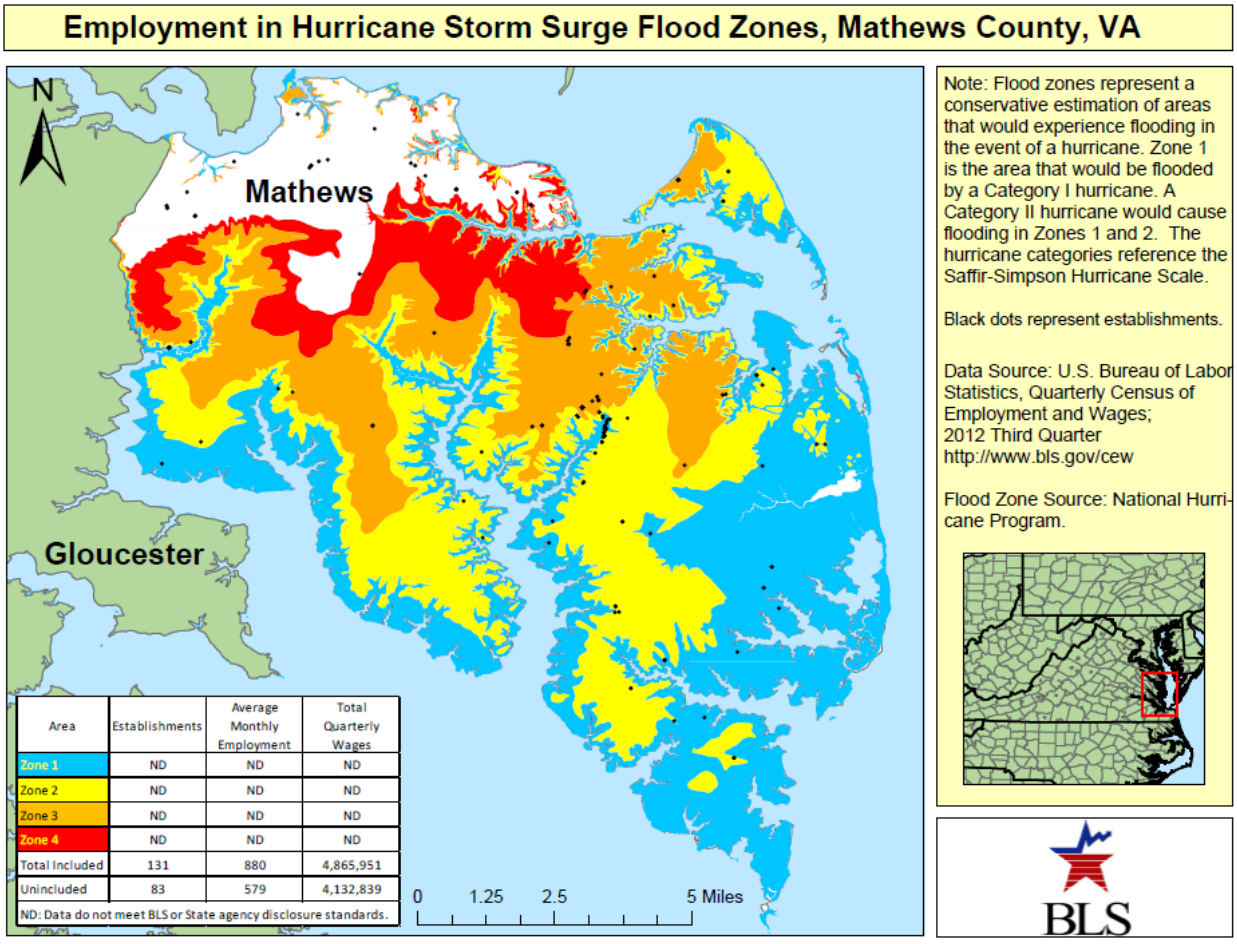


Figure 5: Employment in Hurricane Storm Surge Flood Zones in Middlesex County (BLS, 2012).

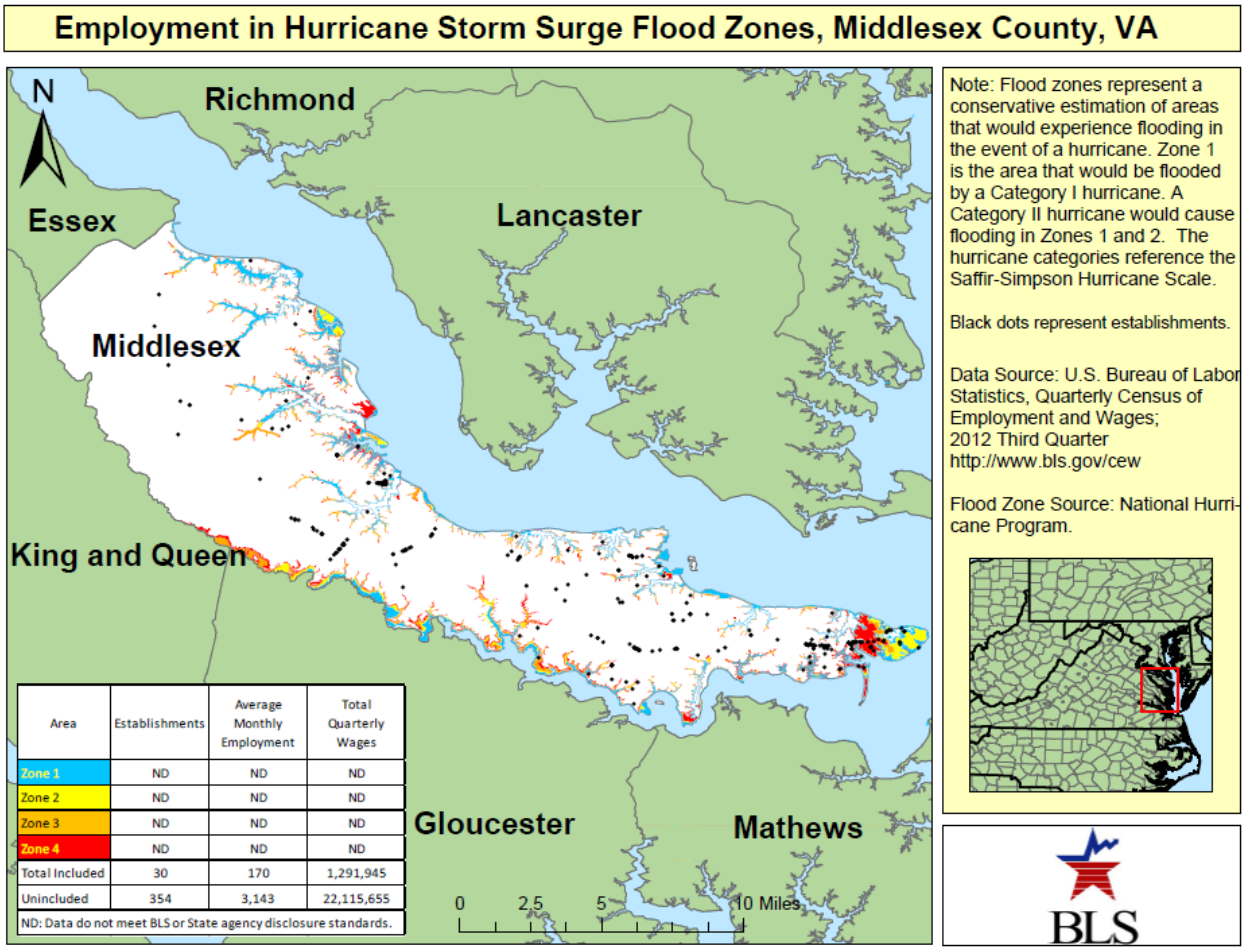
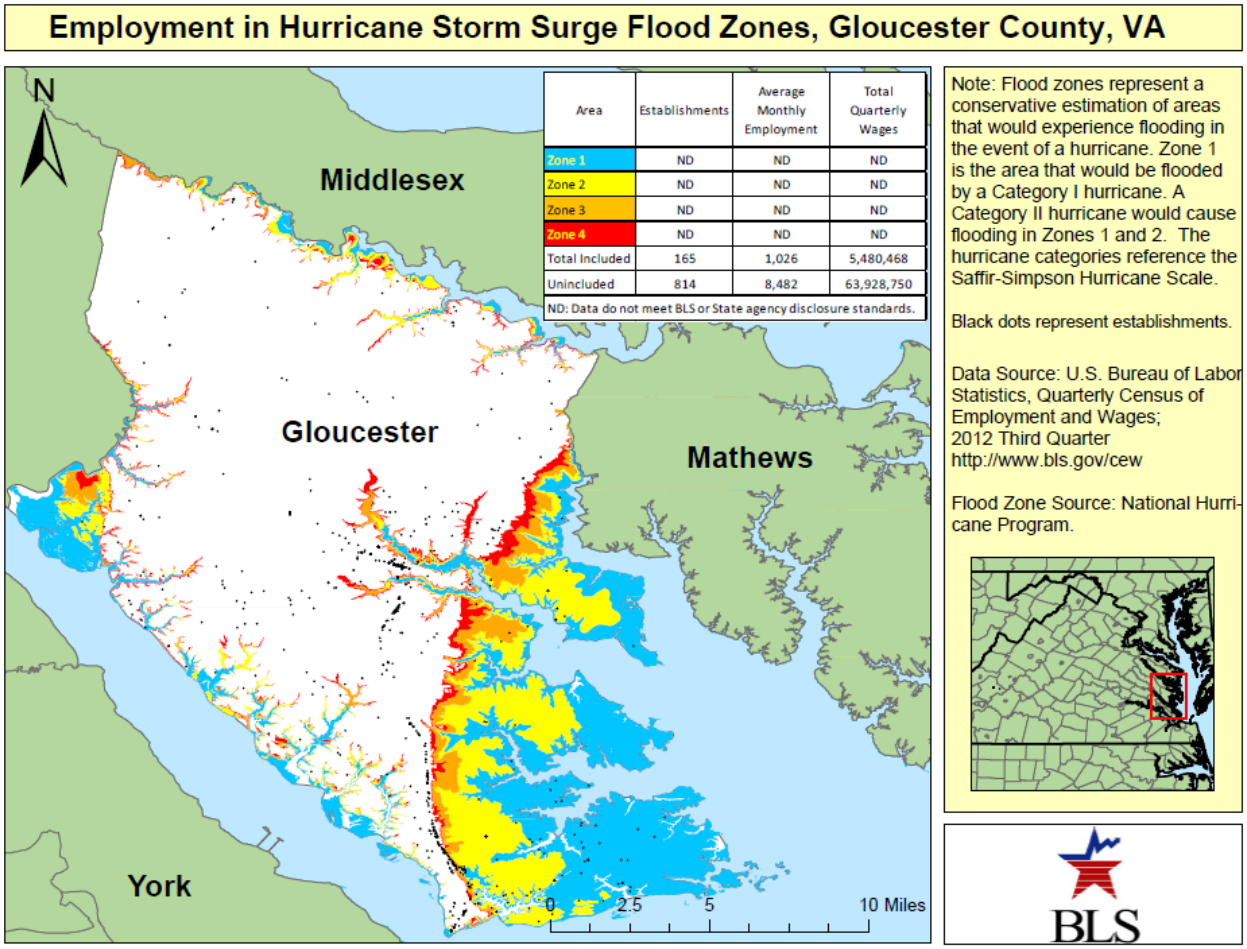


Figure 6: Employment in Hurricane Storm Surge Flood Zones in Gloucester County (BLS, 2012).



Therefore to minimize impacts, not only from hurricane storm surge, but from all other hazards indentified in this plan, local business leaders should anticipate, prepare, and plan for impacts and consider how to recover if such events occur.

Section 4 – Hazard Identification and Risk Assessment

To update this hazard identification section MPPDC staff engaged community partners as well as the general public concerning the nature of hazards that may potentially threaten the Middle Peninsula localities. A Local Planning Team (LPT) was created to provide local insight and expertise. The LPT identified hazards of the Middle Peninsula, how they should be prioritized as critical, moderately-critical and non-critical hazards, and they also decided that an in depth analysis was needed for critical hazards. Non- Critical and moderately hazards were not re-analyzed with the exception of recent occurrences due to their minimal impact.

Based on the Federal Guidelines [Disaster Mitigation Act of 2000, *§201.1(b)]*, the Hazards Identification and Risk Assessment (HIRA) is only focused on natural hazards and their impacts. It measures potential loss of life, personal injury, economic impairment, and property damage resulting from natural hazards that threaten the Middle Peninsula. The Middle Peninsula HIRA involved:

1. Hazard Identification,
2. Risk Assessment Analysis, and
3. Financial Loss Estimations.

4.1 Hazard Identification

The LPT first reviewed and evaluated the 2010 list of hazards that could potentially affect the Middle Peninsula and added four new hazards that they deemed to be of concern to the region (Table 2). However instead of just focusing on natural hazards the LPT decided to be inclusive of all hazards that may threaten Middle Peninsula localities.

Table 2: List of Hazards. *The LPT identified the following as hazards that may impact the region.*

• Hurricanes	• Earthquakes
• Ice Storms	• Shrink-swell Soils
• Tornadoes	• Extreme Cold
• Coastal Flooding/Nor-easters	• Extreme Heat
• Coastal/Shoreline Erosion	• Land Subsidence/Karst
• Sea Level Rise (added in 2010)	• Landslides
• Snow Storms	• Tsunamis
• Riverine Flooding	• Volcanoes
• Wildfires	• **Air Quality (added in 2016)**
• High Winds/Windstorms	• **HAZMAT (added in 2016)**
• Dam Failure	• **Ditch Flooding (added in 2016)**
• Droughts	• **Summer Storms (added in 2016)**
• Lightning	

Based on discussions had by the LPT, four new hazards were added to the list they have caused new concern to the region. More specifically the LPT agreed to add the following new hazards:

HAZMAT is carried by a number of vehicles throughout the region, and while the Commonwealth has a HAZMAT plan, local jurisdictions would be the first responders on scene if an accident/spill where to occur.

Ditch Flooding is a specific hazard that results in flooded roads during localized and widespread events in the whole region. This hazard specifically causes issues for first responders attempting to reach people in distress.

Summer Storms include straight line wind events and are a clearly defined natural hazard that can unexpectedly cause downed trees, power outages, etc. These storms are specific to the warmer months and are clearly different and separate from other storm events.

Air Quality is a hazard that affects many citizens, specifically those suffering from asthma. Developing an Air Quality alert system for our area would be beneficial.

In conjunction with the list of hazards, the LPT reviewed the 2010 prioritization (Table 3) of natural hazards as a result of utilizing the Hazards Vulnerability Tool worksheet provided by VDEM staff (originally designed to estimate medical center hazard and vulnerability by Kaiser Permanente).

Table 3: Prioritization Worksheet for Hazards on the Middle Peninsula *(2010 worksheet)*

MIDDLE PENINSULA HAZARD AND VULNERABILITY ASSESSMENT TOOL
NATURAL HAZARDS -- SUMMARY SHEET

EVENT	PROBABILITY	HUMAN IMPACT	PROPERTY AND FACILITY IMPACT	BUSINESS IMPACT	Mitigation Options	UNMITIGATED RISK	UNMITIGATED RANKING
	Likelihood this will occur	*Possibility of death or injury to public and responders*	*Physical losses and damages*	*COOP and Interruption of services*	*Pre-Planning*	*Relative Threat*	*Based only on probability and threat*
SCORE	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 - 100%	
Hurricanes	3	3	3	3	2	92%	
Winter Storms (Ice)	2	2	2	3	2	50%	
Tornados	2	2	2	2	2	44%	
Coastal Flooding	3	2	3	2	2	75%	
Coastal/Shoreline Erosion	3	1	2	1	2	50%	
Sea Level Rise	3	0	2	2	2	50%	
Winter Storm (Snow)	2	2	2	2	2	44%	
Wildfire	2	1	1	1	2	28%	
Riverine Flooding	2	2	1	1	2	33%	
High Wind/Windstorms	2	2	2	1	1	33%	
Dam Failure	2	1	1	1	2	28%	
Drought	2	0	1	2	2	28%	
Lightning	3	1	2	2	1	50%	
Earthquake	1	0	0	0	0	0%	
Shrink-Swell Soils	2	0	1	0	1	11%	
Extreme Cold	1	2	0	0	1	8%	
Extreme Heat	2	2	0	0	1	17%	
Landslides	1	0	0	0	0	0%	
Land Subsidence/Karst	1	0	0	0	0	0%	
Tsunami	1	0	0	0	0	0%	
Volcano	0	0	0	0	0	0%	
AVERAGE	2.27	1.27	1.67	1.53	1.67	25%	

**Threat increases with percentage.*

UNMITIGATED RISK=	PROBABILITY * IMPACT		
	0.25	0.63	0.39

KAISER PERMANENTE.

Modifications by:
Revised: 2/25/2010

Similar to the 2006 and 2010 updates, the LPT agreed to continue using the Kaiser Permanente Hazard Vulnerability Assessment Tool for this AHMP update. In doing so, this would provide a measure of continuity and consistency between the MPAHMPs. Therefore the emergency services coordinator/manager from each of the nine jurisdictions were asked to complete the vulnerably worksheet for their locality and turn it into the MPPDC Regional Emergency Preparedness Planner. Emergency services coordinators/managers evaluated each hazard based on five criteria to rank the hazards from highest to lowest priorities. The five categories included the probability based on past events, the potential impacts to structures, primary impacts (percentage of damage to a typical structure or industry in the community), secondary impacts (based on impacts to the community at large), and potential mitigation options. The definitions given in Table 4 were used as a standard for evaluation of all the hazards.

Table 4: Prioritization Criteria for Hazards on the Middle Peninsula

Probability - *Frequency of occurrence based on historical data of all potential hazards*

Level
- 0 Not Applicable
- 1 Unlikely (less than 1% occurrence: no events in the last 100 years)
- 2 Likely (between 1% and 10% occurrence: 1-10 events in last 100 years)
- 3 Highly Likely (over 10% occurrence: 11 events or more in last 100 years)

Affected Structures - *Number of Structures affected*

Level
- 0 Not Applicable
- 1 Small (limited to 1 building)
- 2 Medium (limited to 2-10 buildings)
- 3 Large (over 10 buildings)

Primary Impacts - *Based on percentage of damage to a typical structure or industry in the community*

Level
- 0 Not Applicable
- 1 Negligible (less than 3% damage)
- 2 Limited (between 3% and 49% damage)
- 3 Critical (more than 49% damage)

Secondary Impacts - *Based on impacts to the community at large*

Level
- 0 Not Applicable
- 1 Negligible (no loss of function, no displacement time, no evacuations)
- 2 Limited (some loss of function, displacement time, some evacuations)
- 3 Critical (major loss of loss of function, displacement time, major evacuations)

Mitigation Options - *Number of cost effective mitigation options*

Level
- 0 Not Applicable
- 1 Many (over 3 cost effective mitigation options)
- 2 Several (2-3 cost effective mitigation options)
- 3 Few (1 cost effective mitigation option)

After much consideration of the criteria, as well as consider of readily available data, local knowledge and observations the LPT re-ranked the hazards for this update. Table 5 provides the new ranking of the hazards.

Table 5: Prioritization worksheet for Hazards in the Middle Peninsula for the 2016 update.

MIDDLE PENINSULA HAZARD AND VULNERABILITY ASSESSMENT TOOL
NATURAL HAZARDS -- SUMMARY SHEET
Priority Worksheet for Hazards

EVENT						UNMITIGATED	
	PROBABILITY	HUMAN IMPACT	PROPERTY AND FACILITY IMPACT	BUSINESS IMPACT	Mitigation Options	RISK	RANKING
	Likelihood this will occur	*Possibility of death or injury to public and responders*	*Physical losses and damages*	*COOP and Interruption of services*	*Pre-Planning*	*Relative Threat*	*Based only on probability and threat*
SCORE	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 = N/A 1 = Low 2 = Moderate 3 = High	0 - 100%	
Winter Storms (Ice)	3	3	2	2	2	75%	1
Coastal Flooding	3	2	3	2	2	75%	1
Lightning	3	2	2	2	1	58%	2
Hurricanes	2	2	3	2	2	50%	3
Summer Storms	3	2	2	1	1	50%	3
Tornados	2	2	2	2	2	44%	4
Winter Storm (Snow)	2	2	2	2	2	44%	4
Coastal/Shoreline Erosion	2	2	2	1	2	39%	5
Wildfire	2	2	2	1	2	39%	5
Riverine Flooding	2	2	2	1	2	39%	5
Sea Level Rise	2	1	2	1	2	33%	6
High Wind/Windstorms	2	2	2	1	1	33%	6
HAZMAT	2	2	2	1	1	33%	6
Ditch Flooding	2	1	2	1	2	33%	6
Drought	2	1	2	1	1	28%	7
Extreme Cold	2	2	1	1	1	28%	7
Extreme Heat	2	2	1	1	1	28%	7
Dam Failure	1	1	1	1	1	11%	8
Earthquake	1	1	1	1	1	11%	8
Air Quality	1	1	1	1	1	11%	8
Shrink-Swell Soils	1	0	1	0	1	6%	9
Landslides	1	1	1	0	0	6%	9
Land Subsidence/Karst	1	0	0	0	0	0%	10
Tsunami	0	0	0	0	0	0%	10
Volcano	0	0	0	0	0	0%	10
AVERAGE	1.64	1.32	1.48	0.96	1.16	28%	

**Threat increases with percentage.*

UNMITIGATED RISK=		PROBABILITY * IMPACT	
	0.28	0.65	0.43

Spreadsheet developed by:

KAISER PERMANENTE

As an outcome of the reassessment and re-ranking of hazards, there were five hazards ranked as having the highest relative risk and thus considered **"Critical Hazards".** These five hazards include:

1. Winter Storms (Ice),
1. Coastal Flooding,
2. Lightning,
3. Hurricanes, and
3. Summer Storms.

The hazards considered **"Moderately Critical"** have historically occurred in the Middle Peninsula, yet ranked lower than the Critical Hazards in terms of risk during the hazard prioritization exercise. These Moderately-Critical hazards include:

4. Tornadoes,
4. Winter Storms (snow),
5. Coastal/shoreline Erosion,

5. Wildfires,
5. Riverine Flooding,
6. Sea Level Rise,
6. High Wind/Windstorms,
6. HAZMAT, and
6. Ditch Flooding.

Hazards considered **"Non-Critical"** have occurred very infrequently, or have not occurred at all – based on the available historical records. These hazards are not considered a widespread threat that would result in significant losses of property and life in the Middle Peninsula. These Non-Critical hazards included:

7. Drought,
7. Extreme Cold,
7. Extreme Heat,
8. Dam Failure,
8. Earthquake,
8. Air Quality,
9. Shrink-swell Soils,
9. Landside,
10. Land Subsidence / Karst,
10. Tsunami, and
10. Volcano.

4.2. Hazards Considered "Non-Critical" Hazards to the Middle Peninsula

The following section describes hazards that are uncommon throughout the Middle Peninsula region and deemed "Non-Critical" Hazards to the Middle Peninsula by the LPT.

4.2.1. Drought

Empirical studies conducted over the past century have shown that drought is never the result of a single cause. It is the result of many causes, often synergistic in nature, and therefore often difficult to predict more than a month or more in advance. In fact, an area may already be in a drought before drought is even recognized. The immediate cause of drought is the predominant sinking motion of air (subsidence) that results in compressional warming or high pressure, which inhibits cloud formation and results in lower relative humidity and less precipitation. Most climatic regions experience varying degrees of dominance by high pressure, often depending on the season. Prolonged droughts occur when large-scale anomalies in atmospheric circulation patterns persist for months or seasons (or longer). The extreme drought that affected the United States and Canada during 1988 resulted from the persistence of a large-scale atmospheric circulation anomaly (National Drought Mitigation Center, 2004).

There have been four major statewide droughts since the early 1900's (USGS, 2002). The drought of 1930-32 was one of the most severe recorded in the Commonwealth while the droughts of 1938-42 and 1962-71 were less severe; however, the cumulative stream flow deficit for the 1962-71 drought was the greatest of the droughts because of its duration. The drought of 1980-82 was the least severe and had the shortest duration. Tidewater Virginia experienced "Severe Drought" conditions during the drought of 2001-2002 when stream flow into Chesapeake Bay was only half the average annual flow into the Bay (Virginia State Climatology Office, 2002).

In 2007, seventeen counties fell into severe drought status as over $10 million in crop damages occurred in Southwest Virginia.

Virginia is one of 44 states that have implemented a Drought Plan. The goals of these plans are to reduce water shortage impacts, personal hardships, and conflicts between water and other natural resource users. These plans promote self-reliance by systematically addressing issues of principal concern. The National Drought Policy Commission's report to Congress and the president, "Preparing for Drought in the 21st Century" (available on-line at: http://www.fsa.usda.gov/drought/finalreport/fullreport/pdf/reportfull.pdf), emphasizes the need for drought planning at the state, local, federal, and tribal levels of government. While some state plans focus on mitigation strategies, Virginia's Plan emphasizes response strategies.

In a parallel effort, Middle Peninsula localities with the exception of Gloucester County, participated in the development of the Middle Peninsula Regional Water Supply Plan (MPRWSP) in 2009. Gloucester County participated in the development of the Hampton Roads Regional Water Supply Plan. Overall the water supply plans contain proposed strategies and polices that the localities can undertake to mitigate adverse affects of periodic droughts

As both the Regional Water Supply Plan and Drought Response plans focus on responding to drought, both plans should identify the role the jurisdiction's Emergency Services Coordinator/Manager will have with the locality's County Administrator/Town Manager during the implementation of both plans.

Drought Vulnerability

Drought is a phenomenon that, affects the Commonwealth on nearly an annual basis. Drought has several definitions, depending upon the impact. **Agricultural drought** is the most common form of drought, and is characterized by unusually dry conditions during the growing season. **Meteorological drought** is defined as an extended period (generally 6 months or more) when precipitation is less than 75 percent of normal during that period. If coincident with the growing season, agricultural and meteorological drought can occur simultaneously. In general, hydrologic drought is the most serious, and has the most wide reaching consequences. **Hydrologic drought** occurs due to a protracted period of meteorological drought, which reduces stream flows to extremely low levels ("Dry years" in Figure 7), and creates major problems for public (reservoir/river) and private (well) water supplies.

Extended periods of drought can impact crop and hay yields, and significant crop losses can result. The impact of meteorological drought can vary significantly depending upon dry years indicated by red bars the length of the dry period, the time of year the dry period occurs, the antecedent moisture conditions prior to the onset of the dry period, and the relative dryness (in percent of normal precipitation) of the period in question. Drought duration is highly variable by region. The duration also depends on when the precipitation is needed for such activities as planting and irrigation.

In addition to the primary impacts of drought, there are also secondary impacts that can increase the potential for other hazards to occur. Extended periods of drought can increase the risk of wildfire occurrences.

Specific impacts of drought to Middle Peninsula localities may be experienced differently. In particular economic losses may due to crop loss and water shortages.

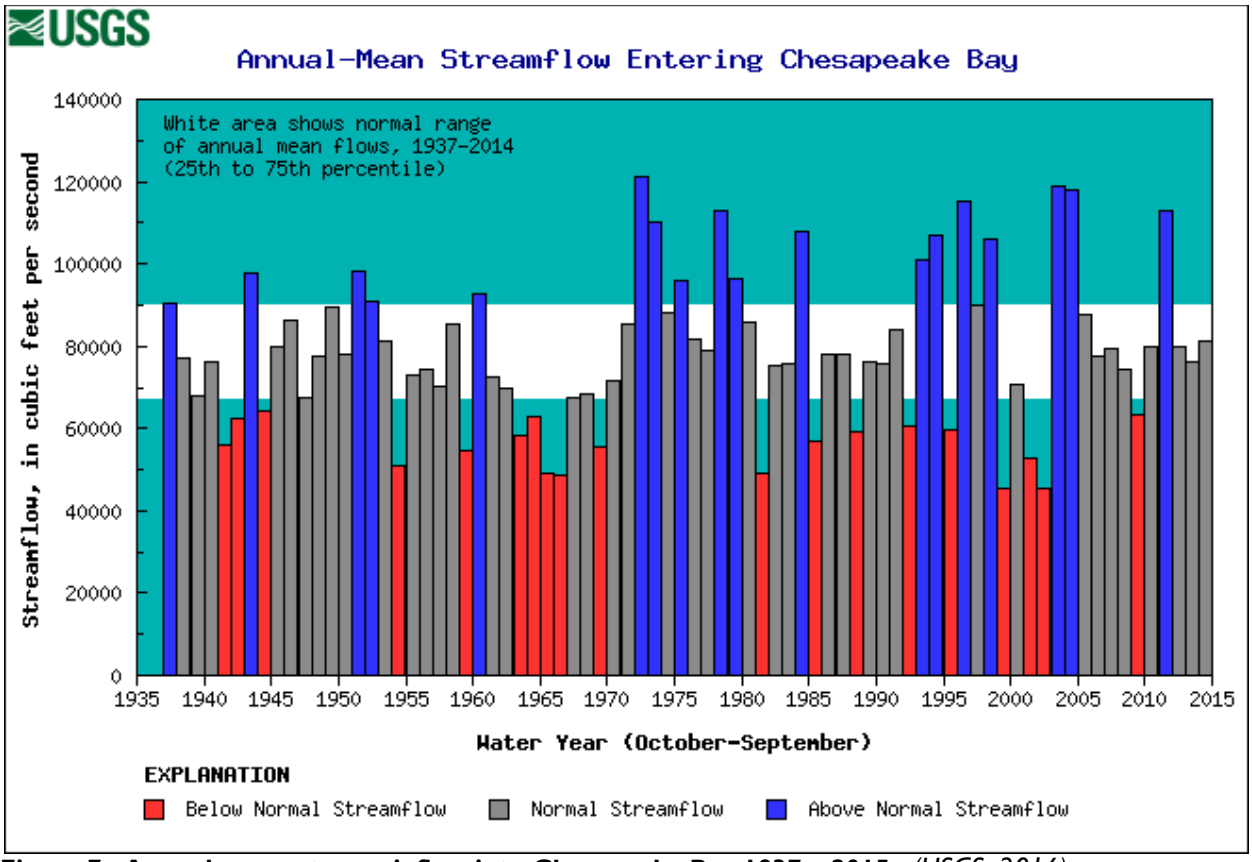


Figure 7: Annual mean stream inflow into Chesapeake Bay 1937 – 2015. *(USGS, 2016).*

Drought Extent (Impact)

To assist in identifying the severity of a drought event a classification system is utilized and will dictate public water restriction (Table 6). Notice that water restrictions start as voluntary and then become required as the severity of the drought increases.

Table 6: Drought Severity Classification

Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions

4.2.2. Extreme Cold and Extreme Heat

Extreme cold temperatures are not an annual event in Virginia. Although wind chill advisories are issued nearly every year, especially in Western and Northern portions of the state, life-threatening extreme cold,

requiring wind chill warnings, is a rare occurrence in the Middle Peninsula. The frequency of occurrence is dependent entirely upon the extreme cold criteria used - wind chill vs. air temperature. The primary impact of extreme cold is increased potential for frostbite, hypothermia, and potentially death because of over-exposure to extreme cold. Some secondary impacts of extreme/excessive cold may present a danger to livestock and pets, and frozen water pipes in homes and businesses.

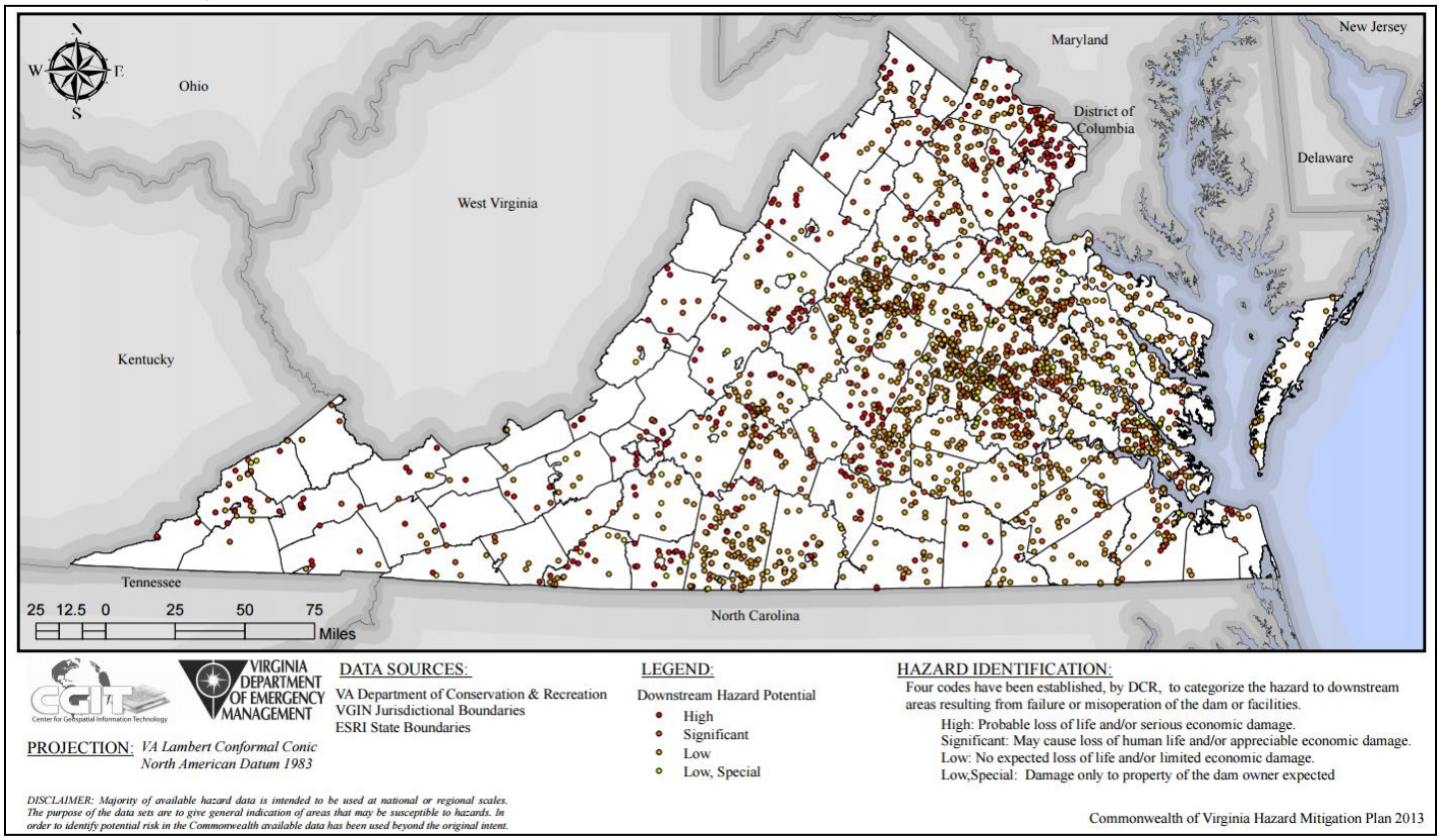
Extreme heat, generally associated with drought conditions, is a phenomenon that is generally confined to the months of July and August, although brief periods of excessive heat have occurred in June and September. Extreme heat can be defined either by actual air temperature, or by the heat index, which relates the combined effects of humidity and air temperature on the body. Extreme heat is not an annual event in the Middle Peninsula. Although heat advisories are issued near every year, especially in the urban areas of Northern Virginia, life-threatening extreme heat is a rare occurrence in the Middle Peninsula region. The frequency of occurrence is dependent entirely upon the extreme heat criteria used (i.e. heat index vs. air temperature). The primary impact of extreme heat is increased potential for hyperthermia, which can be fatal to the elderly and infirmed. In addition, there is an increased risk of dehydration, if proper steps are not taken to ingest adequate amounts of non-alcoholic fluids. The impact of extreme heat is most prevalent in urban areas, which are not found in the Middle Peninsula. Secondary impacts of excessive heat are severe strain on the electrical power system, and potential brownouts or blackouts.

Specific impacts to Middle Peninsula localities will vary due to extreme cold and extreme heat.

4.2.3. Dam Failure

Since the last plan, the Virginia Department of Conservation and Recreation (DCR) created an inventory of dams throughout the Commonwealth. According to DCR data there are approximately 2,406 dams within the Commonwealth and approximately 101 in the Middle Peninsula (Table 7). Figure 8 provides a map of dam locations and their associated hazard potentials.

Figure 8: Dam locations and associated hazard potential *(Source: Commonwealth of Virginia Hazard Mitigation Plan, 2013).*



Dam Failure Extent (Impacts)

As failure of dams may result in a localized major impact, including loss of human life, economic loss, lifeline disruption, and environmental impact such as destruction of habitat, there are also secondary impacts including flooding to the surrounding areas. Thus a scale has been developed to classify the hazard potentials of dams due to their overall impact to a given area:

- **High** – dams that upon failure would cause probable loss of life or serious economic damage.
- **Significant** – dams that upon failure might cause loss of life or appreciable economic damage.
- **Low** – dams that upon failure would lead to no expected loss of life or significant economic damage. This classification includes dams that upon failure would cause damage only to property of the dam owner. **Special criteria** – includes dams that upon failure would cause damage only to property of the dam owner.

Table 7: Inventory of dams within the Middle Peninsula and their risk classification.						
County	**High**	**Significant**	**Low**	**Low, Special**	**Unknown**	**Total # of Dams**
Essex	0	1	15	1	0	17
Gloucester	1	3	6	1	0	11
King and Queen	0	6	8	7	1	22
King William	1	8	23	4	0	36
Mathews	0	0	0	0	0	0
Middlesex	0	2	11	2	0	15
TOTAL	2	20	63	15	1	101

Dam Failure Vulnerability

Dams are classified with a hazard potential depending on the downstream losses estimated in event of failure. The recent regulatory revisions bring Virginia's classification system into alignment with the system already used in the National Inventory of Dams maintained by the U.S. Army Corps of Engineers. Hazard potential is not related to the structural integrity of a dam but strictly to the potential for adverse downstream effects if the dam were to fail. Regulatory requirements, such as the frequency of dam inspection, the standards for spillway design, and the extent of emergency operations plans, are dependent upon the dam classification. The owner of each regulated Class I, II, and III dam is required to apply to the Soil and Water Conservation Board for an operation and maintenance certificate.

The Virginia DCR Division of Dam Safety's mission is to conserve, protect, enhance, and advocate the wise use of the Commonwealth's unique natural, historical, recreational, scenic and cultural resources. The program's purpose is to provide for safe design, construction, operation, and maintenance of dams to protect public safety. Disaster recovery programs include assistance to dam owners and local officials in assessing the condition of dams following a flood disaster and assuring the repairs and reconstruction of damaged structures are compliant with the National Flood Insurance Program (NFIP) regulations.

For those dam failures that pose a risk when there are large potential areas with large populations surrounding dams. On-going dam inspections and Virginia's participation in the National Dam Safety Program maintained by FEMA and the U.S. Army Corps of Engineers serve as preventative measures against dam failures.

Most dam failures occur due to lack of maintenance of dam facilities in combination with excess precipitation events, such as hurricanes and thunderstorms. During Hurricane Floyd in 1999, floods broke open at least 12 unregulated dams in eastern Virginia. One of those failures, at the Cow Creek Dam near Gloucester Courthouse, temporarily closed state Route 14; No one was hurt. Rebuilding the dam cost about $160,000 (U.S. Water News Online, 2002). During Tropical Storm Gaston in late summer of 2004, a dam was overtopped in King William County and caused a washout of Route 610 between Rt. 608 and Rt. 609. The road was closed to traffic for several weeks (VDOT, 2004).

Each Middle Peninsula locality, with the exception of Mathews County, has dams and therefore vulnerable to dam failure. However the degree of vulnerability and impact will vary between the localities if a dam failure occurs. For instance Gloucester County may experience the most impact from a failure at Beaver Dam as it is the largest in the region. The 39' high dam structure, covers approximately 635 acres of land, and is in close proximity to the Gloucester County Courthouse area which is a main residential and business corridor for the County. This increases the potential of economic loss.

Dam Impoundments
In 2001, Virginia's legislature broadened the definitions of "impounding structure" to bring more dams under regulatory oversight. On February 1, 2008, the Virginia Soil and Water Conservation Board approved major revisions to the Impounding Structure Regulations in the Virginia Administrative Code, changing the dam hazard potential classification system, modifying spillway requirements, requiring dam break inundation zone modeling, expanding emergency action plan requirements, and making a variety of other regulatory changes.

All dams in Virginia are subject to the Virginia Dam Safety Act and Dam Safety Regulations unless specifically excluded. A dam is excluded from these regulations if it meets one or more of the following criteria:

1. is less than 6 feet high,
2. has a maximum capacity of less than 50 acre-feet and is less than 25 feet in height,
3. has a maximum capacity of less than 15 acre-feet and is more than 25 feet in height,
4. is used primarily for agricultural purposes and has a maximum capacity of less than 100 acre-feet or is less than 25 feet in height (if the use or ownership changes, the dam may be subject to the Dam Safety Regulations),
5. is owned or licensed by the federal government,
6. is operated for mining purposes under 45.1-222 or 45.1-225.1 of the Code of Virginia, or
7. is an obstruction in a canal used to raise or lower water levels.

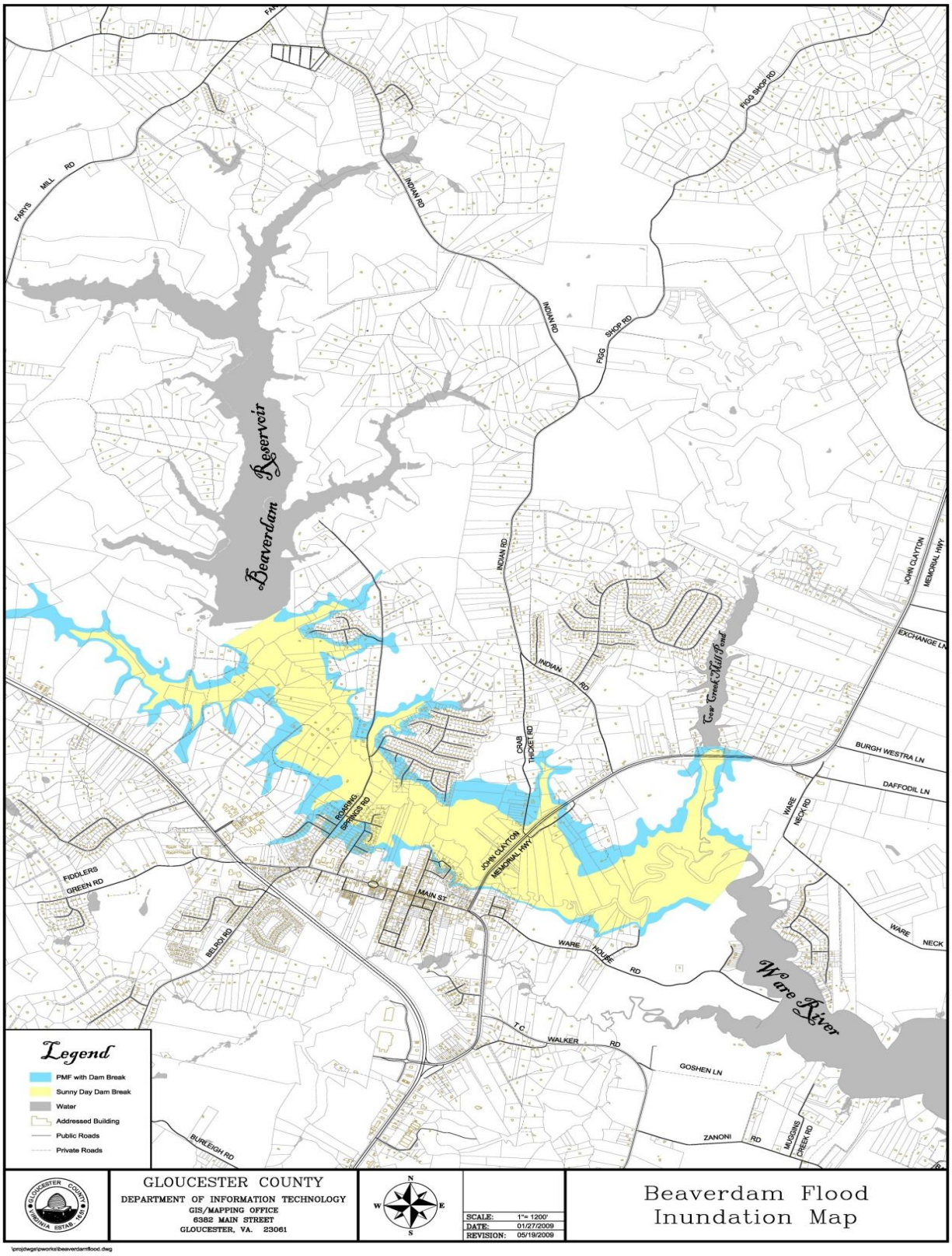
The height of the dam is defined as the vertical distance from the streambed at the downstream toe to the top of the dam. The maximum capacity of a dam is defined as the maximum volume capable of being impounded at the top of the dam.

The DCR – Division of Dam Safety is the state agency responsible for enforcing the Virginia Dam Safety Act and overseeing the issuance of Operation and Maintenance Certificates for regulated dams.

Beaverdam Reservoir Dam – Gloucester, County
The Beaverdam Reservoir, located to the north of the Gloucester Courthouse area, is contained by a 39' high dam structure and covers approximately 635 acres of land. The reservoir is primarily surrounded by land zoned for low density development and there is a 300' by 600' buffer area surrounding this water impoundment. The property is owned by Gloucester County and it is an actively used local recreational site known as Beaverdam Park as well as a drinking water source for Gloucester County residents.

Figure 9 shows areas shaded in yellow and blue that would be inundated if the reservoir dam were to fail. According to Gloucester County officials, these shaded areas represent 405 homes just north of the Gloucester Courthouse Complex and the downtown business district that would be inundated if the dam were to fail.

Figure 9: Beaverdam. *Flood Inundation Map (Source: Gloucester County)*



Lake Anna Dam
The Lake Anna Dam, located near Mineral in Louisa County, Virginia, creates an impoundment with a surface area of approximately 13,000 acres. Periodic major water releases from Lake Anna flow into the Pamunkey River which can have adverse affects on river levels during major releases.

Depending on the amount of water released by the dam owner, Dominion/Virginia Power Company, a potential flooding hazard exists for King William County residents, which would include flooding of low-lying agricultural land, some roads, threes (3) bridges along these roads, a scattering of residences and some agricultural structures.

4.2.4. Earthquakes
An earthquake is a sudden movement or trembling of the Earth, caused by the abrupt release of strain that has accumulated over a long time. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface slowly move over, under, and past each other. Sometimes the movement is gradual; at other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free and result in an earthquake (Shedlock and Pakister, 1997). If the earthquake occurs in a populated area, it may cause deaths, injuries, and extensive property damage.

Earthquake Vulnerability
During an earthquake when the ground is shaking, it experiences acceleration. The peak acceleration (PA) is the largest acceleration recorded by a particular station during an earthquake (expressed as %g). When acceleration acts on a physical body, the body experiences the acceleration as a force. The force we are most experienced with is the force of gravity, which causes us to have weight. Units of acceleration are measured in terms of g, the acceleration due to gravity. For example, an acceleration of 11 feet per second per second is 11*12*2.54 = 335 cm/sec/sec. The acceleration due to gravity is 980 cm/sec/sec, so an acceleration of 11 feet/sec/sec is about 335/980= 0.34 g. Expressed as a percent; 0.34 g is 34 %g.

The United States Geological Survey (USGS) rates the susceptibility of areas of the United States to earthquakes and has published risk maps, which give the probability of various levels of ground motion being exceeded in 5 years. An approximate threshold for shaking that causes building damage (for pre-1965 dwellings or dwellings not designed to resist earthquakes) is 10 %g. According to USGS predictions, the Middle Peninsula is located within the 1-2%g, 2-3%g and 3-4%g contour lines (Figure 10).

Historical data is supportive of this low risk assessment. Virginia has had over 160 earthquakes since 1977 of which 16% were felt (Stover and Coffman, 1993). This equates to an average of one earthquake occurring every month with two felt each year. Figure 11 depicts the historical earthquake epicenters in and near Virginia from 1568 through 2011. The largest earthquake in Virginia was a magnitude 5.8 earthquake in Giles County in 1897. This earthquake was the third largest in the eastern US in the last 200 years was felt in twelve states. Based on the map there were no earthquake epicenters recorded within the area of the Middle Peninsula. However in 2011 a 5.8 earthquake in Mineral, Virginia was felt in the Middle Peninsula region and causes damages according to VDEM (Figure 12).

Depending on the epicenter of the earthquake Middle Peninsula localities may experience varying impacts. According to the USGS (2015) the eastern most portions of Mathews and Gloucester County have a lower chance of being impacted by earthquakes.

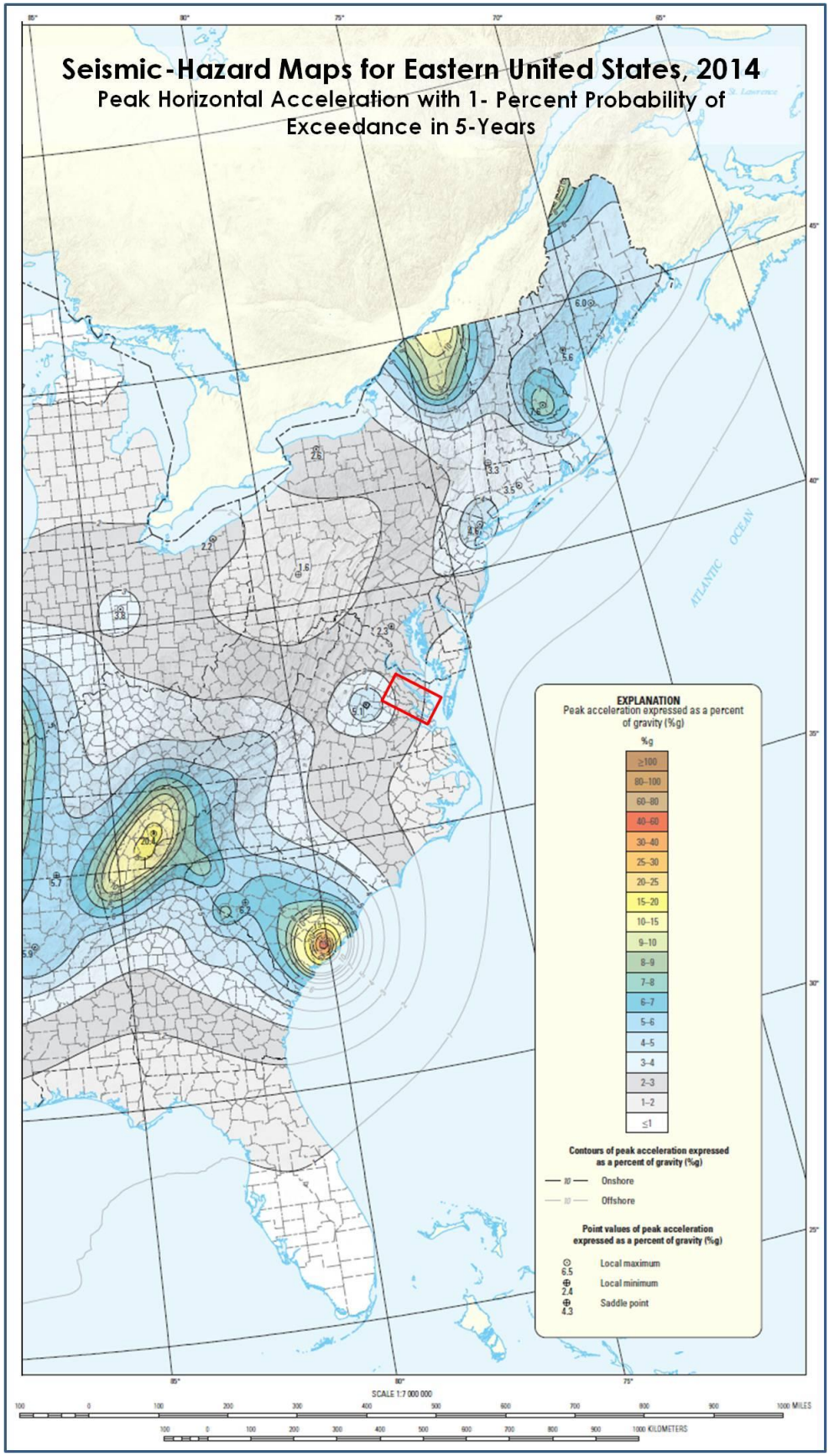


Figure 10: Seismic- Hazard Map of the Eastern United States. *Predicted earthquake hazards are depicted by contour values of earthquake ground motions that have a 1% probability if being exceeded in 5 years. The Middle Peninsula of Virginia (hi-lighted by the red square on the map) falls within the 1-2%g, 2-3%g and 3-4%g contour. Image courtesy of Petersen, et. al. with USGS (2015)*

Figure 11: Significant Earthquakes 1568 – 2011 - *Historical earthquake epicenters in and near Virginia from 1568 through 2011. The Middle Peninsula of Virginia (highlighted by the red square on the map) is void of any historic earthquake epicenters (Source: Commonwealth of Virginia Hazard Mitigation Plan 2013).*

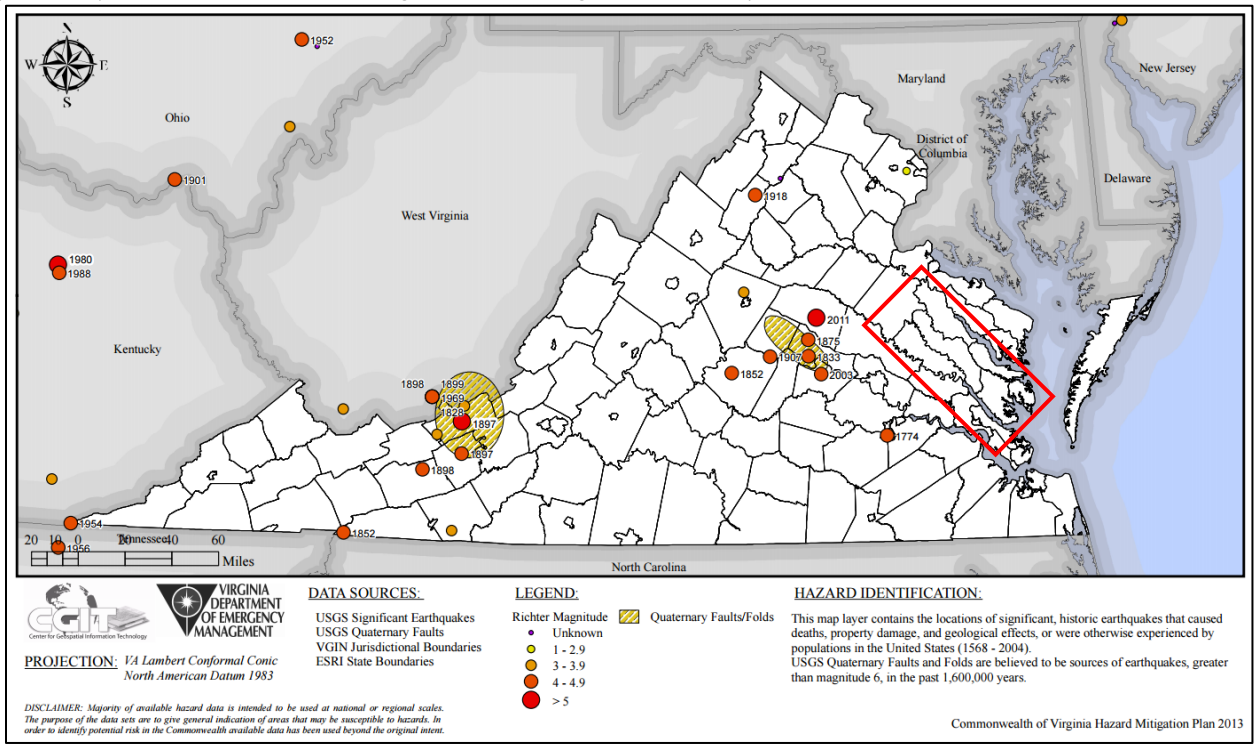
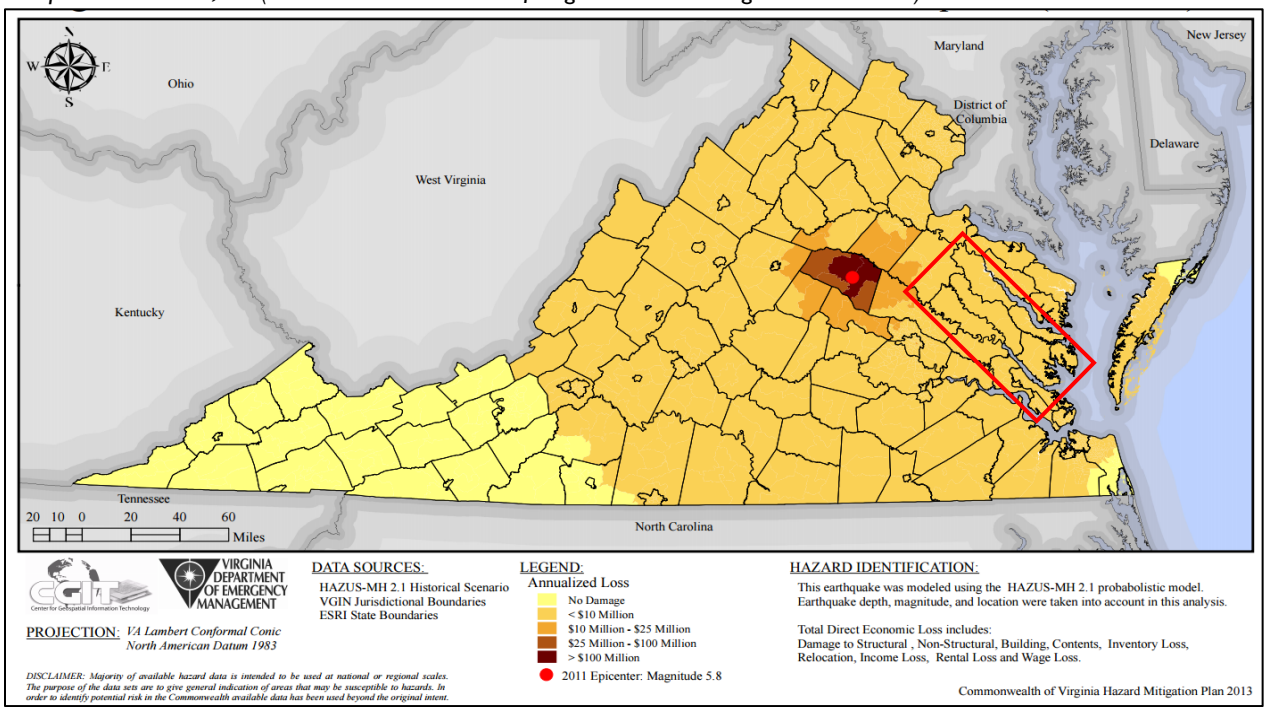


Figure 12: Total loss from 2011 Mineral, VA Earthquake (HAZUS). *The Middle Peninsula of Virginia (highlighted by the red square) is void of any historic earthquake epicenters, however endured losses as a result of impact from the 2011 earthquake in Mineral, VA (Source: Commonwealth of Virginia Hazard Mitigation Plan 2013).*



Earthquake Extent (Impact)

The severity of an earthquake can be expressed in terms of both intensity and magnitude. However, the two terms are quite different, and they are often confused. Intensity is based on the observed effects of ground shaking on people, buildings, and natural features. It varies from place to place within the disturbed region depending on the location of the observer with respect to the earthquake epicenter. Magnitude is related to the amount of seismic energy released at the hypocenter of the earthquake. It is based on the amplitude of the earthquake waves recorded on instruments which have a common calibration. The magnitude of an earthquake is thus represented by a single, instrumentally determined value.

Earthquake severity is commonly measured on two different scales: the Modified Mercalli Intensity scale and the Richter Magnitude scale. The following provides ranking and classification definitions for the two scales (Table 8).

Table 8: Ranking and classification definitions for two scales that measure earthquake severity.

Richter Magnitude Scale	Modified Mercalli Intensity Scale
1.0 to 3.0	I
3.0 to 3.9	II to III
4.0 to 4.9	IV to V
5.0 to 5.9	VI to VII
6.0 to 6.9	VII to IX
7.0 and Higher	VIII or Higher
Defined Modified Mercalli Intensity Scale Rating	
I	Not Felt except by a very few under especially favorable conditions
II	Felt only by a few persons at rest, especially on upper floors of buildings
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors, disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

4.2.3. Air Quality

Good air quality is taken for granted by most of the citizens of the Middle Peninsula of Virginia. However there are natural and human-caused factors that may influence the air quality within the region.

First emissions from human activity can influence overall air quality within the region. From vehicle emissions to local businesses (ie. industry), Virginia Department of Environmental Quality (DEQ) Air Division's monitors and regulates emissions as they responsible for carrying out the mandates of the Virginia Air Pollution Control Law as well as the Federal obligations under the Clean Air Act on behalf of the State Air Pollution Control Board. For local industry, DEQ issues air quality permits to regulate emitted pollutants to ensure that these emissions do not cause harm to the public or the environment. Each year DEQ will compile an inventory of criteria pollutants air emissions from point, area, mobile and biogenic sources (ie. natural sources, from vegetation and soils as well as other relevant sources include volcanic emissions, lightning, and sea salt). Table 9 displays the most recent 2013 Point Source Criteria Pollutant Emissions Report for Middle Peninsula localities.

Table 9: 2013 Point Source Emissions Inventory. *DEQ periodically compiles an inventory of criteria pollutant air emissions from point, area, mobile, and biogenic sources in the state. Point source emissions are inventoried annually (DEQ, 2014).*

County	Plant Name	Emissions (tons)							
		NH_3	NO_2	Pb	PM 10	PM 2.5	SO_2	VOC	Plant Total
Essex	Tidewater Lumber				35.55	35.55			71.11
Essex	June Parker Oil Co Inc							2.31	2.31
Essex	FDP Brakes of Virginia		1.80		2.64	2.64	0.00	14.83	22.14
Essex	Perdue Foods LLC - Tappahannock/Essex		0.75		16.06	15.51	0.00	0.03	32.45
Essex	Essex Concrete Corporation - Tappahannock				0.46	0.46			0.93
Essex	O'Malley Timber Products, Inc.	0.00	9.96		16.24	7.70	1.13	26.82	89.02
Gloucester	Rappahannock Concrete White Marsh		0.02		0.36	0.36	0.04	0.00	0.79
Gloucester	Philips Energy Inc							5.91	5.91
Gloucester	Riverside Walter Reed Hospital	0.04	0.74	0.00	0.09	0.08	0.24	0.01	1.39
Gloucester	Rappahannock Concrete Saluda				0.27	0.27			0.54
Gloucester	Canon Environmental Technologies Incorporated				27.80	27.80			55.59
Gloucester	Middle Peninsula Landfill		109.27		17.73	17.08	4.69	15.25	368.33
Gloucester	C. W. Davis Asphalt Division				0.14	0.14			0.29
Gloucester	Hogg Funeral Home				0.01	0.01			0.04
Gloucester	Contract Crushing/Construction Inc		0.00		0.06	0.06		0.00	0.13
Gloucester	Branscome Incorporated - Gloucester				0.36				0.36
Gloucester	Mid Atlantic Materials Incorporated - Gloucester				2.28	0.41			2.69
Gloucester	Shadow Farms Animal Cremation Services Inc		0.00		0.00				0.00
King and Queen	Ball Lumber Company Incorporated		9.42	0.00	24.77	11.25	1.07	45.72	117.92
King and Queen	Bennett Mineral Company Inc		2.87	0.00	1.07	0.99	1.13	1.36	57.30
King and Queen	Essex Concrete Corporation - Aylett				6.28	6.28			12.56
King and Queen	BFI King and Queen Landfill		24.21		10.45	7.42	6.19	18.05	146.98
King and Queen	INGENCO - King and Queen		96.87		57.45	57.45	0.17	76.12	407.41
King and Queen	Helena Chemical Company - Portable 52353				0.12	0.11		0.00	0.22
King William	West Point Veneer LLC	0.00	5.28	0.00	10.13	10.13	0.27	36.24	71.76

County	Plant Name	Emissions (tons)							
		NH_3	NO_s	Pb	PM10	PM 2.5	SO_2	VOC	Plant Total
King William	Trible-Perry Oil Co/PAPCO Oil Co.							3.85	3.85
King William	RockTenn CP LLC - West Point	64.45	1717.38	0.14	489.52	455.36	814.68	599.83	5524.43
King William	Old Dominion Grain		2.18	0.00	18.04	3.13	0.00	0.06	23.77
King William	Augusta Wood Products LC - Sawmill		1.28	0.00	11.62	11.62	0.25	14.51	48.55
King William	NPPC King William		45.16		38.25	38.25	0.23	1.02	138.97
King William	West Point Chips Incorporated				40.43	40.43			80.85
King William	Aggregate Industries MAR - Mattaponi Plant				0.12	0.12			0.24
King William	Powerhouse Equipment and Engineering Co Inc		0.00		0.00		0.00	0.00	0.00
King William	Cross Land Harbour LLC				0.43	0.43			0.86
King William	Powerhouse Equipment and Enginrng - Portable 52322		11.20		0.56		3.98		18.54
King William	Gillies Creek Recycling Center - Portable 52420		4.90		1.19		0.32	0.08	7.40
King William	Vincent Funeral Home - West Point		0.00		0.00		0.00	0.00	0.00
Mathews	Wroten Oil Company							2.67	2.67
Middlesex	J T and C A Thrift Incorporated							2.01	2.01
Total Regional Admissions		**64.49**	**2043.29**	**0.15**	**830.5**	**751.05**	**834.4**	**866.65**	**866.65**

**Note: Blank squares within the table indicate that there are no emissions to be measured.

NH_3 – Ammonia; **NO_2**- Nitrogen dioxide; **Pb** – Lead; **PM 10** –particulate matter 10 micrometers or less in diameter; **PM 2.5** – particulate matter 2.5 micrometers or less in diameter, generally described as fine particles; **SO_2**- Sulfur dioxide; **VOC**- Volatile organic compound

With the passing of the Clean Air Act in 1970 and then amendments in 1990, the US Congress required DEQ to enhance the vehicle emissions inspection program in order to keep improving air quality and to reduce emission further. In response Virginia now requires the inspection of vehicles operating in the counties of Arlington, Fairfax, Loudoun, Prince William, Stafford and the Cities of Alexandria, Fairfax, Falls Church, Manassas and Manassas Park. Vehicle emission contain pullulates that contribute to the formation of ozone, the main component of smog that builds up at ground level in hot sunny weather and may impact water quality in the Chesapeake Bay and its tributaries (ie. through atmospheric deposition).

In conjunction with emissions caused by humans there are natural, such as forest fires and controlled burns, may cause the air quality to deteriorate and become unsafe, especially for those who suffer medical conditions that make them sensitive to poor air quality. As a rural region of Virginia, the Middle Peninsula landscape is dominated by fields and forests. To properly manage these resources, property owners may carry out prescribed burning, a deliberate use of fire under specified and controlled conditions to achieve a resource management goal. Benefits including:

- site preparation for reforesting,
- hardwood control in pine stands,
- wildfire hazard reduction,
- improved wildlife habitat, and
- threatened and endangered species management.

According to the VDOF: *Products from the combustion of forest fuels are mainly carbon-containing compounds. The most important pollutants being particulate matter and carbon monoxide (CO).*

Two products of complete combustion are carbon dioxide (CO2) and water, these make up over 90% of the total emissions. Under ideal conditions it takes 3.5 tons of air to completely burn 1 ton of fuel. The combustion of 1 ton

of fuel will produce the following:

Carbon dioxide (CO2)	*2,000 to 3,500 lbs*
Water Vapor	*500 to 1,500 lbs*
Particulate Matter	*10 to 2000 lbs*
Carbon Monoxide (CO)	*20 to 500 lbs*
Hydrocarbons	*4 to 40 lbs*
Nitrogen Oxides	*1 to 9 lbs*
Sulfur Oxide	*Negligible amounts*

To assist with the management of the smoke generated from prescribed burning, the VDOF has developed voluntary smoke management guidelines to lessen the public health and welfare impacts (www.dof.virginia.gov/resources/fire/prescribed-fire-smoke-mgmt.pdf). In additional to prescribed burns there are also unplanned forest fires that would impact the region's air quality. For instance, on August 4, 2011, a lightning strike caused a fire in the Great Dismal Swamp that kept smoldering for 111 days. This impacted air quality impacted Southern Virginia, Middle Peninsula Localities as well as northward across Virginia and as far as Annapolis, Maryland. Wind currents over the Chesapeake Bay provided a channel for the ash-heavy smoke to travel north and caused a CODE ORANGE (See Table 10 below) for most of coastal Virginia.

Each locality within the Middle Peninsula will have varying vulnerability to air quality impacts. Localize events (i.e. wildfires, emissions for business, etc.) as well as wind currents may influence air quality within a given area.

Air Quality Extent

To monitor and assess daily air quality, the Environmental Protection Agency (EPA) has established the Air Quality Index (AQI). This scale determines how clean or polluted the air is and its impacts on human health. Based on a 0-500 scale, the higher the AQI value the greater the level of air pollutions and the greater the health concern. Table 10 identifies the AQI levels of health concern, the associated numerical value and the meaning:

Table 10: AQI Scale. *AQI levels and associated numerical values and meaning of the index (AirNow, 2015).*

Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	Air Quality is considered satisfactory, and air pollution poses little or no risk
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensible groups may experience more serious health effects
Very Unhealthy	201 to 300	Health warning of emergency conditions. The entire population is more likely to be affected.
Hazardous	301 to 500	Health alert: everyone may experience more serious health effects

Based on this scale the EPA will calculate daily AQI number for each of the five major air pollutants regulated by the Clean Air Act, including ground ozone, particle pollution, carbon dioxide, sulfur dioxide, and nitrogen dioxide (Table 11).

Table 11: Description of regulated pollutants *(AirNow, 2015))*.

Pollutant	Description
Ozone (O_3)	Ozone is a form of oxygen with three atoms instead of the usual two atoms. It is a photochemical oxidant and, at ground level, is the main component of smog. Unlike other gaseous pollutants, ozone is not emitted directly into the atmosphere. Instead, it is created in the atmosphere by the action of sunlight on volatile organic compounds and nitrogen oxides. Higher levels of ozone usually occur on sunny days with light winds, primarily from March through October. An ozone exceedance day is counted if the measured eight-hour average ozone concentration exceeds the standards.
Carbon Monoxide (CO)	Carbon Monoxide (CO) is a colorless, odorless, very toxic gas produced by the incomplete combustion of carbon-containing fuels, most notably by gasoline powered engines, power plants, and wood fires. CO can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues. At extremely high levels, CO can cause death.
Sulfur Dioxide (SO_2)	Sulfur dioxide (SO_2) is one of a group of highly reactive gasses known as "oxides of sulfur." The largest sources of SO_2 emissions are from fossil fuel combustion at power plants (73%) and other industrial facilities (20%). Smaller sources of SO_2 emissions include industrial processes such as extracting metal from ore, and the burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment. SO_2 is linked with a number of adverse effects on the respiratory system.
Nitrogen Dioxide (NO_2)	Nitrogen dioxide (NO_2) is one of a group of highly reactive gasses known as "oxides of nitrogen", or "nitrogen oxides (NO_x)". Other nitrogen oxides include nitrous acid and nitric acid. While EPA's National Ambient Air Quality Standard covers this entire group of NO_x, NO_2 is the component of greatest interest and the indicator for the larger group of nitrogen oxides. NO_2 forms quickly from emissions from cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level ozone and fine particle pollution, NO_2 is linked with a number of adverse effects on the respiratory system.
Particulate Matter (PM-2.5 PM-10)	Particle pollution (also called particulate matter or PM) is the term for a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small, they can only be detected using an electron microscope. Particle pollution includes *inhalable coarse particles*, with diameters larger than 2.5 micrometers and smaller than 10 micrometers and *fine particles*, with diameters that are 2.5 micrometers and smaller. How small is 2.5 micrometers? Think about a single hair from your head. The average human hair is about 70 micrometers in diameter -- making it 30 times larger than the largest fine particle. These particles come in many sizes and shapes and can be made up of hundreds of different chemicals. Some particles, known as *primary particles*, are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks or fires. Others form in complicated reactions in the atmosphere of chemicals such as sulfur dioxides and nitrogen oxides that are emitted from power plants, industries and automobiles. These particles, known as *secondary particles*, make up most of the fine particle pollution in the country. Coarse particulates (PM-10) come from sources such as windblown dust from the desert or agricultural fields (sand storms) and dust kicked up on unpaved roads by vehicle traffic. PM-10 data is the near real-time measurement of particulate matter 10 microns or less in size from the surrounding air. This measurement is made at standard conditions, meaning it is corrected for local temperature and pressure. Fine particulates (PM-2.5) are generally emitted from activities such as industrial and residential combustion and from vehicle exhaust. Fine particles are also formed in the atmosphere when gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds, emitted by combustion activities, are transformed by chemical reactions in the air. Large-scale agricultural burning or sand storms can produce huge volumes of fine particulates. PM-2.5 data is the near real-time measurement of particulate matter 2.5 microns or less in size from the surrounding air. This measurement is made at local conditions, and is not corrected for temperature or pressure.

AirNow.com provides a daily air quality forecast for select regions of Virginia including Hampton Roads, Northern Virginia, Richmond, Roanoke, Shenandoah National Park and Winchester. This site also provides calendars of air quality nationally as well as at the state level (Figure 13 & 14).

Figure 13: Calendar of air quality *throughout across the nation (AirNow, 2015).*

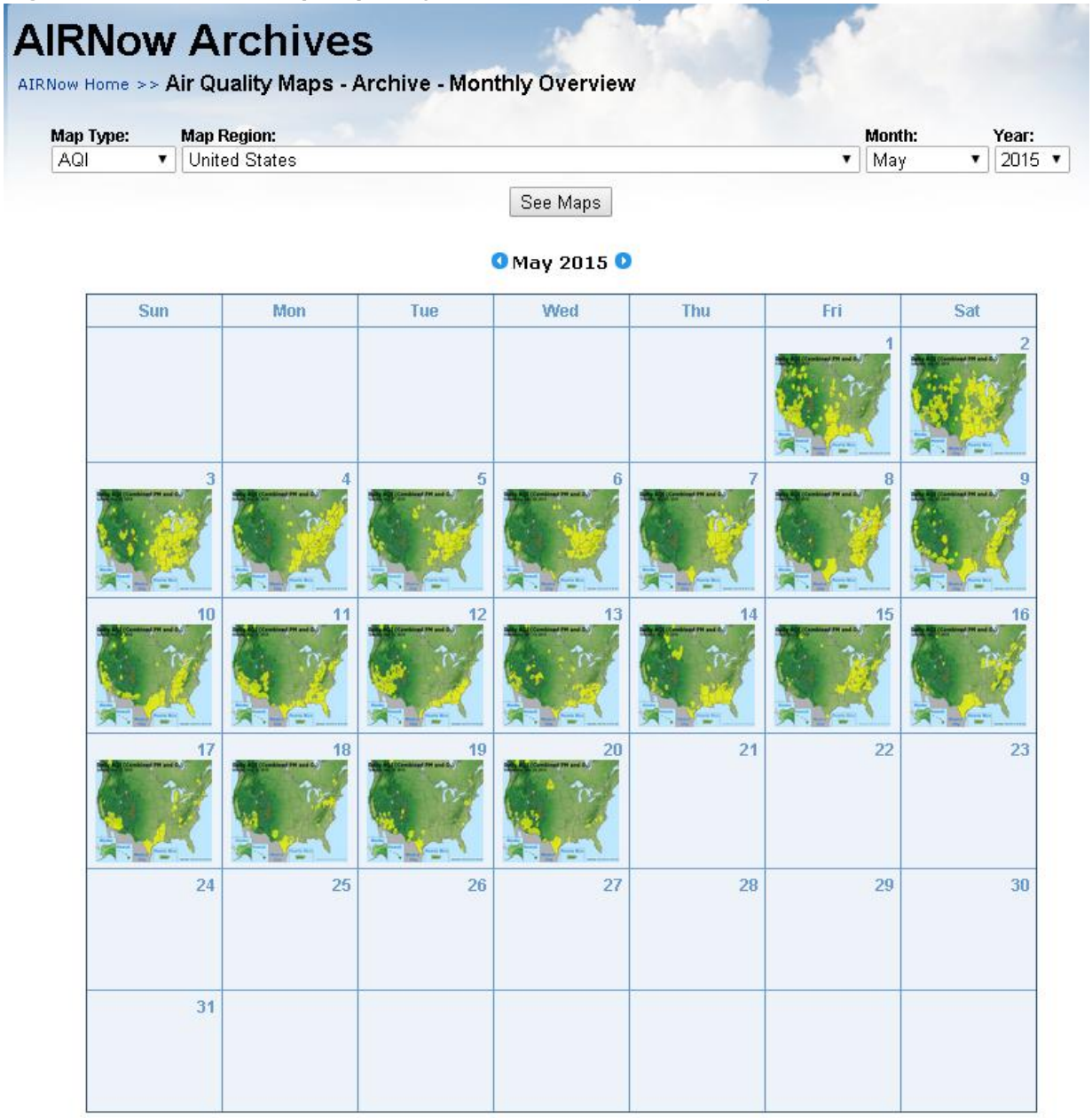
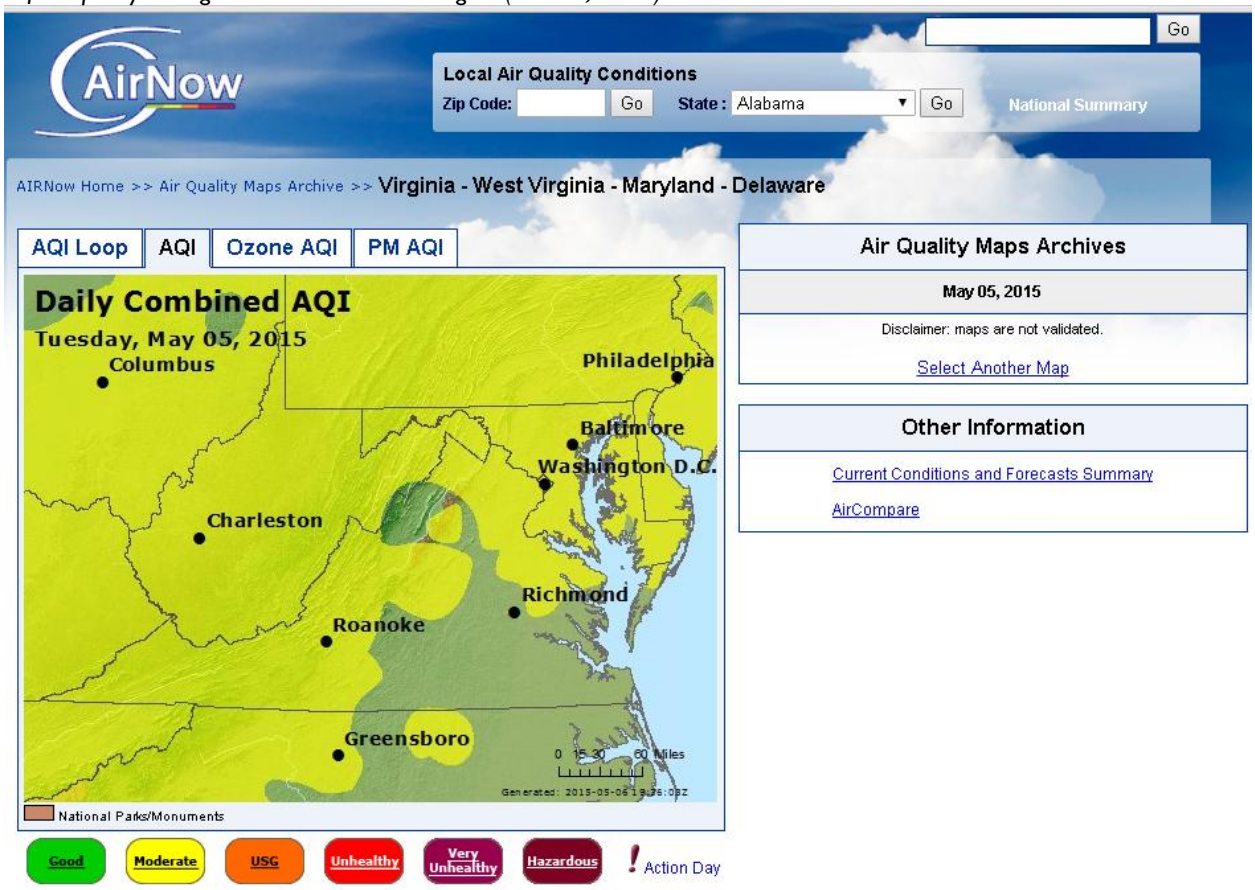


Figure 14: Regional map *of Virginia, West Virginia, Maryland, and Delaware on May 5, 2015. This provides an example of air quality throughout the Mid Atlantic Region (AirNow, 2015).*



Air Quality Vulnerability

Poor air quality can impact a variety of factors including human health, the local economy as well as the environment.

Human health impacts of air pollution can range from minor breathing problems to premature death. The more common effects include changes in breathing and lung function, lung inflammation, and irritation and aggravation of existing heart and lung conditions (e.g., asthma, emphysema and heart disease). For instance, $PM_{2.5}$ and ground-level O_3 can affect human respiratory and cardiovascular systems. $PM_{2.5}$ and ground-level O_3 has also been associated with eye, nose and throat irritation, shortness of breath, exacerbation of respiratory conditions, chronic obstructive pulmonary disease and asthma, exacerbation of allergies, increased risk of cardiovascular diseases and premature death. Another example is as CO enters the lungs it forms a compound known as carboxyhemoglobin that inhibits the blood capacity to carry oxygen to organs and issues. Therefore, heart disease patients may be sensitive to CO pollution. Additionally infants, elderly and individuals with respiratory diseases are also sensitive to air pollution. Such negative health effects increase with concentrations of pollutants in the air increases.

Economic impacts of air pollution can result from the health effects air pollution. Air pollution may not only reduce work attendance and overall participation in the labor force, it can increase health care costs, missed days of work, and reduced work productivity. Ultimately this would impact a local and regional economy and profit. While the impacts to human health can be detrimental to the economy, increased O_3 levels may reduce the growth of crops, plants and trees, leading to economic losses in agriculture and

forestry. Finally, smog can lower tourism since it reduces and impair visibility of surroundings and scenic views.

Environmental impacts of air pollution consist of:

- Ground-level O_3 can significantly impact vegetation and reduce the productivity of some crops. It can also injure flowers and shrubs and may contribute to forest decline. Ecosystem changes can also occur, as plant species that are more resistant to O_3 can become more dominant than those that are less resistant.
- Plant response to PM is largely due to the resultant changes in soil chemistry rather than direct deposition on the plant. Various PM constituents taken up by the plant from the soil can reduce plant growth and productivity. PM can also cause physical damage to plant surfaces via abrasion.
- NO_x and SO_2 can become acidic gases or particulates, and cause or accelerate the corrosion and soiling of materials. Together with NH_3, they are also the main precursors of acid rain. Acid rain affects soils and water bodies, and stresses both vegetation and animals.

4.2.4. Shrink-swell Soils

Various areas of the Middle Peninsula have expandable soils that may have the potential to shrink and /or swell with changes in moisture content. The sensitivity of a soil to shrink or swell is related to the amount of clay minerals in the soil. These soils are very affected by changes in moisture content. They have a high tendency to expand (swell) when receiving a lot of moisture and contract (shrink) during times of little or no precipitation. Soils that have a high shrink-swell rating may cause damage to buildings, roads, or other structures if not compensated for by engineering. Special design is often needed for construction in such soils.

House Joint Resolution No. 243 (passed by the Virginia House of Delegates and Senate in March 1996) requires mandatory education for Virginia building code officials on the issue of expansive soils. Where expansive or other problem soils are identified, various methods for responding to them are permitted, including removal and replacement of soils, stabilization by dewatering or other means, or the construction of special footings, foundations, or slabs on how to deal with such soil conditions. This mandatory education is intended to provide guidance on the type of construction techniques to be employed where problem soils are present. While not preventing a site from being used, a high shrink-swell capability places a potential restriction on the size and weight of the building that may be built upon it.

Shrink-swell soils are not specifically addressed in the Essex County Comprehensive Plan (1998 & 2015), however soils associations are generally described. The Rappahannock-Molena-Pamunkey soil association is located on tidal marshes along the Rappahannock River and along floodplain of major creeks that feed into the River. The soil association is predominately Rappahannock soils, which are not suitable for any type of development because of flooding, high water table, and high organic content. These soils are very poorly drained with a surface layer of loam and subsurface of loam, fine sandy loam, and clay loam. About half of the land within this soil association is farmed; the rest is tidal and freshwater marshes. Some areas are used for waterfront development, but seasonal wetness, flooding, and unsuitability for septic systems limits the uses of this land. The suitability of the soil for septic systems and for agriculture is a prime consideration in making general land use policy decisions in Essex County.

Some of the area of the Town of Tappahannock is also on soils of the Rappahannock-Molena-Pamunkey soil association, primarily along Hoskin's Creek and Tickner's Creek (Town of Tappahannock Comprehensive Plan, 2014). These areas are not suitable for development, therefore eliminating potential problems associated with structures built on shrink-swell soils.

Shrink-swell soils are not specifically addressed in the Gloucester County Comprehensive Plan (amended 2001). However, in an analysis of soil suitability for development, clayey soils account for roughly 6,600 acres, or approximately 5% of the area of the county. Because these conditions are often coincident with shrink-swell soils, this is an approximate estimation of shrink-swell soil conditions within the county. These clayey soils are also listed as being unsuited for housing septic systems. The Gloucester County Land Use Plan generally coordinates the Bayside Conservation District and Resource Conservation District with large areas of soils unsuitable for septic tank use or otherwise unsuitable for high density or commercial development due to physical constraints. Shrink-swell soils are also not addressed in the King and Queen County Comprehensive Plan (2006).

Only one area in King William County (Bohicket) is rated high for shrink-swell soils (King William Comprehensive Plan, 2003). According to the Comprehensive Plan, the County uses the Soil Survey results in formulating future land use policies. Goals and implementation strategies within the County's Comprehensive Plan include increasing public awareness of potential problems resulting from building on soils with moderate to high shrink-swell characteristics, discouraging development in areas that are unsuited for development because of soil conditions, continue policies that require soil feasibility studies prior to approval of residential rezonings, include in the plan review process a requirement for evaluating shrink-swell soil qualities, and provide builders and developers with advice and information on shrink-swell qualities of soils and the need to evaluate these conditions before committing to construction. Shrink-Swell soils are not addressed in the Town of West Point's Comprehensive Plan (2000).

High shrink-swell soils are present in the northeastern tip of Mathews County and along the waterfront of the rivers and streams. Most of the wetlands in the County and most of the areas within the Chesapeake Bay Resource Protection Areas (protected from development by the Chesapeake Bay Preservation Act, adopted by the Virginia General Assembly in 1988) are shrink-swell soils. These soils account for just a little more than 7,000 acres of Mathews County.

According to the Middlesex County Comprehensive Plan (2009), shrink-swell soils within Middlesex County limit community development in the Ackwater, Craven, and Slagle soil series. Together, the lands comprised of these soils make up approximately 12,350 acres, or roughly 15% of the area of the county. Community development in these areas is restricted because the limitations caused by these soils cannot normally be overcome without exceptional, complex, or costly measures.

Only low to moderate shrink-swell soil potential exists in the Town of Urbanna, leaving the soils of the Town generally moderately suited for development (Town of Urbanna Comprehensive Plan, 2012). The Town's Comprehensive Plan states that individual sites should be examined in detail prior to any development.

Therefore it's important to note that there are varying degrees of vulnerability amongst Middle Peninsula localities.

Shrink-swell Soil Vulnerability

As shrink-swell soil expands and shrinks this may cause pressure and stress on house foundations. If foundations are not properly designed to handle this, then the foundation may crack, ultimately causing harm to residents.

Shrink-swell Soil Extent (Impact)

A soil survey is a scientific inventory of soils. This inventory can include maps that show soil's location and type, detailed descriptions of each soil and laboratory data on many physical and chemical properties of the soil. The data can be used to make decisions on how to use the land.

These surveys show the extent and hazards of flood-prone areas, give the amount of sand, silt and clay in soil, and rate the shrinking and swelling potential of soils high in clay content. They also detail erodibility, slope, permeability, wetness, depth to bedrock and water tables to determine, for example, whether a septic tank absorption field can be safely installed.

The amount of clay present in the soil determines its shrink-swell potential. Soils containing 60% or more of clay are considered to have a high shrink-swell potential.

4.2.5. Landslides

Similar to karst, Figure 15 shows that most landslide hazards are located in western and southwestern Virginia. The term "landslide" is used to describe the downward and outward movement of slope-forming materials reacting under the force of gravity. The term covers a broad category of events, including mudflows, mudslides, debris flows, rock falls, rock slides, debris avalanches, debris slides, and earth flows. These terms vary by the amount of water in the materials that are moving.

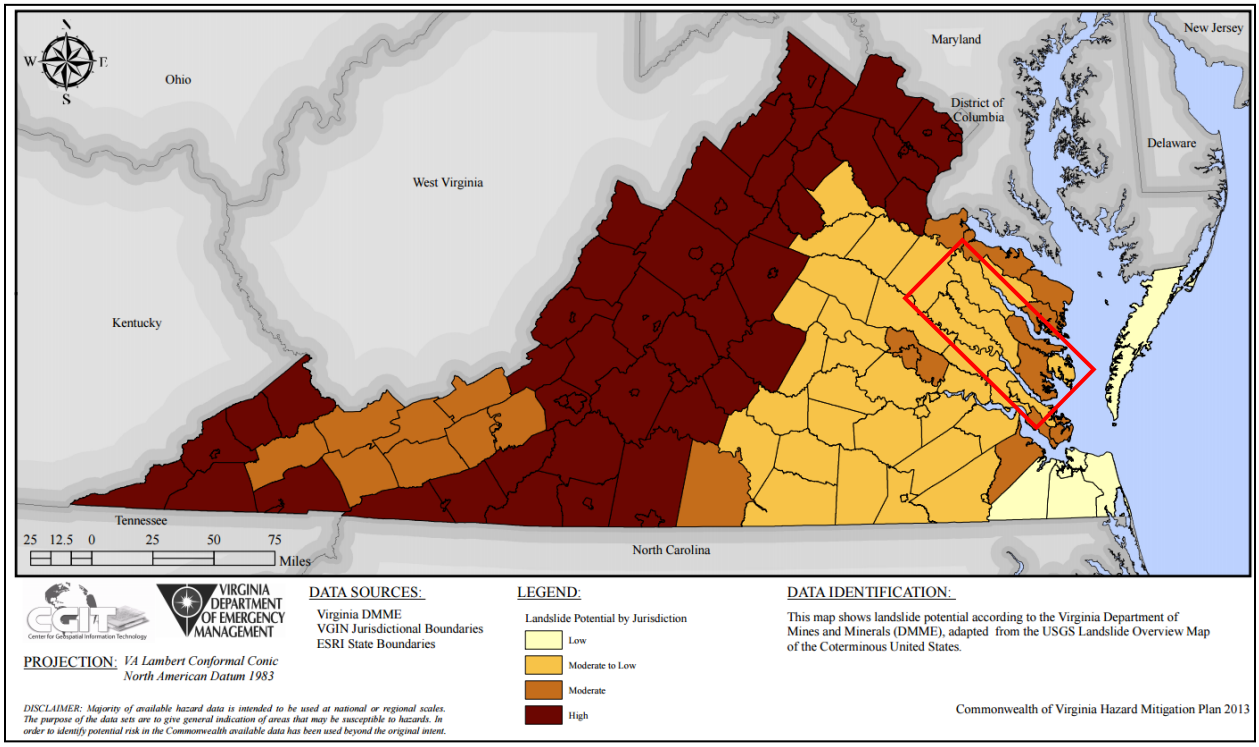


Figure 15: Landslide Potential *as assessed by VDEM. Middle Peninsula localities have a potential of landslides ranging from Moderate or Low to Moderate. The area encompassing the Middle Peninsula is highlighted on the map with a red square. (Source: Commonwealth of Virginia Hazard Mitigation Plan, 2013)*

Landslide Vulnerability

Several natural and human factors may contribute to or influence landslides. How these factors interrelate is important in understanding the hazard. The three principal natural factors are topography, geology, and precipitation. The principle human activities are cut-and-fill construction for highways, construction of buildings and railroads, and mining operations. Landslides can cause serious damage to highways, buildings, homes, and other structures that support a wide range of economies and activities. Landslides commonly

coincide with other natural disasters. Expansion of urban development contributes to greater risk of damage by landslides.

As depicted in Figure 15, there are varying degrees of vulnerability throughout the region. While Essex, King William, King & Queen and Mathews County have a moderate to low potential of landslides, Gloucester and Middlesex County have a higher potential for landslides. Additionally, Figure 16 identified that that a small portion of King William County is highly susceptibility to landslides.

Landslide Impact (Extent)

The USGS divides landslide risk into six categories. These six categories were grouped into three, broader categories to be used for the risk analysis and ranking; geographic extent is based off of these groupings. The categories include:

<u>High Risk</u>

1. High susceptibility to landsliding and moderate incidence.
2. High susceptibility to landsliding and low incidence.
3. High landslide incidence (more than 15% of the area is involved in landsliding).

<u>Moderate Risk</u>

4. Moderate susceptibility to landsliding and low incidence.
5. Moderate landslide incidence (1.5 - 15% of the area is involved in landsliding).

<u>Low Risk</u>

6. Low landslide incidence (less than 1.5 % of the area is involved in landsliding).

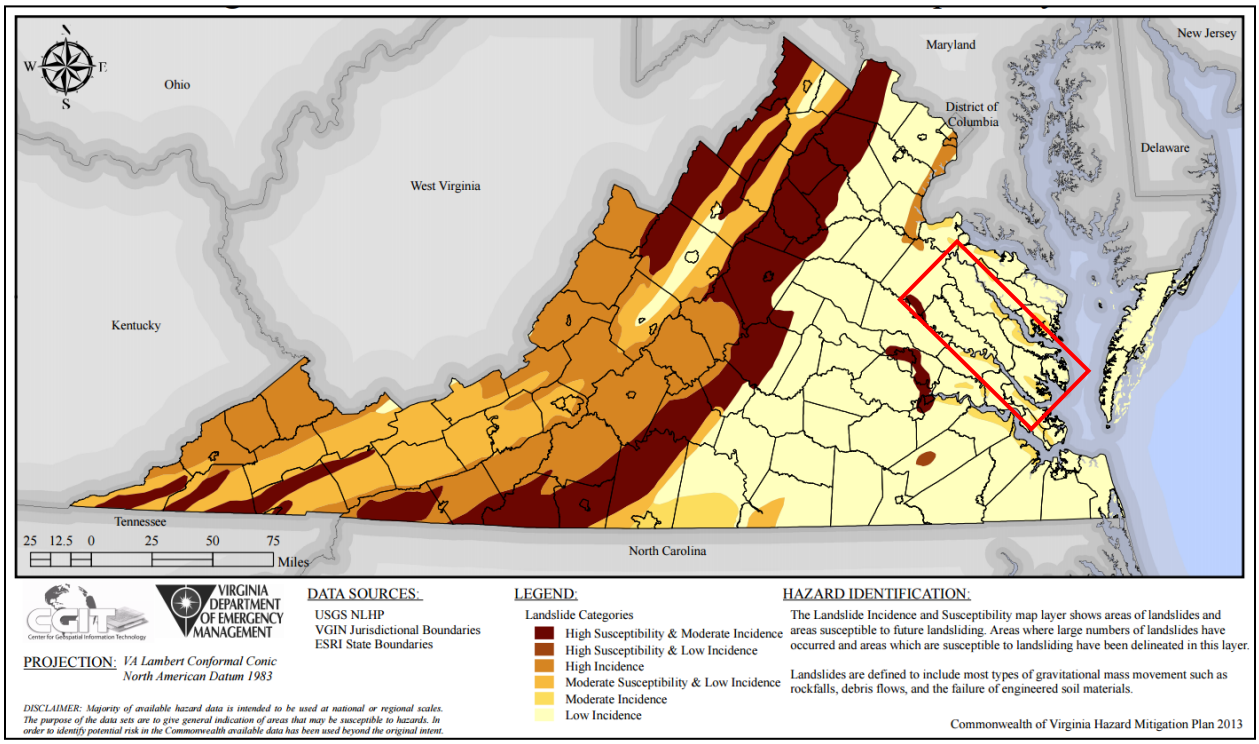


Figure 16: Landslide Incidence and Susceptibility. *The area encompassing the Middle Peninsula is highlighted on the map with a red square. (Source: Commonwealth of Virginia Hazard Mitigation Plan, 2013)*

4.2.5. Land Subsidence due to Karst

According to the Unite State Geological Survey, land subsidence is the gradual settling or sudden sinking of the Earth's surfaces. Principal causes of land subsidence may include aquifer system compaction, drainage of organic soils, underground mining, hydro-compaction, natural compaction, sinkholes and thawing permafrost. In particular, human activity such as withdrawing water, oil, or gas from underground reservoirs may cause land subsidence.

Land subsidence often occurs in regions with mildly acidic groundwater and where the geology is dominated by limestone, dolostone, marble or gypsum. In western parts of the Commonwealth the geology consists of karst which is limestone and similar soluble rocks. Therefore as karst is easily dissolved by acidic groundwater sinkholes are created. Sinkholes are classified as natural depressions of the land surface. Areas with large amounts of karst are characterized by the presence of sinkholes, sinking streams, springs, caves and solution valleys. As karst is not part of the Middle Peninsula geology, land subsidence due to karst does not occur within the region (Figure 17).

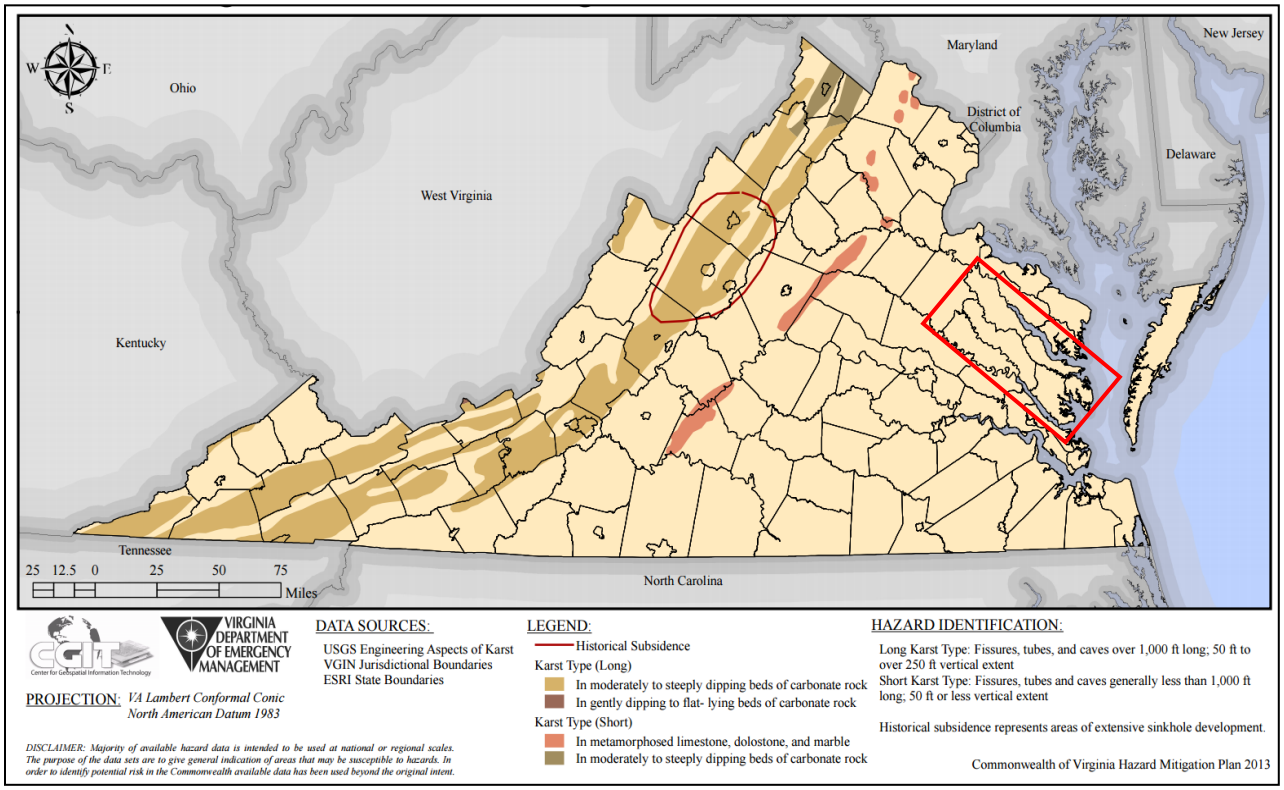


Figure 17: Karst regions and Historical Subsidence *are primarily limited to the mountainous regions of the state. The area encompassing the Middle Peninsula is highlighted on the map with a red square. (Source: Commonwealth of Virginia Hazard Mitigation Plan, 2013)*

While the Middle Peninsula may not be impacted by land subsidence due to karst it's important to note that the region is impacted by land subsidence due to water withdraws as well as rebounding land from the last glacial period. Land subsidence rates on the order of 0.05-0.06 in/yr (1.2-1.4 mm/yr) are attributed to the postglacial forebulge collapse within the Bay region (Douglas 1991). It can take many thousands of years for impacted regions to reach isostatic equilibrium.

Land Subsidence due to Karst Extent
The USGS recognizes four major impacts caused by land subsidence: (1) Changes in elevation and slope of streams, canals, and drains; (2) Damage to bridges, roads, railroads, storm drains, sanitary sewers, canals and levees; (3) Damage to private and public buildings; and (4) Failure of well casings from forces generated by compaction of fine-grained materials in aquifer systems.

Land Subsidence due to Karst Extent
Since the Middle Peninsula region does not have karst the region is not susceptible to land subsidence due to karst.

4.2.7. Tsunami

A tsunami is a wave, or series of waves, generated in a body of water by a disturbance that vertically displaces (moves up or down) the water column. Earthquakes, landslides, explosions, volcanic eruptions, and meteorites can generate tsunamis (Musick, 2005). Earthquakes can cause tsunamis when large areas of the sea floor move and vertically displace the overlying water. If the sea floor movement is horizontal, a tsunami is not generated. After a large-scale vertical sea-floor movement, waves are formed when the displaced water mass travels across the surface of the ocean.

Tsunami Vulnerability
Tsunamis along the east coast of the United States are extremely unlikely. However, geologists Steven N. Ward and Simon Day (2001) describe a landslide that could cause a collapse of a massive piece of the west flank of Cumbre Vieja Volcano on La Palma Island in the Canary Islands (off the western coast of Africa) into the Atlantic Ocean. This could generate tsunami waves that arrive on the coasts of the Americas as much as 70 ft in height. The scientists used modeling techniques to produce their conclusion of this "worst case scenario". The Cumbre Vieja Volcano last erupted in 1949 and shows no signs of activity.

Tsunamis have great erosion potential, stripping beaches of sand that may have taken years to accumulate and undermining trees and other coastal vegetation. Tsunamis are capable of inundating, or flooding, hundreds of miles inland past the typical high-water level, the fast-moving water associated with the inundating tsunami can crush homes and other coastal structures.

There are varying degrees of vulnerability amongst Middle Peninsula localities. While the majority of the region would be impacted, the lowest lying localities, including Gloucester and Mathews County would get the brunt of the water damage. As one moves up the region to King William, King & Queen and Essex Counties, the impacts would be less; however ultimately this would be depended on the direction and strength of the tsunami.

Tsunami Extent (Impact)
Tsunamis can be measured in a variety of manner including tide gauges, satellites, and the DART System. Through tide gauges the height of the sea-surface is measured. While they may not be able to predict a tsunami the tide gauges can measure the tsunami. Satellite altimeters measure the height of the ocean surface directly by the use of electro-magnetic pulses. These are sent down to the ocean surface from the satellite and the height of the ocean surface can be determined by knowing the speed of the pulse, the location of the satellite and measuring the time that the pulse takes to return to the satellite. One problem with this kind of satellite data is that it can be very sparse - some satellites only pass over a particular location about once a month. The Deep-ocean Assessment and Reporting of Tsunamis (DART system) created by the National Ocean and Atmospheric Administration (NOAA) was developed in 1995. This system is currently deployed in the Pacific Ocean to measure the pressure of the pressure of the water column which relates to the height of the sea surface.

4.2.8. Volcanoes

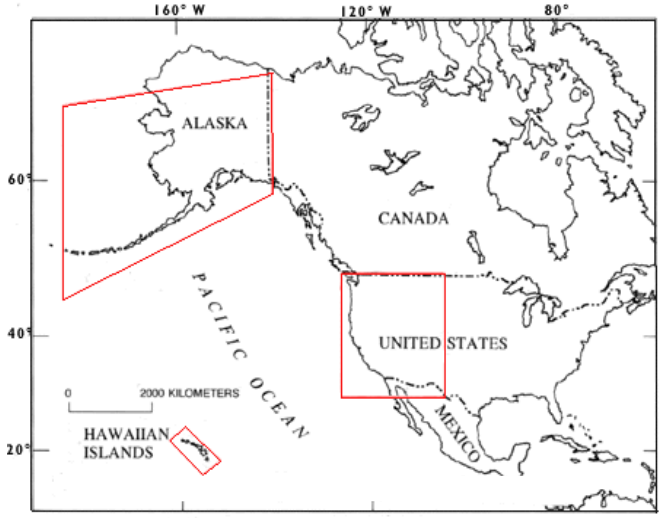


Figure 18: Map of United States showing areas where active volcanoes are located *(USGS, 1997).*

The United States ranks third, behind Indonesia and Japan, in the number of historically active volcanoes. In addition, about 10 percent of the more than 1,500 volcanoes that have erupted in the past 10,000 years are located in the United States (Brantley, 1997). Most of these volcanoes are found in the Aleutian Islands, the Alaska Peninsula, the Hawaiian Islands, and the Cascade Range of the Pacific Northwest; the remainders are widely distributed in the western part of the Nation (Figure 18).

Volcano Vulnerability

Volcanoes are considered hazardous because of the dangers associated with pyroclastic flows emitted from them during an eruption (USGS, 1999). Pyroclastic flows are high-density mixtures of hot, dry rock fragments and hot gases that move away from the vent that erupted them at high speeds. They may result from the explosive eruption of molten or solid rock fragments, or both. They may also result from the non-explosive eruption of lava when parts of dome or a thick lava flow collapses down a steep slope. A pyroclastic flow will destroy nearly everything in its path. With rock fragments ranging in size from ash to boulders traveling across the ground at speeds typically greater than 80 km per hour, pyroclastic flows knock down, shatter, bury or carry away nearly all objects and structures in their way. The extreme temperatures of rocks and gas inside pyroclastic flows, generally between 200°C and 700°C, can cause combustible material to burn, especially petroleum products, wood, vegetation, and houses.

Volcano Extent (Impact)

The Eastern United States does not have any active volcanoes; therefore, pyroclastic flows are not considered a critical hazard to the Middle Peninsula.

4.3. Hazards considered "Moderately-Critical" Hazards to the Middle Peninsula

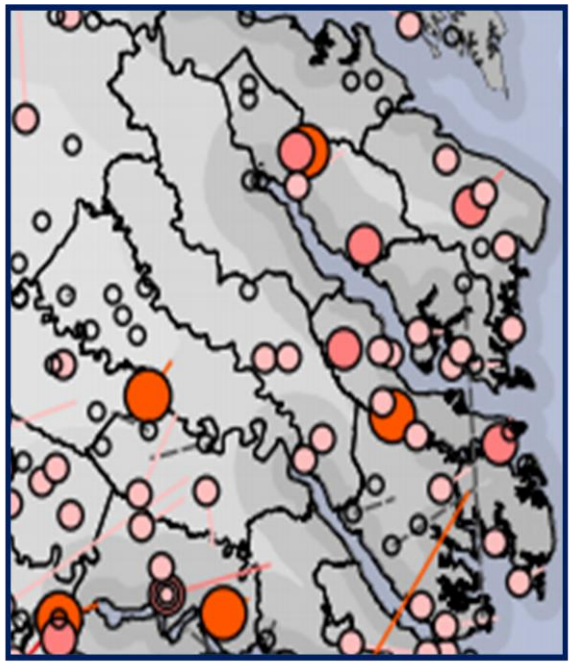
The following sections describe hazards that have historically occurred in the Middle Peninsula, yet ranked lower than the Critical Hazards in terms of risk during hazard prioritization. These hazards were deemed "Moderately-Critical Hazards" to the Middle Peninsula region by the LPT.

4.3.1 Tornadoes

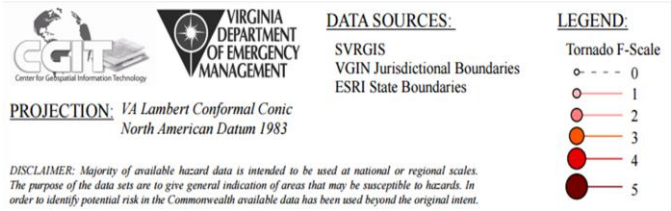
The National Weather Service (NWS) defines a tornado as a violently rotating column of air in contact with the ground and extending from the base of a thunderstorm. A condensation funnel does not need to reach to the ground for a tornado to be present; however a debris cloud beneath a thunderstorm is all that is needed to confirm the presence of a tornado, even without a condensation funnel. Tornadoes are distinguishable from waterspouts, which are small, relatively weak rotating columns of air over water beneath a cumulonimbus or towering cumulus cloud. Waterspouts are most common over tropical or subtropical waters. The exact definition of waterspout is debatable. In most cases the term is reserved for small vortices over water that are not associated with storm-scale rotation (i.e., they are the water-based equivalent of landspouts). Yet there is sufficient justification for calling virtually any rotating column of air a waterspout if it is in contact with a water surface.

Tornadoes often appear as a funnel shaped cloud or a spiraling column of debris extending from storm clouds to the ground. They are created during severe weather events like thunderstorms and hurricanes when cold air overrides a layer of warm air, causing the warm air to rise rapidly. Tornadoes may be only several yards across, or in rare cases, over a mile wide. Winds within a tornado can reach speeds over 250 mph, but most tornado winds are 100 mph or less. Weak tornadoes (categorized as F0 and F1 on the Fujita scale, Table 12 & 13) are most common on the Middle Peninsula and often last only a minute before dissipating. From 1950 through the year 2014, 673 tornadoes were documented in Virginia (Tornado History Project, 2015). Within Middle Peninsula localities 38 tornadoes that touched down between1950 to 2014 (See Appendix H). While the most tornadoes touched down in the Middle Peninsula during April, July is considered the most active month for tornadoes in Virginia. The hot, humid days common to July are often accompanied by a late afternoon or evening thunderstorm.

Figure 19: Historic Tornado Touchdowns and Tacks 1950-2011.



HAZARD IDENFICATION: Historic tornado touchdowns and tracks are symbolized for visual effect and are not drawn to scale. Actual tornado swath widths vary considerably, although more intense tornadoes are generally wider.



The hot temperatures and humidity of the late afternoon fuel the thunderstorm's growth. If certain conditions are right, a tornado may develop. Hurricane-induced tornadic activity can also occur close to the coastline as a hurricane makes landfall (Watson, 2002). Virginia's tidewater counties see a fair number of tornadoes for two reasons, both of which are related to the region's proximity to Chesapeake Bay and the coast. For instance, as waterspouts are common they will occasionally come onshore and do some damage. Once the waterspout comes onshore, it is considered a tornado and is generally classified as a F0. The second instance this area sees an increase in tornadoes is that often during the warm months there is a bay breeze or sea breeze front (bay or sea cooled air on one side of the front and land heated air on the other). When a large rotating thunderstorm moves over a boundary/front such as this, there is an increased chance that conditions will be right for the development of a tornado (Watson, 2002). Between 1950 and 2014, twelve tornadoes were reported in Gloucester County, seven in Middlesex, seven in Mathews, six in King and Queen County, two in Essex County, and seven in King William County (NCDC Storm Event Database, 2015). The Virginia State Hazard Plan illustration above shows historic tornado touchdowns within the Middle Peninsula (Figure 19). While the historic data appears to show that the Middle Peninsula has a low annual probability of being struck by a tornado, it is important to note that because tornadoes can result from severe thunderstorms and hurricanes, the susceptibility of this region to these storms carries the threat of tornadoes along with it. However it's important to mention that the vulnerability will vary from locality to locality. This is clear when looking at Figure 19. Those localities within the closest proximity to the water seem to be more vulnerable where as the upper localities (i.e. King William, King & Queen and Essex) are less vulnerable.

On April 16, 2011, three separate tornadoes touched down in the Middle Peninsula. The first tornado came from the southwest. The tornado took a 46 mile path that hit Surry, James City, York, Gloucester and Mathews County. This tornado registered as a F3 tornado on the Fujita Scale which means that winds were 158-206 miles per hour (mph) that can severely damage roofs and wall and can throw cars. In Gloucester County alone this tornado tore the roof off Page Middle School and crumpled fences and buses on the property (Figure 20). Overall this tornado caused approximately $8,020,000 in damages, caused 2 fatalities and 60 injuries. The second and third tornadoes touched down in Middlesex County. The second tornado registered as a FI tornado on the Fujita Scale. This path was 1.06 miles and caused approximately $100,000 in damages. The third tornado registered as a F2 tornado on the Fujita Scale. This path was 2.8 miles and caused approximately $6,000,000 in damages.



Figure 20: Photo of the damage at Page Middle School in Gloucester County *(Gloucester-Mathews Gazette Journal, 2011).*

Tornado Vulnerability

Weak tornadoes may break branches or damage signs. Damage to buildings (ie. mobile homes or weak structures) primarily affects roofs and windows, and may include loss of the entire roof or just part of the roof covering and sheathing. Windows are usually broken from windborne debris.

In a strong tornado, some buildings may be destroyed but most suffer damage like loss of exterior walls or roof or both; interior walls usually survive.

Violent tornadoes cause severe to incredible damage, including heavy cars lifted off the ground and thrown and strong frame houses leveled off foundations and swept away; trees are uprooted, debarked and splintered.

Weak tornadoes make up 74% of all tornadoes, while 67% of all tornado deaths come from violent tornadoes.

Tornado Extent (Impact)

In Virginia, tornadoes primarily occur from April through September, although tornadoes have been observed in every month. Low-intensity tornadoes occur most frequently; tornadoes rated F2 or higher are very rare in Virginia, although F2, F3, and a few F4 storms have been observed. In comparison to other states, Virginia ranks 28th in terms of the number of tornado touchdowns reported between 1950 and 2006; Midwestern and Southern states ranked significantly higher.

Table 12: Fujita Scale to measure tornados.

F #	Est. Wind (mph)	Typical Damage
F0	< 73	Light: chimneys damaged, shallow-rooted trees pushed over
F1	73-112	Moderate: mobile homes pushed off foundations, cars blown
F2	113-157	Considerable: mobile homes demolished, trees uprooted, roofs torn off frame houses
F3	158-206	Severe: roof and walls torn down, trains overturned, cars thrown
F4	207-260	Devastating: well-constructed walls leveled, large objects thrown
F5	261-318	Incredible: homes lifted and carried, cars thrown 300 ft, trees de-barked

Table 13: Fijita Scale, Derived Enhanced Fujita (EF) Scale and Operated EF Scale.

Fujita Scale			Derived EF Scale		Operational EF Scale	
F #	Fastest ¼ mile (mph)	3 Second Gust (mph)	EF #	3 Second Gust (mph)	EF #	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

4.3.2. Snow Storm

The winter months can bring a wide variety of hazards to the Middle Peninsula, including blizzards, snowstorms, ice, sleet, freezing rain, and extremely cold temperatures. All of these weather events can be experienced throughout the state, depending on the depth of cold air that is in place over the region when the storm event comes. The Middle Peninsula's biggest winter weather threats come from Northeasters or Nor'easters. These large storms form along the southern Atlantic coast and move northeast into Virginia along the Mid-Atlantic coast. These events are explained in detail in the following section describing Critical Hazards to the Middle Peninsula, under the sub-heading "Winter Ice Storms". Winter storm events can bring strong winds and anything from rain to ice to snow to even blizzard conditions over a very large area. This combination of heavy frozen precipitation and winds can be quite destructive and lead to widespread utility failures and high cleanup costs. Nor'easters may occur from November through April, but are usually at their worst in January, February, and March.

Snow Storm Vulnerability

The impacts of winter storms are minimal in terms of property damage and long-term effects. The most notable impact from winter storms is the damage to power distribution networks and utilities. Severe winter storms with significant snow accumulation have the potential to inhibit normal functions of the Middle Peninsula. Governmental costs for this type of event are a result of the needed personnel and equipment for clearing streets. Private sector losses are attributed to lost work when employees are unable to travel. Homes and businesses suffer damage when electric service is interrupted for long periods. Health threats can become severe when frozen precipitation makes roadways and walkways very slippery and due to prolonged power outages and if fuel supplies are jeopardized. Occasionally, buildings may be damaged when snow loads exceed the design capacity of their roofs or when trees fall due to excessive ice accumulation on branches. The primary impact of excessive cold is increased potential for frostbite, and potentially death as a result of over-exposure to extreme cold. Some secondary hazards extreme/excessive cold present is a danger to livestock and pets, and frozen water pipes in homes and businesses.

Snowstorms do not occur every year in the Middle Peninsula. The West Virginia University Extension Service developed estimates the likelihood for snowfall frequency and accumulation for 152 monitoring stations across the Commonwealth based on historic snowfall accumulation and frequency data (Rayburn and Lozier 2001, these data are available on-line at: http://www.wvu.edu/~agexten/forglvst/VAsnow/index.htm). Three of these stations are located on the Middle Peninsula: Urbanna in Middlesex County, Walkerton in King and Queen County, and West Point in King William County. While the other counties of the Middle Peninsula were not included in the West Virginia University Extension Office data, these stations may be considered representative to predict annual snow cover likelihood for the rest of the Middle Peninsula.

At the Urbanna Station in Middlesex County, snow cover data was collected for 24 years between 1949 and 1973. Based on snowfall frequency and accumulation during this period, a general risk of snow cover and snow depth in a given year was calculated. Rayburn and Lozier determined that there is a 50% risk of having between 1 and 8 inches of snow on the ground for 8 days or more. This means that, in one (1) year out of two (2), Urbanna will probably have snow of up to 8 inches on the ground for 8 days. In one (1) year out of four (4), Urbanna may have snow cover up to 8 inches deep for 12 days (in other words, there is a 25% chance of having snow for 12 days). In one year out of ten, Urbanna may have up to 8 inches of snow for 17 days (there is a 10% chance of having snow for 17 days). For deeper accumulations (greater than 8 inches), there is a 10% risk of having snow cover for 2 days or more. This means that, in 1 year out of 10, this location probably will have snow cover of at least 8 inches for 2 days.

At the Walkerton Station in King and Queen County, snow cover data was collected for 66 years between 1931 and 1997. Based on snowfall frequency and accumulation during this period, a general risk of snow cover and snow depth in a given year was calculated. Rayburn and Lozier determined that there is a 50% risk of having between 1 and 8 inches of snow on the ground for 6 days or more. This means that, in one year out of two, Walkerton will probably have snow of up to 8 inches on the ground for 6 days. In one year out of 4, Walkerton may have snow cover up to 8 inches deep for 13 days (in other words, there is a 25% chance of having snow for 13 days). In one year out of ten, Walkerton may have up to 8 inches of snow for 22 days (there is a 10% chance of having snow for 22 days). For deeper accumulations (greater than 8 inches), the risk is the same as reported for Urbanna and there is a 10% risk of having snow cover for 2 days or more. This means that, in 1 year out of 10, this location probably will have snow cover of at least 8 inches for 2 days. The average annual snowfall for 2014 at the Walkerton Station was 10.0 inches.

At the West Point station in King William County, snow cover data was collected for 44 years between 1953 and 1997. Based on snowfall frequency and accumulation during this period, a general risk of snow cover and snow depth in a given year was calculated. Rayburn and Lozier determined that there is a 50%

risk of having between 1 and 8 inches of snow on the ground for 8 days or more. This means that, in one year out of two, West Point will probably have snow of up to 8 inches on the ground for 8 days. In one year out of 4, West Point may have snow cover up to 8 inches deep for 15 days (in other words, there is a 25% chance of having snow for 15 days). In one year out of ten, West Point may have up to 8 inches of snow for 19 days (there is a 10% chance of having snow for 19 days). For deeper accumulations (greater than 8 inches), the risk is the same as reported for both Urbanna and Walkerton. There is a 10% risk of having snow cover for 2 days or more. This means that, in 1 year out of 10, this location probably will have snow cover of at least 8 inches for 2 days. The average annual snowfall for 2014 at the West Point Station was 10.1 inches.

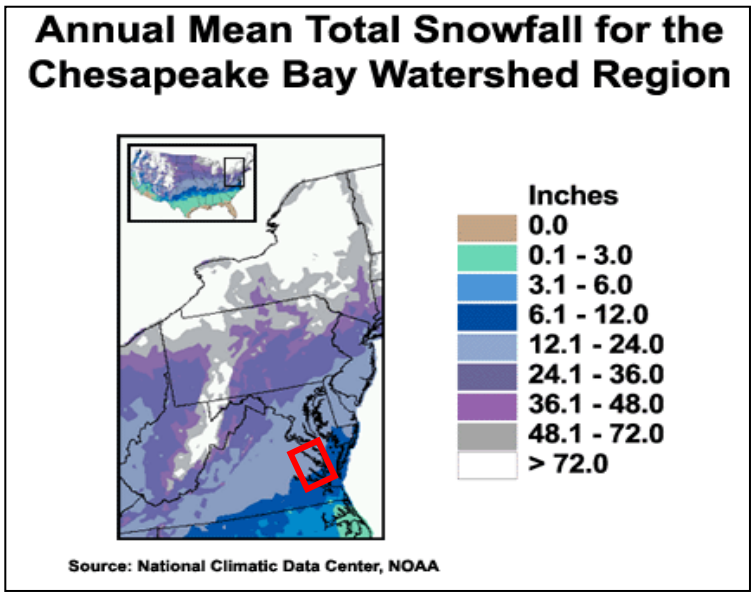


Figure 21: Map of annual mean total snowfall for the Chesapeake Bay Watershed region *(StormCenter Communications, 2003). The area encompassing the Middle Peninsula is highlighted on the map with a red square.*

Compared to western, northern, and mountainous regions of the state, the risk of high snow accumulations in the Middle Peninsula is low and will vary amongst localities (Figure 21). According to the National Climactic Data Center, mean annual snowfall in the Middle Peninsula ranges from between 6 and 12 inches at the lower reaches of the region (primarily in Gloucester and Mathews Counties) to as much as 12 to 24 inches in the upper reaches of the region (primarily in Essex, King and Queen, King William, and Middlesex Counties). The proximity of adjacent water bodies bordering the region (Chesapeake Bay and its tributaries) to the Atlantic Ocean allows the Bay to retain heat and buffer to the region from intense snow. The amount of snow that falls across the watershed varies both from year to year and from location to location. Generally, areas to the north, such as in Pennsylvania and New York, see more snow in an average year than locations in the southern part of the watershed. For areas to the south, such as Norfolk, winters typically pass without a measurable amount of snowfall.

Snow without ice has adverse impacts for the road transportation network, which therefore limits the ability of residents to have access to essential and for some, life-critical emergency medical care.

The ability of the local jurisdictions to provide critical public safety services (ie. fire, emergency medical and law enforcement) could be a focus of any mitigation strategies proposed in the update during the emergency response phase when severe snow events hit the Middle Peninsula.

In December of 2009, a major snowstorm slammed the East Coast and snarled the busy holiday travel season as airports shut down runways, rail service slowed and bus routes were suspended on the last weekend before Christmas. Record snowfall totals were reported at Washington Dulles and Reagan

National airports. Accumulation at Dulles reached 16 inches, breaking the old record of 10.6 inches set December, 12, 1964; 13.3 inches was reported at Reagan. The old record there was 11.5 inches set December 17, 1932.

Snowfall Extent (Impact)

The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin and Louis Uccellini of the NWS (Kocin and Uccellini, 2004) characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10 inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS gives an indication of a storm's societal impacts.

NESIS categories, their corresponding NESIS values, and a descriptive adjective:

Category	NESIS Value	Description
1	1—2.499	Notable
2	2.5—3.99	Significant
3	4—5.99	Major
4	6—9.99	Crippling
5	10.0+	Extreme

Winter Weather Section

Since the original plan was developed there has only been one significant snowfall event in the Middle Peninsula. According to the National Climatic Data Center (NCDC), on February 10, 2010 between 1 and 5 inches fell across the region. All of the land area within the region is subject to snowfall. Due to only two operating weather stations in King and Queen and King William Counties, there is little data available for additional analysis. Therefore the information described in the West Virginia Extension Service in the original plan will suffice.

Additional impacts include downed power lines, roof collapses during heavy snow loads, as well as frozen utility lines during extreme cold events.

4.3.3 Coastal/Shoreline Erosion

As flooding is the most frequent and costly natural hazard in the United States - besides fire, nearly 90% of Presidential Disaster Declarations result from natural events where flooding is a major component. Excess water from snowmelt, rainfall, or storm surge accumulates and overflows onto adjacent floodplains and other low-lying land adjacent to rivers, lakes, ponds and the Chesapeake Bay.

Coastal flooding is typically a result of storm surge, wind-driven waves, and heavy rainfall. These conditions are produced by hurricanes during the summer and fall, and nor'easters and other large coastal storms during the winter and spring. Storm surges may overrun barrier islands and push sea water up coastal rivers and inlets, blocking the downstream flow of inland runoff.

Soil Erosion
Hurricanes and nor'easters produce severe winds and storm surges that create significant soil erosion along rivers and streams in the Middle Peninsula. In addition to the loss of soil along these water bodies, there is damage to man-made shoreline hardening structures such as bulkheads and rap-rap as well as to piers, docks, boat houses and boats due to significant storm surges.

These damages are more severe along the broad open bodies of water on major rivers located closer to the Chesapeake Bay. In general terms, the damage is less intense as you move up the watershed from the southeastern area of the region towards the northwestern end of the Middle Peninsula. Therefore, the soil erosion would is most severe in Mathews, Gloucester and Middlesex Counties and to a lesser degree in the 3 remaining Middle Peninsula Counties of King and Queen, King William and Essex Counties.

The location and the angle at which these hurricanes/nor'easters come ashore region can significantly affect the amount of soil erosion during a particular storm. It can generally be said that hurricane generated soil erosion is uneven in occurrence and that the storm surge affords 2 opportunities for erosion – once as water inundates low-lying amount coast lands and again as floodwaters ebb.

For example with Hurricane Isabel in 2003, its enormous wind field tracked in a north-northwest direction to the west of the Chesapeake Bay with the right front quadrant blowing from the south-southeast. This pushed the storm surge up the Bay and piling it into the western shore – causing serious soil erosion to the eastern land masses in Mathews, Gloucester and Middlesex Counties.

Destructive as it was, Hurricane Isabel might have been worse. If it had been stronger at landfill, the storm surge generated in the Chesapeake Bay may have been higher. Had it stalled along its path and lingered through several tide cycles, prolonged surge conditions, exacerbated by high winds, might have cause more severe erosion. If rainfall has been higher, bank erosion due to slope failure might have been more common, particularly given the wetter than normal months that preceded Hurricane Isabel.

Coastal/Shoreline Erosion Vulnerability
Thousands of acres of crops and forest lands may be inundated by both saltwater and freshwater. Escape routes, particularly from barrier islands, may be cut off quickly, stranding residents in flooded areas and hampering rescue efforts. Coastal flooding is very dangerous and causes the most severe damage where large waves are driven inland by the wind. These wind driven waves destroy houses, wash away protective dunes, and erode the soil so that the ground level can be lowered by several feet. Because of the coastal nature of the Middle Peninsula, the region is very susceptible to this type of flooding and resulting damage.

Coastal/Shoreline Erosion Extent (Impacts)
While coastal/shoreline erosion can be seen by the naked eye, it can also be observed through the comparison of historical coastal aerial photographs and current ones.

4.3.4. Wildfire
A wildfire is an uncontrolled burning of grasslands, brush, or woodlands. The potential for wildfire depends upon surface fuel characteristics, recent climate conditions, current meteorological conditions, and fire

behavior. Hot, dry summers, and dry vegetation increase susceptibility to fire in the fall, a particularly dangerous time of year for wildfire.

The three leading causes of wildfires in Virginia are escaped debris fires, arson, and machine use. Wildfires can also result from natural occurrences, such as lightning strikes. Wildfire danger can vary greatly season to season and is often exacerbated by dry weather conditions.

The VDOF indicates that there are three principle factors that can lead to the formation of wildfire hazards: topography, fuel, and weather. The environmental conditions that exist during spring (March and April) and fall (October and November) exacerbate the hazard. When relative humidity is low and high winds are coupled with a dry forest floor (brush, grasses, leaf litter), wildfires may easily ignite. Years of drought can lead to environmental conditions that promote wildfires. In Virginia, accidental or intentional setting of fires by humans is the largest contributor to wildfires. Residential areas that expand into wild land areas also increase the risk of wildfire threats.

Wildfire Vulnerability

As development has spread into areas which were previously rural, new residents have been relatively unaware of the hazards posed by wildfires and have used highly flammable material for constructing buildings. This has not only increased the threat of loss of life and property, but has also resulted in a greater population of people less prepared to cope with wildfire hazards.

The impacts of wildfires can be widespread leading to many secondary hazards. During a wildfire, the removal of groundcover that serves to stabilize soil can lead to hazards such as landslides, mudslides, and flooding. In addition, the leftover scorched and barren land may take years to recover and the resulting erosion can be problematic.

Because of wild fire risk, the Virginia Department of Forestry (VDOF) has provided new information on identifying high-risk fire areas. Their Fire Risk Assessment Mapping Database was designed to help communities determine areas with the greatest vulnerability to wildfire. Since wildfire occurrence is based on multiple factors, the VDOF developed a fire ranking map to assist to wildfire prevention efforts, as shown in Figure 22. In 2002 and 2003, VDOF examined which factors influence the occurrence and advancement of wildfires and how these factors could be represented in a Geographic Information System (GIS) model. VDOF determined that historical fire incidents, land cover (fuels surrogate), topographic characteristics, population density, and distance to roads were critical variables in a wildfire risk analysis. The resulting high, medium, and low risk category reflect the results of these analyses. Figure 22 and Table 14 show the varying degree of risk amongst Middle Peninsula localities.

Figure 22: Middle Peninsula Wildfire Risk. *Throughout the region risk to wildlife varies due to historic fire incidents, land cover, topographic, characteristics, population density and distance to roads.*

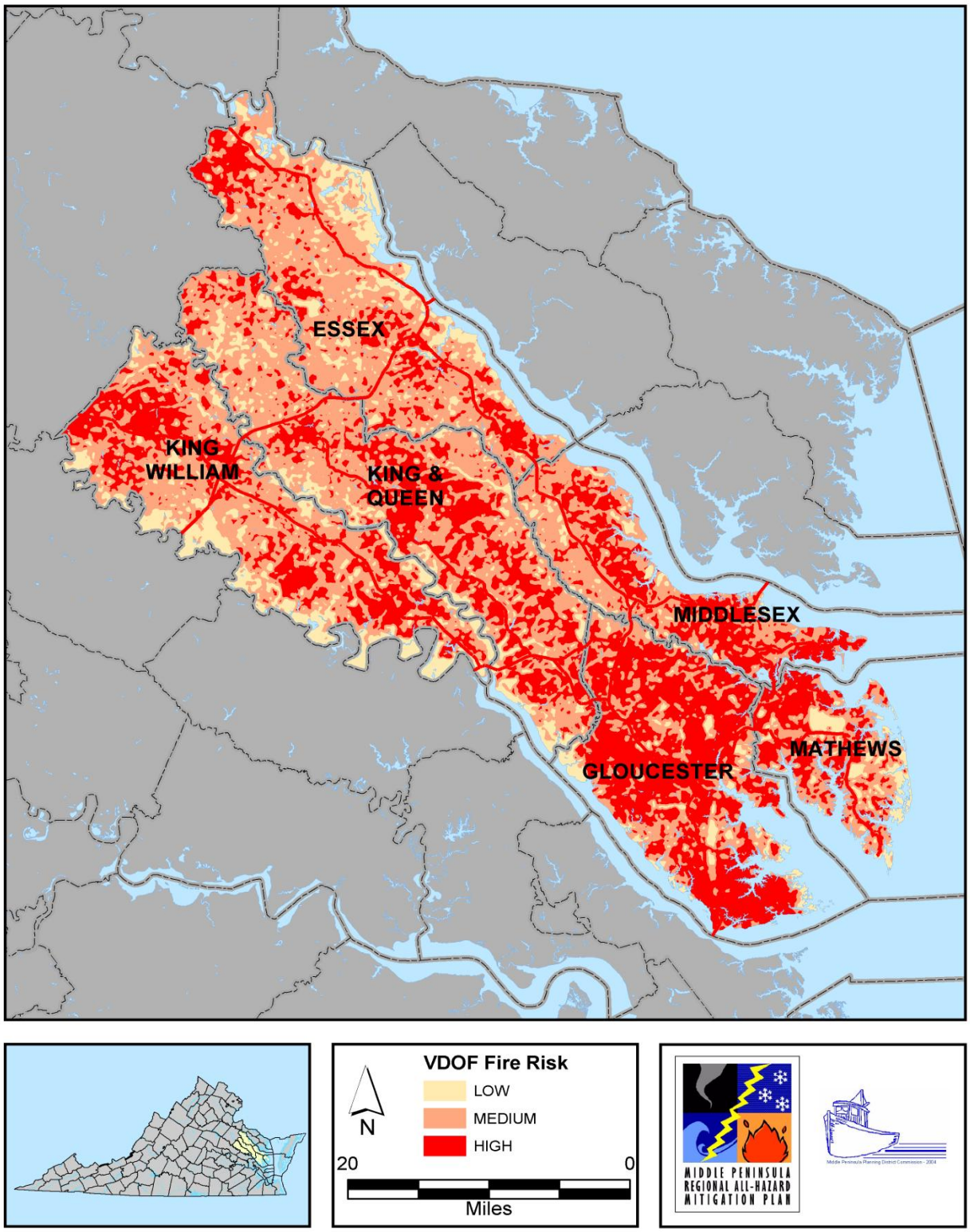


Table 14: Acres of each Middle Peninsula County within each VDOF Fire Risk Category.				
County	**LOW**	**MEDIUM**	**HIGH**	**Total Acreage**
Essex	33,894	105,885	31,999	171,778
Gloucester	16,267	46,195	90,182	152,644
King and Queen	28,569	117,897	59,440	205,906
King William	42,127	89,417	51,039	182,583
Mathews	14,903	28,819	21,966	65,688
Middlesex	8,619	50,251	33,320	92,190
Middle Peninsula Total	**144,389**	**438,464**	**287,946**	**870,789**

Table 15: Percent of each Middle Peninsula County's area within each VDOF Fire Risk Zone.			
County	**LOW**	**MEDIUM**	**HIGH**
Essex	19.7	61.6	18.6
Gloucester	10.7	30.3	59.1
King and Queen	13.9	57.3	28.9
King William	23.1	49.0	28.0
Mathews	22.7	43.9	33.4
Middlesex	9.3	54.5	36.1
Middle Peninsula	**16.6**	**50.4**	**33.1**

As a region, most of the area making up the Middle Peninsula falls within the "Medium" Fire Risk category (Table14 and 15). It is noteworthy that nearly 60 percent of the area of Gloucester County falls within the "High" Fire Risk category (Table 15).

Debris burning continues to be the leading cause of forest fires in Virginia. The Commonwealth of Virginia has several laws that help to reduce the risk of wildfires. Most notably is the 'Virginia's 4:00 PM Burning Law', which goes into effect each spring. The 4:00 PM Burning Law is different from the burning bans, which are invoked only during periods of extreme fire danger. Briefly, the 4:00 PM Burning Law states: from February 15 through April 30 of each year, no burning before 4:00 PM is permitted if the fire is in, or within 300 feet of, woodland, brushland or fields containing dry grass or other flammable material.

Since forest fuels cure during the winter months, the danger of fire is higher in early spring than in summer when the forest and grasses are green with new growth. The 4:00 PM Burning Law is an effective tool in the prevention of forest fires.

Areas where homes meet the Wildland are called the Wildland/Urban interface. Flammable forest fuels often surround homes located in the woods. The VDOF suggests the following safety tips to minimize the threat to homes:

- Have a least 30 feet of defensible space surrounding a home. This will reduce the wildfire threat to a home by changing the characteristics of the surround vegetation. Defensible space also allows firefighters room to put out fires.
- Build with fire-resistant exterior construction materials, such as cement, brick, plaster, and stucco and concrete masonry. Double pane glass windows can make a home more resistant to wildfire heat and flames. Roofs should be Class A.
- Use landscaping materials and design to also create defensible space. Remove flammable plants that contain resins, oils and waxes that burn readily. Large, leafy hardwood trees should be pruned so that the lowest branches are at least 6 to 10 feet high to prevent a fire on the ground from spreading up to the treetops.

- Identify a home and neighborhood with legible and clearly marked street names and numbers so emergency vehicles can rapidly find the location of the emergency. Include a driveway that is at least 12 feet wide with a vertical clearance of 15 feet – provide access to emergency apparatus.

Since the 2010 plan there has been a total of 100 wildfires within the region (Appendix I). Based on VDOF records, each locality has been impacted by wildfire (Table 16 and 17):

Table 16: The number wildfires in a given year (VDOF, 2015)

County	Number of Wildfires in a Given Year						Total
	2010	2011	2012	2013	2014	2015*	
Essex	7	7	5	2	3	2	26
Gloucester	7	9	7	13	4	6	46
Middlesex	3	7	4	0	3	1	18
Mathews	3	1	3	1	2	0	10
King & Queen	2	1	3	2	2	1	11
King William	8	3	3	0	4	3	21

*Please note that the 2015 data is only through mid-June.

Table 17: The number of acres burned at as result of wildfires in a given year (VDOF, 2015)

County	Number of Acres Burned in a Giver Year						Total
	2010	2011	2012	2013	2014	2015*	
Essex	88.7	28.9	4.7	.9	7.5	3.1	133.8
Gloucester	4	664	132.4	4.3	14.6	145	964.3
Middlesex	7.5	479.9	1.4	0	0.7	1	490.5
Mathews	30.5	0.2	3.5	0.5	4.4	0	39.1
King & Queen	3.1	5	20.1	7	50.5	16	101.7
King William	14.1	52	22	0	1.6	1.4	91.1

*Please note that the 2015 data is only through mid-June.

Previous wildfire events identified in the 2011 Mitigation Plan include:

- During 2009, Middlesex County experienced a major wildfire north of Urbanna between route 602 and US Route 17 near Hilliard Pond.

- During 2008, Gloucester County experienced a significant fire in the Guinea area that burned several acres. While this fire did not require any evacuations it did require mutual aid from other jurisdictions. This fire was coordinated through Abington Volunteer Fire and Rescue.

In 2008, drought conditions combined with strong winds resulted in sporadic wildfires in numerous locations throughout the Middle Peninsula region. Mutual aid assistance between area fire departments, as well as from the VDOF, was widely used during these wildfire events.

As discussed at the PENEX '09 Regional Training Exercise in September 2009, there is a need for more formalized written agreements between some neighboring jurisdictions when it comes to mutual aid assistance. Also, the lack of operable communications between neighboring jurisdictions willing to offer mutual aid to one another, as well as with state forces, is an issue that was also cited in the After-Action-Report from the PENEX '09 Regional Training Exercise. The PENEX '09 exercise covered jurisdictions in both the Middle Peninsula and Northern Neck regions.

Mitigation strategies formalizing MOUs between area fire departments to quickly respond to the adverse effects of the wildfire hazard should be included as part of the MPNHMP update.

Mitigation strategies to improve communication systems between the local jurisdictions and with their state fire-fighting partners should also be proposed with this update.

In addition, the VDOF safety tips - as noted above - lend themselves to a public education mitigation strategy dealing with wildfires and should be included with this update.

Wildfire Extent (Impact)
The VDOF thoroughly tracks the number of acres burned and estimated damages for each incident in the Commonwealth. Timing and coordination resulted in limitations in using this data as part of the ranking methodology.

4.3.5. Riverine Flooding

A flood is partial or complete inundation of normally dry land areas. *Riverine flooding* is defined as the overflow of rivers, streams, drains, and lakes due to excessive rainfall, rapid snowmelt, or ice. This type of flooding is different from *coastal flooding*, which is caused by storm surge and wave action and affects coastal areas, especially those along the beachfront. There are several types of riverine floods, including headwater, backwater, interior drainage, and flash flooding. Flash flooding is characterized by rapid accumulation or runoff of surface waters from any source. This type of flooding impacts smaller rivers, creeks, and streams and can occur because of dams being breached or overtopped. Because flash floods can develop in a matter of hours, most flood-related deaths result from this type of event.

Periodic flooding of lands adjacent to non-tidal rivers and streams is a natural and inevitable occurrence. When stream flow exceeds the capacity of the normal water course, some of the above-normal stream flow spills over onto adjacent lands within the floodplain. Riverine flooding is a function of precipitation levels and water runoff volumes within the watershed of the stream or river. The recurrence interval of a flood is defined as the average time interval, in years, expected to take place between the occurrence of a flood of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

The major rivers of the Middle Peninsula are tidal in nature, serving as estuarine tributaries of the Chesapeake Bay. Flood hazard varies by locality and type of flooding. Riverine flooding is more of a threat to mountainous regions, where population areas typically lie in narrow valleys, which lack the ability to store and dissipate large amounts of water. Consequently, stream flow tends to increase rapidly.

Riverine flooding was addressed during the flood mitigation planning process and mitigation strategies in this update will include:

1. Continuing to maintain and enforce a strong NFIP,
2. Investigating the feasibility of undertaking a FEMA-promoted Community Rating System (CRS) for enhanced floodplain protection policies, and
3. Actively promoting public education programs about development in and adjacent to areas with a history of flooding from rivers and creeks.

Riverine Flooding
As riverine flooding is defined as the overflow of rivers, streams, drains, and lakes due to excessive rainfall, rapid snow melt, rapid ice melt or a combination of all three and this type of flooding involves the partial or

complete inundation of normally dry land areas. If differs from coastal flooding, which is caused by a combination of rain, storm surge and wave action and affects coastal areas, especially those along the beachfront.

Approximately 60% of Virginia's river flooding begins with flash flooding from tropical systems passing over or near the state. Riverine flooding also occurs because of successive rainstorms. Rainfall from any one storm may not be enough to cause a problem, but with each successive storm's passage over the basin, rivers rise until eventually they overflow their banks. If this occurs in late winter or spring, melting snow in the mountains can produce additional runoff that can compound flooding problems.

There are several types of riverine flooding including headwater, backwater, interior drainage, and flash flooding:

Headwater flooding results from significant rain events that occur at the upper reaches of a watershed that then flow downstream within a short period of time.

Backwater flooding results when the lower portion of a river or stream is blocked by debris or backed up due to a storm surge along the coast.

Interior drainage flooding results when a dam gives way and the water being held in the impoundment is released all at once to the downstream receiving channel.

Flash flooding is characterized by rapid accumulation and runoff of surface waters from any source. This type of flooding impacts smaller rivers, creeks, and streams and can occur because of dams being breached or overtopped. Because flash floods can develop in a matter of hours, most flood-related deaths result from this type of event.

Although flash flooding is more of a threat in the steeper mountainous regions of the state where population areas typically lie in narrow valleys that lack the ability to store and dissipate large amounts of water, some of the hilly areas in the upper reaches of the Middle Peninsula watersheds can experience rapid increase in stream flow resulting in some riverine flooding and subsequent threats to life and property.

Periodic flooding of lands adjacent to non-tidal rivers and streams is a natural and inevitable occurrence. When stream flow exceeds the capacity of the normal water course, some of the above-normal stream flow spills over onto adjacent lands within the floodplain. Riverine flooding is a function of precipitation levels and water runoff volumes within the watershed of the stream or river.

The recurrence interval of a flood is defined as the average time interval, in years, expected to take place between the occurrence of a flood of a particular magnitude and a second one of equal or greater magnitude. Flood magnitude increases with increasing recurrence interval. The interval most referred to and also the basis for many local government regulations is known as the 100-year flood or storm event.

The major rivers in the lower Middle Peninsula are tidal in nature and they serve as estuarine tributaries of the Chesapeake Bay. Flood hazards vary due to the river's location and the type of storm event taking place.

Riverine Flooding Vulnerability

Populations and property are extremely vulnerable to flooding. Homes business, public buildings and critical infrastructure may suffer damage and be susceptible to collapse due to heavy flooding. Floodwaters can

carry chemicals, sewage, and toxins from roads, factories, and farms; therefore any property affected by the flood may be contaminated with hazardous materials. Debris from vegetation and man-made structures may also be hazardous following the occurrence of a flood. In addition, floods may threaten water supplies and water quality, as well as initiate power outages, and create health issues such as mold.

Riverine Flooding Extent (Impact)
The FEMA Special Flood Hazard Area designations area associated with the probability of flooding (Tables18):

Table 18: FEMA Flood Zone Designations and probabilities (VDEM, 2013).	
Zone V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined
Zone VE	Coastal flood zone with velocity hazard (wave action); wave heights above 3 feet; Base Flood Elevations determined.
Zone A	100 Year flood area (1% annual change of flood). Base Flood Elevations determined.
Zone AE	100 year flood area (1% annual chance of flood). Base Flood Elevations determined.
Zone AO	Subject to 100 year shallow flooding with flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); Base Flood Elevations undetermined
Zone X	Areas with 0.2% annual chance of flood or less; areas in 100 year flood zone with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
Zone X500	The same description as Zone X, however, this area falls between the 100 and 500-year flood zone.
UNDES	Area in which flood hazards are undetermined.

4.3.6. Sea Level Rise

A look at the geologic record of Chesapeake Bay shows a long and dynamic history - from the bolide (asteroid or comet) impact about 35 million years ago which formed the Chesapeake Bay impact crater, to the melting of glaciers beginning about 18,000 years ago, resulting in a continued rise of sea level and drowning of the Susquehanna River valley. Given that the rise in sea level has been occurring for thousands of years and is fundamental to the present formation of the Chesapeake Bay and our local tidal waters, there has been a heightened level of concern in recent years. Concern is justified given that current and projected rates of sea level rise represent a significant increase over what we experienced during the last century. There is general consensus that rise in sea level will continue for centuries to come, and that human and natural communities within the Middle Peninsula will be vulnerable. Understanding the challenge is vital for local government to develop strategies to reduce the regions vulnerability to sea level rise.

Causes and Current Rates of Local Sea Level Rise
Processes responsible for rising sea levels are complex. To help simplify the matter, it is useful to make a distinction between the concepts of eustatic and relative sea level (RSL) change. Eustatic change, which can vary over large spatial scales, describes sea level changes at the oceanic to global scale that result from changes in the volume of seawater or the ocean basins themselves. The two major processes responsible for eustatic change are the thermal expansion of seawater due to warming and the melting and discharge of continental ice (i.e., glaciers and ice sheets) into the oceans. The global average for current (2003-mid 2011) eustatic sea level change is 0.11 in/yr(2.8 mm/yr) (NOAA Laboratory for Satellite Altimetry, 2008) with estimates for the Chesapeake Bay region on the order of 0.07 in/yr (1.8 mm/yr; Boon et al. 2010) for the approximate same time period.

RSL change describes the observed change in water level at a particular location and represents the sum of eustatic sea level change and local vertical land movement (subsidence or uplift) at that location. Within the Chesapeake Bay region, land subsidence represents a significant component of RSL change. Processes contributing to land subsidence include tectonic (movement of the earth's crust) and man-induced impacts (e.g., groundwater withdrawal, hydrocarbon removal). During the last glacial period (maximum extent approximately 20,000 yr BP), the southern East Coast limit of the Laurentide ice sheet coincided with northern portions of Pennsylvania (Mickelson and Colgan, 2003). As a consequence, land subsided under the ice load and, in turn, created a fore-bulge or upward displacement of lands south of the ice load. Upon retreat of the glacier, the land continued to redistribute, rebounding in previously glaciated areas and subsiding in the more southern forebulge region. Land subsidence rates on the order of 0.05-0.06 in/yr (1.2-1.4 mm/yr) are attributed to the postglacial forebulge collapse within the Bay region (Douglas, 1991). It can take many thousands of years for impacted regions to reach isostatic equilibrium.

At a more local level, overdrafting of groundwater is a significant factor driving land subsidence rates. Within the Eastern Virginia Groundwater Management Area, large industrial and domestic use groundwater withdrawals from the Potomac aquifer series occur in the areas of Franklin, Suffolk and West Point, VA. Elevated subsidence rates, which integrate both regional and local causes, were first observed near the centers of large groundwater withdrawals through repetitive high-precision relevelings and analysis of tide records, and later through studies that directly measured aquifer system compaction. Land subsidence rates within the Middle Peninsula, based on releveling analysis, vary between 0.09-0.15 in/yr (2.4-3.8 mm/yr) with maximum values being observed at West Point (Holdahl and Morrison 1974; Davis 1987). Pope and Burbey (2004) reported average aquifer system compaction rates of 0.06 in/yr (1.5 mm/yr; 1979-1995) and 0.15 in/yr (3.7 mm/yr; 1982-1995) near the Franklin and Suffolk pumping centers, respectively, and that compaction appeared to correlate with groundwater withdrawal; West Point was not included as part of this study. It has been suggested that the Chesapeake Bay impact structure, whose outer rim traverses the lower Middle Peninsula (Powars and Bruce, 1999) may contribute to local land subsidence. While observations suggest post impact subsidence at a geologic scale (Johnson et al. 1998), present day influence is currently unknown.

It is important to note however that the lower lying counties like Gloucester and Mathews County will most likely see the largest impact from sea level rise.

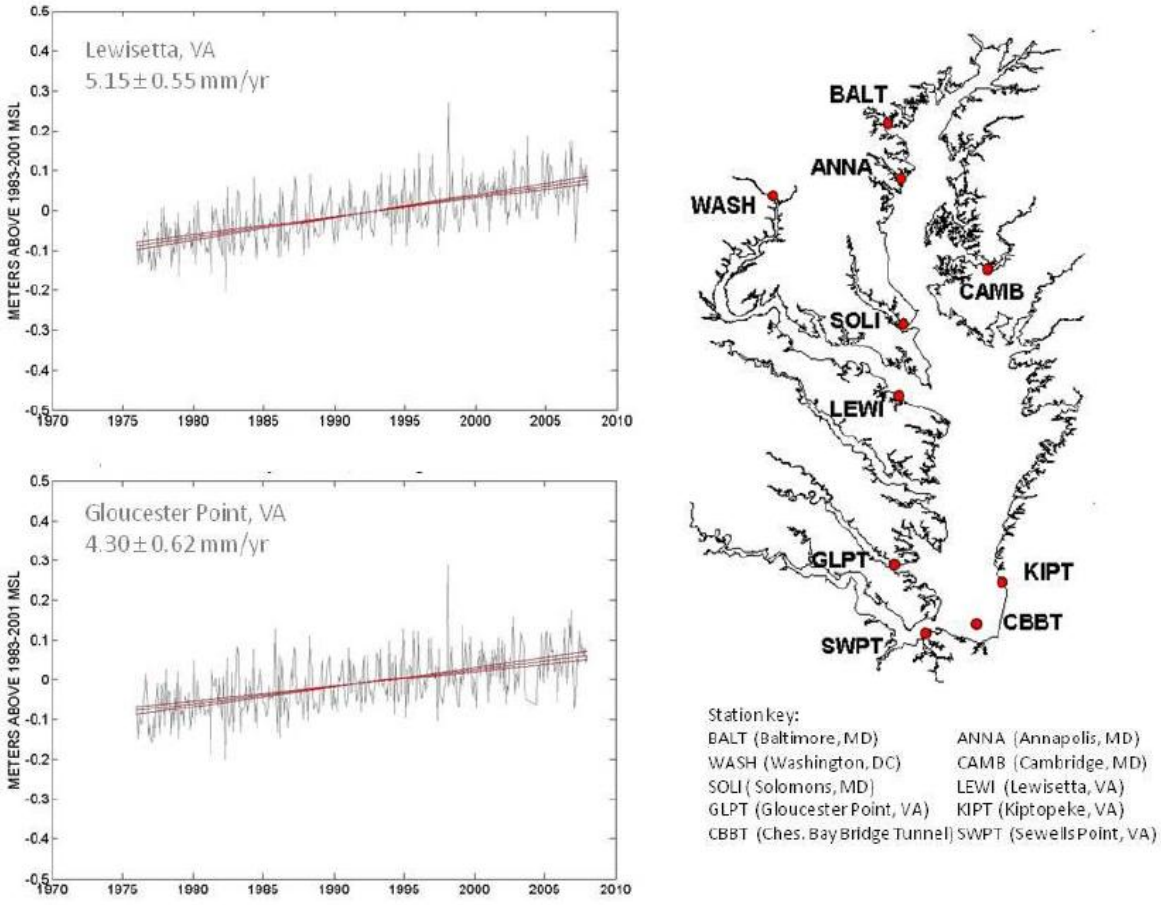


Figure 23: RSL Trends. *RSL trends and 95% confidence intervals for Lewisette, VA and Gloucester Point, VA (after removal of Seasonal cycle and decadal signal) from the 1976-2007 period and location map for Chesapeake Bay National Water Level Observation Network Stations (Boon et al. 2010).*

Sea Level Rise Vulnerability

Coastal habitat as well as activity may be impacted by sea level rise. As the water reaches further inland it will influence humans, the environment and the economy. Table 19 shows the potential impacts to sea level rise.

Table 19: Impacts of sea level rise on humans, the environment and the economy.	
Sector	Effect
IMPACTS TO HUMANS	
Recreation	-Public access point throughout the region may be inundated
Transportation	-Roads may be inundated -Travel disruptions
Infrastructure	-Property loss and increased need to mitigate -Increased demands on stormwater management systems -Inundation of public and private infrastructure
Health	-Sanitation concerns will increase as rising groundwater levels and sea waters may inundate onsite wastewater disposal systems and drainfields.
Emergency Response	-The ability to provide emergency services to all inundated areas may be reduced. There may be difficulty reaching these locations due to high waters.
IMPACTS TO THE ENVIRONMENT	
Hydrology and Water resources	-Water quality could be impacted as rising groundwater levels and sea waters may inundate onsite wastewater disposal systems and drainfields. -Changes in hydrology could impact local natural resources.
Agricultural crops	-Increased inundation of crop fields. This could drown the crops. -Salt water intrusion could destroy crops.
Forests	-Salt water intrusion could destroy forests creating "ghost forests".
IMPACT TO THE ECONOMY	
Transportation	-As roads are inundated this may cause travel and commerce disruptions -Increase road maintenance and cost
Business	-Reduced interest in the region to locate business -Higher insurance rates -Impacts to business infrastructure
Agriculture	-As the region's economy is based on natural resources, salt water intrusion could damage silviculture stands and crops that will have a negative impact on the local and regional economy.

Sea Level Rise Extent (Impact)

RSL rise rates at the local level are derived from accurate time series of water level measurements spanning several decades or more. A recent analysis of tide gauge data by the Virginia Institute of Marine Science reported RSL rise rates ranging from 0.11-0.23 in/yr (2.9-5.8 mm/yr; period: 1976-2007; 10 stations) within the Chesapeake Bay region, with a number of the values representing the highest rates reported along the U.S. Atlantic coast (Boon et al. 2010). With respect to the Middle Peninsula, the two nearest stations located at Gloucester Point and Lewisetta, VA indicate current RSL rise rates of 0.17 (4.30 mm/yr) and 0.20 in/yr (5.15 mm/yr), respectively (see Figure 23). Although there are no additional adequate tidal records available for the Middle Peninsula's bordering rivers (i.e. York and Rappahannock Rivers), one would expect RSL rise rates to increase as one approached areas of elevated land subsidence such as West Point, VA. Based on land subsidence and eustatic sea level information, the RSL rise rate would be expected to be on the order of 0.22 in/yr (5.6 mm/yr) at or near West Point, VA. Extrapolating current Gloucester Point and Lewisetta rates, RSL would increase by another 0.7- 0.8 ft (21-25 cm) by 2050 and 1.4-1.7 ft (43-51 cm) by 2100; this represents a conservative and low-end estimate. There is growing

concern that RSL rise rates will accelerate in the future with projections of sea level increases in the Bay region of approximately 2.3-5.3 ft (70-160 cm) by 2100 (Pyke et al. 2008).

4.3.7. High Wind / Windstorms (excluding tornados and hurricanes)

High winds and windstorms, when not a result of hurricanes or tornadoes, are often associated with thunderstorms. The NWS defines a severe thunderstorm as having winds 50 kts (58 mph) or hail greater than ¾" in diameter (about dime-sized). A thunderstorm is considered severe if it produces hail larger than 3/4 of an inch (2 cm), winds greater than 58 mph (93 kph), or tornadoes. This strong frontal system could produce violent damaging effects to the community, such as hail, lightning, high winds (sometimes including tornadoes), and flash floods. Numerous thunderstorms occur in Middle Peninsula every year and vary amongst localities.

High Wind/Windstorms Vulnerability

The threat that any particular thunderstorm presents varies depending on its intensity, structure, and the ground below it. Many thunderstorms simply require people and their belongings to seek shelter inside a sturdy building. However, severe thunderstorms can be very dangerous and require seeking shelter underground because of the damage, they can cause to buildings. Historically the most severe occur during the spring and summer. In the U.S., only about 10% of all thunderstorms are classified as severe. Seeking shelter before a thunderstorm has arrived is best because high wind and lightning can form well in advance of any precipitation. Hail-resistant roofs can reduce property damage, as can properly attached roofs. As always, learning about what safety measures to take during a thunderstorm is the first and most important step in coping with thunderstorms.

In the U.S., the NWS issues severe thunderstorm watches and warnings. A watch is issued when atmospheric conditions are favorable for the development of a severe thunderstorm. A warning is issued when severe thunderstorms have developed. Similar to tornado watches and warnings, severe thunderstorm warnings are broadcast via media (ie. radio and television), Internet, and NOAA weather radios. Particularly of note for coastal communities, such as the Middle Peninsula, are wind advisories associated with water bodies. A Small Craft Advisory is issued for sustained winds 25-33 knots and/or Seas > 7 feet within 12 hours; There is no legal definition of "small craft" but the Coast Guard generally recommends boats smaller than 33 feet should avoid being on the water, but it depends on the experience of the crew. A Gale Warning is issued for 1-minute sustained surface winds in the range 34 kt (39 mph or 63 kph) to 47 kt (54 mph or 87 kph) inclusive, either predicted or occurring not directly associated with tropical cyclones. Reliable forecasting is essential to providing communities with adequate warnings about incoming thunderstorms and the specific threats that each storm possesses.

Damage from strong winds associated with thunderstorms can result in scattered, but severe damage to buildings and vegetation. Although these severe weather events usually occur during the spring and summer months, the emergency management staff should be prepared for them to occur at any time throughout the year.

Utilizing VDEM-generated information available on the state website and/or other information sources, community preparedness mitigation strategies should be developed by the localities for quick dissemination to their residents. Dissemination outlets should include jurisdictional websites, local radio and TV stations as well as social media sites such as Facebook and twitter.

Derecho

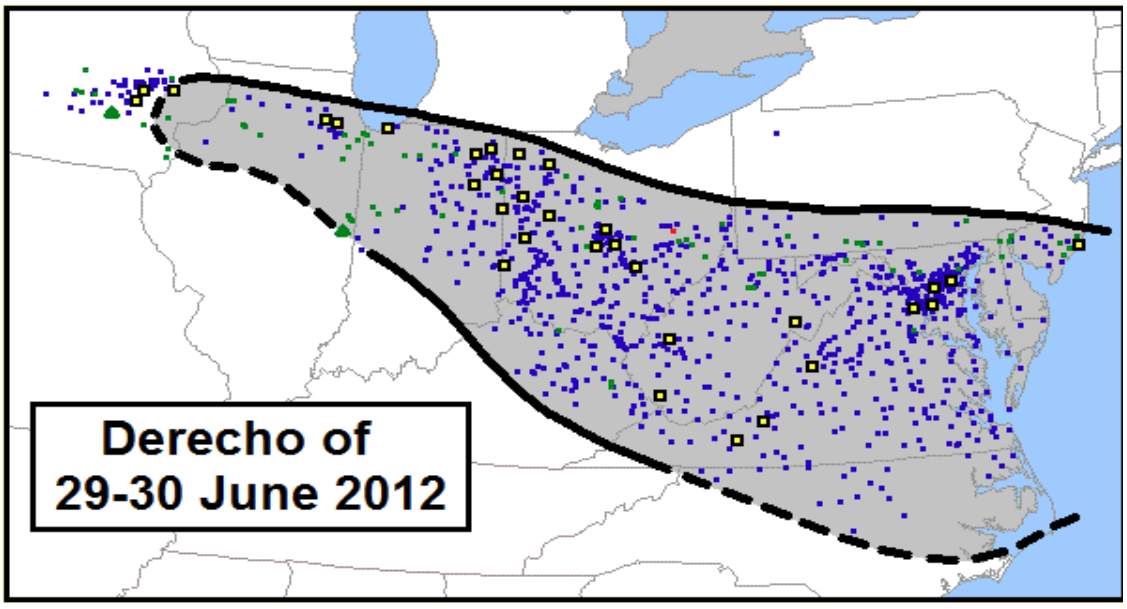
According to the National Weather Service, a derecho is a complex of thunderstorms or a mesoscale convective system (MCS) that produce large swaths of severe, straight-line wind damage at Earth's surface. To be classified as a derecho, the following conditions must be met:

- There must be a concentrated area of convectively induced wind damage or gust greater than or equal to 58 mph occurring over a path length of at least 250 miles.
- Wind reports much show a pattern of chronological progression in either a singular swath (progressive; this event was a classic example) or a series of swaths (serial.
- There must be at least three reports separated by 64 kilometers (km) or more of Enhances Fujita (EFI) damage/or measured convective wind gusts of 74 mph or greater.
- No more than 3 hours can elapse between successive wind damage/gust events.

Derechos can occur year-round but are most common from May to August (Coniglio et al., 2004)

On June 29, 2012, a derecho struck the Ohio Valley and Mid-Atlantic states. The derecho traveled 700 miles, impacting 10 states and Washington, D.C. (Figure 24). The hardest hit states were Ohio, West Virginia, Virginia, and Maryland, as well as Washington, D.C. The winds generated by this system were intense, with several measured gusts exceeding 80 mph, thirteen people were killed by the extreme winds, mainly by falling trees. An estimated 4 million customers lost power for up to a week. The region impacted by the derecho was also in the midst of a heat wave. The heat, coupled with the loss of power, led to a life-threatening situation. Heat claimed 34 lives in areas without power. The Middle Peninsula experienced wind gusts ≥65 kts (74 mph).

Figure 24: Area affected (black contours) and storm reports (colored symbols) associated with the June, 29, 2012 derecho. *Reports are for the 24-hour period from 7:00 a.m (Central Daylight Time (CDT)) Friday, June 29 to 7:00 a.m. CDT Saturday, June 30. Areal outline based in Iowa and Illinois to reflect the derecho's origin from convection in the region that did not immediately produce continuous derecho-like conditions. In addition, some of the report in those states occurred not with the system here discussed, but rather with a subsequent storm complex that formed on the evening of June 29. The areal outline also is dashed in North Carolina to reflect that many of the damaging wind gusts in the state occurred south of the thunderstorms that produced them. Storm reports depicted as follows. Wind damage or wind gust ≥ 50 kts (59 mph), small blue squares, estimated or measured with gusts ≥65 kts (74 mph), large black squares with yellow centers, hail ≥0.75 inches, small green squares, hail ≥2.0 inches, large green triangles, tornadoes, small red squares (NWS, 2012).*



High Wind / Windstorms Extent (Impact)
Wind risk can be determined by measuring the speed of the winds. The categories used to determine risk and ranking hazards include the following:

Hurricane Risk	Wind Speed (mph)	Category
Low	≤59.9	High Wind
Medium – Low	60.0-73.9	Tropical Storm
Medium – High	74.0-94.9	Category 1 Hurricane
High	≥95.0	Category 2 +

4.3.8. HAZMAT

HAZMAT can be defined as a material (as flammable or poisonous material) that would be a danger to life or to the environment if released without precautions. Furthermore, a hazardous material is any substance or material in a quantity or form that may pose a reasonable risk to health, the environment, or property. The risk of hazardous material risks will vary amongst Middle Peninsula as it includes incidents involving substances such as toxic chemicals, fuels, nuclear wastes and/or products, and other radiological and biological or chemical agents. In addition to accidental or incidental releases of hazardous materials due to fixed facility incidents and transportation accidents, regions must be ready to respond to hazmat releases as potential terrorism. It's important to note that the risk of a Hazmat incident are unpredictable and will vary amongst Middle Peninsula localities.

According to VDEM, all jurisdictions in Virginia have a Local Emergency Planning Committee that identified local industrial hazardous materials and keeps the community informed of the potential risks. With a fixed facility, the hazards are pre-identified, and the facility is required to prepare a risk management plan and provide a copy of this plan to local governments.

Hazardous materials carried through Middle Peninsula localities by commercial vehicle may also cause a risk, particularly if the vehicle is involved in an accident. While the vehicle should have placards on the vehicle to identify the hazard on board, however they are less predictable. In accordance with 9VAC20-110 the Virginia Waste Management Board is responsible for promulgating regulations governing the transport of hazardous materials within the Commonwealth. Additionally the VAC also provides requirements for "every person who transports or offers for transportation of hazardous materials within or through the Commonwealth of Virginia" (9VAC20-110-110) Therefore there are measures in place to help reduce the risk of hazards materials being transported through the Middle Peninsula Region.

HAZMAT Vulnerability
The effects of hazardous materially is ultimately dependent on the type and amount of hazardous material, however injuries and/or deaths could occur as a result of a hazmat incident. They can pose risk to health, safety, and property during transportation. According to VDEM, "A business might have to evacuate depending on the quantity and type of chemical released or local officials might close a facility or area for hours, possibility days until a substance is properly cleaned up. Businesses that store, produce or transport hazardous materials will be fined for sills. The business involve in the release would typically be responsible for the cost of the clean up. A business that is located near the site of the hazardous site of a hazardous materials spill or release is likely to be unaffected unless the substance is airborne and poses a threat to areas outside the accident site. In that case local emergency official would order an immediate evaluation of areas that could potentially be affected. Depending on the type of hazardous substance, it could take hours or days for emergency official to deem the area safe for return." Ultimately this would impact business productivity and could impact the local/regional economy.

HAZMAT Extent (Impact)

Hazardous materials are categorized into nine major hazard classes that communicated the risk associated with it. Table 20 shows categories and provides examples of the hazardous material.

Table 20: Hazardous material are divided into 9 categories (VDEM, 2013).

CLASS	Division	NAME OF CLASS OR DIVISION	EXAMPLE
1	1.1 1.2 1.3 1.4 1.5 1.6	Explosives (mass detonation) Projections Hazards Mass Fire Hazards Minor Hazards Very Insensitive Extremely Insensitive	Dinitrophenol Ammunition Smoke, White Phosphorous Article, Explosive No. 5 Fireworks Blasting Agents Explosive, Blasting, Type E Article, Explosive Extremely Insensitive
2	2.1 2.2 2.3	Flammable Gases Non Flammable Gases Poisonous/Toxic Gases	Propane Helium, Compressed Fluorine, Compressed
3		Flammable Liquids	Gasoline, Alcohol, Diesel Fuel, Fuel Oils
4	4.1 4.2 4.3	Flammable Solids Spontaneously Combustible Dangerous when wet	Ammonium Picrate, Wetted Phosphorus, White Dry Sodium
5	5.1 5.2	Oxidizers Organic Peroxides	Ammonium Nitrate, Liquid Organic Peroxide Type B, Liquid
6	6.1 6.2	Poisons (Toxic Material) Infectious Substance	Potassium Cyanide Diagnostic Specimen
7		Radioactive	Uranium, Plutonium
8		Corrosives	Hydrochloric Acid, Battery Acid, Formaldehyde, Sulfuric Acid
9		Miscellaneous Hazardous Materials	Asbestos, Airbag Inflaters
None		ORM-D (Other Regulated Material – Domestic)	Consumer Commodity (Hair Spray or Charcoal)
Combustible Liquid		Combustible Liquid	Heating Oil, Diesel Fuel

In addition to the categories of hazardous material, when shipping hazardous material driver must keep shipping papers and use the following to identify that they have hazardous material on board:

Package labels are diamond-shaped hazard warning labels found on most hazardous materials packages. These labels inform others of the hazard. If the diamond label does not fit on the package, shippers may put the label on a tag attached to the package. For example, compressed gas cylinders often have tags or decals.

Placards warn others of hazardous materials. They are placed on the outside of the vehicle and identify the hazard class of the cargo. A placarded vehicle must have at least four identical placards. Placards must be readable from all four directions. Therefore, they are put on the front, rear and both sides of the vehicle. Placards measure 10 ¾ inches square and are turned in a diamond shape. Cargo tanks and other bulk packaging display the identification number of their contents on placards. Or they may use orange panels or white diamond-shape displays the same size as placards.

4.3.9. Ditch Flooding

As per the Commonwealth of DEQ Guidance Memorandum No. 08-2004 Regulation of Ditches under the Virginia Water Protection (VWP) Program, ditch is defined as a linear feature excavated for the purpose of draining or directing surface or groundwater. Ditches may also be constructed to collect groundwater or surface water for the purposes of irrigation.

Ditch Flooding Vulnerability

Throughout the Middle Peninsula of Virginia, the network of aging roadside ditches and outfalls, serving 670 miles of roads, creates the region's primary stormwater conveyance system. Currently each locality in the region experiences inadequate drainage and as a result, roads and private properties are frequently flooded after a storm event. The lowest lying localities (ie. Mathews and Gloucester County) are more vulnerable to ditch flooding as most of their land is either at or slightly above sea level. This low topography and lack of grade does not assist the flow of water out of areas. Therefore, roadway flooding frequently cuts residents and business off from the county and emergency services for extended periods of time. Flooding has also caused the county school system to be closed due safety concerns. Flooding, risks to public health and safety, property damage, and long-term loss of property use and values are consequences of the inadequate drainage systems, all of which ultimately negatively impact the economy of the Middle Peninsula.

Conditions contributing to the failure of the drainage system, include, but are not limited to, the following:

1. A lack of maintenance, including removal of sediment and overgrown vegetation, causing slopes to be inadequate or reverse slope and/or tides not allowed to recede;
2. Insufficient elevation change (topographic constraints);
3. Cross-culverts are filled with sediment, not adequately maintained, damaged, and/or installed with an inadequate / reverse slope;
4. Unclear ownership and ditch maintenance responsibility (VDOT or private);
5. Sea level rise; and
6. Land subsidence.

When high exposure to hurricanes, nor'easters, tropical storms, sea level rise, and land subsidence is coupled with clogged roadside ditches and outfalls, illicit filling of the ditches on private property, and/or failing ditches, there are significant social, economic, and environmental impacts.

Ditch Flooding Extent (Impact)

Ditch flooding is currently measured through observations. Currently in Mathews County a citizen group records observations and takes photos of the ditch flooding. Additionally in 2015 the Draper Aden Associated partnered with Mathews County to develop a Stormwater Ditch Steering Committee that consisted of private citizens, VDOT, and MPPDC representatives. Areas within Mathews were selected to focus on that were prone to ditch flooding and were called priority areas. These priority areas were visited and existing conditions were noted. Based on findings in the field, DAA provided site recommendations to improve the given ditch as well as associated costs of the improvements. This information will be the basis of a roadside ditch database underdevelopment in 2016.

4.4. Hazards Considered "Critical" Hazards to the Middle Peninsula

The following sections describe hazards that are common throughout the Middle Peninsula region and deemed "Critical Hazards" to the Middle Peninsula by the Steering Committee.

4.4.1. Winter Ice Storms

Virginia's biggest winter storms are the great "Nor'easters". At times, Nor'easters have become so strong that they have been labeled the "White Hurricane". In order for these storms to form, several things need

to occur. High pressure builds over New England. Arctic air flows south from the high center into Virginia. The colder and drier the air is, the denser and heavier it becomes. This cold, dry air is unable to move west over the Appalachian Mountains and it remains trapped to the east side, funneling down the valleys and along the coastal plain toward North Carolina. To the east of the arctic air is the warm water of the Gulf Stream. The contrast of cold air sinking into the Carolinas and the warm air sitting over the Gulf Stream creates a breeding ground for storms. Combine this with the right meteorological conditions such as the position of the jet stream, and storm development may become "explosive" (sudden, rapid intensification; dramatic drop in the central pressure of the storm) (Watson and Sammler, 2004) (Figure 25).

Winter Ice Storms occur generally as freezing rain, when precipitation, starts falling as snow, melts as it passes through a warm layer of air several thousand feet above the ground. Beneath the warm layer of air is a shallow layer of freezing air just above the ground. As the liquid precipitation falls through this layer of freezing air, it becomes super-cooled, meaning that its temperature falls below freezing, but it remains a liquid. Before it has a chance to freeze solid (into sleet or ice pellets), the super-cooled liquid droplets hit the ground (or some object such as a tree limb or power line), whose temperature is also below freezing; the water then freezes on contact.

For a good Nor'easter to develop, the jet stream entering the West Coast of the United States splits. The northern branch crosses the northern Rockies and Canada while the southern branch dips to cross the Gulf Coast states, where it picks up a disturbance that it carries northeast across Virginia to rejoin the northern branch over Newfoundland. The northern branch of the jet supports the southward sinking cold air. When this disturbance interacts with the temperature boundary formed by the warm Gulf Stream waters and the arctic air mass inland, a low-pressure system forms. The strong wind from the northeast gives the low-pressure storm its name, *Nor'easter*. Wind blowing counter-clockwise around the storm center carries warm, moist air from the Gulf Stream up and over the cold inland air. The warm air rises and cools, and snow begins. The storm's speed and exact track to the north become critical in properly forecasting and warning for heavy snow across Virginia. On the Middle Peninsula, it is quite common for the rain-snow line to fall right over the northern sections of King William, King and Queen, and Essex Counties. Heavy snow often falls in a narrow 50-mile wide path about 150 miles northwest of the low-pressure center. Closer to the low's center, the warmer ocean air changes the precipitation to sleet, freezing rain and eventually rain. If the forecasted storm track is off by just a little bit, it may mean - 64 - the difference between forecasting heavy rain, freezing rain or sleet, and a foot of snow (Watson and Sammler, 2004). Therefore Middle Peninsula localities will not experience winter ice storms the same.

Intense winds around the storm's center build waves that rack the coastline and sometimes drive water inland, causing extensive coastal flooding and severe beach erosion. Unlike a hurricane, which usually comes and goes within one tidal cycle, the Nor'easter can linger through several tides, each one piling more water on shore and into the bays. The March 5-9, 1962 Nor'easter, known as the "Ash Wednesday Storm", lingered off the Virginia Capes for days. It caused over $200 million (in 1962 dollars) in property damage and major coastal erosion from North Carolina to Long Island, N.Y.

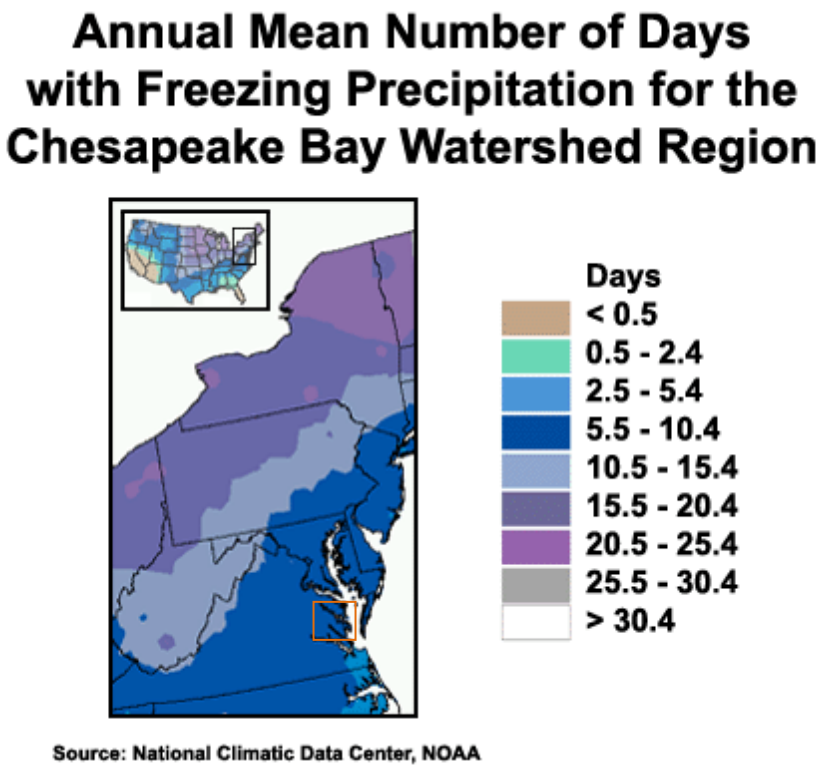


Figure 25: Annual mean number of days with freezing precipitation *(rain or drizzle) for the Chesapeake Bay Watershed region. The area encompassing the Middle Peninsula is highlighted on the map with a red square.*

As with snow, the frequency with which freezing rain occurs varies throughout the Chesapeake Bay watershed. In the northern part of the watershed, around Binghamton, NY, the incidence of freezing rain is one of the highest in the country. Although less common, freezing rain is still a threat even to the southern parts of the watershed. Figure 25 shows how the number of days with freezing precipitation (both rain and drizzle) in an average year varies throughout the Chesapeake Bay region. The Middle Peninsula generally experiences between 5.5 and 10.4 days of freezing rain annually. During the winter of 1993-1994, a series of ice storms struck Virginia. The conditions for the formation of an *ice storm* are not completely unlike those for the formation of a Nor'easter. High pressure over New England funnels cold, dry arctic air south over the state. The air tries to push west but cannot rise over the - 65 - Appalachian Mountains and becomes trapped on the east side. A storm moves northeast from the southern plains or Gulf Coast region. Instead of passing south and east of Virginia, it often moves up the western slopes of the mountains. As this warm, moist air rises over the mountains and the trapped cold air on the east side, precipitation begins (Watson and Sammler, 2004) (Figure 26). The type of precipitation depends on the depth of the cold air. At first the thickness of the 3cold air mass is often enough to produce snow, but as the warm air passes over the cold air and erodes it, the cold air mass gets more and more shallow. Soon the cold air mass is too thin to produce snow. Rain droplets freeze into small ice pellets, or *sleet*, as it falls through the cold air. When sleet hits the ground, it bounces and does not stick to objects (Watson and Sammler, 2004).

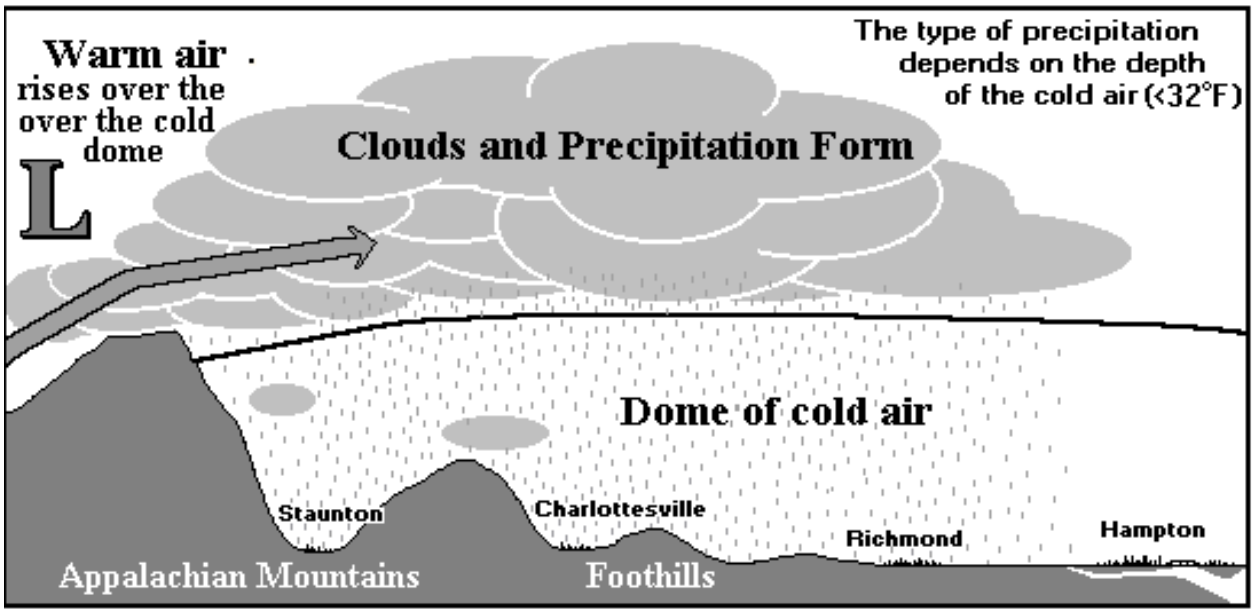


Figure 26: Ice Storm-Formation *(Watson and Sammler 2004).*

Eventually, the cold air mass is so shallow that the rain does not freeze. If the temperature of the earth's surface is below freezing, then rain will freeze as it hits the ground, producing *freezing rain*, a very dangerous on roadways or walkways. As the ice accumulates on trees and wires, the weight eventually causes them to break, knocking out power and phone service. Sometimes, so much ice can accumulate that structural damage and collapse can occur to buildings and communication towers. This is precisely what occurred during the "Christmas Ice Storm" of December 1998, which hit southeast Virginia, including the Middle Peninsula. Icy conditions caused injuries from slips, falls, and numerous vehicle accidents. Ice accumulations of up to an inch brought down trees and power lines. Outages were so widespread (400,000 customers on Christmas Eve) that some people were without power for up to ten days (Watson and Sammler, 2004). Other types of weather systems generally do not cause major problems for Virginia. Storms such as the "*Alberta Clipper*," a fast moving storm from the Alberta, Canada region, or a cold front sweeping through from the west generally do not bring more than one to four inches of snow in a narrow 50 to 60 mile-wide band. Sometimes, the high pressure and cold arctic air that follow in the wake of a clipper become the initial set up for a Nor'easter. In very rare cases, elements combine to produce very localized heavy snow without any fronts or storm centers nearby. These events are nearly impossible to forecast with any accuracy (Watson and Sammler, 2004).

However in November 2009, Tropic Storm Ida made landfall in Alabama, but weakened, losing its tropical storm characteristics, as it crossed to North Carolina. The storm redeveloped off the coast of Carolina in the Atlantic Ocean. The resulting coastal low combined with an unusually strong Canadian high over New England resulted in a strong pressure gradient over Coastal Virginia and the Carolinas. This caused storming northeasterly winds, high waves and record high water levels. Stations of the coastline of the Virginia recorded wind speeds, gusts and barometric pressures of this Nor'easter (Table 21).

Table 21: Maximum observed wind speeds, gusts and barometric pressure by stations located near Middle Peninsula Localities during the November 2009 Nor'easter.								
Station Name	**Maximum Wind Speed**			**Maximum Wind Gust**			**Minimum Barometric Pressure**	
	Date & Time (GMT)	**m/s***	**Kt****	**Date & Time (GMT)**	**m/s**	**Kt**	**Date & Time (GMT)**	**mb*****
Kiptopeke, VA	11/13 00:00	14.7	29	11/12 21:12	22.3	43	n/a	n/a
Lewisetta, VA	11/12 00:00	12.3	24	11/12 21:30	19.5	38	11/12 8:24	1006.7
Yorktown USCG Training Center, VA	11/12 23:06	21.4	42	11/12 23:12	25.9	50	11/12 23:06	1001.5
Chesapeake Bay Bridge Tunnel, VA	11/12 22:42	26.6	52	11/13 4:24	33.4	65	11/12 4:24	997.0
* 1 m/s (meters/second) = 2.2 miles per hour (mph) = 1.9 knots ** 1 kt (knot) = 1.2 mph = 0.05 m/s *** mb (millibar) = 0.03 inches								

Winter Ice Storms Vulnerability

Winter ice storms can impact individuals, property as well as the overall community. At the individual level ice has the potential to cause automobile accidents and reduce the walkability of community due to ice-covered walkways. Personal property may be impacted as pipes freeze or structural failures occur due to the weight of the ice. The overall community may also be impacted as transportation will be interrupted or halted, and the weight of ice to snap tree limbs could damage power lines or infrastructure.

Winter Ice Storm Extent (Impact)

While a winter ice storm may be measured based the damages caused by the ice storm, wind speed and the barometric pressure, winter ice storms may also be measure on the Sperry-Piltz Ice Accumulation Index (2009). This scale can predict the projected footprint, total ice accumulation and the resulting potential damages from approaching ices storms (Table 22).

Table 22: The Sperry-Piltz Ice Accumulation Index, or "SPIA Index". The below categories of damages are based upon combinations of precipitation totals, temperatures and wind/speeds/directions (SPIA, 2009).	
ICE DAMAGE INDEX	**DAMAGE AND IMPACT DISCRIPTIONS**
0	Minimal risk of dame to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1-5 days
4	Prolonged and widespread utility interruptions with extensive damage to main distribution feeder lines and some high voltage transmission lines/structures. Outages lasting 5-10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

4.4.2. Coastal Flooding

According to the Virginia Hazards Mitigation Plan coastal flooding occurs when strong onshore winds push water from an ocean, bay or inlet onto the land. In addition, coastal areas experience flooding from overland flow, ponding and inadequate storm water drainage. Coastal flooding may arise from tropical cyclones (hurricanes and tropical storms) or Nor'easters (extra tropical storms).

Flooding is the most frequent and costly natural hazard in the United States - besides fire. Nearly 90% of Presidential Disaster Declarations result from natural events where flooding is a major component. Excess water from snowmelt, rainfall, or storm surge accumulates and overflows onto adjacent floodplains and other low-lying land adjacent to rivers, lakes, ponds and the Chesapeake Bay. Based on data

Coastal flooding is typically a result of storm surge, wind-driven waves, and heavy rainfall. These conditions are produced by hurricanes during the summer and fall, and nor'easters and other large coastal storms during the winter and spring. Storm surges may overrun barrier islands and push sea water up coastal rivers and inlets, blocking the downstream flow of inland runoff.

Coastal Flooding Vulnerability

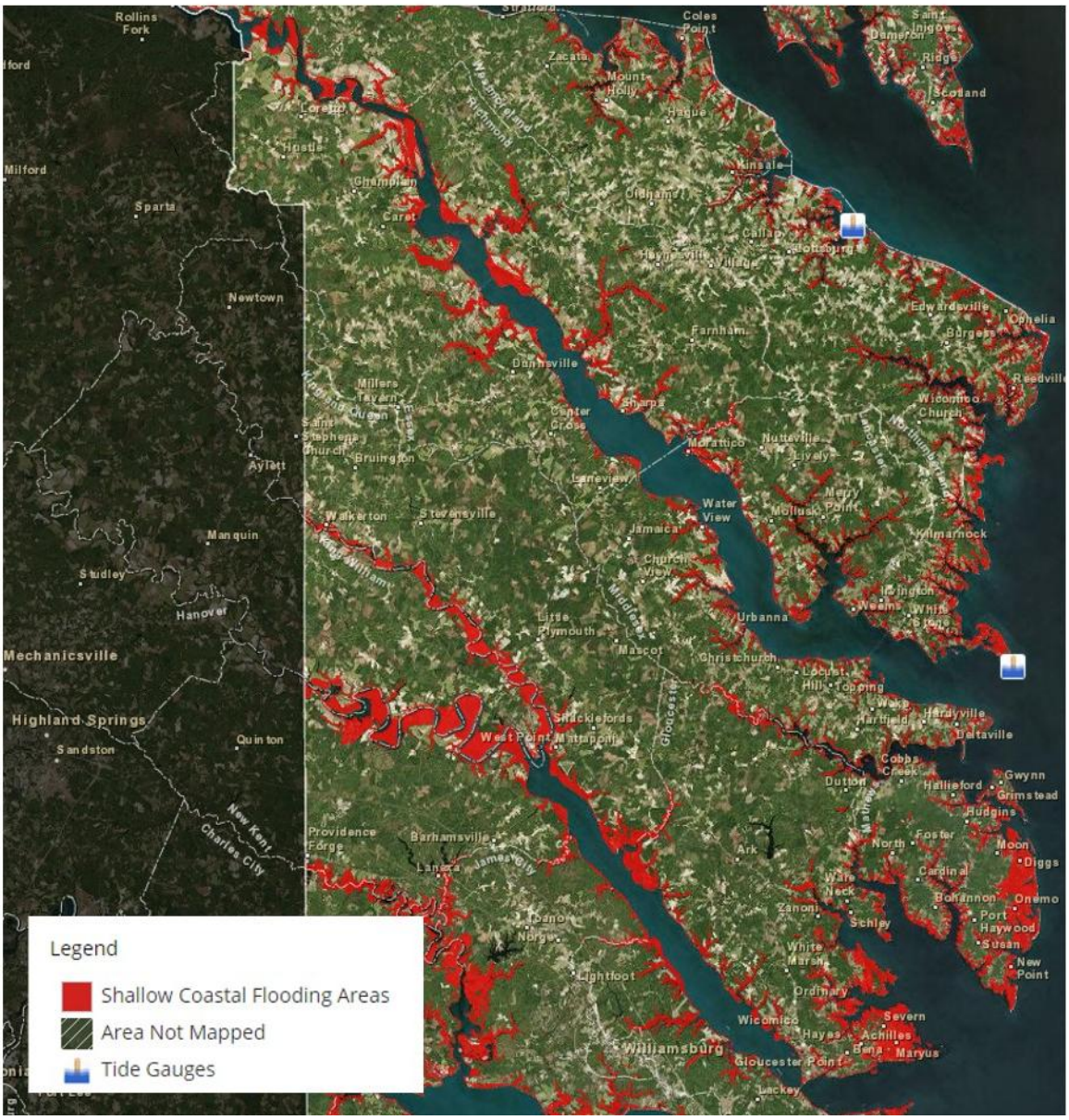
Thousands of acres of crops and forest lands may be inundated by both saltwater and freshwater. Escape routes, particularly from barrier islands, may be cut off quickly, stranding residents in flooded areas and hampering rescue efforts. Coastal flooding is very dangerous and causes the most severe damage where

large waves are driven inland by the wind. These wind driven waves destroy houses, wash away protective dunes, and erode the soil so that the ground level can be lowered by several feet. Because of the coastal nature of the Middle Peninsula, the region is very susceptible to this type of flooding and resulting damage.

Based on NOAA's Coastal Management Digital Coast Database frequent shallow flooding occurs in the Middle Peninsula region. As many coastal areas experience periodic mini-to-moderate shallow coastal flooding events – typically as result of meteorological factors that include high tides, winds, and rain. Figure 27 is a map of the Middle Peninsula showing the areas impacting the coastal areas. One can see that there is varying degree of impact amongst Middle Peninsula localities.

Figure 27:

Frequent Shallow Coastal Flooding in Middle Peninsula Virginia (NOAA, 2015)



Coastal Flooding Extent (Impacts)
To help identify coastal flooding, FEMA will conduct engineering studies referred to as Flood Insurance Studies (FISs). Using the information gathered in these studies, FEMA engineers and cartographers delineate Special Flood Hazard Areas (SFHAs) on flood maps. SFHA are subject to inundation by a flood that has a 1-percent or greater chance of being equaled or exceeded in any given year. This type of flood is commonly referred to as the 100-year flood or base flood. A 100-year flood is not a flood that occurs every 100 years. In fact, the 100-year flood has a 26 percent chance of occurring during a 30 year period, the length of many mortgages. The 100- year flood is a regulatory standard used by Federal agencies and most states, to administer floodplain management programs. The 100-year flood is also used by the NFIP as the basis for insurance requirements nationwide. The FEMA Special Flood Hazard Area designations area associated with the probability of flooding (Table 18):

4.4.3. Lightning
Virginia averages 35 to 45 thunderstorm days per year statewide (Watson, 2001). Thunderstorms are generally beneficial because they provide needed rain for crops, plants, and reservoirs. Thunderstorms can occur any day of the year and at any time of the day, but are most common in the late afternoon and evening during the summer months. About five percent of thunderstorms become severe and can produce tornadoes, large hail, damaging downburst winds, and heavy rains causing flash floods. Thunderstorm can develop in less than 30 minutes, allowing little time for warning. All thunderstorms produce lightning, which can be deadly. The NWS does not issue warnings for ordinary thunderstorms nor for lightning. The NWS does highlight the potential for thunderstorms in the daily forecasts and statements. The VDEM suggests that the public be alert to the signs of changing weather, such as darkening skies, a sudden wind shift, and drop in temperature, and having a warning device such as NOAA Weather Radio.

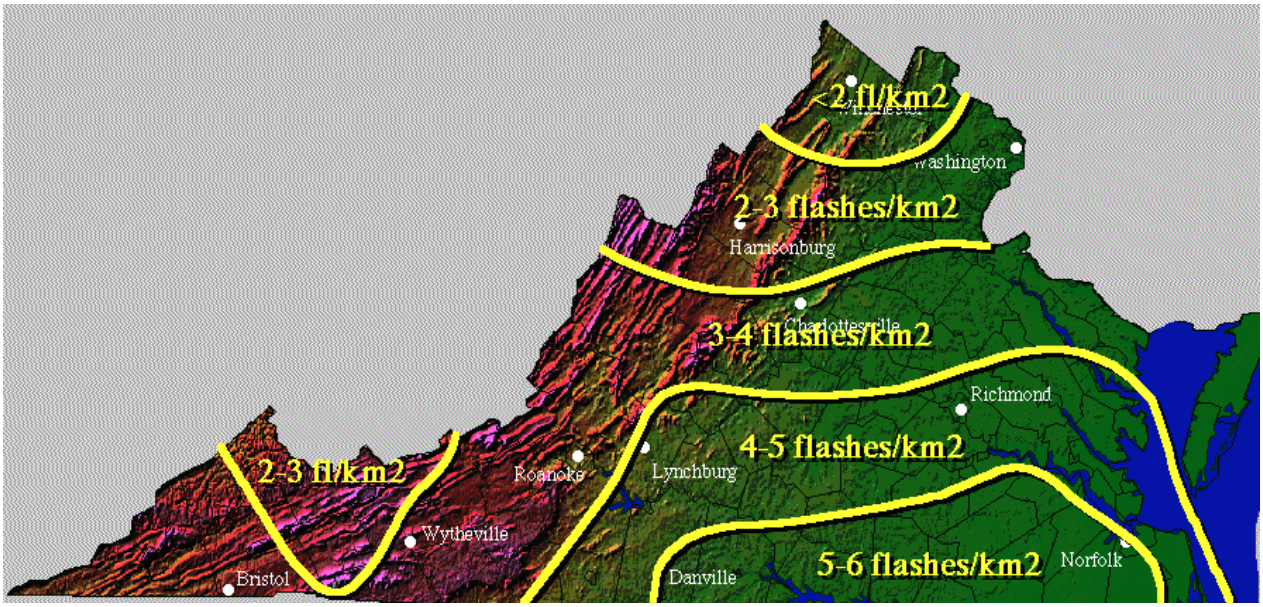


Figure 28: Lightning Flash Density Map *computed for 1989 (Electric Power Institute) (University of Virginia Climatology Office, 1989).*

Lightning can strike up to 10 to 15 miles from the rain portion of the storm. The lightning bolt originates from the upper part of the thunderstorm cloud known as the anvil. A thunderstorm can grow up to 8 miles into the atmosphere where the strong winds aloft spread the top of the thunderstorm cloud out into an anvil. The anvil can spread many miles from the rain portion of the storm but it is still a part of that storm. Lightning, from the anvil, may strike several miles in advance of the rain. Lightning bolts may also

come from the side or back of the storm, striking after the rain and storm have seemed to pass, or hitting areas that were totally missed by the rain.

Lightning Vulnerability

Between 1959 and 2014, lightning killed 66 people in Virginia and from 1959 to 1994 has injured at least 238 people. Many additional injuries from lightning go unreported or are not captured by NWS data collection techniques. Nationally, from 1959 through 2014, there have been 4049 deaths due to lightning. Most deaths were males between the ages of 20 and 40 years old who were caught outdoors on fishing, camping, boating or farming /ranching. A national network of 114 lightning ground stroke detectors was put in place by the Electric Power Research Institute (EPRI), a private organization, that serves the needs of power companies and other subscribers interested in lightning across the country (Virginia Climate Advisory, 1992). These detectors sense the characteristic electromagnetic impulses of cloud-to-ground lightning strikes that occur up to several hundred kilometers away. Then, by using triangulation techniques, the network is able to describe the location of every ground strike that it detects in the continental U.S. (Figure 28). It's important to realize that the contours on the map are very general and because accurate, long term records of lightning strikes do not exist, the illustration may not be representative of long-term patterns. Historic data shows that the Middle Peninsula is at a low risk of suffering damages from lightning and thunderstorms, yet it is important to note that thunderstorms and lightning can be very dangerous and can accompany hurricanes and other severe weather events.

Although lightning can be dangerous and/or life threatening, it is hard to generate specific mitigation strategies for this potential natural hazard other than a general public awareness/education campaign associated with thunderstorm/lightning activity.

4.4.4. Hurricanes

Hurricanes are cyclonic storms that originate in tropical ocean waters. Most hurricanes develop in an area 300 miles on either side of the equator. Hurricanes are heat engines, fueled by the release of latent heat from the condensation of warm water. Their formation requires a low-pressure disturbance, sufficiently warm sea surface temperature, a rotational force resulting from the spinning of the earth and the absence of wind shear in the lowest 50,000 feet of the earth's atmosphere.

Hurricanes that impact Virginia form in the so-called Atlantic Basin - from the west coast of Africa towards the Caribbean Sea and Gulf of Mexico. Hurricanes in this basin generally form between June 1 and November 30 – with a peak around mid-September. In an average season, there are about 10 named tropical storms in the Atlantic Basin with 6 of these likely to develop into hurricanes. The busiest hurricane season in the 20th century was in 1933, which saw 21 hurricanes/tropical storms. Two of these storms hit the Tidewater Region and caused significant devastation in the Middle Peninsula - known as the "Chesapeake-Potomac Hurricanes of 1933". By contrast, the 1914 season saw no hurricanes and only one tropical storm.

As a hurricane develops, barometric pressure at its center falls and winds increase. A weather system with winds at or exceeding 39 mph is designated as a tropical storm, which is given a name and closely monitored by the NOAA National Hurricane Center in Miami, Florida. When winds are at or exceed 74 mph, the tropical storm is deemed to be a hurricane. Hurricane intensity is measured using the Saffir-Simpson Scale, ranging from a Category 1 (minimal) to a Category 5 (catastrophic) hurricane.
The scale categorizes the intensity of hurricanes using a linear method based upon maximum sustained winds, minimum barometric pressure and storm surge potential, which are combined to estimate the potential flooding and damage to property given a hurricane's estimated intensity. See the table below for greater details on the characteristics of Category 1 thru Category 5 hurricanes.

Hurricane Vulnerability

Hurricanes have the greatest potential to inflict damage as they cross the coastline from the ocean, which is called landfall. Because hurricanes derive their strength from warm ocean waters, they are generally subject to deterioration once they make landfall. The forward momentum of a hurricane can vary from just a few miles per hour to 40 mph. This forward motion, combined with a counterclockwise surface air flow, makes the right front quadrant of the hurricane the location of the most potentially damaging winds.

Hurricanes have the potential to spawn dangerous tornadoes. The excessive rainfall and strong winds can also cause flash floods, flooding and abnormal rises in sea levels known as storm surges. Although a hurricane may cause a tremendous amount of wind and water damage, the accompanying storm surge is much more dangerous to life and property in coastal regions. The storm surge is a great dome of water typically 50 miles wide that comes sweeping across the coastline near the area where the eye of the hurricane makes landfall. This storm surge, aided by the hammering effect of breaking waves, acts like a giant bulldozer as it sweeps everything in its path. The stronger the hurricane, the higher and more dangerous the storm surge will be. Nine out of ten hurricane fatalities are caused by the storm surge.

The vulnerability will vary amongst localities within the Middle Peninsula. In particular, as Gloucester and Mathews County are located within the Chesapeake Bay Carter, and therefore these lower lying areas of the region will be the most vulnerability. Also, generally, as hurricane hit land the storm is slowed therefore those coastal areas of the region will be at most risk. However secondary impacts may be experienced inland and in upland counties (i.e. King William, King & Queen, and Essex Counties).

Hurricane Extent (Impact)

The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 categorization based on the hurricane's intensity at the indicated time. The scale – originally developed by wind engineer Herb Saffir and meteorologist Bob Simpson – has been an excellent tool for alerting the public about the possible impacts of various intensity hurricanes. The scale provides examples of the type of damage and impacts in the United States associated with winds of the indicated intensity. In general, damage rises by about a factor of four for every category increase.

Category One Hurricane

Very dangerous winds will produce some damage

(Sustained winds 74-95 mph, 64-82 kt, or 119-153 km/hr)

People, livestock, and pets struck by flying or falling debris could be injured or killed. Older (mainly pre-1994 construction) mobile homes could be destroyed, especially if they are not anchored properly as they tend to shift or roll off their foundations. Newer mobile homes that are anchored properly can sustain damage involving the removal of shingle or metal roof coverings, and loss of vinyl siding, as well as damage to carports, sunrooms, or lanais. Some poorly constructed frame homes can experience major damage, involving loss of the roof covering and damage to gable ends as well as the removal of porch coverings and awnings. Unprotected windows may break if struck by flying debris. Masonry chimneys can be toppled. Well-constructed frame homes could have damage to roof shingles, vinyl siding, soffit panels, and gutters. Failure of aluminum, screened-in, swimming pool enclosures can occur. Some apartment building and shopping center roof coverings could be partially removed. Industrial buildings can lose roofing and siding especially from windward corners, rakes, and eaves. Failures to overhead doors and unprotected windows will be common. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. There will be occasional damage to commercial signage, fences, and canopies. Large branches of trees will snap and shallow rooted trees can be toppled. Extensive damage to power lines and poles will likely result in power outages that could last a few

to several days. Hurricane Dolly (2008) is an example of a hurricane that brought Category 1 winds and impacts to South Padre Island, Texas.

Category Two Hurricane
Extremely dangerous winds will cause extensive damage
(Sustained winds 96-110 mph, 83-95 kt, or 154-177 km/hr)
There is a substantial risk of injury or death to people, livestock, and pets due to flying and falling debris. Older (mainly pre-1994 construction) mobile homes have a very high chance of being destroyed and the flying debris generated can shred nearby mobile homes. Newer mobile homes can also be destroyed. Poorly constructed frame homes have a high chance of having their roof structures removed especially if they are not anchored properly. Unprotected windows will have a high probability of being broken by flying debris. Well-constructed frame homes could sustain major roof and siding damage. Failure of aluminum, screened-in, swimming pool enclosures will be common. There will be a substantial percentage of roof and siding damage to apartment buildings and industrial buildings. Unreinforced masonry walls can collapse. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. Commercial signage, fences, and canopies will be damaged and often destroyed. 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. Potable water could become scarce as filtration systems begin to fail. Hurricane Frances (2004) is an example of a hurricane that brought Category 2 winds and impacts to coastal portions of Port St. Lucie, Florida with Category 1 conditions experienced elsewhere in the city.

Category Three Hurricane
Devastating damage will occur
(Sustained winds 111-130 mph, 96-113 kt, or 178-209 km/hr)
There is a high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. Most newer mobile homes will sustain severe damage with potential for complete roof failure and wall collapse. Poorly constructed frame homes can be destroyed by the removal of the roof and exterior walls. Unprotected windows will be broken by flying debris. Well-built frame homes can experience major damage involving the removal of roof decking and gable ends. There will be a high percentage of roof covering and siding damage to apartment buildings and industrial buildings. Isolated structural damage to wood or steel framing can occur. Complete failure of older metal buildings is possible, and older unreinforced masonry buildings can collapse. Numerous windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Most commercial signage, fences, and canopies will be destroyed. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to a few weeks after the storm passes. Hurricane Sandy (2012) is an example of a hurricane that brought Category 3 winds and impacts to coastal portions of Cuba, but it downgraded to a Category 2 storm off the coast of the Northeast.

Category Four Hurricane
Catastrophic damage will occur
(Sustained winds 131-155 mph, 114-135 kt, or 210-249 km/hr)
There is a very high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. A high percentage of newer mobile homes also will be destroyed. Poorly constructed homes can sustain complete collapse of all walls as well as the loss of the roof structure. Well-built homes also can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Extensive damage to roof

coverings, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will break most unprotected windows and penetrate some protected windows. There will be a high percentage of structural damage to the top floors of apartment buildings. Steel frames in older industrial buildings can collapse. There will be a high percentage of collapse to older unreinforced masonry buildings. Most windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months. Hurricane Charley (2004) is an example of a hurricane that brought Category 4 winds and impacts to coastal portions of Punta Gorda, Florida with Category 3 conditions experienced elsewhere in the city.

Category Five Hurricane

Catastrophic damage will occur

(Sustained winds greater than 155 mph, greater than 135 kt, or greater than 249 km/hr)
People, livestock, and pets are at very high risk of injury or death from flying or falling debris, even if indoors in mobile homes or framed homes. Almost complete destruction of all mobile homes will occur, regardless of age or construction. A high percentage of frame homes will be destroyed, with total roof failure and wall collapse. Extensive damage to roof covers, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will occur to nearly all unprotected windows and many protected windows. Significant damage to wood roof commercial buildings will occur due to loss of roof sheathing. Complete collapse of many older metal buildings can occur. Most unreinforced masonry walls will fail which can lead to the collapse of the buildings. A high percentage of industrial buildings and low-rise apartment buildings will be destroyed. Nearly all windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Nearly all trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months. Hurricane Andrew (1992) is an example of a hurricane that brought Category 5 winds and impacts to coastal portions of Cutler Ridge, Florida with Category 4 conditions experienced elsewhere in south Miami-Dade County

Hurricane Isabel in 2003 was one of Virginia's costliest disasters, causing widespread devastation and disrupting the lives of thousands of citizens – including those living in the Middle Peninsula. This deadly storm was a Category 2 hurricane when it made landfall between Cape Lookout and Cape Hatteras on North Carolina's Outer Banks on Thursday, September 18, 2003. By the time it reached Virginia, it was downgraded to a Category 1 hurricane. Even though the storm followed a path west of the City of Richmond, Isabel's destructive effects were felt throughout Tidewater Virginia and the entire Mid-Atlantic Region.

Hampton Roads remained in the right front quadrant through most of the storm's landfall, which helped to push the storm surge into many inland areas along the rivers. Property damage resulting from the 4 to 12-foot storm surge was extensive in many parts of the region. Homes, bulkheads and piers were damaged and the winds resulted in significant damage to properties and power lines. Rainfall totaled between 2 and 11 inches along the storm's track. Trees, especially those with shallow root systems, were blown over. Damages due to wind, rain, and storm surge resulted in flooding, electrical outages, piles of debris, transportation interruptions and damaged homes/businesses. Many citizens were without power for

several days - with others in remote locations of the Middle Peninsula without power for up to three weeks.

Statewide losses to residential property were estimated to exceed $590 million and businesses reported over $84 million in losses. Thirty-two deaths were directly or indirectly attributed to this storm in Virginia. One of these deaths was in Gloucester County when an individual died of a heart attack after their vehicle was swept up in high water. Hurricane Isabel is considered one of the most significant tropical cyclones to affect portions of northeastern North Carolina and east-central Virginia since Hurricane Hazel in 1954 and the Chesapeake-Potomac Hurricane of 1933 (Beven and Cobb, 2004).

Although Virginia was spared a direct hit, the hurricane season of 2004 may be the costliest on record in the United States. Fifteen tropical or subtropical storms formed in the North Atlantic. Nine of these storms become hurricanes with six becoming major hurricanes of Category 3 or higher on the Safflir-Simpson Hurricane Scale. Six of the hurricanes, Alex, Charley, Frances, Gaston, Ivan and Jeanne, and three tropical storms struck the United States in 2004. The strongest hurricane was Ivan, which reached Category 5 status. Ivan was directly blamed from 26 deaths and damage estimates were $13 billion in the United States.

With 4 hurricanes and tropical storms hitting the United States in a 5-week period, 2004 has been labeled as the year of the hurricane according to leading experts who participated in a Center for Health and the Global Environment briefing at Harvard Medical School (Compass Publications, Inc. 2004). They report that the intense period of destructive weather may be a harbinger of what is to come. Hurricanes have been on the increase over the past decade as part of a natural multi-decadal cycle (Ananthaswamy, 2003). These storms are more likely to form when the Atlantic is warm, as it was from the 1930s to the 1960s.

Although the decades since the 1960s have seen fewer hurricanes, numbers have risen since 1995 and may not have reached the predicted peak yet. There is growing evidence and concern that tropical storms will be more intense and pronounced as future climate changes are expected to persist.

By virtue of its position along the Atlantic Ocean and near the Gulf Stream, southeastern Virginia is frequently impacted by hurricanes. Continuous weather records for the Hampton Roads Area of Virginia began on January 1, 1871 when the National Weather Service was established in downtown Norfolk. However, the recorded history of significant tropical storms that affected the area goes back much further.

Prior to 1871, very early storms have been described in ship logs, newspaper accounts, history books, and countless other writings. The residents of coastal Virginia during Colonial times were very much aware of the weather. They were a people that lived near the water and largely derived their livelihood from the sea. To them, a tropical storm was indeed a noteworthy event. The excellent records left by some of Virginia's early settlers and from official records of the National Weather Service are summarized in the "*Chronology of Middle Peninsula Hazard Events.*"

Since 1953, Atlantic tropical storms have been named from lists originated by the National Hurricane Center. The lists featured only women's names until 1979, after which male and female names were included in the lists for both the Atlantic and Gulf of Mexico storms. Whenever a hurricane has had a major impact, any country affected by the storm can request that the name of the hurricane be "retired" by agreement of the World Meteorological Organization (WMO). Retiring a name actually means that it cannot be reused for at least 10 years, to facilitate historic references, legal actions, insurance claim activities, etc. and to avoid public confusion with another storm of the same name. Retired names for storms that hit the Tidewater Region include Agnes (1972), Cleo (1964), David (1979), Donna (1960),

Floyd (1999), Fran (1996), Gloria (1985), Gracie (1959), Hazel (1954), and Isabel (2003) (NOAA Atlantic Oceanographic and Meteorological Laboratory, Hurricane Research Division).

Middle Peninsula Storm Surge Hazard Maps

In order to estimate the geographic extent of potential damage from these hurricanes, a review of the 2008 Middle Peninsula Storm Surge Hazard Maps show the worst case scenario of hurricane storm surge inundation at mean tide. Figures 29- 32 are maps developed by the U.S. Corp of Engineers in conjunction with the VDEM as part of their 2008 Virginia Hurricane Evacuation Study.

Due to the nature of the study, only Mathews, Gloucester and Middlesex Counties in the Middle Peninsula were included since they are considered coastal counties that suffer greatly from tidal surge impacts and therefore have impacts for evacuating residents from low-lying areas. Although the limits of the study only included the lower half of our region, it should be noted that all of the Middle Peninsula localities experienced storm surges during the latest severe storm - Hurricane Isabel in September 2003.

The data reflects only still salt water flooding. Freshwater flooding may also occur with hurricane events from heavy rainfall runoff, and waves may accompany the surge and cause further inundation. The maps represent the surge from Category 1 through 4 hurricanes. State and federal officials do not include storm surges from a Category 5 hurricane since they do not believe that the ocean water temperature off of the Virginia Coast is warm enough for such an intense storm.

Figures 21 through 24 summarize surge height estimates using the SLOSH (Sea, Lake, and Overland Surges from Hurricane) Model. The model was developed by Chester Jelesnianski of the NOAA, NWS. The storm surge computations and analysis were conducted by the Storm Surge Group of the National Hurricane Center.

The SLOSH model was used to develop data for various combinations of hurricane strength, wind speed, and direction of movement. Hurricane strength was modeled by use of central pressure (defined as the difference between the ambient sea level pressure and the minimum value in the storm's center), the storm eye size, and the radius of maximum winds (using four of the five categories of each hurricane intensity as depicted in the Saffir-Simpson Hurricane Scale). The modeling for each hurricane category was done using the mid-range wind speed for that category. Six storm track headings (WNW, NW, NNW, N, NNE, NE) were selected as being representative of storm behavior in the Virginia region, based on observations by forecasters at the National Hurricane Center. Additional inputs into the model included depths of water offshore, the heights of the terrain and onshore barriers.

Figure 29: Storm Surge Inundation Map of Middlesex, Gloucester, and Mathews Counties (VDEM, 2014).

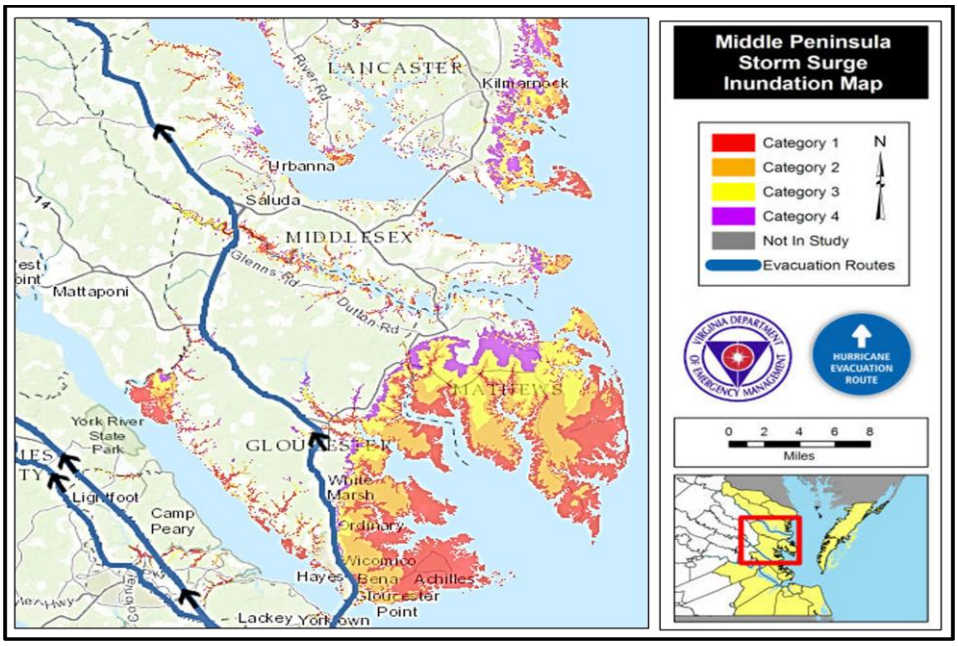


Figure 30: Storm Surge Inundation Map *of Middlesex County (VDEM, 2014).*

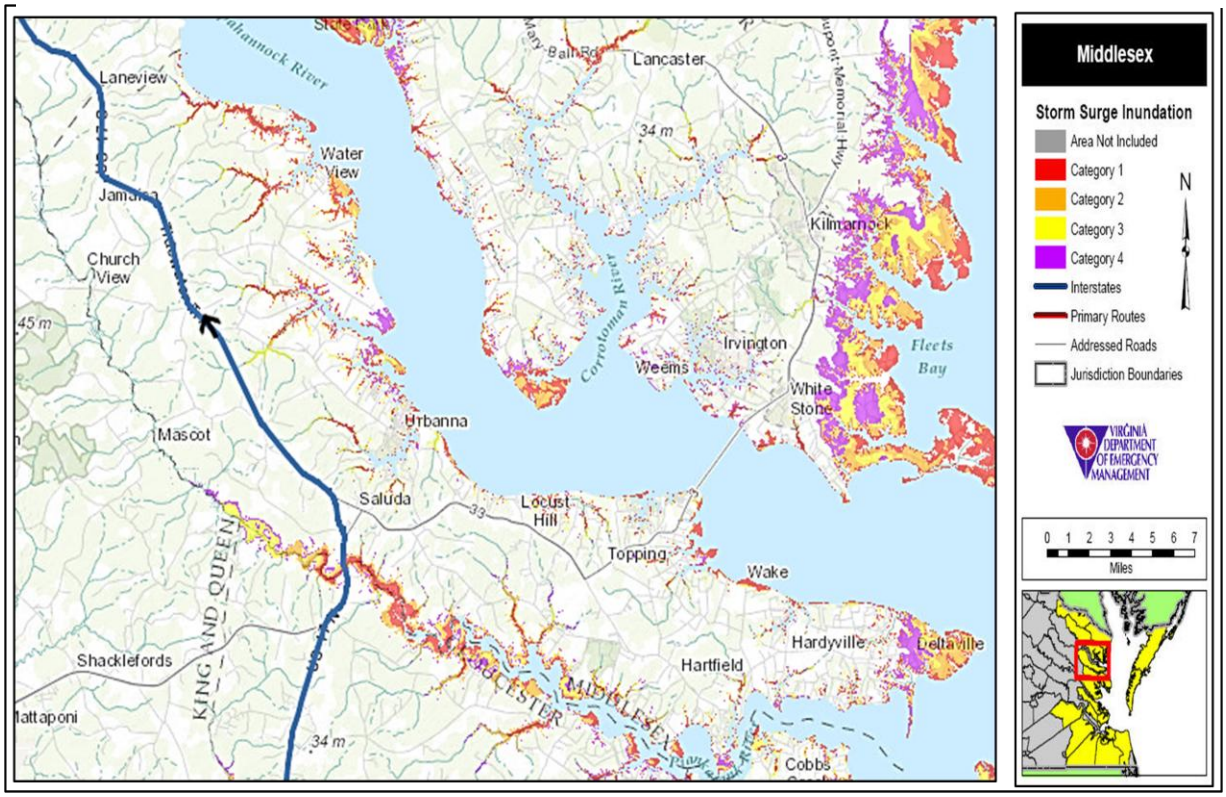


Figure 31: Storm Surge Inundation Map *of Mathews County (VDEM, 2014).*

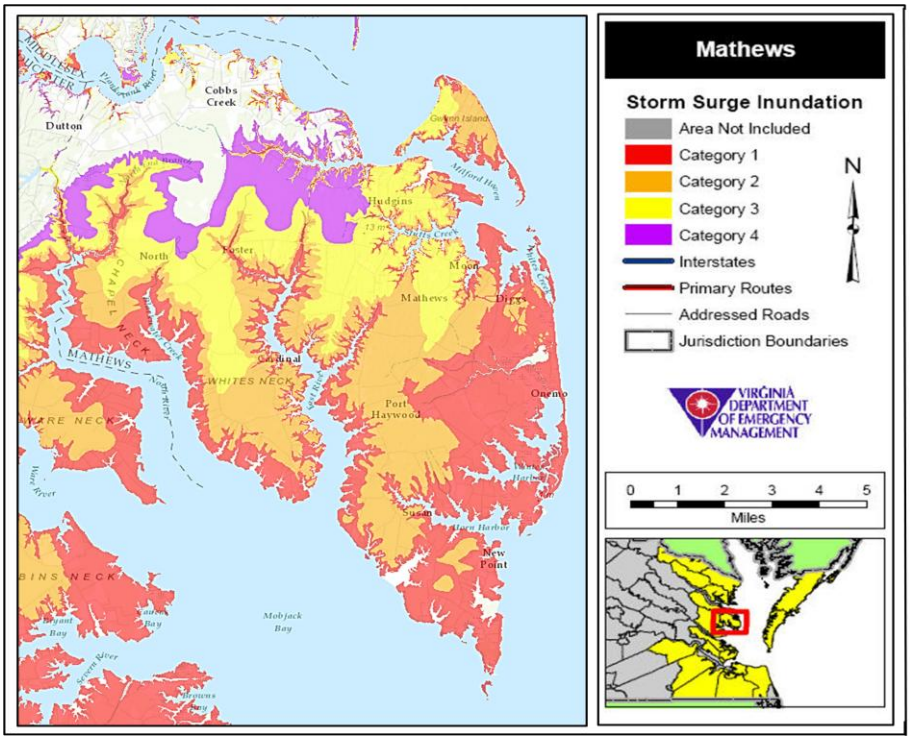
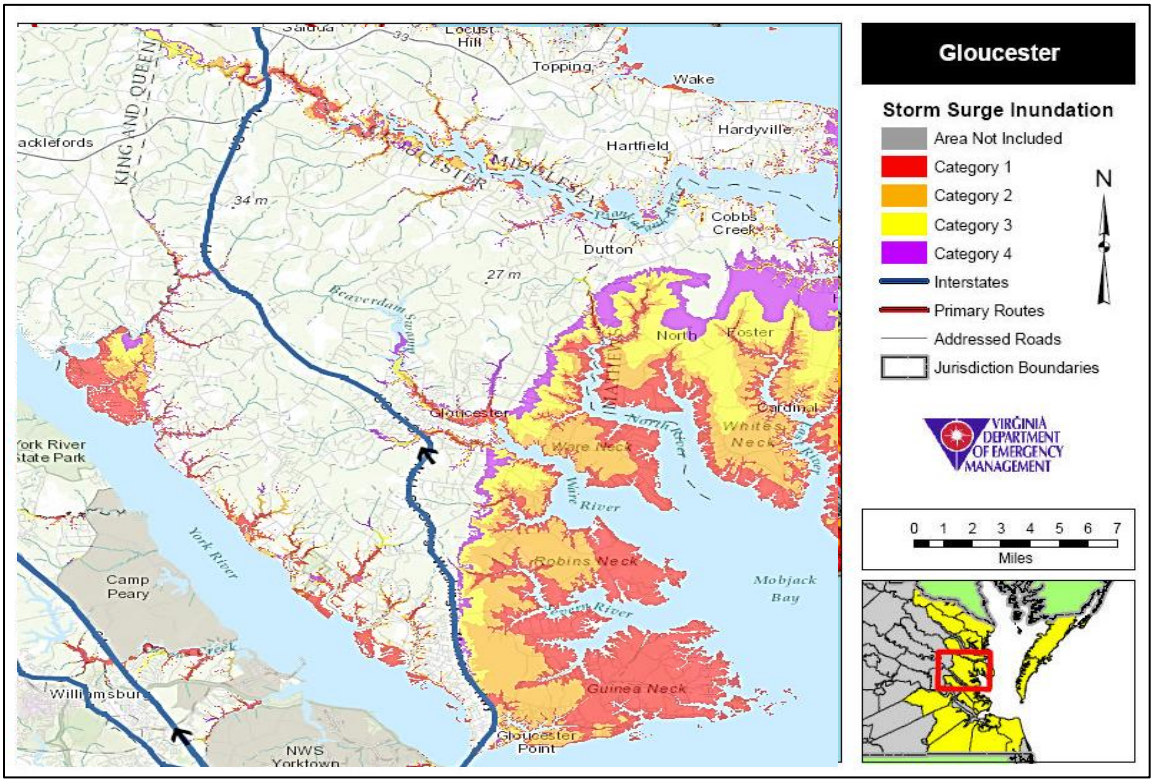


Figure 32: Storm Surge Inundation Map *of Gloucester County (VDEM, 2014).*



Historical Occurrences
In evaluating localized threats of hurricanes and tropical storms to the Middle Peninsula Region, NOAA hurricane tracking data from 1851 to 2014 was analyzed to identify storms that may have posed a threat to the region.

Based on these data, 43 storms - including hurricanes, tropical storms and tropical depressions - passed within 25 nautical miles of the Middle Peninsula Region. Of these storms 2 were hurricanes, 22 were tropical storms, 8 were tropical depressions, and 11 were extra-tropical storms (Table 23). Over the same period of time, 60 storms passed within 50 nautical miles of the region, including 4 hurricanes, 31 tropical storms, 11 tropical and subtropical depressions, and 14 extra-tropical storms (Table 23).

Table 23: Historic Storm Tracks within 50 and 25 nautical mile radii of the Middle Peninsula between 1851 and 2014.

Type of Storm	Quantity passing within 50 nm	Quantity passing within 25 nm
Hurricane – Category 5 (winds >155 mph)	0	0
Hurricane – Category 4 (winds 131-155 mph)	0	0
Hurricane – Category 3 (winds 111-130 mph)	0	0
Hurricane – Category 2 (winds 96-110 mph)	1	1
Hurricane – Category 1 (winds 74-95 mph)	3	1
Tropical Storm (winds 39-73 mph)	31	22
Tropical Depression (winds <38 mph)	10	8
Subtropical Storm (winds 39-73 mph)	0	0
Subtropical Depression (winds <38 mph)	1	0
Extra-tropical Storm (winds <39 mph)	14	11
Total:	**60**	**43**

General Chronology of Middle Peninsula Coastal Storm Hazard Events
Because of its proximity to the Atlantic Coast and Chesapeake Bay, the Middle Peninsula has been impacted by coastal storms throughout recorded history, and therefore it is not surprising that hurricanes, coastal flooding, nor'easters, and coastal/shoreline erosion were among the top ranked hazards affecting the Middle Peninsula Region as ranked by the Regional Risk Assessment and Mitigation Planning Committee in 2005 and re-affirmed by the Middle Peninsula Flood Mitigation Plan Team Members in 2009.

Hurricanes come close enough to produce hurricane force winds approximately three times every 20 years. Two or three times a century, winds and tides produce considerable damage and significantly threaten life. Historical records are invaluable to researchers trying to understand long-term patterns in the frequency and intensity of coastal storms and such data on storms and weather go back a long time in Virginia, thanks to record keeping by early weather observers such as George Washington, James Madison and Thomas Jefferson as well as journals/articles written by early settlers. The following is a brief synopsis of the major coastal storm events that have impacted the Middle Peninsula Region.

From 1564 to 1799
Hurricanes played an important role during the European exploration and colonization of the Americas. Great storms that besieged Virginia influenced the establishment of new settlements and changed the coastal geography, particularly on the Middle Peninsula. While official weather records did not begin until 1871 in Norfolk, tremendous coastal storms were often recorded through the shipwrecks they induced and in the writings of the early Virginia colonists.

The records of hurricane and tropical storm occurrences during this era are sparse compared to modern-day accounts, since the colonies were not settled until the early 1600's. The original settlers at Jamestown experienced the wrath of such storms firsthand and it is suggested that the lost colony of Roanoke Island may have been doomed by a coastal storm. The first such storm to be recorded occurred in 1564. Others followed in June 1566, June 1586, August 1587, and August 1591. A September 1667 storm, deemed the "Dreadful Hurry Cane of 1667", destroyed thousands of homes in Virginia (Brinkley, 1999). Twelve days of rain was said to have followed this storm, causing the Chesapeake Bay to rise 12 feet. This storm and a July 1788 hurricane may have followed a similar track as the 1933 hurricane, which caused massive devastation to the Middle Peninsula.

The October Hurricane of 1749 was a great disaster for Virginians. It formed Willoughby Spit in Norfolk and put the city streets of Hampton 4 feet below water. The Bay was said to have risen 15 feet above normal, destroying waterfront buildings (Ludlum, 1963). At least 50 vessels were driven ashore along the Virginia coast, with a loss of 22 lives. Damage in and around the city of Norfolk was estimated to be at least 30,000 Virginia Pounds (approximately $3 million in today's currency – Brinkley, 1999).

The September 8, 1769 hurricane, considered one of the worst storms of the eighteenth century, passed over Williamsburg. Damage was "inconceivable" and crops were destroyed. Many old homes and trees were leveled. Heavy rain ruined tobacco crops and flooded roads. Tobacco in storage warehouses was also damaged. Heavy damage was seen in Chesapeake Bay. High winds tore off the top of a wharf at Yorktown and a schooner rammed a nearby storehouse. Four ships in the York River were driven ashore. Two ships on the James River were also wrecked. A vessel from Norfolk, filled with coal from Williamsburg, was forced up to Jamestown before it went to pieces (Roth and Cobb, 2001).

"The Independence Hurricane" of September 1775 ravaged the coast between Currituck, N.C. and Chincoteague on the Eastern Shore. Wharves and storehouses on the waterfront of Norfolk were devastated. Raging waters carried bridges away. At Williamsburg, mill-dams broke and corn stalks were blown flat. Many ships were damaged as they were thrown ashore at Norfolk, Hampton, and York. A full blockade of Hampton Roads thereafter brought shipping to a halt for three months. At least 25 died due to a shipwreck. On September 9, 1775, a Williamsburg correspondent of the Virginia Gazette wrote, "The shocking accounts of damage done by the rains last week are numerous; most of the mill-dams are broke, the corn laid almost level with the ground, and fodder destroyed; many ships and other vessels drove ashore and damaged at Norfolk, Hampton, and York. The death toll in Virginia and North Carolina was 163 lives (Roth and Cobb, 2001).

A strong gale played a role in a battle between the Royal Governor of Virginia, Dunmore, and General Lewis of the rebel forces on July 10, 1776. The royal fleet had been injured prior to the storm by General Lewis' forces and was sailing from Gwynn's Island (Mathews County) toward St. George's Island, in the Potomac. The British crew was without water and enduring smallpox when the gale struck. A flour-laden supply ship ran aground. One ship foundered at the Mouth of the Rappahannock, while another was stranded on the Eastern shore (Roth and Cobb, 2001).

On October 16, 1781, a storm of "unknown character" struck Virginia. The French Fleet and the Patriot Army, under the command of George Washington, trapped the Earl of Cornwallis at Yorktown. The Earl decided to flee to the north to Gloucester Point under the cover of darkness. A "furious storm" doomed the plan to failure, as seas ran high and every boat was "swamped." He sent forward his flag of truce and surrendered, thus ending the battle (Roth and Cobb, 2001).

The "most tremendous gale of wind known in this country" passed over the Lower Chesapeake Bay September 22-24, 1785 and went along a track very similar to the Chesapeake-Potomac Hurricane of 1933

and likely severely impacted the Middle Peninsula. At Norfolk, lower stories of dwellings were flooded. Warehouses were totally carried away by the storm surge, causing large amounts of salt, sugar, corn, and lumber to disappear. A large number of cattle drowned, and people hung onto trees for dear life during the tempest. Vessels floated inland into cornfields and wooded areas (Roth and Cobb, 2001).

"George Washington's Hurricane" of July 23-24, 1788, made landfall in Virginia and passed directly over the Lower Chesapeake Bay and Mount Vernon, the home of George Washington. This track is very similar to the track of the Chesapeake-Potomac Hurricane of 1933. At Norfolk, winds increased at 5 p.m. on the 23rd with the wind originating from the northeast. At 12:30 a.m., the wind suddenly shifted to the south and "blew a perfect hurricane, tearing down chimneys, fences, and leveling corn." In addition, large trees were uprooted and houses were moved from their foundations. Port Royal (Caroline County) and Hobb's Hole (Essex County) experienced a violent northeast gale, which drove several vessels ashore. In Fredericksburg, great quantities of corn, tobacco, and fruit were destroyed. Houses and trees fell in great numbers across Northumberland, Lancaster, Richmond and Westmoreland Counties on the Northern Neck. Crops were destroyed and many livestock perished in lower Mathews County. Many plantations saw their houses leveled. Homes were flooded with water six feet deep and several inhabitants drowned. Gloucester County was inundated, and an estimated $400,000 (in 1788 dollars) in damage was incurred (Roth and Cobb, 2001).

1800-1899

Great Coastal Hurricane of 1806 (August 23) caught British and French ships off guard, while engaged in the Napoleanic Wars in the U.S. shipping lanes. The British man-of-war *L'Impeteax* drifted under jury masts for 23 days before finally beaching near Cape Henry. Ships of the two warring nations put in for repair and refitting at the port of Norfolk after the storm. This hurricane, due to its slow movement and consequent erosion of the coastline, completed the creation of Willoughby Spit at Hampton Roads. A seawall built to prevent further erosion at Smith Point lighthouse at the mouth of the Potomac River was damaged (Roth and Cobb, 2001).

A severe coastal storm dropped heavy rains on the Fredericksburg area in January 1863. It rained for 30 hours, dropping more than twelve inches, making mud so deep that mules and horses died attempting to move equipment. The rivers became too high and swift to cross, disrupting the Union Army offensive operation in the ill-famed "Mud March" (Watson and Sammler, 2004).

The Gale of '78 was one of the most severe hurricanes to affect eastern Virginia in the latter half of the 19th century and struck on October 23, 1878. This hurricane moved rapidly northward from the Bahamas on October 22nd and struck the North Carolina coast later that same day moving at a forward speed of 40 to 50 mph. The storm continued northward passing through east central Virginia, Maryland, and eastern Pennsylvania. Cobb and Smith Islands on the Eastern Shore were completely submerged during this storm (Roth and Cobb, 2001).

A September 1882 tropical storm, the "protracted and destructive rain storm", swept away four mills near Ware's Wharf along the lower Rappahannock. The brunt of the cyclone only extended fifty miles inland. Heavy rains were also seen at Washington, D.C. (Roth and Cobb, 2001).

During an April 1889 Nor'easter, the Tidewater Region had sustained winds from the north of 75 mph measured at Hampton Roads and 105 mph at Cape Henry. Tides at Norfolk reached 8.37 feet above Mean Low Water, which is over 4 feet above flood stage level (Watson and Sammler, 2004).

Noteworthy hurricanes or tropical storms also occurred in September 1821 (one of the most violent on record for the 19th century), June 1825, August 1837, September 1846 (which formed Hatteras and Oregon

Inlets in North Carolina), August 1850, September 1856, September 1876, August 1879, October 1887, August 1893, September 1894, October 1897 (tides in Norfolk rose 8.1 feet above Mean Lower Low Water), and October 1899 (tide in Norfolk rose 8.9 feet above Mean Lower Low Water).

From 1900 to 1999

A number of coastal storms hit the Tidewater Region in the early part of the 20th century. Hurricanes and tropical storms in October 1903, August 1924, September 1924, August 1926, and September 1928 each brought high winds (in excess of 70 mph measured in Norfolk and in Cape Henry). The 1903 and 1928 storms also raised tides as much as 9 feet and 7 feet, respectively, higher than normal in the region (Roth and Cobb, 2001).

The summer of 1933 was the most active storm season for eastern Virginia in the 20th century. Two hurricanes, one on August 23 and one on September 16, struck the North Carolina and Virginia coasts and caused much devastation on the Middle Peninsula. In Chesapeake lore, the "Storm of '33" is recalled by older residents and enshrined in legend as the worst storm in memory (Mountford, 2003). The August storm brought winds in excess of 80 mph and a storm surge that forced the tide nearly 10 feet above normal.

The September storm struck the area 24 days later and had sustained winds as high as 88 mph (measured at the Naval Air Station in Norfolk) and the tide reached 8.3 feet above Mean Lower Low Water (Roth and Cobb, 2001). Much of the land around the New Point Comfort lighthouse, the third oldest light on the Bay located at the entrance to Mobjack Bay and the mouth of the York River in Mathews County, was washed away and caused the lighthouse to be stranded on a very small island a few 100 yards from the tip of the mainland.

Hurricane Hazel hit eastern Virginia on October 15, 1954. This storm brought with it gusts of 100 mph which is the highest wind speed record at the Norfolk Airport location. A reliable instrument in Hampton recorded 130 mph winds (Roth and Cobb, 2001).
A severe nor'easter gave gale force winds (40+ mph) and unusually high tides to the Tidewater Virginia area on April 11, 1956. At Norfolk, the strongest wind gust was 70 mph. The strong northeast winds blew for almost 30 hours and pushed up the tide, which reached 4.6 feet above normal in Hampton Roads. Thousands of homes were flooded by the wind-driven high water and damages were huge. Two ships were driven aground. Waterfront fires were fanned by the high winds. The flooded streets made access by firefighters very difficult, which added to the losses (Watson and Sammler, 2004).

The "Ash Wednesday Storm" hit Virginia during "Spring Tide" (sun and moon phase to produce a higher than normal tide) on March 5-9, 1962. The storm moved north off the coast past Virginia Beach and then reversed its course moving again to the south and bringing with it higher tides and higher waves which battered the coast for several days. The storm's center was 500 miles off the Virginia Capes when water reached 9 feet at Norfolk and 7 feet on the coast. Huge waves toppled houses into the ocean and broke through Virginia Beach's concrete boardwalk and sea wall. Houses on the Middle Peninsula also saw extensive tidal flooding and wave damage. The beaches and shorefront had severe erosion (Watson and Sammler, 2004).

Hurricane Cleo in September 1964 produced the heaviest coastal rainfall in the area (11.40 inches in 24 hours) since records began in 1871 (Roth and Cobb, 2001).

Hurricane Agnes was downgraded to a tropical depression by the time it moved into Virginia in June 1972, but the rainfall produced by Agnes made this storm more than twice as destructive as any previous hurricane in the history of the United States (Roth and Cobb, 2001).

In July 1996, Hurricane Bertha passed over portions of Suffolk and Newport News. Bertha spawned 4 tornadoes across east-central Virginia. The strongest, an F1 tornado, moved over Northumberland County injuring 9 persons and causing damages of several million dollars. Other tornadoes moved over Smithfield, Gloucester and Hampton (Roth and Cobb, 2001).

In September 1999, Hurricane Floyd produced 10 to 20 inches of rain on saturated ground and resulted in a recorded 500-year flood for Franklin, VA. While North Carolina and southeastern Virginia were hit with the brunt of this storm, significant damage from downed trees and localized flooding occurred and all of the counties of the Middle Peninsula were included in the Federal Disaster Declaration (FEMA FEMA-1293-DR, Virginia).

From 2000 to 2009

Hurricane Isabel hit the coasts of North Carolina and Virginia on September 18, 2003. It was a Category 1 hurricane when it made landfall. The highest sustained wind was 72 mph at Chesapeake Light. Storm surge varied significantly across the region. At Sewell's Point in Norfolk, the maximum water level was 7.9 feet above MLW. This represented a 5-foot storm surge - the biggest in the region since Hurricane Hazel in 1954. Thirty six deaths were attributed to Hurricane Isabel in Virginia, including one in Gloucester County. Total damages for the Hampton Roads area amounted to $506 million.

In 2004, Tropical Storm Gaston caused serious damage to a handful of VDOT Secondary Roads in the Central Garage/Manquin sections of King William County.

In 2006, Tropical Storm Ernesto caused residential and roadway flooding damage as well as beach erosion damage in Mathews County.

There were an additional 5 named tropical events during this period to hit the Middle Peninsula region resulting in minor severe weather damage.

In 2009 Middle Peninsula coastal localities experienced a significant Nor-Easter with high winds and coastal flooding.

From 2010-2015

Hurricane Irene was hit the coast of North Carolina and had impacts on the Virginia coastal on August 26-27, 2011. Heavy rain, including some totals more than 10 inches, fell on eastern sections of Virginia. Irene lashed the eastern third of Virginia with tropical storm and isolated hurricane force gusts.

In early September 2011, the remand of Tropical storm Lee produced flash flooding in some sections of eastern Virginia, with the Washington, DC, suburbs particularly hard hit.

Hurricane Sandy ate season hurricane that passed off the Mid Atlantic coast, before turning west, and striking the New Jersey & New York coast on October 29, 2012. Sandy was a very large storm that was transitioning from a tropical to a non-tropical storm as it moved north paralleling the U.S. East coast during the October 27-29 time frame. Sandy's impact was relatively small in Virginia, with very heavy rainfall and some flooding the biggest impacts. The most significant impact was felt on the DELMARVA, especially on the east side of the Chesapeake Bay from Salisbury, MD southward to Onancock, VA, where severe coastal flooding and storm surge inundated many areas, as Sandy passed by to the north. Crisfield, MD and Saxis, VA were hardest hit, with millions of dollars in damage to homes and businesses. Damage and flooding were worse than that which occurred in the same area during Hurricane Floyd (1999).

On record for the 2014 season, eight name tropical or subtropical storms formed in the North Atlantic. Six of these became hurricanes and two of these reached major hurricanes of Category 3 or higher on the Saffir-Simpson Hurricane Scale. Six of the hurricanes, Arthur, Bertha, Cristobal, Edouard, Fay, Gonzalo and Hanna, and one tropical storm struck the United States. According to the NWS, activity in the basin in 2-14 was only about 63% of the 1981-2010 average.

Soil Erosion

Hurricanes and nor'easters produce severe winds and storm surges that create significant soil erosion along rivers and streams in the Middle Peninsula. In addition to the loss of soil along these water bodies, there is damage to man-made shoreline hardening structures such as bulkheads and rap-rap as well as to piers, docks, boat houses and boats due to significant storm surges.

These damages are more severe along the broad open bodies of water on major rivers located closer to the Chesapeake Bay. In general terms, the damage is less intense as you move up the watershed from the southeastern area of the region towards the northwestern end of the Middle Peninsula. Therefore, the soil erosion would is most severe in Mathews, Gloucester and Middlesex Counties and to a lesser degree in the 3 remaining Middle Peninsula Counties of King and Queen, King William and Essex Counties.

The location and the angle at which these hurricanes/nor'easters come ashore region can significantly affect the amount of soil erosion during a particular storm. It can generally be said that hurricane generated soil erosion is uneven in occurrence and that the storm surge affords 2 opportunities for erosion – once as water inundates low-lying amount coast lands and again as floodwaters ebb.

For example with Hurricane Isabel in 2003, its enormous wind field tracked in a north-northwest direction to the west of the Chesapeake Bay with the right front quadrant blowing from the south-southeast. This pushed the storm surge up the Bay and piling it into the western shore – causing serious soil erosion to the eastern land masses in Mathews, Gloucester and Middlesex Counties.

Destructive as it was, Hurricane Isabel might have been worse. If it had been stronger at landfill, the storm surge generated in the Chesapeake Bay may have been higher. Had it stalled along its path and lingered through several tide cycles, prolonged surge conditions, exacerbated by high winds, might have cause more severe erosion. If rainfall has been higher, bank erosion due to slope failure might have been more common, particularly given the wetter than normal months that preceded Hurricane Isabel.

Middle Peninsula Resources at Potential Risk of Loss

Floodplain Properties and Structures

While floodplain boundaries are officially mapped by FEMA's National Flood Insurance Program (NFIP), flood waters sometimes go beyond the mapped floodplains and/or change courses due to natural processes (e.g., accretion, erosion, sedimentation, etc.) or human development (e.g., filling in floodplain or floodway areas, increased imperviousness areas within the watershed from new development, or debris blockages from vegetation, cars, travel trailers, mobile homes and propane tanks).

Since the floodplains in the United States are home to over 9 million households and there continues to be a high demand for residential and commercial development along water features, most property damage results from inundation by sediment and debris-filled water. Flooding is one of the most significant hazards faced by the Middle Peninsula. A majority of the flooding that has damaging effects on the region is tidal flooding, which primarily occurs in conjunction with severe coastal storms such as hurricanes or nor'easters.

In addition to tidal flooding, some regions of the Middle Peninsula are subject to flooding events induced by rain associated with a hurricane or a tropical storm, which can produce extreme amounts of rainfall in short periods of time. In August 2004, Tropical Storm Gaston dumped 14 inches of rain in a matter of hours on King William County, washing out numerous roads and bridges. This storm qualified the county for disaster aid through a Presidential Disaster Declaration.

Flooding of vacant land or land that does not have a direct effect on people or the economy is generally not considered a problem. Flood problems arise when floodwaters cover developed areas, locations of economic importance, infrastructure or any other critical facility. Low-lying land areas of Essex, Gloucester, Mathews, and Middlesex Counties and the lower reaches of King and Queen and King William Counties are highly susceptible to flooding, primarily from coastal storm when combined with tidal surges.

These flood-prone regions include marsh areas adjacent to waterways, and the wide, flat outlets where its streams and rivers meet the Chesapeake Bay and its tributaries. Fluctuations in the surrounding water levels produce a mean tidal range of approximately 3 feet. The timing or coincidence of maximum surge-producing forces with the normal high tide is an important factor in consideration of flooding from tidal sources. Strong winds from the east or southeast can push Chesapeake Bay water into the mouth of the York and Rappahannock Rivers and Mobjack Bay – thereby flooding lower portions of the Middle Peninsula. This surge combined with the normal high tide can increase the mean water level by 15 feet or more.

The Flood Insurance Rate Maps (FIRMs) show flooding during a 100-year storm event or, in other words, the storm that has a 1% chance of being equaled or exceeded in any given year. The FIRMs account for both coastal surge driven flooding, as well as flooding generated from rain events. The 1% annual-chance-flood (or the 100-year flood as it is commonly referred to) represents a magnitude and frequency that has a statistical probability of being equaled or exceeded in any given year. Another way of looking at it is that the 100-year flood has a 26% (or a 1 in 4) chance of occurring over the life of a 30-year mortgage on a home (FEMA, 2002).

Along with nearly 20,000 communities across the country, all of the localities in the Middle Peninsula voluntarily participate in the National Flood Insurance Program by adopting and enforcing floodplain management ordinances in order to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities (FEMA, 2002).

The U.S. Congress established the National Flood Insurance Program (NFIP) with the passage of the National Flood Insurance Act of 1968. Flood insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. Flood damage is reduced by nearly $1 billion a year by communities implementing sound floodplain management requirements and property owners purchasing flood insurance.

Additionally, buildings constructed in compliance with NFIP building standards suffer approximately 80% less damage annually than those not built in compliance with these standards. It is estimated that for every $3 paid in flood insurance claims, there is $1 spent in disaster assistance payments (FEMA, 2002).

Mapping flood hazards creates broad-based awareness of the flood hazards and provides the data needed for local floodplain management programs and to provide flood insurance actuarial rates for new construction (FEMA, 2002).
Floodplain maps covering the Middle Peninsula Region have recently been updated. FEMA produced these new digital maps in the following years:

2015
Essex County
Middlesex County

2014
Gloucester County
Mathews County

2013
King & Queen County
King William County

The recently completed digital floodplain maps/data can be integrated into the GIS of those Middle Peninsula localities that utilize GIS technology.

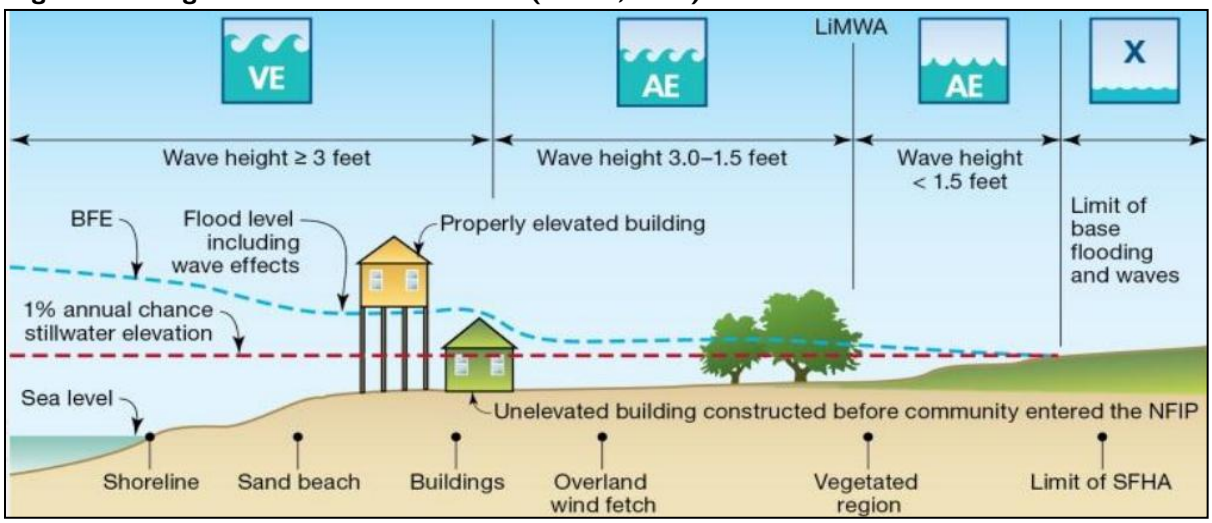
In recent years, FEMA has comprehensively analyzed Region III's coastal flood hazard and integrated the lasted topographic data sets with state-of-the-art storm modeling techniques (FEMAI, 2015). This new information replaces maps and studies that are based on data and modeling technology from as far back as the 1970's (FEMA, 2015). With this new data and technology, new FIRMs have been generated. The FIRMs reflect floodplain zones are standardized to the 100-year flood and assigned an area called the Special Flood Hazard Area (SFHA). A SFHA is a high-risk area defined as any land that would be inundated by a flood having a 1-percent chance of occurring in any given year (FEMA, 2002). In the Middle Peninsula, the SFHA includes zones designated as VE, A, Coastal A, AE, AO, X, and X500. Table 24 provides definitions for the zones.

Table 24: FEMA Flood Zone Designations found in the Middle Peninsula Region.	
Zone VE & V	SFHA along coasts subject to inundation by the 100-year flood with additional hazards due to velocity (wave action). Base flood elevations derived from detailed hydraulic analyses are shown within these zones. This delineated flood hazard includes wave heights equal to or greater than three feet. *Mandatory flood insurance purchase requirements apply.*
Zone A	SFHA subject to inundation by the 100-year flood. Because detailed hydraulic analyses have not been performed, no base flood elevation or depths are shown. *Mandatory flood insurance purchase requirements apply.*
Zone AE	SFHA subject to inundation by the 100-year flood determined in a Flood Insurance Study by detailed methods. Base flood elevations are shown within these zones. This delineate flood hazard includes wave heights less than three feet. *Mandatory flood insurance purchase requirements apply.*
Zone AO	SFHA inundated by the 100year flood where flooding is anticipated to average depth of 1 to 3 feet, where a clearly defined channel does not exist, where the path of flooding is unpredictable, and where velocity flow may be evident.
Zone X	These areas have been identified in the Flood Insurance Study as areas of moderate or minimal hazard from the principal source of flood in the area. However, buildings in these zones could be flooded by severe, concentrated rainfall coupled with inadequate local drainage systems. Local storm water drainage systems are not normally considered in the community's FIS. The failure of a local drainage system creates areas of high flood risk within these rate zones. *Flood insurance is available in participating communities, but is not required by regulation in these zones.*
Zone X500	The same description as Zone X, however, this area falls between the 100 and 500-year flood zone.
UNDES	Undescribed. No information available.

To further assist community official and property owners in recognizing an increased potential for damage due to wave action in the AE zone, FEMA issued guidance in December 2008 on identifying and mapping the 1.5-foot wave high line, referred to as the Limit and Moderate Wave Action (LiMWA) (Figure 33). As

LiMWA addresses the fact that wave action does cease at the AE Zone delineate, a new SFHA has been developed between the VE and AE Zone called Zone Coastal A. Zone Coastal A is landward of a V Zone, or land ward of an open coastal without mapped V Zones. While the Coastal A Zone in not a NFIP mandate, it offers design and construction practice for communities that wish to adopt high floodplain management standards. Within the Middle Peninsula, Gloucester County, Mathews County and the Town of Wet Point are the only locality that has included Coastal A Zone within their FIRMs and floodplain management policy.

Figure 33: Diagram of coastal flood zones (FEMA, 2015).



Under the NFIP regulations, participating NFIP communities are required to regulate all development in the SFHAs. Development is defined as:

> *"any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials."*

Before a property owner can undertake any development in the SFHA, a permit must be obtained from the locality. The locality is responsible for reviewing the proposed development to ensure that it complies with the locality's floodplain management ordinance. Localities are also required to review proposed developments in the SFHAs to ensure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law, such as 404 Wetland Permits from the Army Corps of Engineers or permits under the Endangered Species Act.

Under the NFIP, localities must review all new development proposals to ensure that they are reasonably safe from flooding and that the utilities and facilities serving these developments are constructed to minimize or eliminate flood damage.

In general, the NFIP minimum floodplain management regulations require that new construction or substantial improvements to existing buildings in the Zone A must have their lowest floor, including basements, elevated to or above the Base Flood Elevation (BFE). Non-residential structures in Zone A can be either elevated or dry-flood proofed. In Zone V, the building must be elevated on piles/columns and the bottom of the lowest horizontal structural member of the lowest floor of all new construction or substantially improved existing buildings must be elevated to or above the BFE.

When the NFIP was created, the U.S. Congress recognized that insurance for "existing buildings" constructed before a community joined the Program would be prohibitively expensive if the premiums were not subsidized by the Federal Government. Congress also recognized that most of these flood-prone buildings were built by individuals who did not necessarily have sufficient knowledge of the flood hazard to make informed decisions.

Under the NFIP, "existing buildings" are generally referred to as pre-FIRM buildings. These buildings were built before the flood risk was known and identified on the locality's FIRM. Currently, about 26% of the 4.3 million NFIP policies in force are pre-FIRM subsidized policies as compared to 70% of the policies that were being subsidized in 1978 (FEMA, 2002).

Middle Peninsula Flood Insurance Data

According to data from FEMA dated March 31, 2015 there are a total of 4,354 flood insurance policies covering Middle Peninsula properties (Table 25). The following is a summary of flood insurance policy data by locality:

Table 25: Flood Insurance Policies within the Middle Peninsula (FEMA, 2015).

Locality	Total Policies	# of Claims Since 1978	Total Value of Claims
Essex	229	239	$6,197,534.36
Tappahannock	66	16	$193,571
Gloucester	1693	1339	$30,285,748.62
King & Queen	55	22	$584,113.30
King William	18	8	$158,306.60
West Point	102	76	$2,165,826.96
Mathews	1637	1179	$20,165,826.96
Middlesex	488	225	$2,943,857.77
Urbanna	20	12	$277,744.64
Totals	4308	3116	$62,972,530.21

Table 26: Repetitive Loss Properties in the Middle Peninsula

County	# of Properties	# of Claims	Total Building Claims	Average Claim
Essex	32	82	$1,855,068.89	$22,622.79
Mathews	169	417	$8,252,285.42	$19,789.65
Gloucester	146	384	$3,310,607.84	$21,642.21
Middlesex	35	78	$1,084,995.57	$13,910.20
Town of Urbanna	2	4	$120,595.91	$30,148.98
Town of Tappahannock	2	4	$66,220.74	$16555.19
Town of West Point	9	21	$644,314.91	$30,681.66

According to the Virginia Hazards Mitigation Plan repetitive loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling ten-year period, since 1978 (Table 26). In 2004 the National Flood Insurance Reform Act recognized repetitive loss as a

significant and problem and defined severe repetitive loss (SRL) as: "a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000 and with cumulative amount of such claims payments exceeding $20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property. Table 27 show the number of SRL properties within the Middle Peninsula region.

Table 27: Severe Repetitive Loss Properties in the Middle Peninsula.

County	# of Properties	# of Claims	Total Building Payments	Average Pay
Essex	2	9	$142,973.31	$22,884.81
Mathews	11	49	$1,288.909.58	$34,179.62
Gloucester	13	63	$1,857,182.84	$33,028.95
Middlesex	2	6	$157,821.97	$37,271.90

4.4.5. Summer Storms

Summer Storms are weather systems accompanied by strong winds, lightning, heavy rain, and possibly hail and tornadoes. They can occur at any time in the Middle Peninsula of Virginia, although they are most frequent during the warm spring and summer months from April through September. The most common summer storm is the thunderstorm, with the severe thunderstorm with the most potential to cause damage. The potential thunderstorm threat is often measured by the number of "thunderstorm days" – defined as days in which thunderstorms are observed.

Thunderstorms form when a shallow layer of warm, moist air is overrun by a deeper layer of cool, dry air. Cumulonimbus clouds, frequently called "thunderheads," are formed in these conditions. These clouds are often enormous (up to six miles or more across and 40,000 to 50,000 feet high) and may contain tremendous amounts of water and energy. That energy is often released in the form of high winds, excessive rains, lightning, and possibly hail and tornadoes.

Thunderstorms are typically short-lived (often lasting no more than 30-40 minutes) and fast moving (30-50 miles per hour). Strong frontal systems, however, may spawn one squall line after another, composed of many individual thunderstorm cells. Severe thunderstorms may also cause severe flood problems because of the torrential rains that they may bring to an area. Thunderstorms sometimes move very slowly, and can thus dump a tremendous amount of precipitation onto a location. Flooding can result, including flash floods, "urban flooding," and river flooding.

4.5. Locality Specific Critical Facilities and Public Utilities

4.5.1. King and Queen County Critical Facilities and Public Utilities

The County's Courthouse Complex is located in the central portion of the county along the Route 14 ridgeline, which runs in a southeasterly/northwesterly direction. This Complex is the center of county government and contains all county offices. The law enforcement and public safety functions are located in the new courts/administration building, which has a generator that serves these areas of the building during a power outage. This complex is located outside of the 500-year floodplain.

Additional properties that the County owns include 4 solid waste facilities located at 4 different locations in the county and the property that the regional library is located on. All 5 of these properties lie outside of the 500-year floodplain.

There are 4 volunteer fire departments (VFD) and 2 volunteer rescue squads (VRS) located at scattered positions throughout the county. All of these emergency response facilities are located outside the 500-year floodplain.

The County's 3 school sites are all located along the high and dry Route 14/721 corridor. Central High School, located in the King and Queen Courthouse area in the middle portion of the county, is the County's designated shelter due to flooding or any other type of natural disaster.

The Middle Peninsula Regional Airport is located in the southern portion of the county and is owned and operated by a regional authority. The Airport Authority is made up of 4 local governments including King and Queen, King William and Gloucester Counties as well as the Town of West Point. Life-Evac, a medical transport helicopter service, is located at the airport. The airport terminal and runway are located outside the 500-year floodplain.

There are no public water or sewer facilities anywhere in the County - all properties in the County are served by individual wells and septic systems.

Repetitive and Severe Repetitive Loss Residential Structures in King and Queen County
According to FEMA's records, King and Queen County has no Repetitive Loss residential properties or Severe Repetitive Losses as of 5/31/15.

According to VDOT and County officials, flood prone roads in King and Queen County include the following in Table 28.

Table 28: King and Queen County Flood Prone Roads

Route	Road Name	Location of Flooding
749	Kays Lane	At Root Swamp
721	Newtown Road	near Bradley Farm Road
721	Newtown Road	near Level Green Road
721	Newtown Road	near Glebe Road
623	Indian Neck Road	near Rappahannock Cultural Center
625	Poplar Hill Road	near Spring Cottage Road
628	Spring Cottage Road	near Eastern View Road
628	Todds Bridge Road	near Gunsmoke Lane
628	Pattie Swamp Road	at swamp
631	Fleets Mill Road	at Fleets Millpond
631	Norwood Road	at Dickeys Swamp
636	Minter Lane	at Walkerton Creek
620	Powcan Road	at Poor House Lane
620	Duck Pond Road	at Garnetts Creek
634	Mt. Elba Road	at flat areas
633	Mantua Road	at Garnetts Creek
617	Exol Road	at Exol Swamp
614	Devils Three Jump Road	Devils Three Jump Road
14	The Trail	at Truhart

613	Dabney Road	At Little Tastine Swamp
611	Tastine Road	At Little Tastine Swamp
603	Lombardy Road	At Little Tastine Swamp
608	Clancie Road	At Bugan Villa Drive
601	Stratton Major Road	Near Union Prospect Baptist Church
601	Stratton Major Road	Near Union Road
644	Jonestown Road	At Meadow Swamp
605	Plain View Lane	At Guthrie Creek
601	Cheery Row Lane	At Guthrie Creek and swamp
666	Tuckers Road	Entire road including Tuckers R.P.
667	Wrights Dock Road	Entire road
640	Lyneville Road	At 36" cross-pipes
625	Bryds Mill	At cross-pipes
615	Union Hope Road	At Exol Swamp
604	Bryds Bridge Road	At Bryds Bridge
612	Lilly Pond Rod	At Dragons Swamp Bridge
610	Dragonville Rod	At Timber Brook Swamp
614	Rock Springs Road	At bridge
14	Buena Vista Road	at K&Q/ Gloucester County line

Public Boat Ramps

There are 2 public boats ramps in the county along the Mattaponi River that are operated/maintained by the Virginia Department of Game and Inland Fisheries (VDGIF):

Water Body	Access Area	Barrier Free	Type	Ramps	Latitude	Longitude
Mattaponi River	Melrose	Yes	Concrete Ramp	1	37° 38' 14" N 37.6372145	76° 51' 18"W -76.8549627
Directions: From King & Queen Courthouse, Rt. 14 South (2.8 miles); Right onto Rt 602 (1.2 miles) to Ramp						
Mattaponi River	Waterfence	Yes	Concrete Ramp	1	37° 35' 31" N 37.5920552	76° 47' 55"W -76.7987125
Directions: From West Point, Rt 33 East, turn Left onto SR 14 (5 miles), turn Left onto SC 611 to end						
Virginia Department of Game an Inland Fisheries, 2015						

In addition to the VDGIF sites, there is a water access site to the Mattaponi River in Walkerton. Located at the base of the bridge off Route 629, this site is privately owned; however the owner allows public access upon receipt of a donation for use.

Due to the low velocity of the flood waters along this section of the Mattaponi River, none of these boat landings sustain damage from flood waters.

Properties in the 100-year Floodplain by Census Block Groups

The following series of maps show the location of structures in King and Queen County that are either in Flood Zone A or Flood Zone AE in the100-year flood plain. The map also shows structures in the 500-year plain that are labeled: "0.2% annual chance flood hazard". The legend is color coded to indicate the specific flood zone in which each structure lies.

Figure 34:

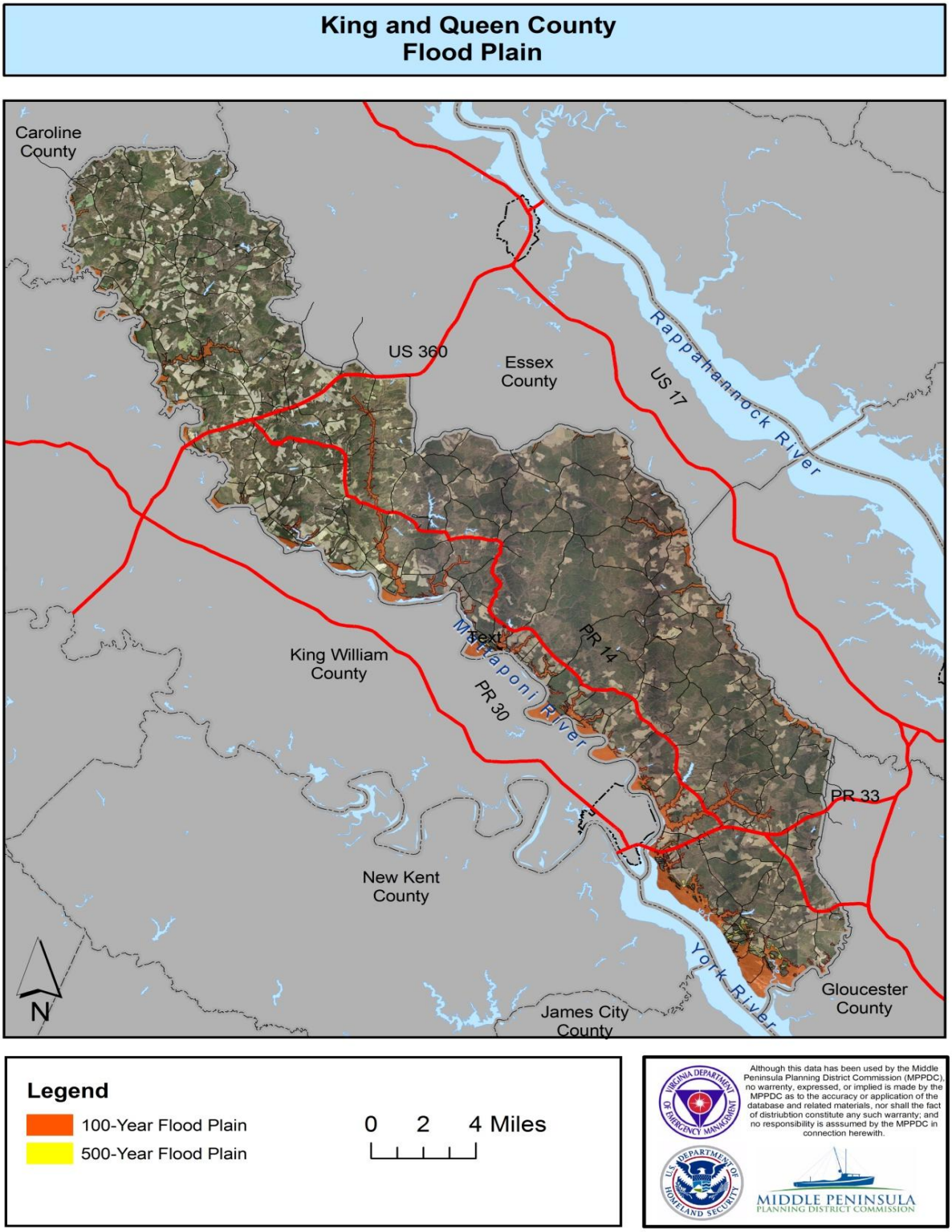

King and Queen County
Flood Plain
Caroline County
US 360
Essex County
US 17
Rappahannock River
King William County
Mattaponi River
PR 14
PR 30
PR 33
New Kent County
James City County
York River
Gloucester County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
0 2 4 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warranty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 35:

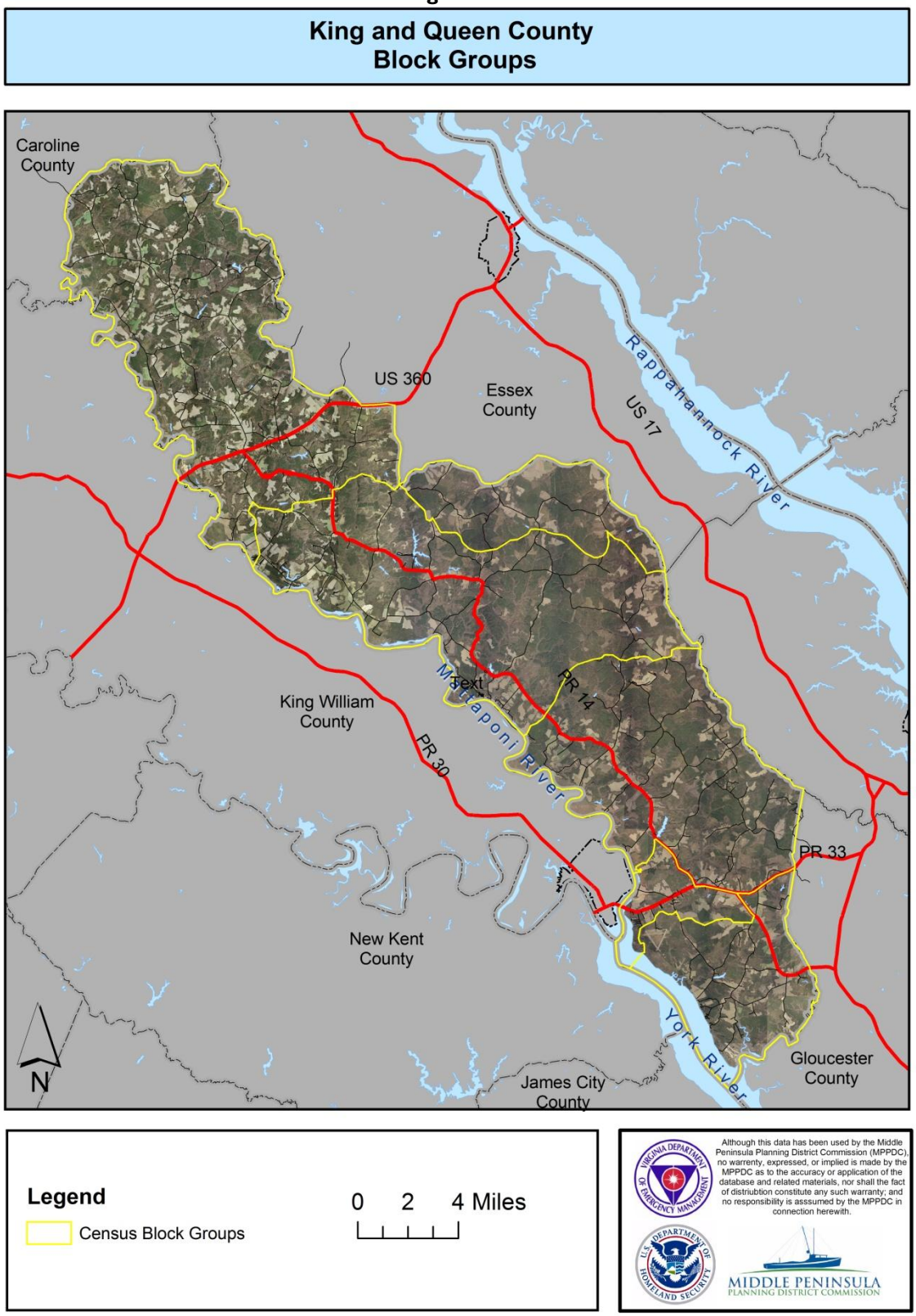

King and Queen County
Block Groups
Caroline County
US 360
Essex County
US 17
Rappahannock River
King William County
PR 14
PR 30
Mattaponi River
PR 33
New Kent County
York River
Gloucester County
James City County
N
Legend
Census Block Groups
0 2 4 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 36:

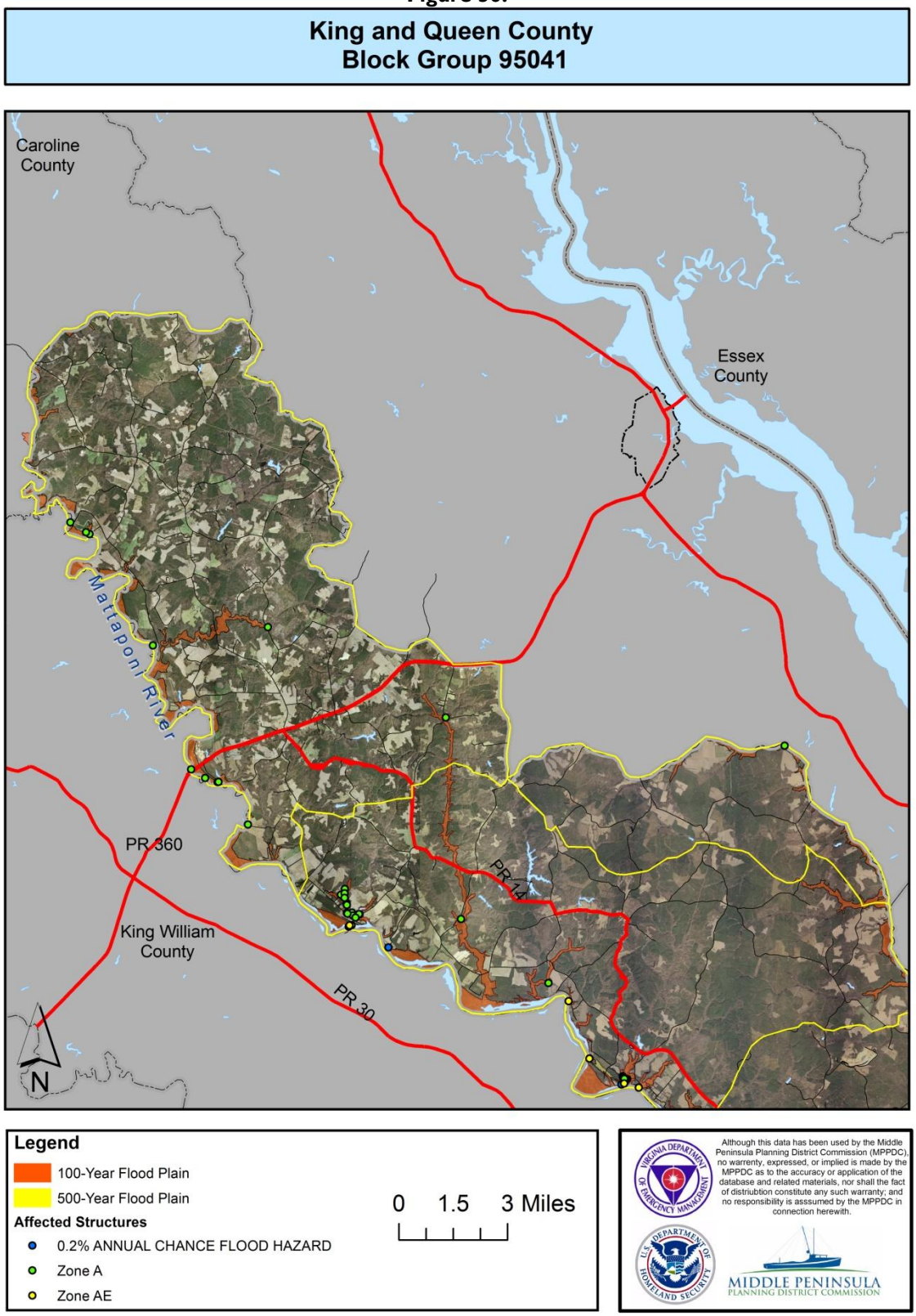

King and Queen County
Block Group 95041
Caroline County
Essex County
Mattaponi River
PR 360
PR 14
King William County
PR 30
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
0.2% ANNUAL CHANCE FLOOD HAZARD
Zone A
Zone AE
0 1.5 3 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 37:

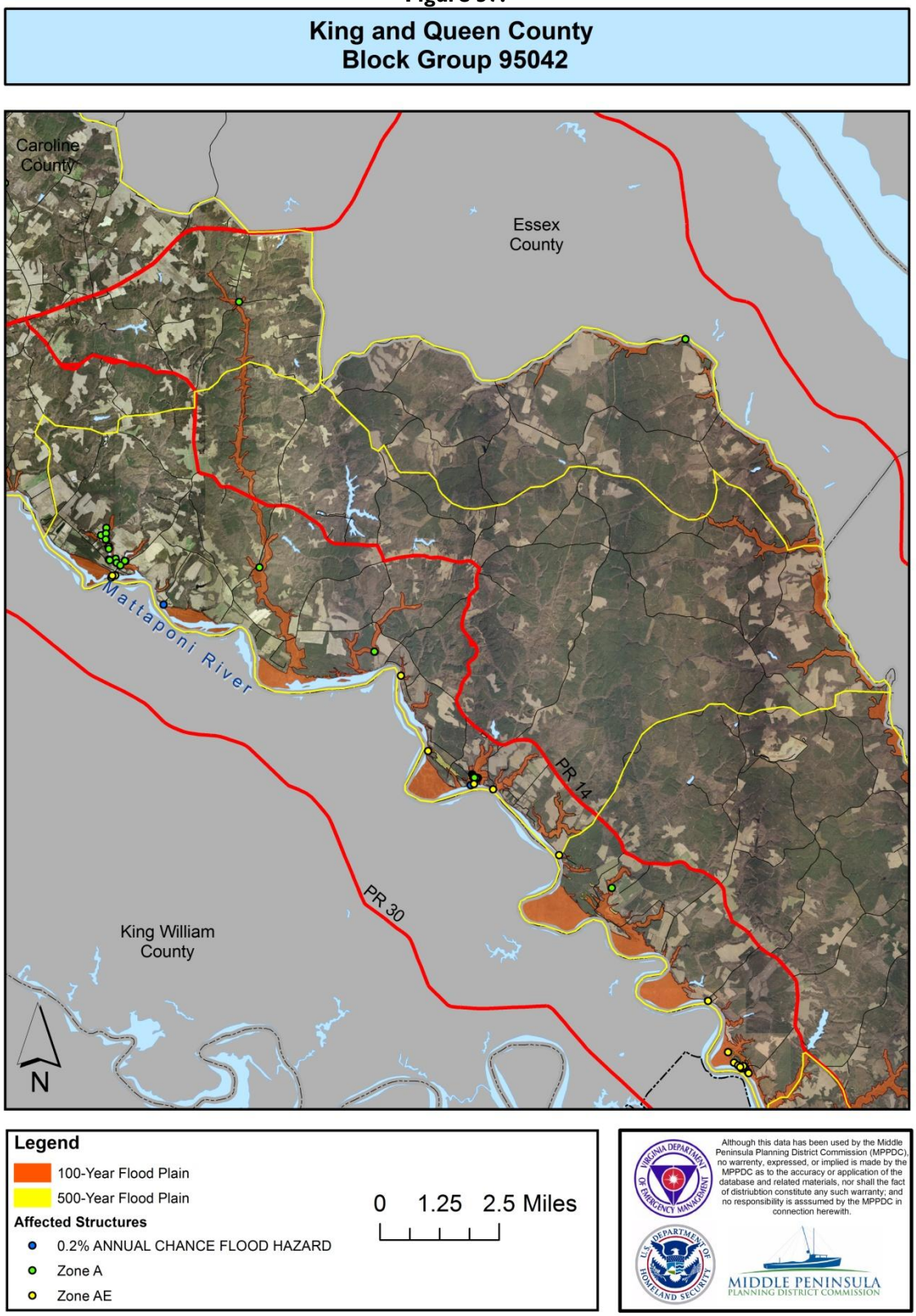

King and Queen County
Block Group 95042
Caroline County
Essex County
Mattaponi River
PR 14
PR 30
King William County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
0.2% ANNUAL CHANCE FLOOD HAZARD
Zone A
Zone AE
0 1.25 2.5 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 38:

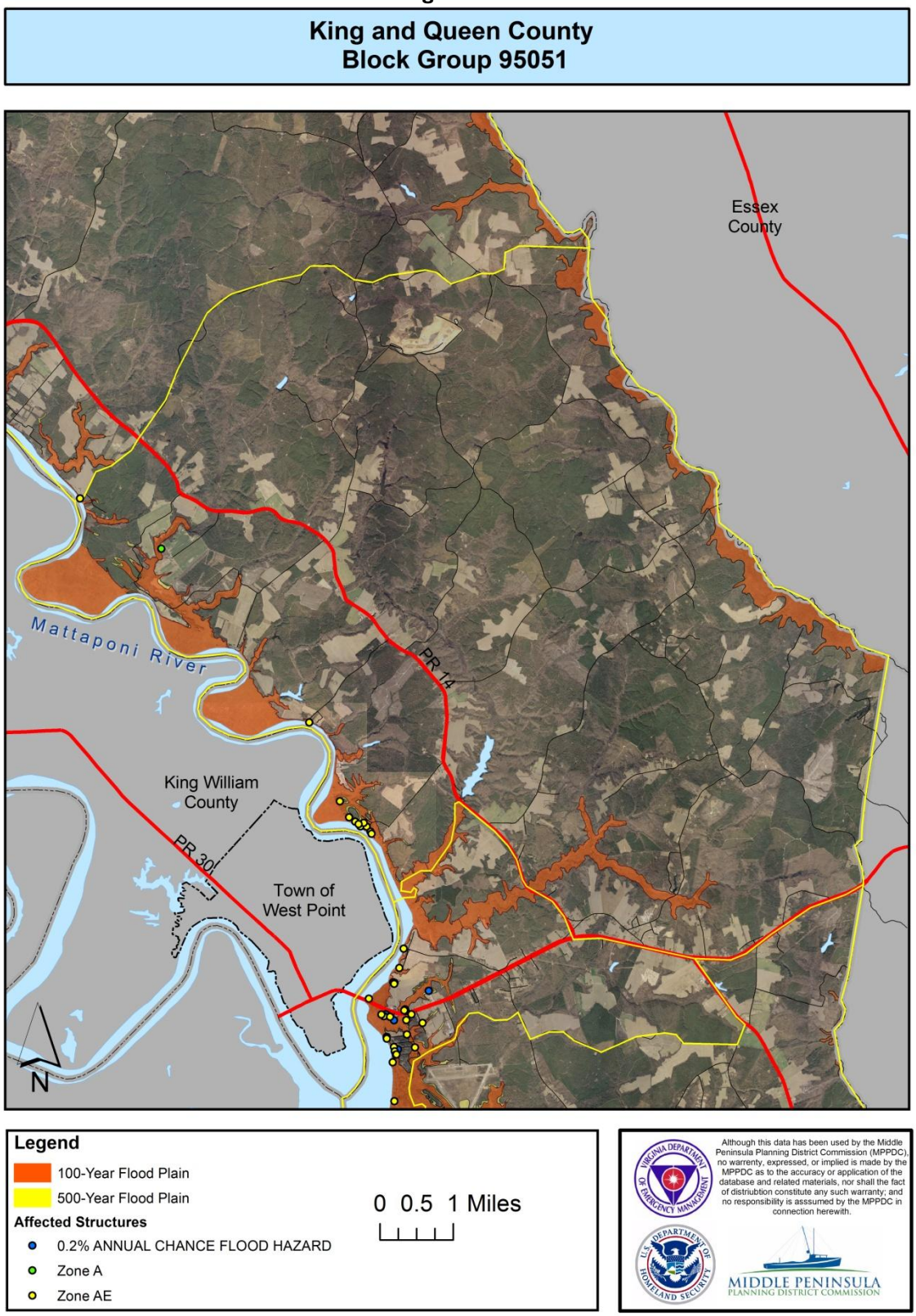

King and Queen County
Block Group 95051
Essex County
Mattaponi River
PR 14
King William County
PR 30
Town of West Point
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
0.2% ANNUAL CHANCE FLOOD HAZARD
Zone A
Zone AE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 39:

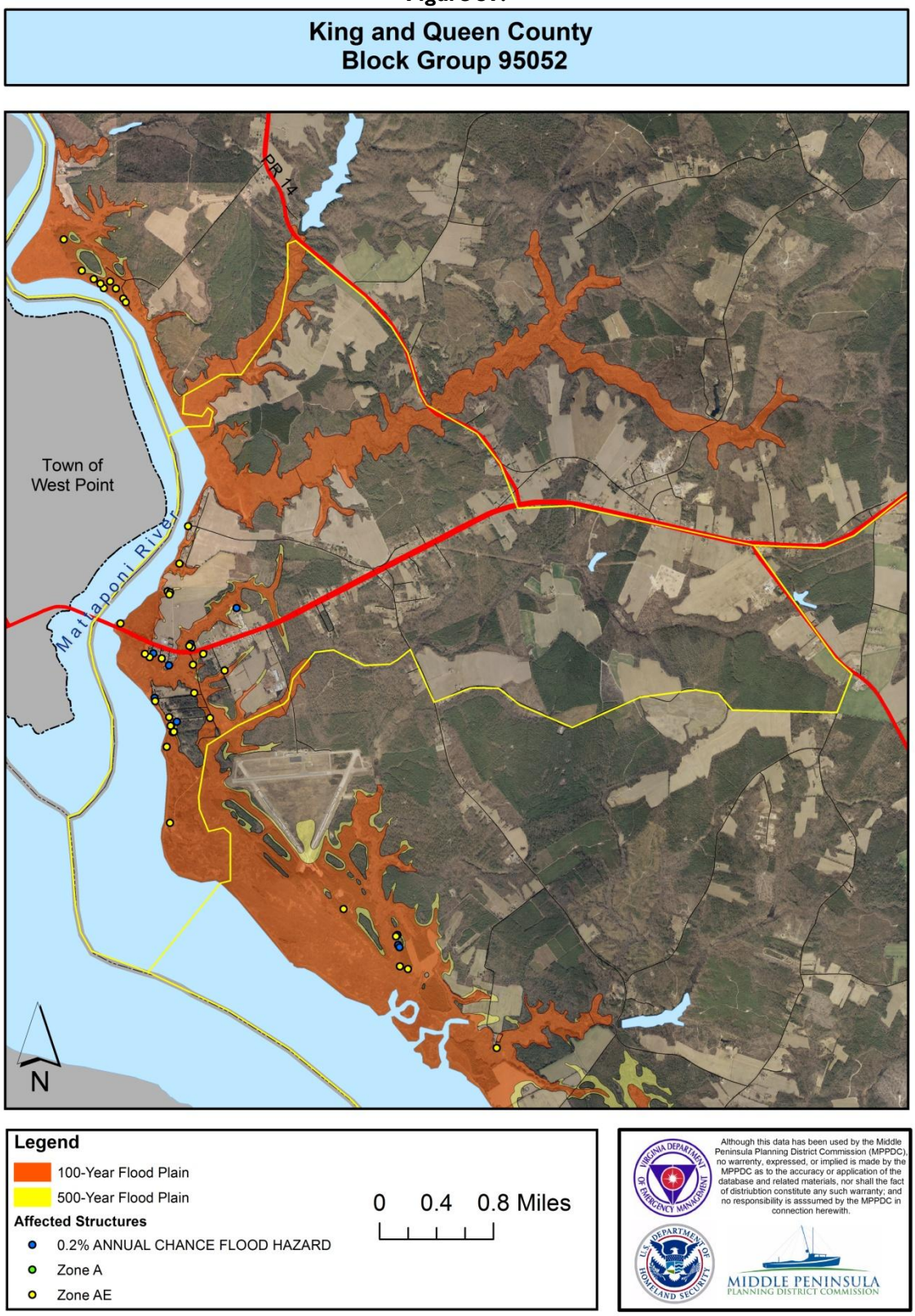
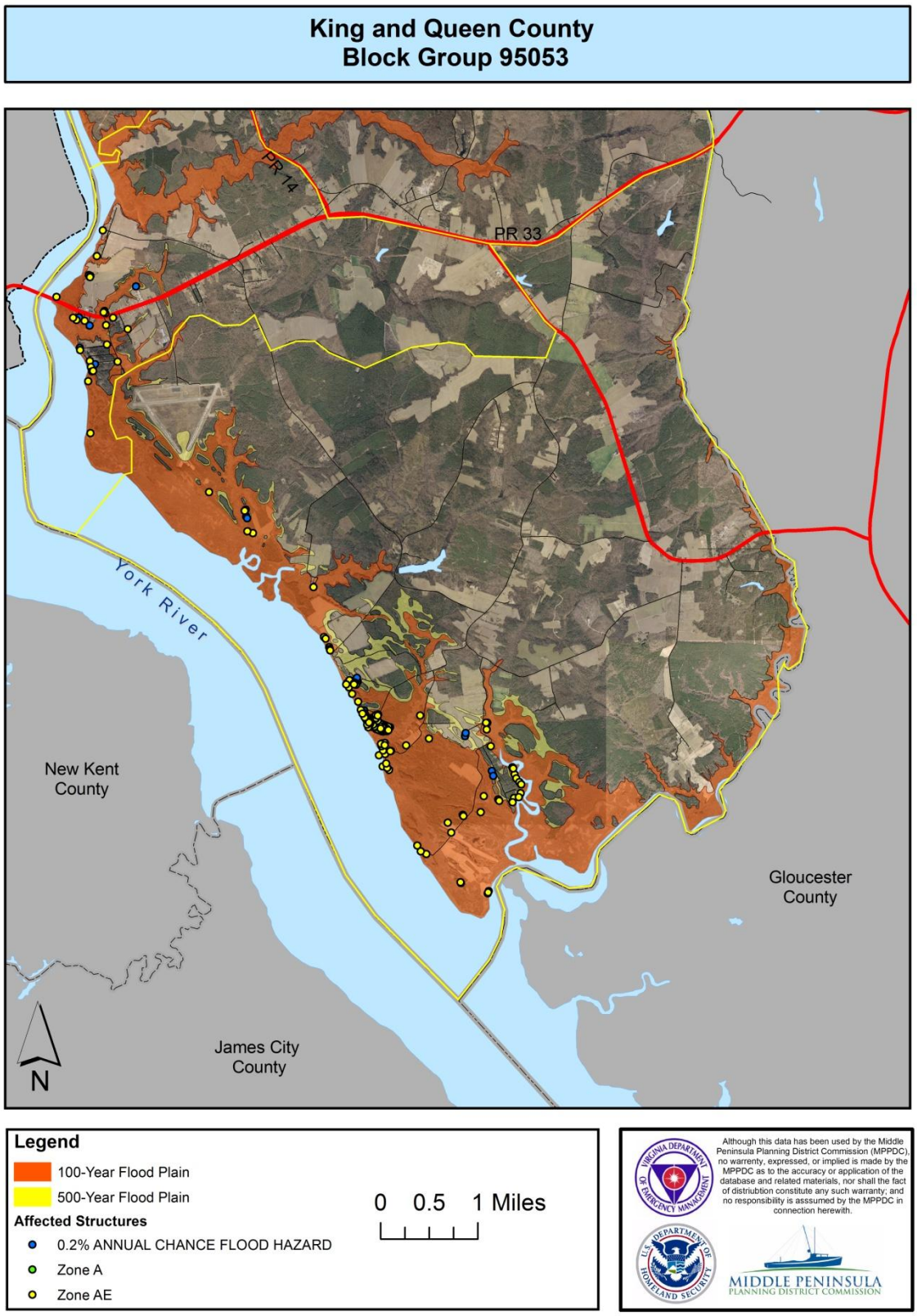

King and Queen County
Block Group 95052
PR 14
Town of
West Point
Mattaponi River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
0.2% ANNUAL CHANCE FLOOD HAZARD
Zone A
Zone AE
0 0.4 0.8 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 40:

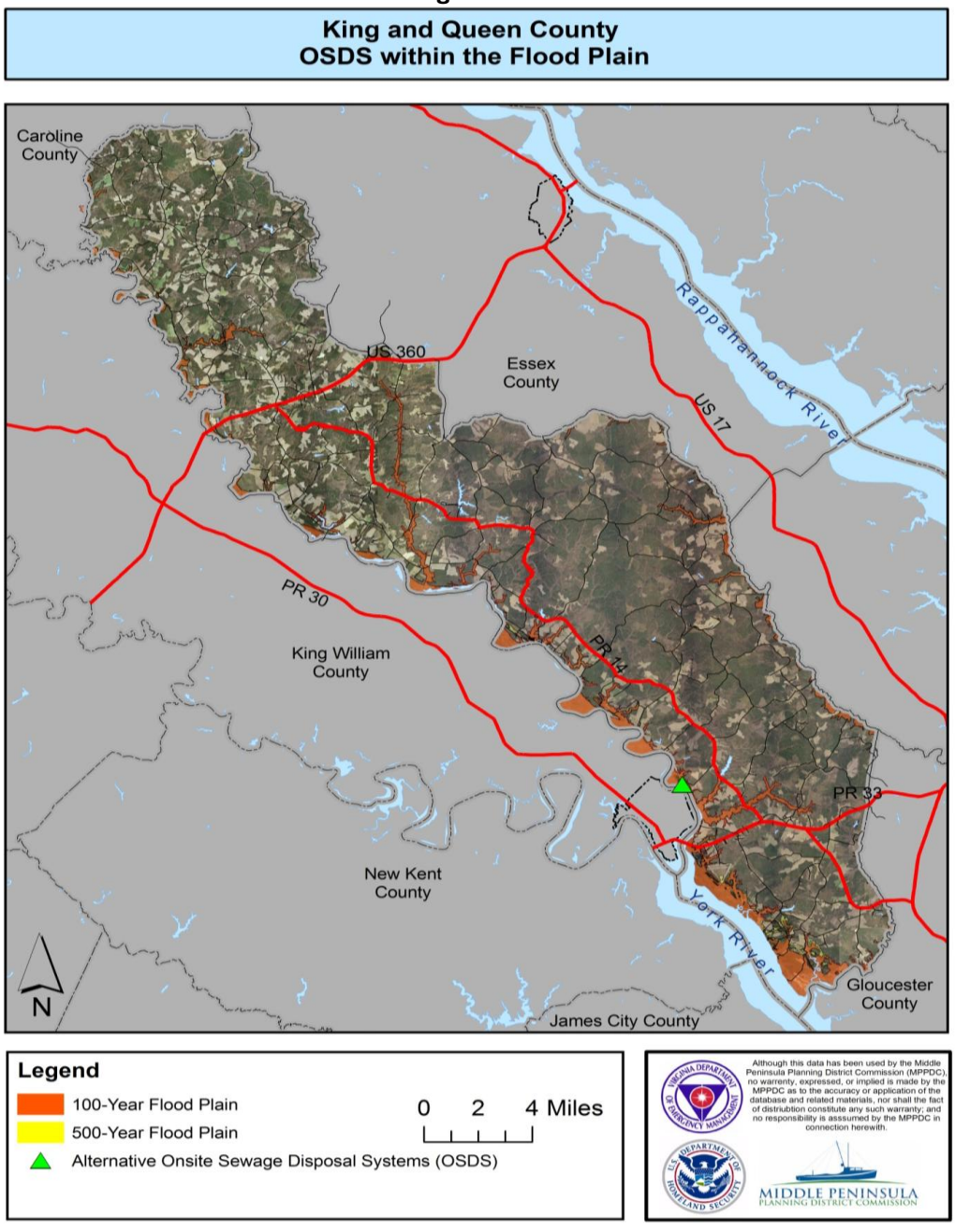

King and Queen County
Block Group 95053
PR 14
PR 33
York River
New Kent County
Gloucester County
James City County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
0.2% ANNUAL CHANCE FLOOD HAZARD
Zone A
Zone AE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Alternative On-site Sewage Disposal Systems (OSDS)

The Virginia Department of Health (VDH) regulations have changed dramatically in recent years to keep pace with improvements in technology. Now, there are a number of "alternative on-site sewage disposal systems" that are allowed to be constructed where poor soils and/or a high water table prevented the construction of a conventional septic system on the property. As of 2009, there were 1,208 OSDSs permitted and installed in the Middle Peninsula. There are an additional 2,006 OSDSs permitted by the health department, but not yet installed (Figure 41).

Many of these are located in the 100-year floodplain, some of which could suffer damage during flooding events since most of the systems have essential mechanical and other components at-grade or slightly above grade.

Figure 41:



4.5.2. Essex County Critical Facilities and Public Utilities

The County's Offices are located within the Town of Tappahannock, which is centrally located mid-county along the Route 17 corridor. The County Offices are located in a handful of buildings in downtown Tappahannock in an area that is outside of the 500-year floodplain. There are emergency generators at the County Administration Building and at the Sheriff's Office/Dispatch Center.

Additional properties that the County owns includes 2 solid waste facilities located at Center Cross and Bray's Fork, the county library, the elementary school/school board offices and the middle school/high school complex. All of these properties are located outside of the 500-year floodplain. The new middle school has an emergency generator.

The county/town is served by 1 volunteer fire department that has 3 fire stations. One station is located in Tappahannock along Airport Road, another is located at the northern end of the county along Route 17 at Loretto and the third station is located at the southern end of the County near Center Cross. The Tappahannock Volunteer Rescue Squad is located in downtown Tappahannock and it serves town residents as well as all county residents. All of these emergency response facilities are located outside of the 500-year floodplain. The fire department on Airport Road and the EMS facility downtown have emergency generators.

The new Tappahannock-Essex County Community Airport is located off of Route 360 at Paul's Crossroads. The airport is located on a high ridge-line, which is obviously outside of the 500-year floodplain.

The new animal shelter that serves the town and county is located at the town's former maintenance facility along Airport Road, which does not flood.

Repetitive and Severe Repetitive Loss Residential Structures in Essex County

According to FEMA's records, Essex County has 32 Single-Family Repetitive Loss properties and 2 Single-Family Severe Repetitive Losses as of 5/31/15.

According to VDOT officials, flood prone roads in the Essex County/Tappahannock area include the following:

Table 29: Essex/Tappahannock Flood Prone Roads

Route	Road Name	Location
17	Church Lane	Tickners Creek at June Parker Marina
617	Island Farm Road	Piscataway Creek
646	Fort Lowery Lane	Rappahannock River
680	River Place	Rappahannock River

Route 17 is the main south/north road serving the county. This primary road has been designated as a hurricane evacuation route by the Commonwealth of Virginia for some Tidewater residents evacuating northward during a Category 2 or stronger hurricane. However, a portion of Route 17 on the north side of Tappahannock (near the June Parker Marina) floods on a regular basis during storms of minor to moderate intensity. As Essex County and Town of Tappahannock developed plans and proposed them to VDOT in 2014 VDOT began construction on this section of the highway. VDOT will elevate the road and install a bridge to reduce the occurrence of flooring on Route 17, a hurricane evacuation route, from just north Marsh Street to just south of Airport Road. Construction work will began in January 2014 and will conclude by May 2016.

Also according to town officials, all roads that dead end at the Rappahannock River flood, but sustain little damage since flood velocities are low along this section of the river through Tappahannock.

Properties in the 100-year Floodplain by Census Block Groups

The following series of maps show the location of structures in Essex County that are either in the Flood Zone A or in Flood Zone AE in the 100-year flood plain. The map also shows structures in the 500-year plain that are labeled: "0.2% annual chance flood hazard". The legend is color coded to indicate the specific flood zone in which each structure lies.

Figure 42:

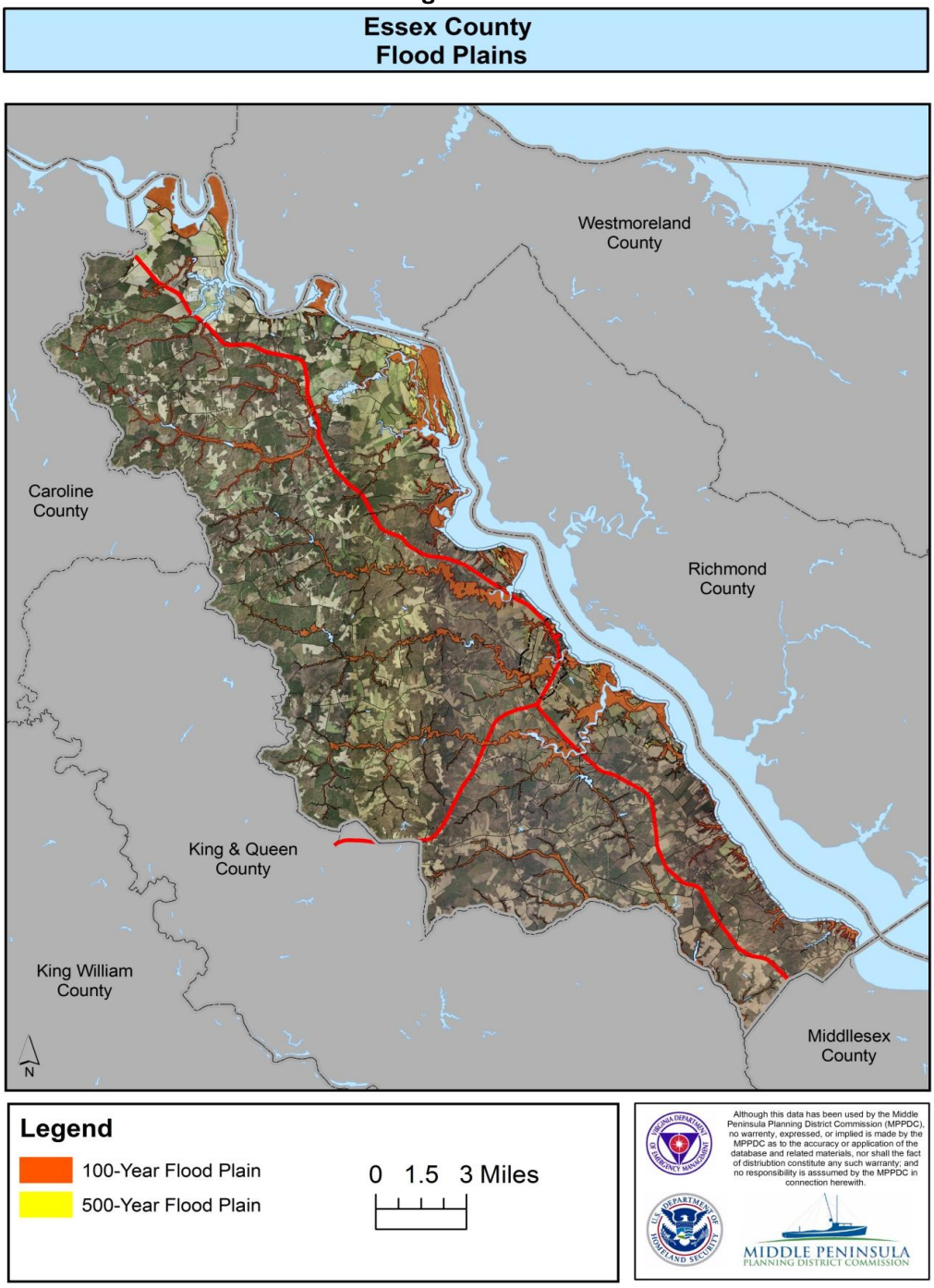


Figure 43:

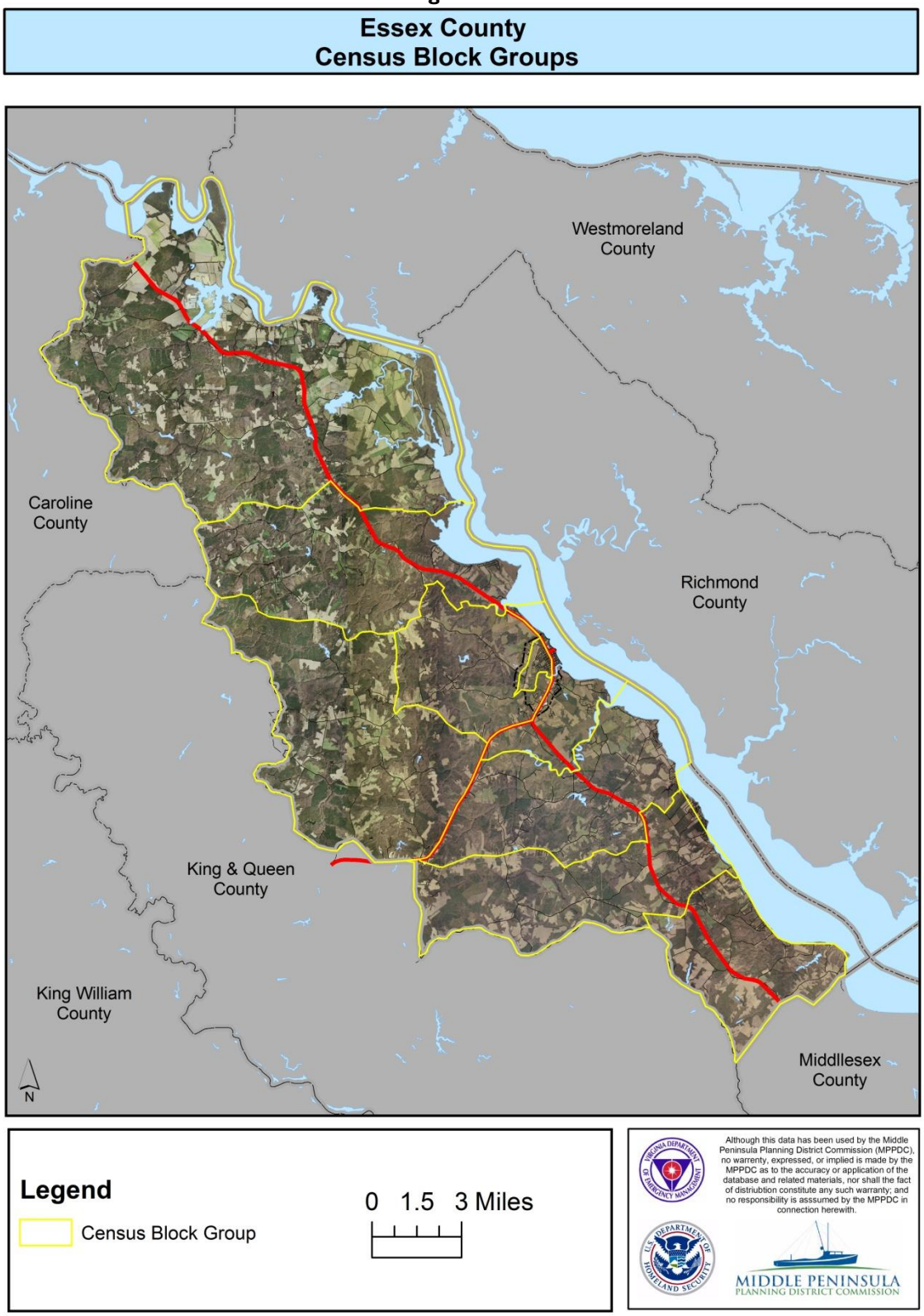

Essex County
Census Block Groups
Westmoreland County
Caroline County
Richmond County
King & Queen County
King William County
Middllesex County
N
Legend
Census Block Group
0 1.5 3 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 44:

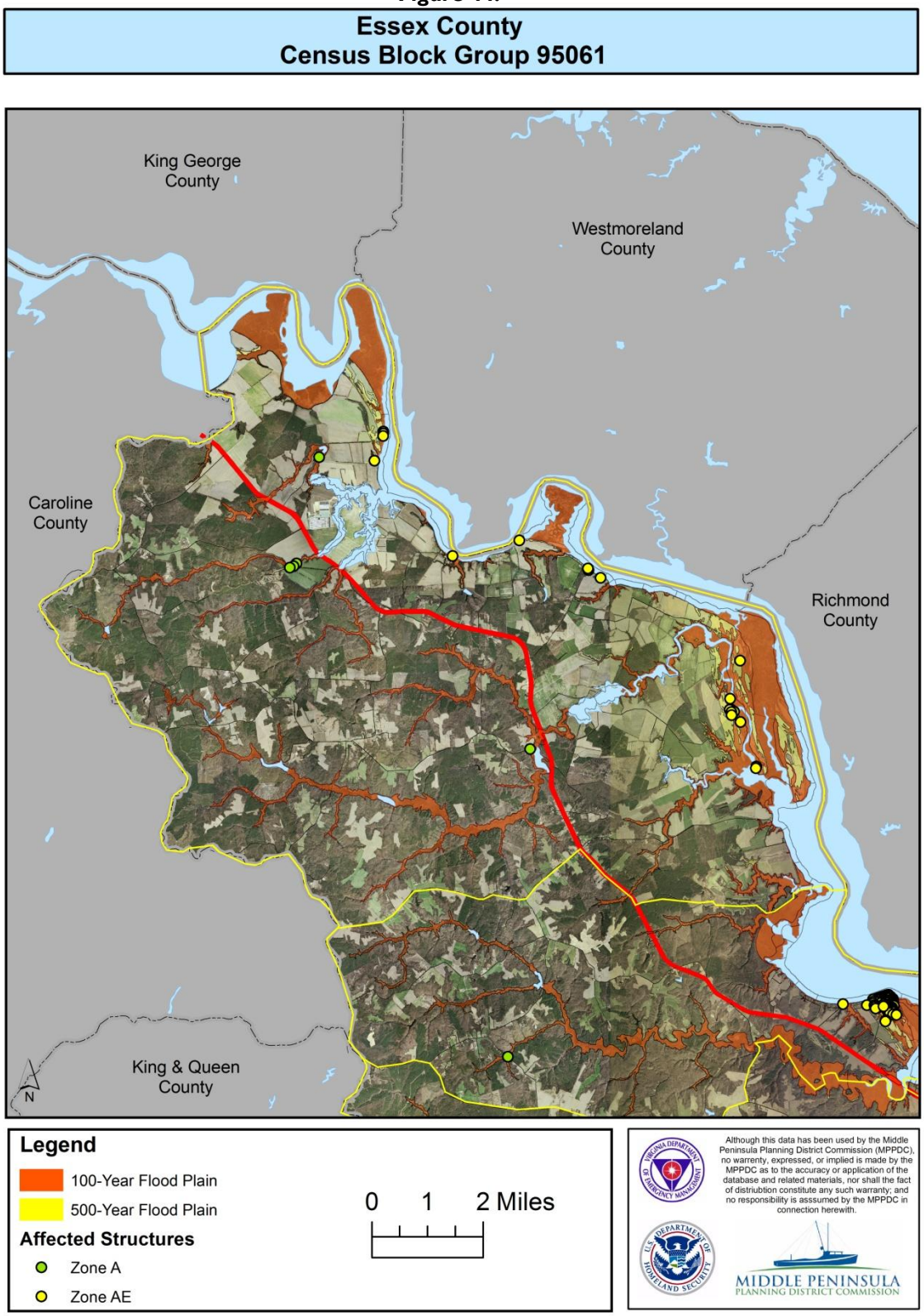

Essex County
Census Block Group 95061
King George County
Westmoreland County
Caroline County
Richmond County
King & Queen County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
0 1 2 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 45:

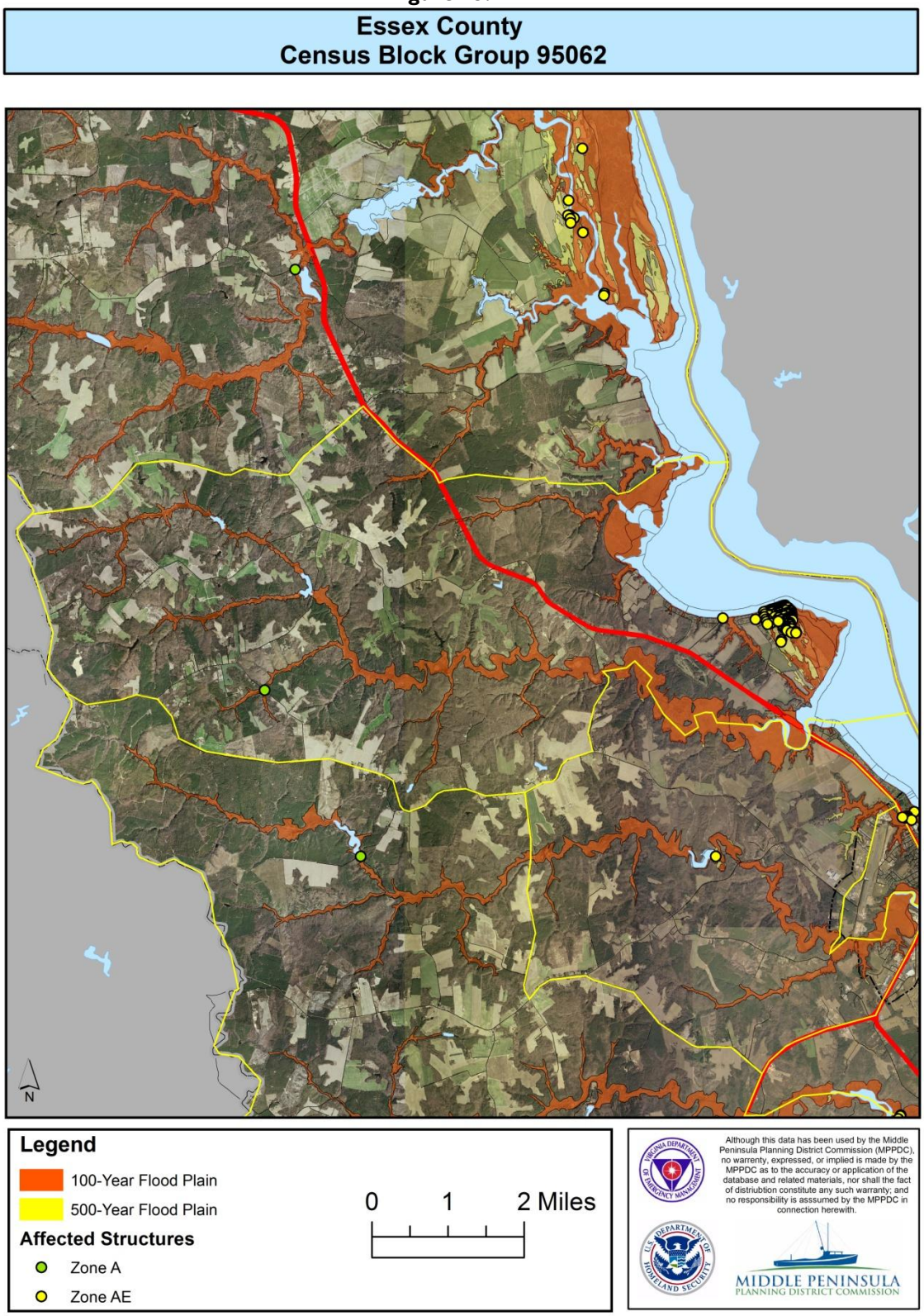

Essex County
Census Block Group 95062
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
0 1 2 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 46:

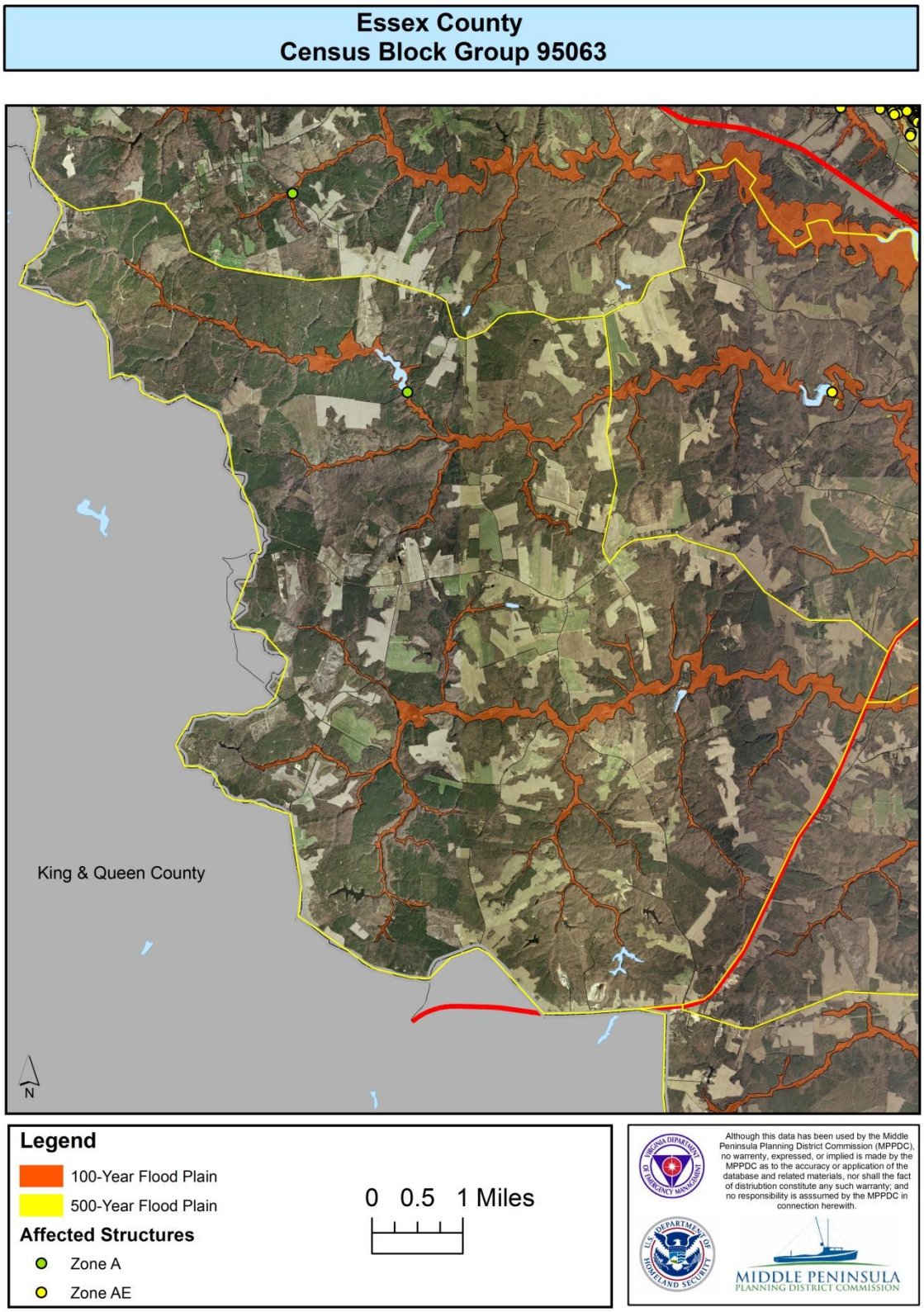

Essex County
Census Block Group 95063
King & Queen County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 47:

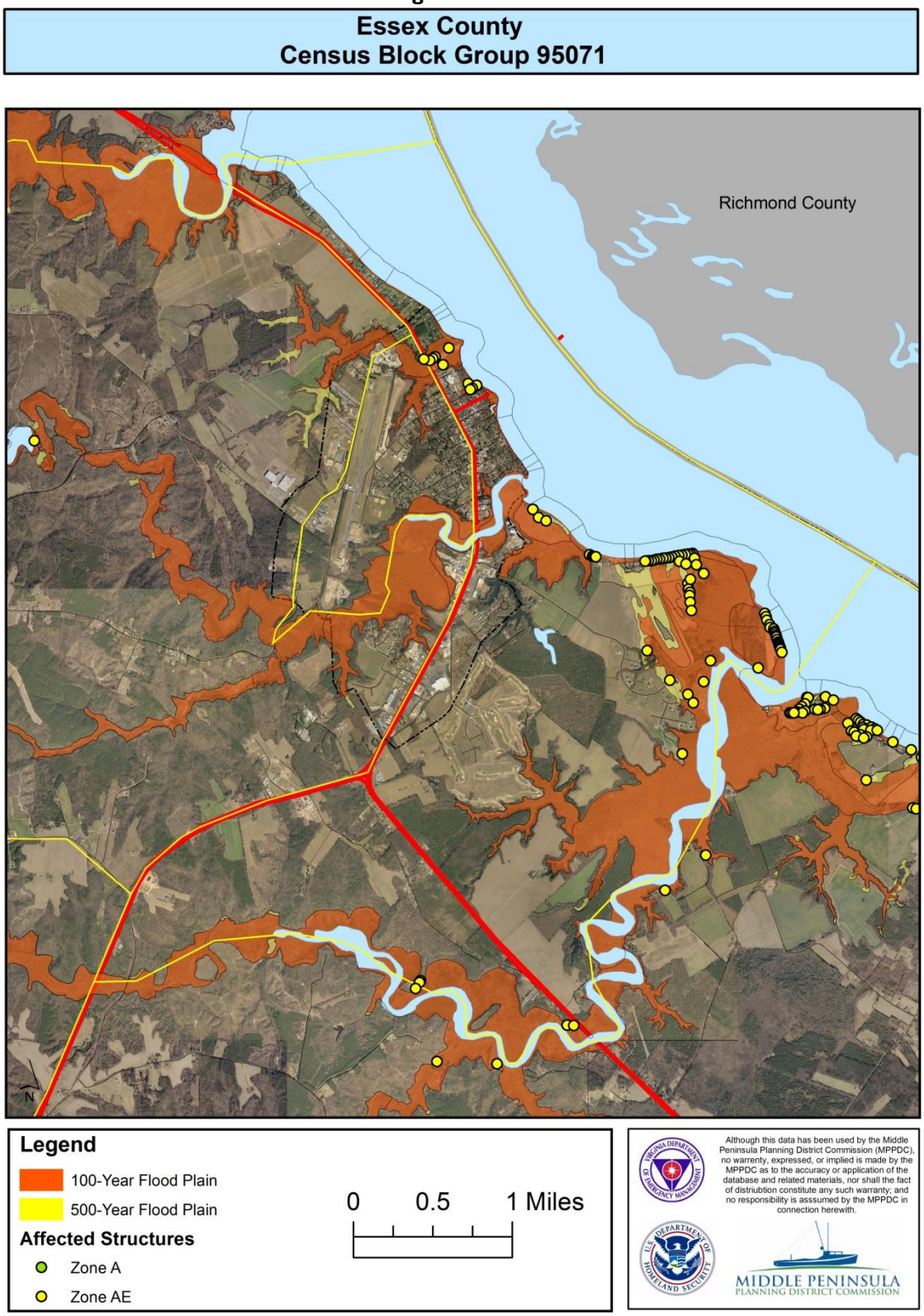

Essex County
Census Block Group 95071
Richmond County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
0
0.5
1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 48:

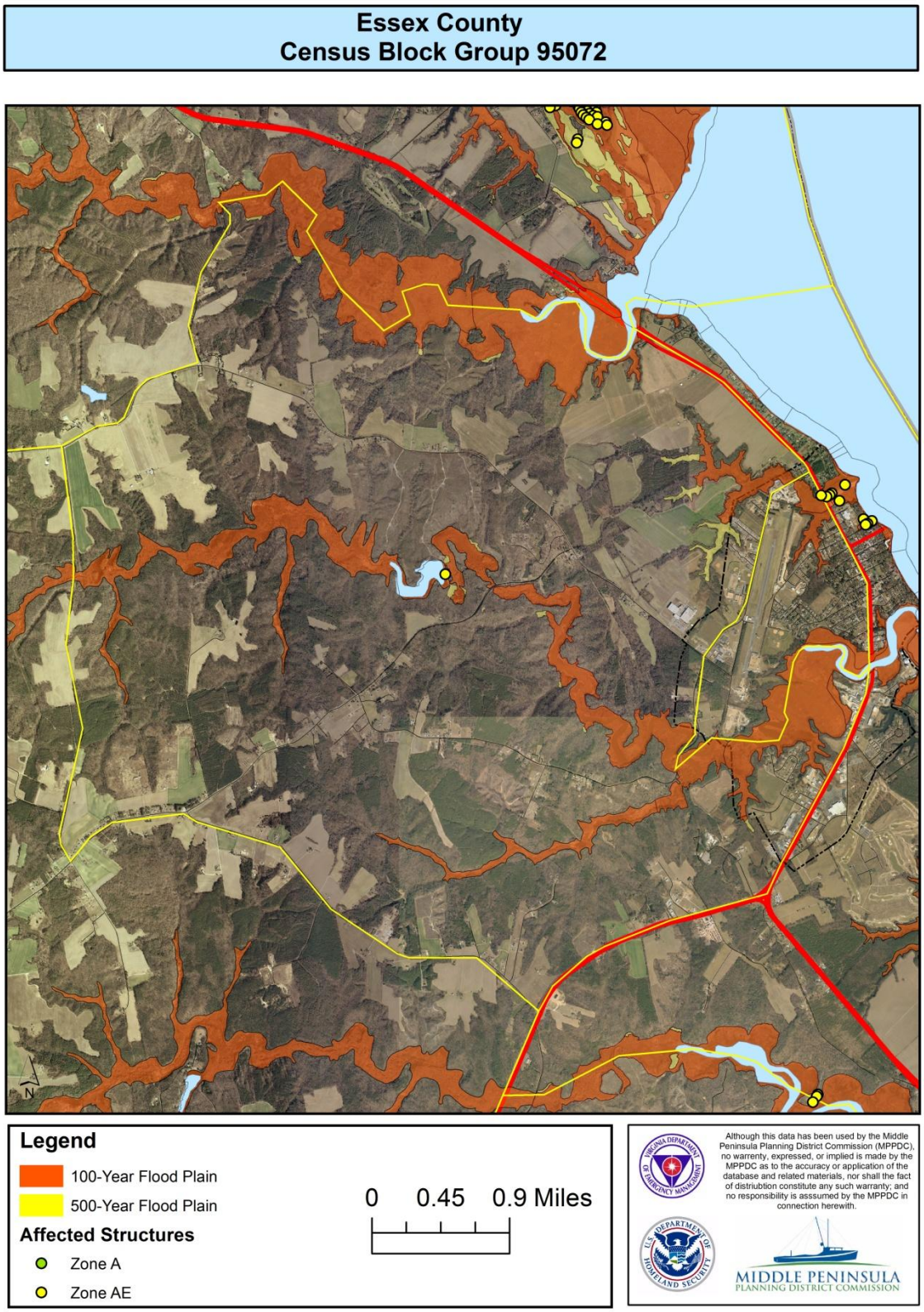

Essex County
Census Block Group 95072
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
0 0.45 0.9 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 49:

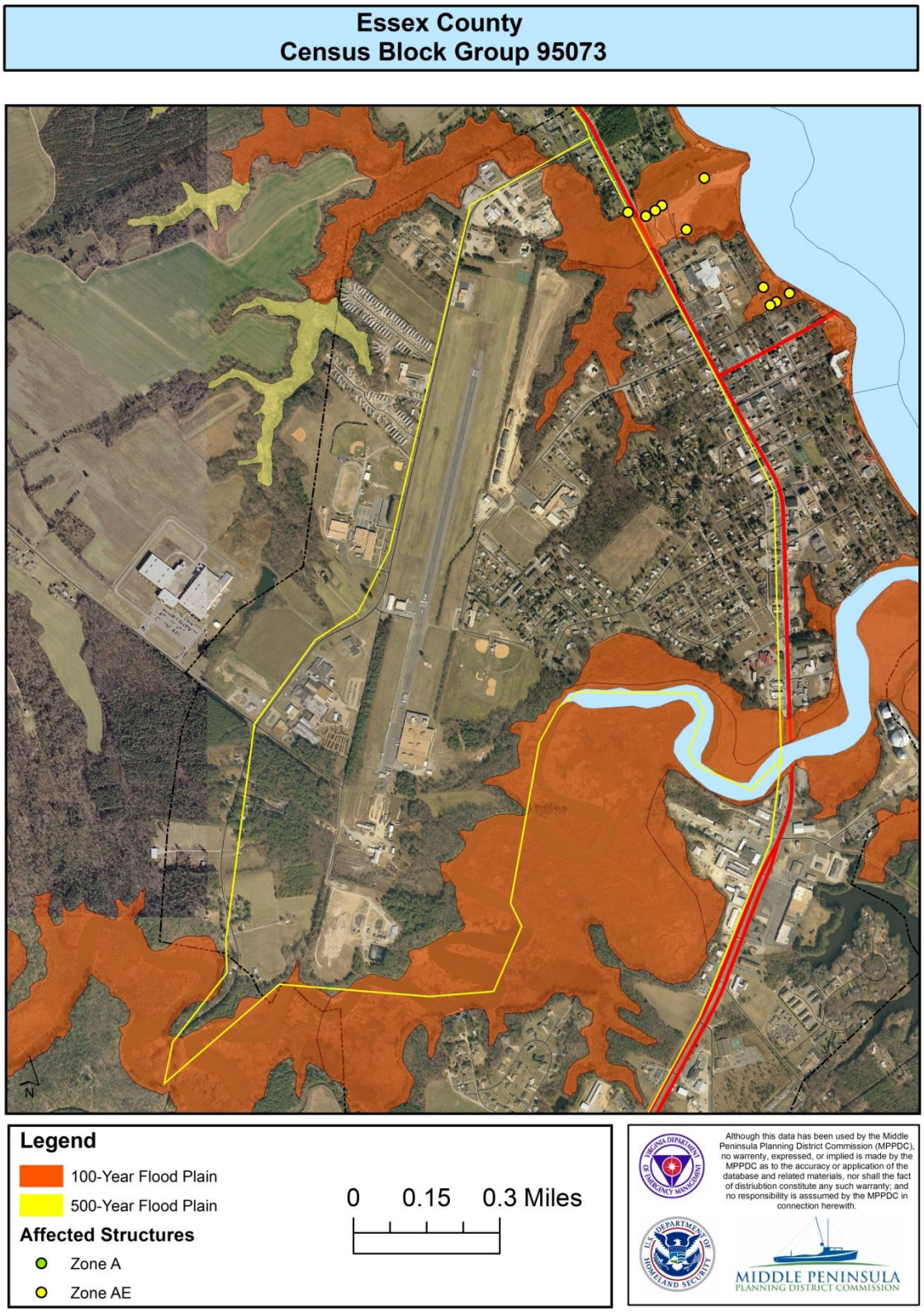

Essex County
Census Block Group 95073
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
0 0.15 0.3 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 50:

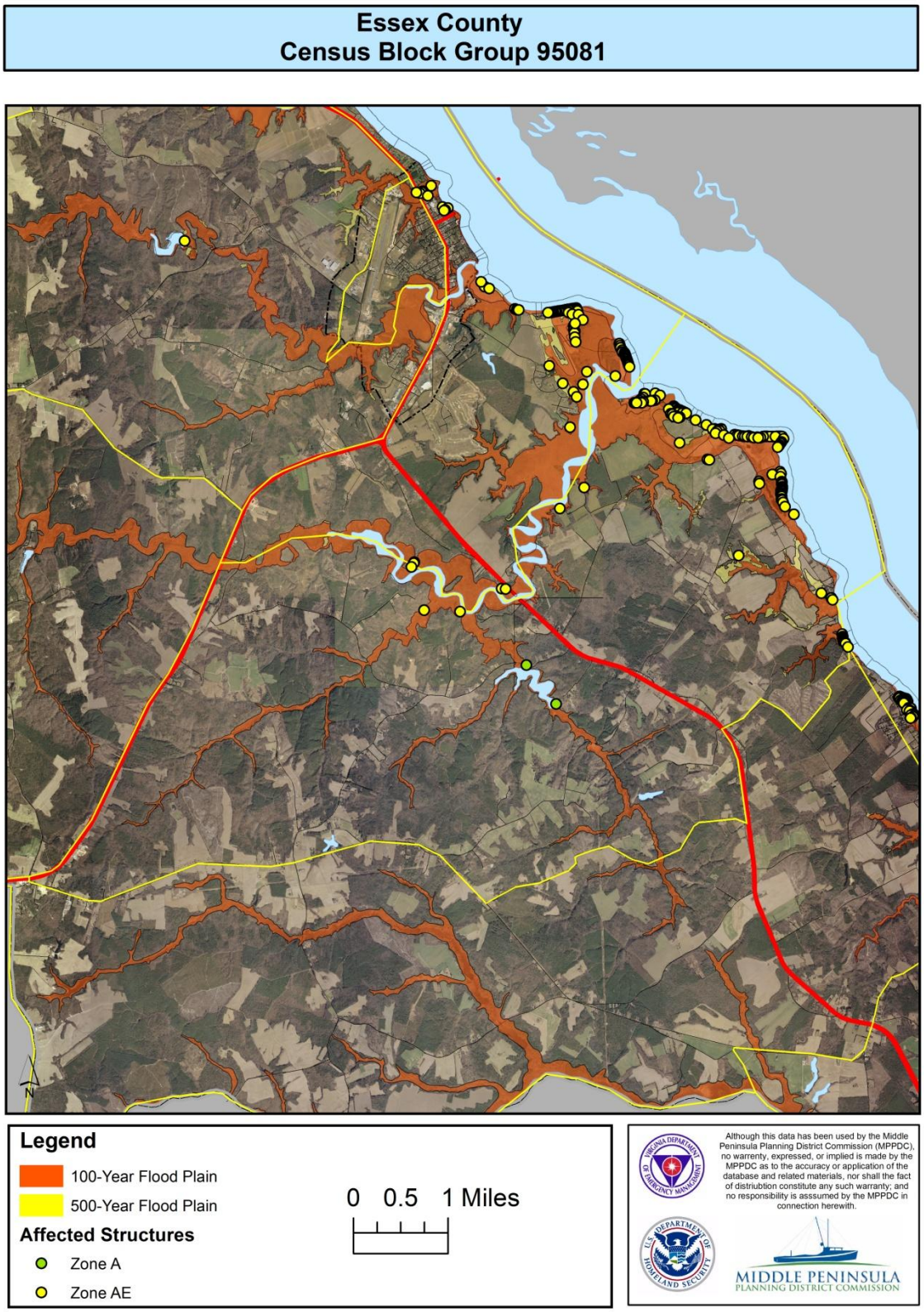

Essex County
Census Block Group 95081
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 51:

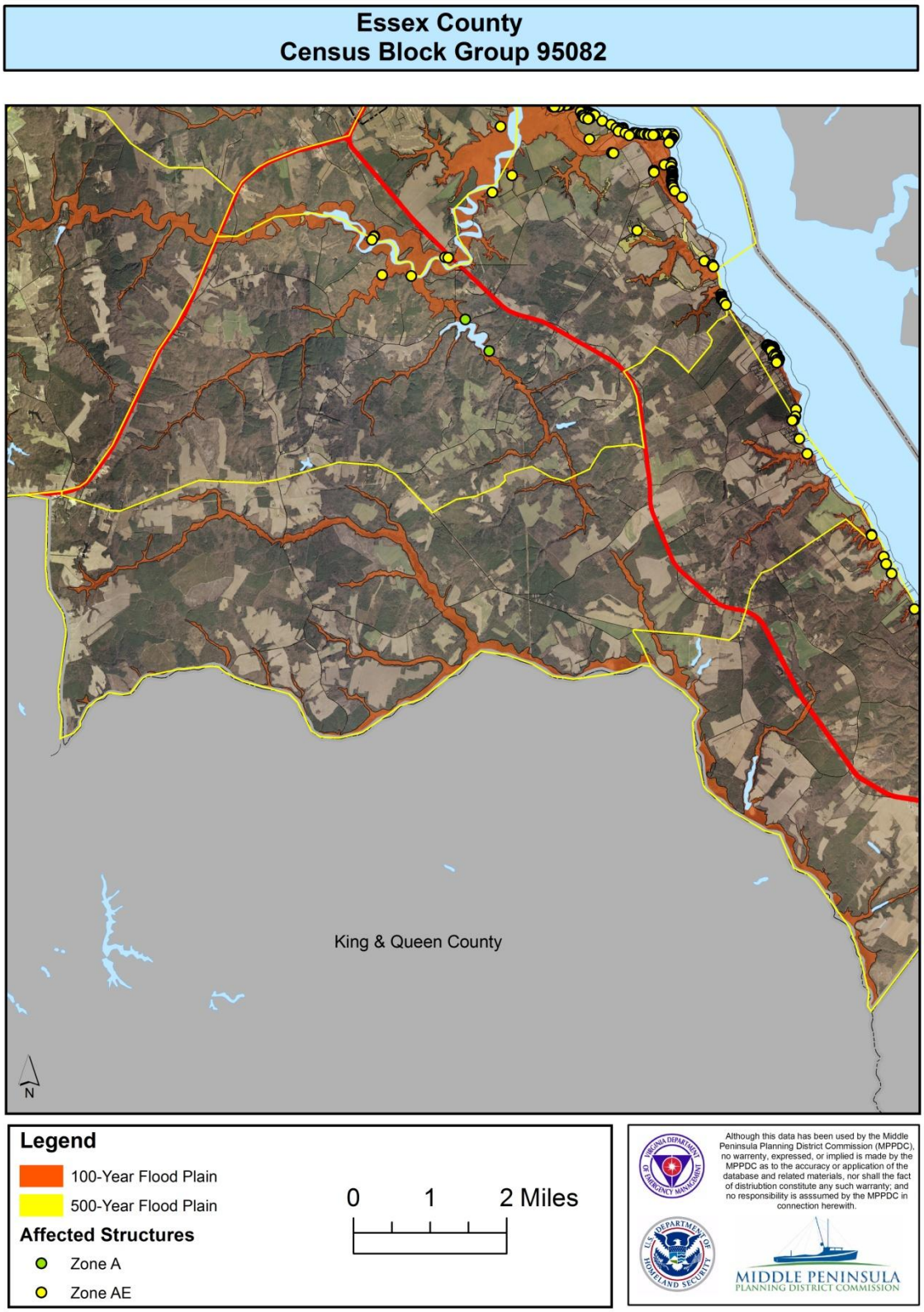
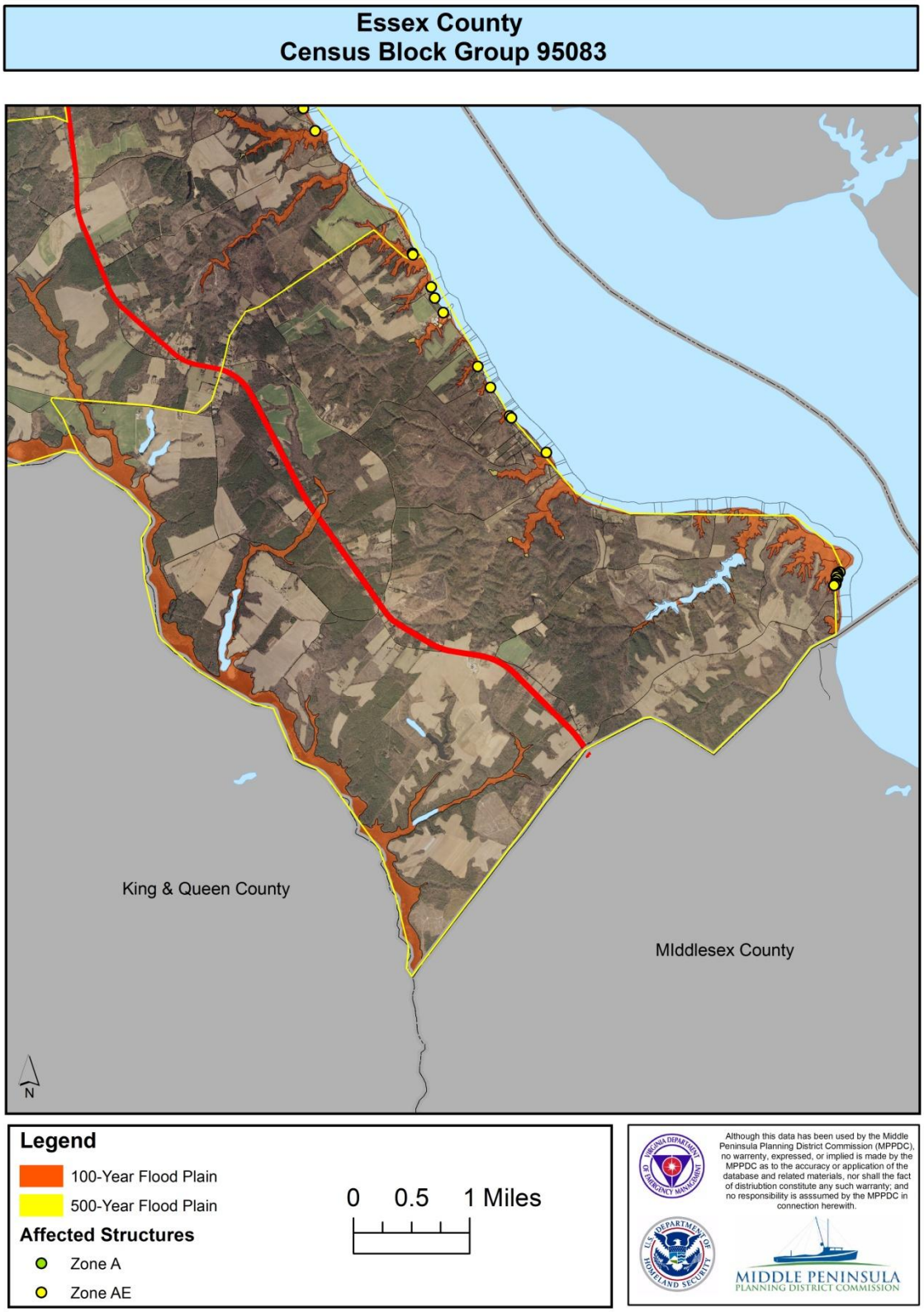
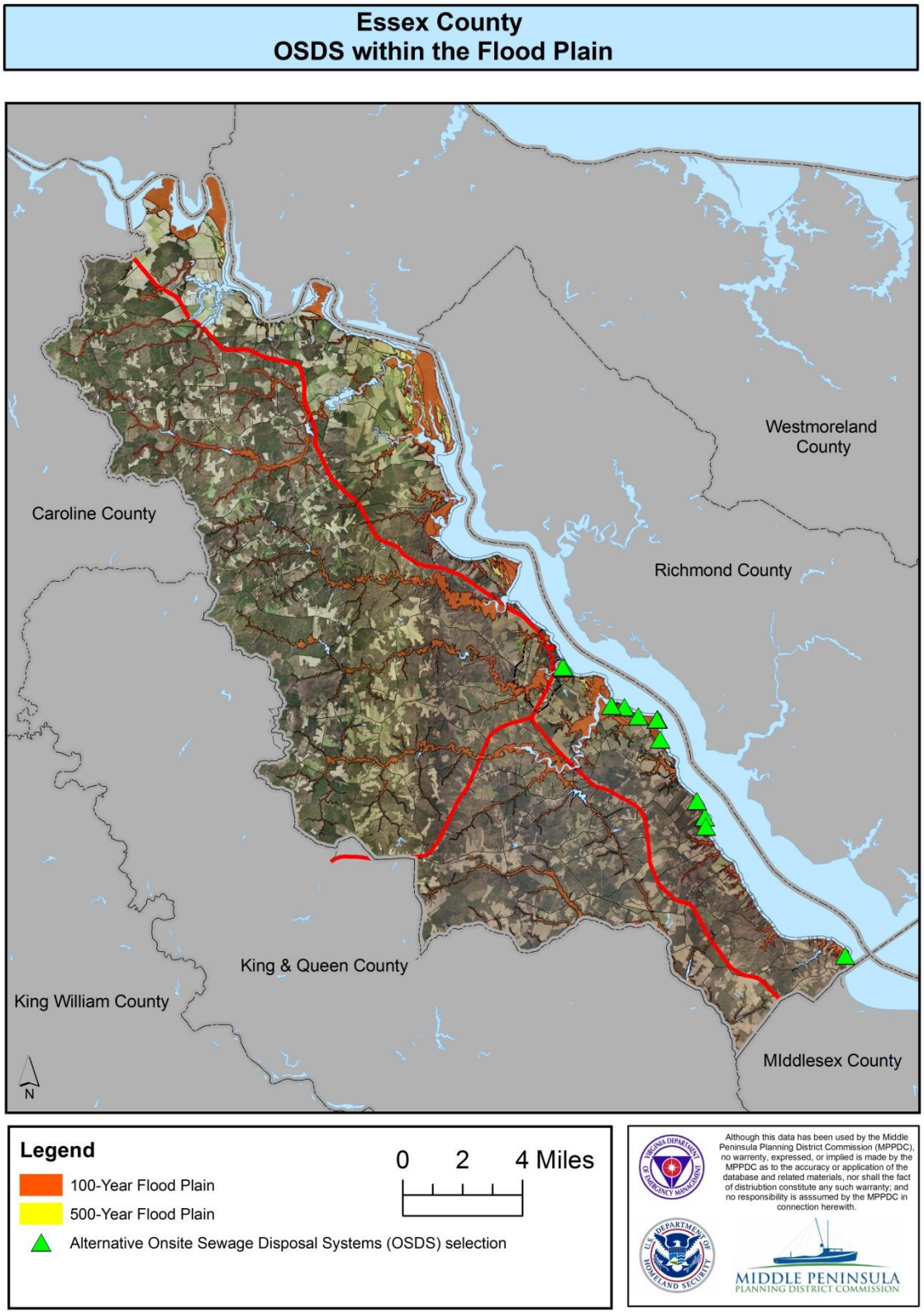

Essex County
Census Block Group 95082
King & Queen County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
0 1 2 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 52:


Essex County
Census Block Group 95083
King & Queen County
MIddlesex County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Alternative On-site Sewage Disposal Systems (OSDS). The following map (Figure 53) show the location of the OSDS systems constructed in the 100-year and 500-year floodplain in Essex County:

Figure 53:



Tappahannock Critical Facilities and Public Utilities
The Town of Tappahannock provides public water and sewer services to its citizens. The water system does not sustain damage during floods.

The wastewater treatment plant is located along Hoskins Creek on the west side of Route 17. The wastewater treatment plant does not suffer damage during severe flooding events. In the last plan there was mention that there was one sewerage pump station located along Newbill Drive that received flood damage during hurricane strength storms. During Hurricane Isabel in 2003, the electrical controls needed to be repaired since there was flood damage. However since the last plan the Newbill Drive electrical controls have been raised to above the flood line of Hurricane Isabel in hopes to avoid future issues.

Public Boat Landings
There is one public boat ramp in the Town of Tappahannock along Hoskin's Creek that is operated/maintained by the VDGIF:

Water Body	Access Area	Barrier Free	Type	Ramps	Latitude	Longitude
Hoskin's Creek	Hoskin's Creek	No	Concrete Ramp	1	35° 55' 12" N 37.9200873	76° 51' 26"W -76.8571004
Directions: Town of Tappahannock, Rt. T-1002 (Dock Street)						
Virginia Department of Game an Inland Fisheries, 2015						

In addition to Hoskin's Creek, there is public access at the Prince Street road ending which is owned by the Middle Peninsula Chesapeake Bay Public Access Authority. While Prince Street may suffer minor damage during severe storm events, Dock Street does not sustain damage from flood waters according to town officials.

Repetitive and Severe Repetitive Loss Residential Structures in the Town of Tappahannock
According to FEMA's records, the Town of Tappahannock has 2 Single Family Repetitive Loss properties and no Severe Repetitive Losses as of 5/31/15.

4.5.3. King William County Critical Facilities and Public Utilities
Public water and sewerage systems serve portions of the Route 360 growth corridor in Central Garage. A package wastewater treatment plant discharges sewer effluent into an unnamed tributary that leads into Moncuin Creek, which then flows into the Pamunkey River. Floodwaters do not adversely impact the wastewater treatment plant.

The public water system serves the relatively high and dry Central Garage area. Therefore, this Route 360/30 area water system does not sustain damage from flooding events.

According to VDOT officials, flood prone roads in the King William County/West Point area include the following:

Table 30: King William County/West Point Flood Prone Roads		
Route	**Road Name**	**Location**
30	King William Road	Cypress Swamp at Olson's Pond
636	VFW Road	Cypress Swamp
632	Mt. Olive- Cohoke Road	Intersection of Route 633
609	Smokey Road	Herring Creek
628	Dorrel Road	Herring Creek
1006	Thompson Ave	West Point Creek
1003	Chelsea Road	West Point Creek to dead end
1130	Glass Island Road	Mattaponi River
1107	Kirby Street	1st to 7th Streets
n/a	1st to 7th Streets	Between Kirby St. and Pamunkey River
n/a	2nd to 5th Streets	Between Lee St. and Mattaponi River

Public Boat Landings

There are 2 public boat ramps in King William County that is owned and maintained by VDGIF:

Water Body	Access Area	Barrier Free	Type	Ramps	Latitude	Longitude
Mattaponi River	Aylett	Yes	Concrete Ramp	1	37° 47' 8" N 37.7855806	77° 6' 11"W -77.1030150
Directions: Aylett, Rt 360 East, Right onto Rt 600						
Pamunkey River	Lestor Manor	Yes	Concrete Ramp	1	37° 35' 10" N 37.5861120	76° 59' 4"W -76.9845725
Directions: From King William Courthouse, Rt 30 South (.7 miles); Right on Rt 633 (7.4 miles); Left on Rt 672 (.4 miles)						
Virginia Department of Game an Inland Fisheries, 2015						

Additionally there is a very small canoe/kayak launce at Zoar State Forest located a few miles north of Route 360.

Due to the low velocity of the flood waters along these upper reaches of the Mattaponi River, neither of these boat landings sustain damage from flood waters.

Repetitive and Severe Repetitive Loss Residential Structures in King William County

According to FEMA's records, King William County has no Repetitive Loss residential properties or Severe Repetitive Loss as of 5/31/15.

Properties in 100-year Floodplain by Census Block Group

The following series of maps show the location of structures in King William County that are either in the Flood Zone A or in Flood Zone AE in the 100-year flood plain. The map also shows structures in the 500-year plain that are labeled: "0.2% annual chance flood hazard". The legend is color coded to indicate the specific flood zone in which each structure lies.

Figure 54:

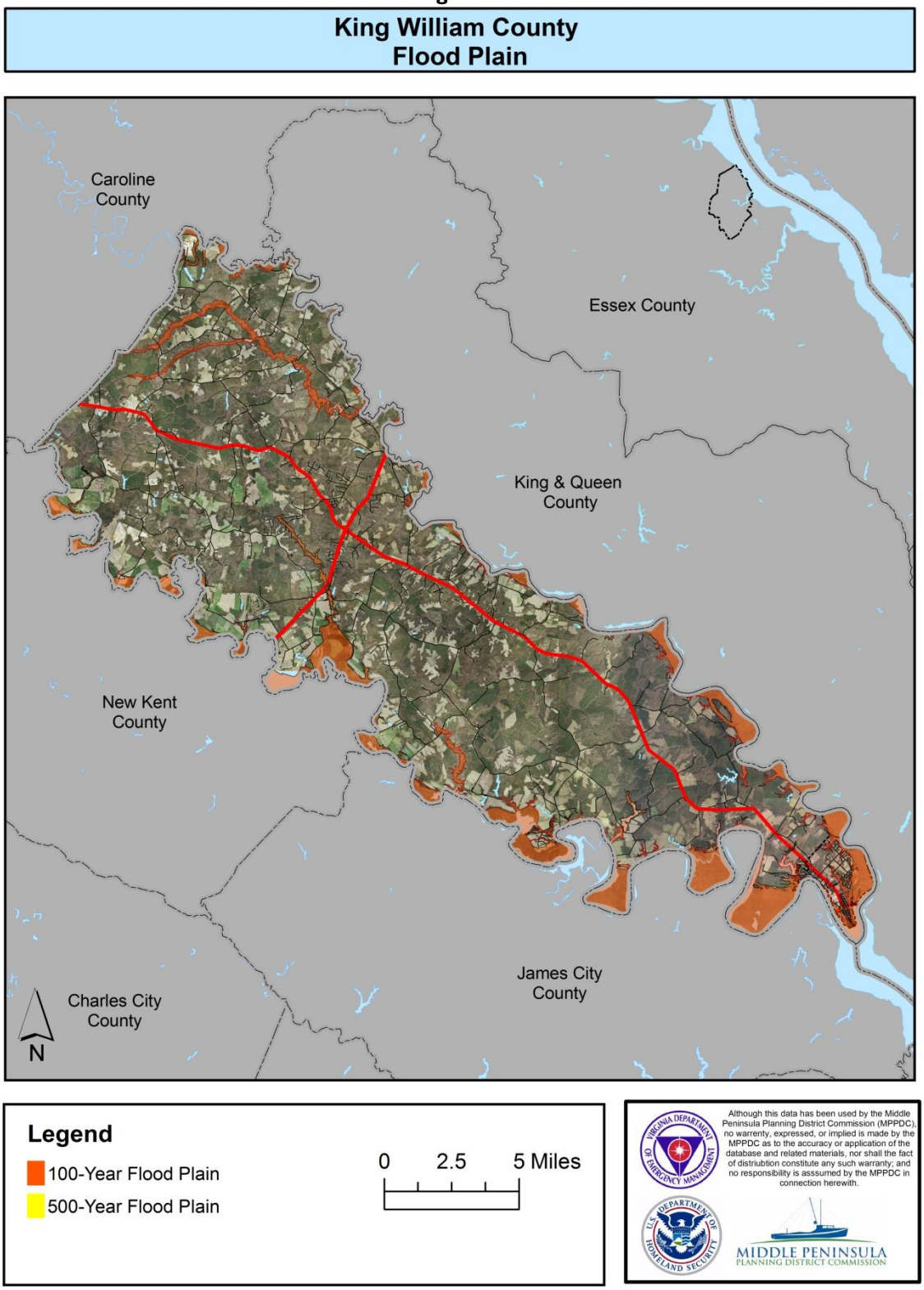

King William County
Flood Plain
Caroline County
Essex County
King & Queen County
New Kent County
James City County
Charles City County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
0 2.5 5 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 55:

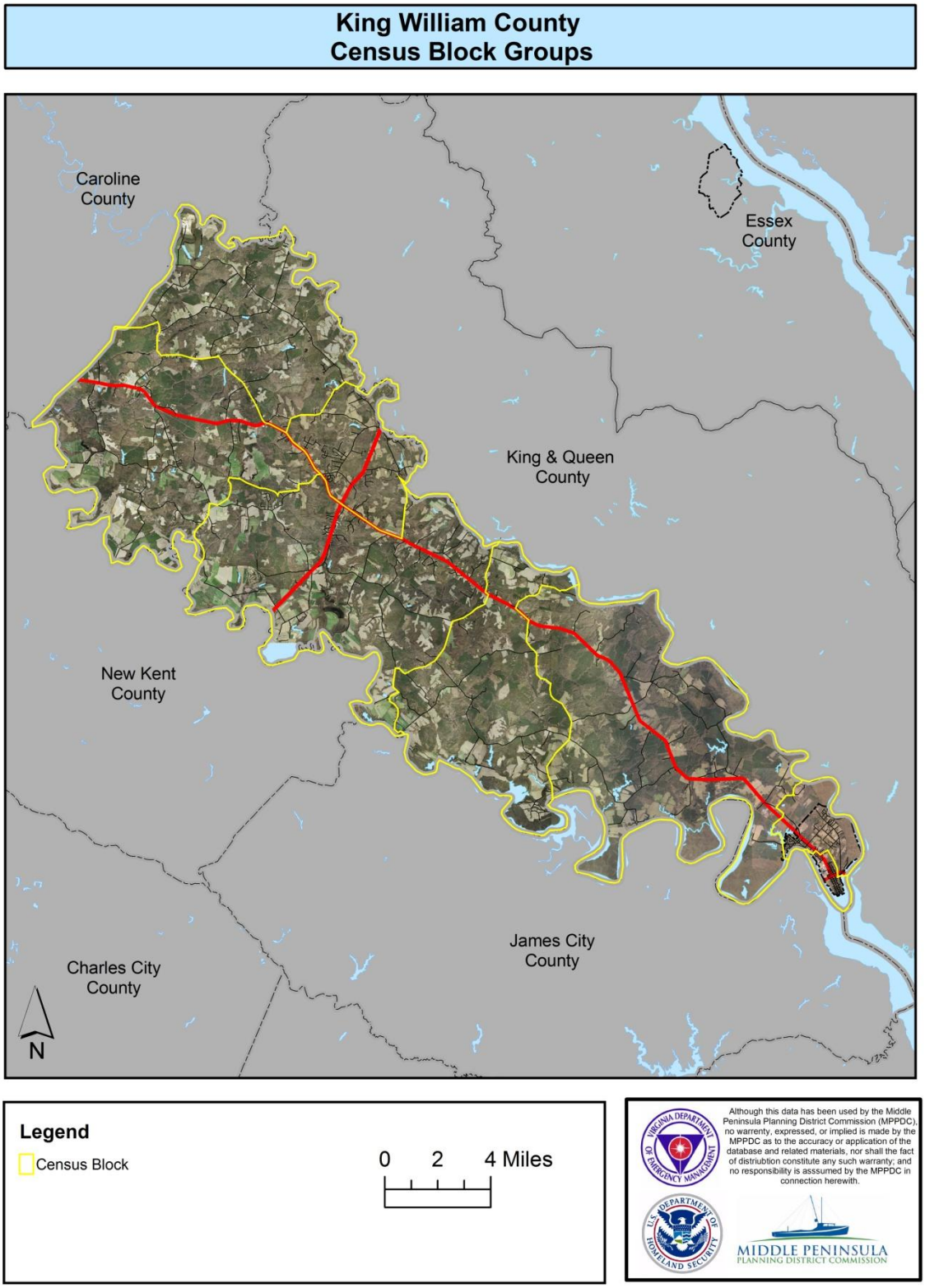

King William County
Census Block Groups
Caroline County
Essex County
King & Queen County
New Kent County
James City County
Charles City County
N
Legend
Census Block
0 2 4 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 56:

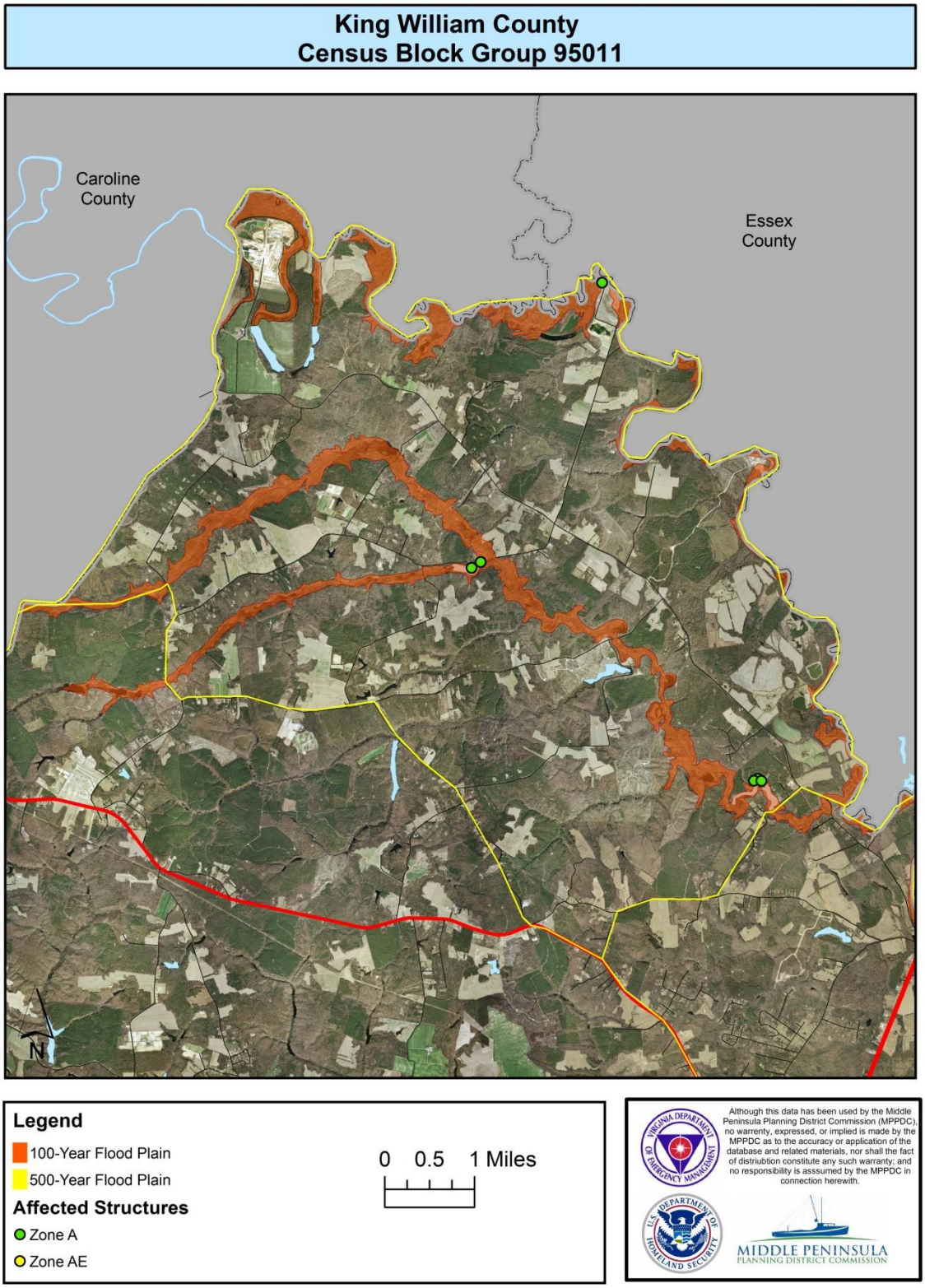

King William County
Census Block Group 95011
Caroline County
Essex County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 57:

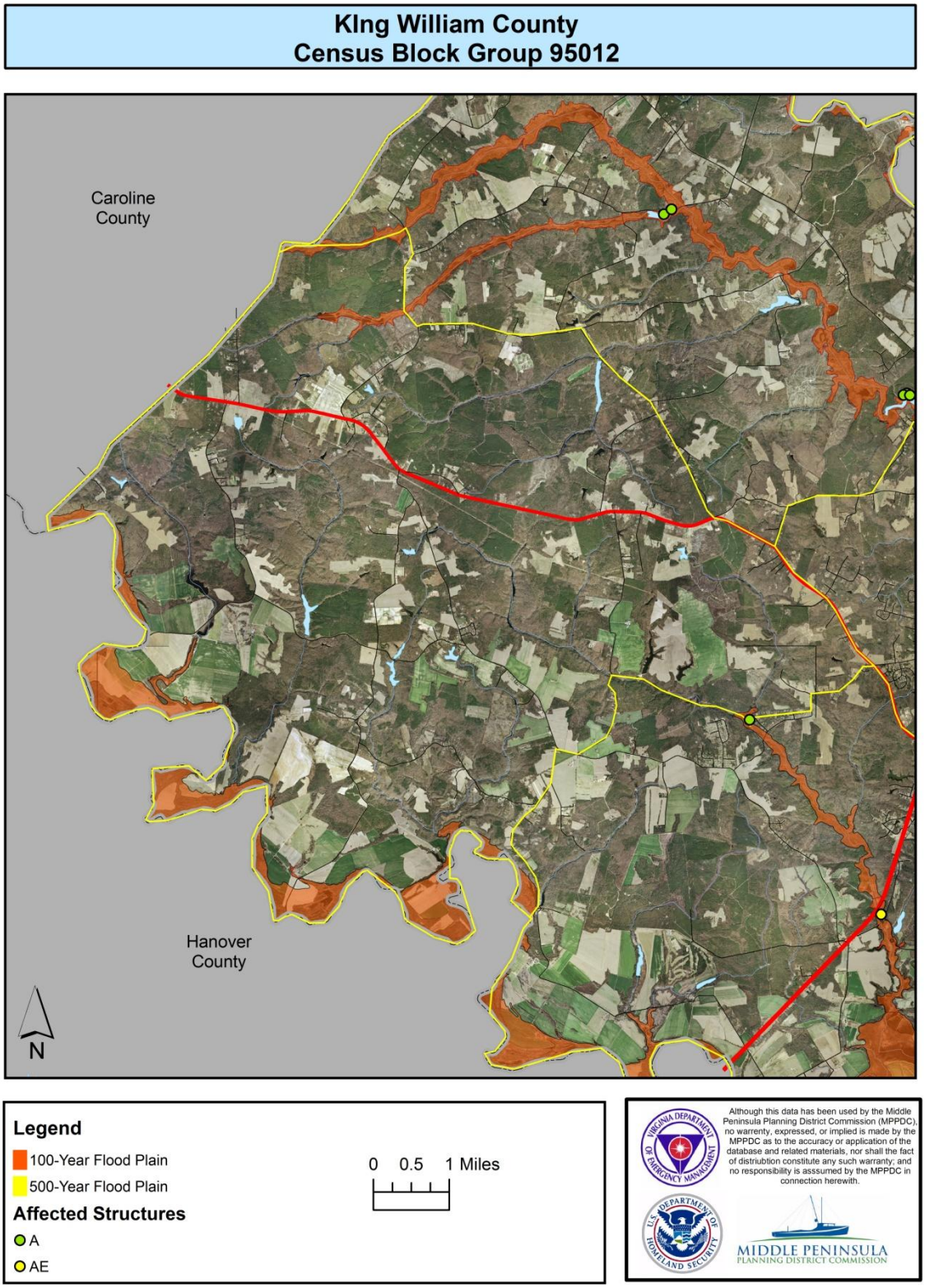

Kln William County
Census Block Group 95012
Caroline County
Hanover County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
A
AE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 58:

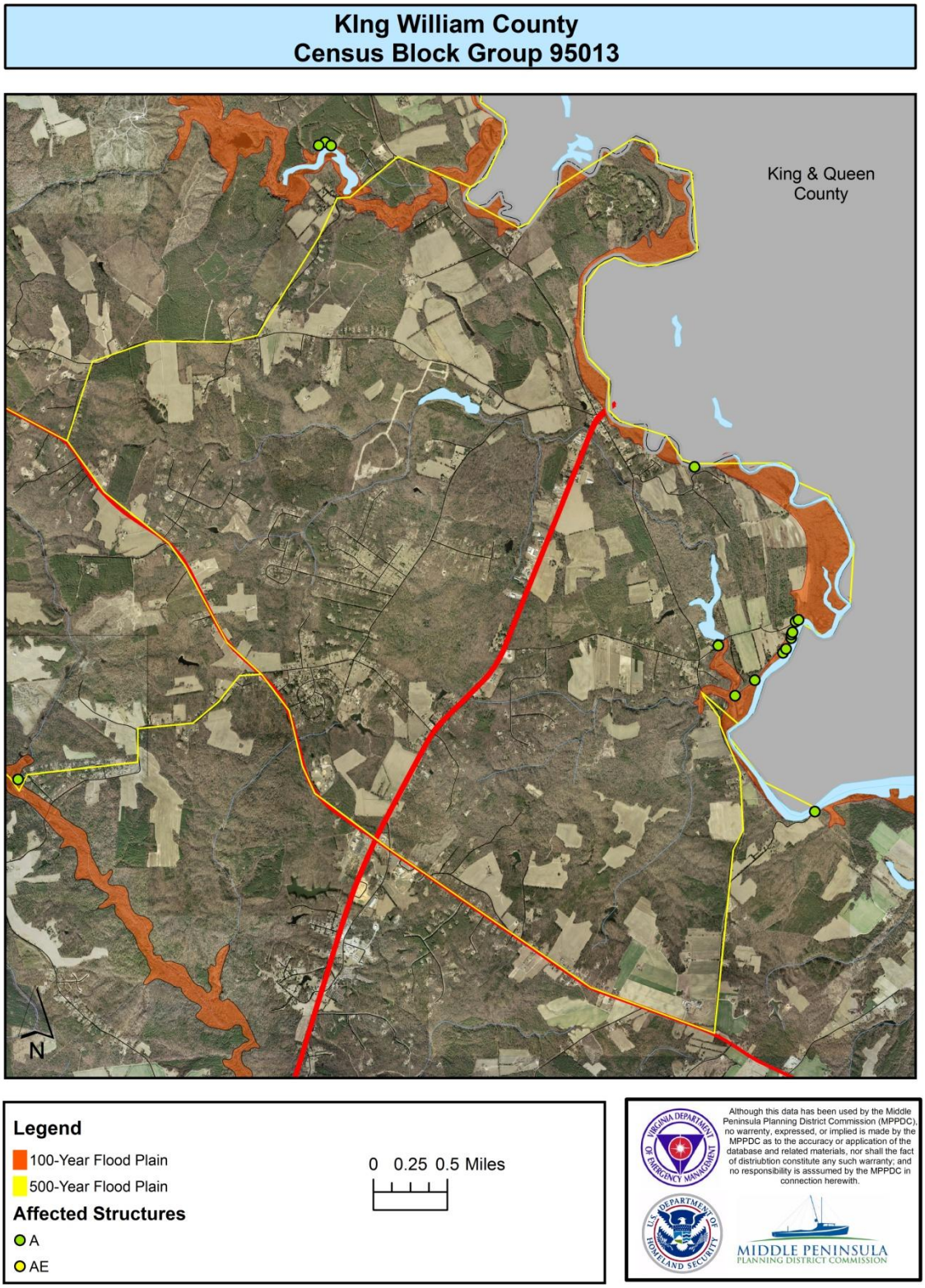

King William County
Census Block Group 95013
King & Queen County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
A
AE
0 0.25 0.5 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 59:

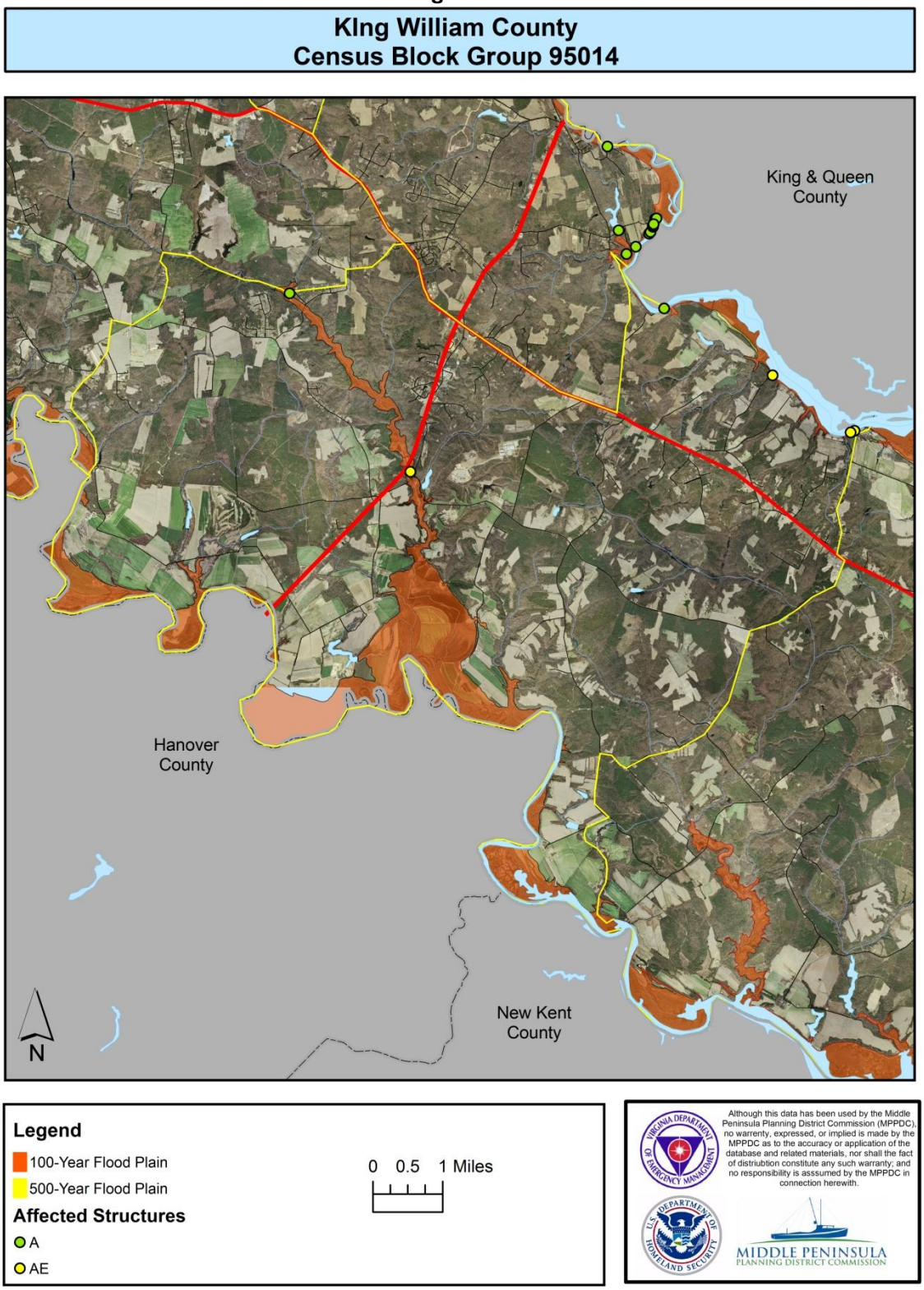

King William County
Census Block Group 95014
King & Queen County
Hanover County
New Kent County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
A
AE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 60:


King William County
Census Block Group 95021
King & Queen County
Hanover County
New Kent County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
A
AE
0 0.45 0.9 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 61:

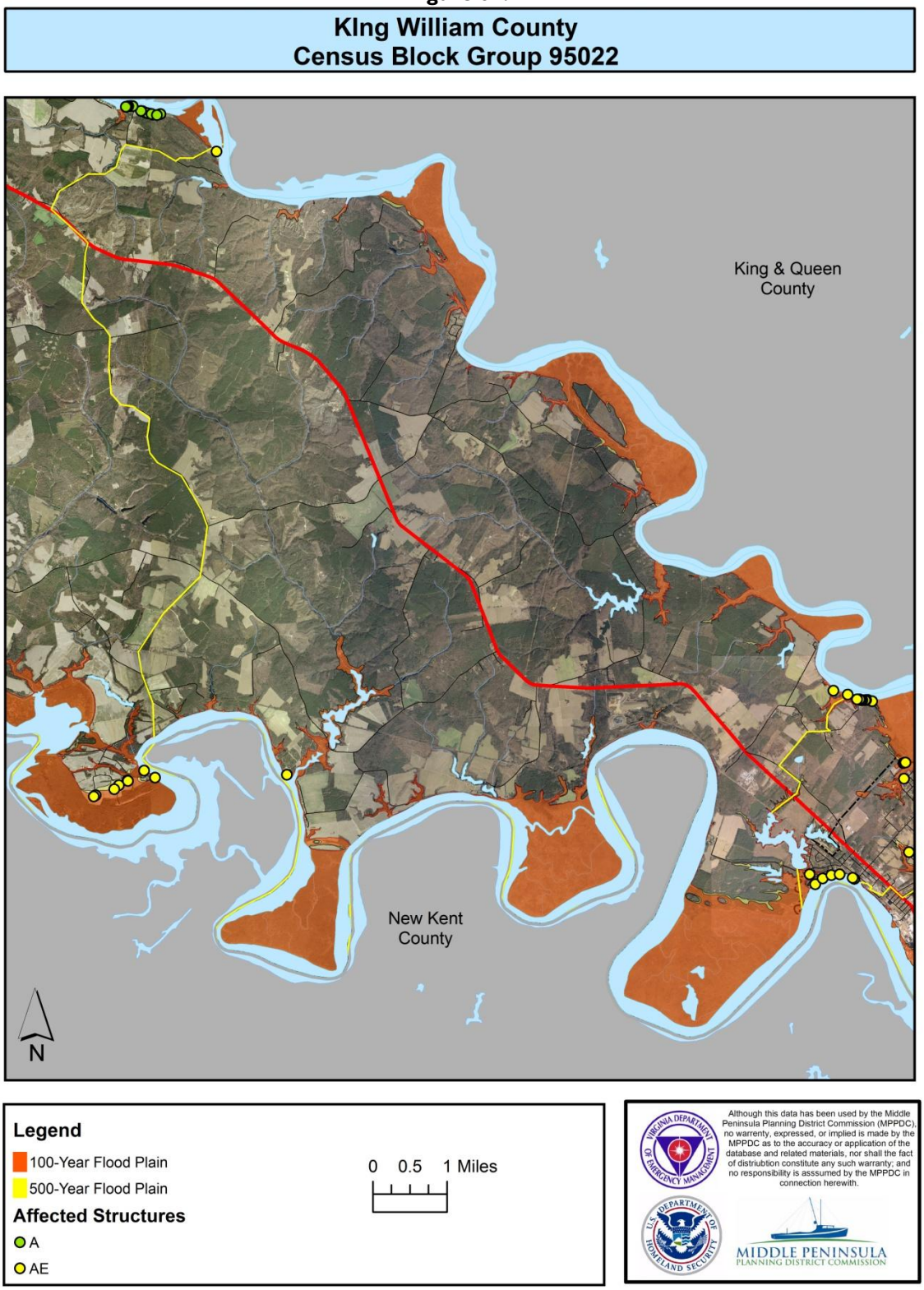

King William County
Census Block Group 95022
King & Queen County
New Kent County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
A
AE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 62:

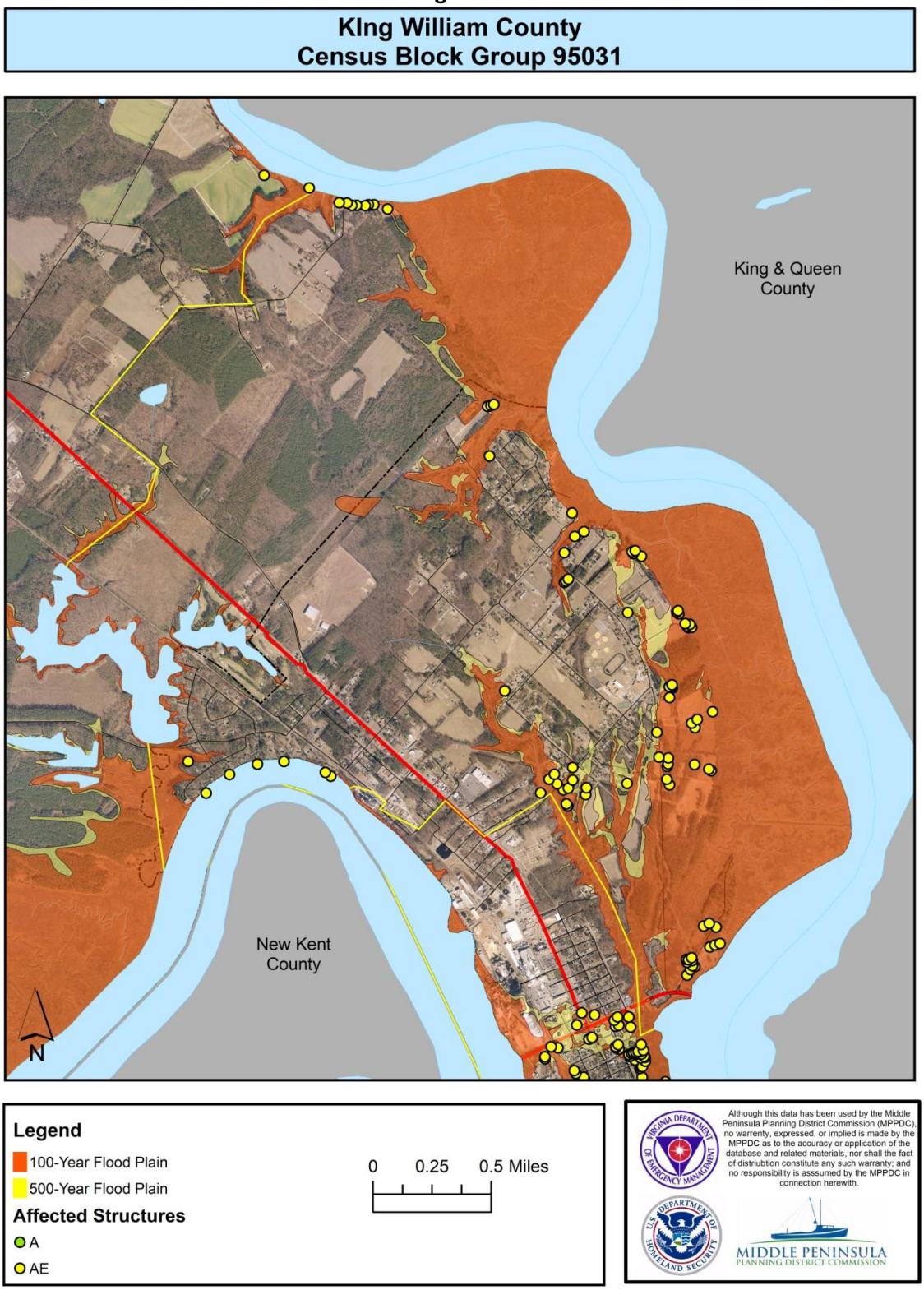
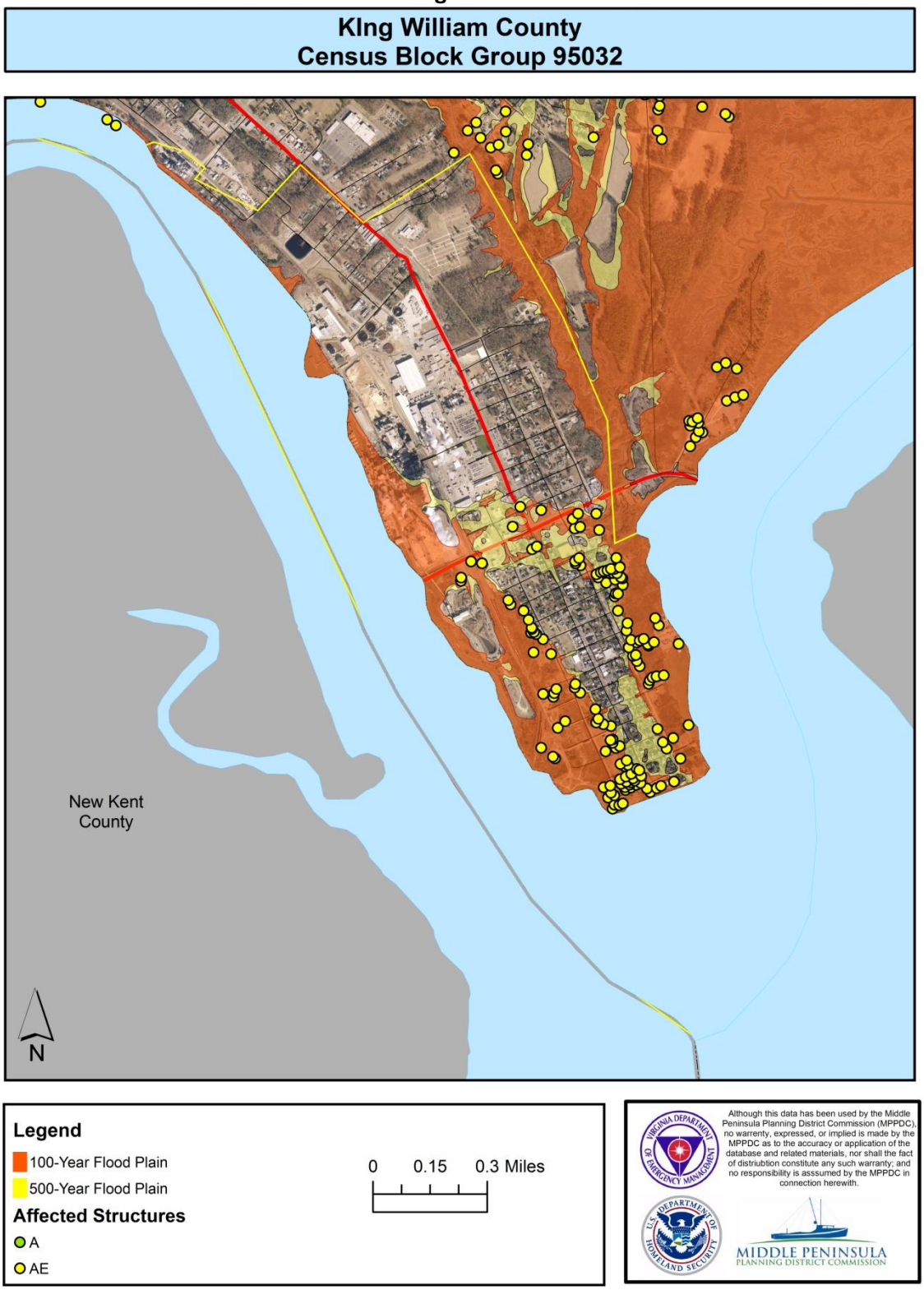

Klng William County
Census Block Group 95031
King & Queen County
New Kent County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
A
AE
0 0.25 0.5 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

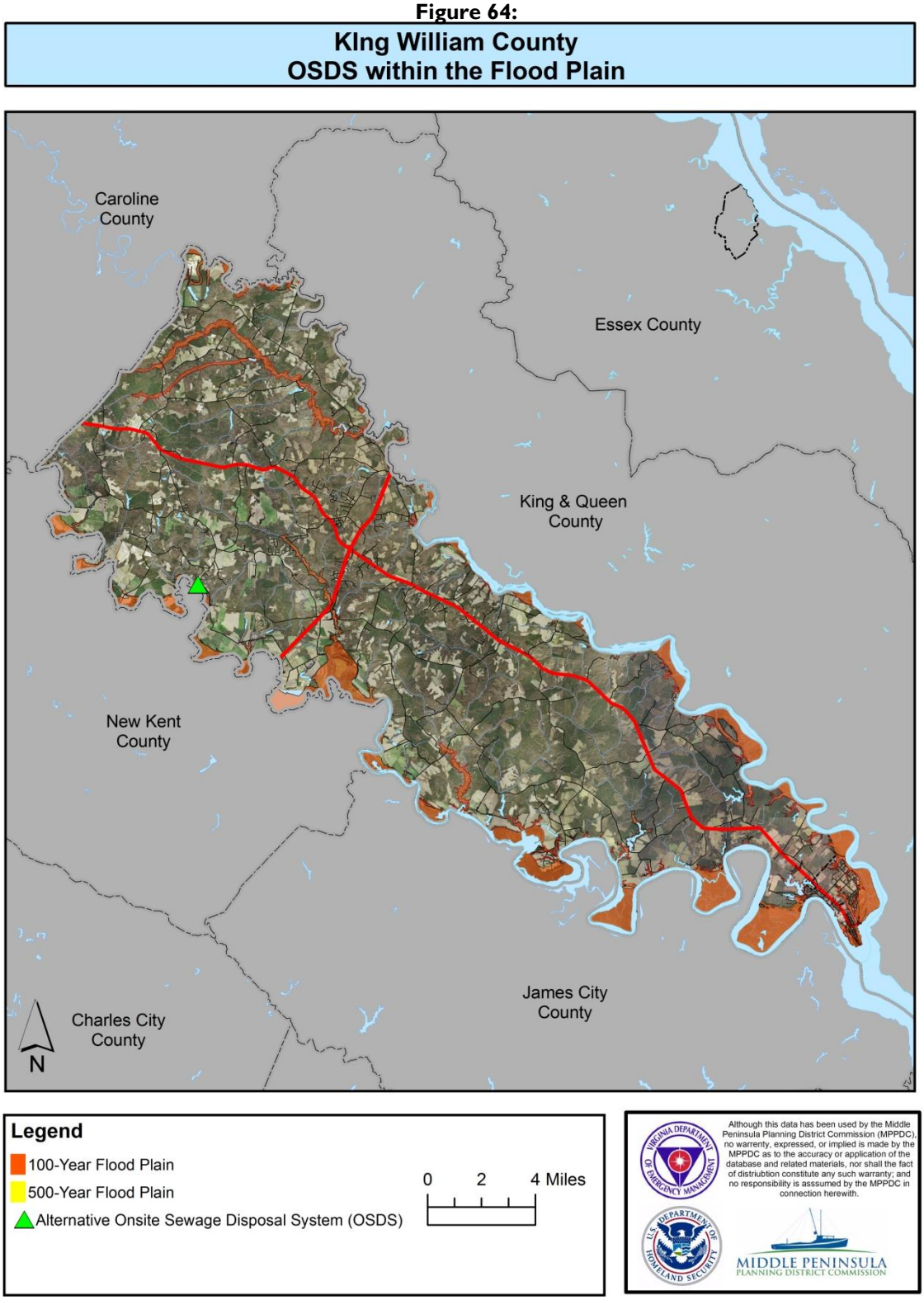
Figure 63:


Klng William County
Census Block Group 95032
New Kent
County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
A
AE
0 0.15 0.3 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Alternative On-site Sewage Disposal Systems (OSDS)

The map (Figure 64) below shows the locations of the installed OSDS facilities constructed in the 100-year floodplain in King William County.

Figure 64:



West Point Critical Facilities and Public Utilities
Located at the confluence of the Mattaponi and Pamunkey Rivers where they become the headwaters of the York River, there is public infrastructure, private residences and downtown businesses that are at risk of flooding during severe storms.

The town provides both public water and sewer service to its residents. The water system is owned and operated by the town and sustains little damage during flooding events.

The ownership and operation of the town's sewerage system has been turned over to the Hampton Roads Sanitation District (HRSD). The wastewater treatment plant is located at the east end of 23rd Street. The facility did not flood during Hurricane Isabel in 2003 and the vital electrical and mechanical controls are on a slightly elevated portion of the site and therefore, the facility's location does not pose a risk of flooding.

A sewer pump station located on 2nd Street near the point does have a flooding problem. During Hurricane Isabel, the pump motors in the well house flooded and needed to be dried out. However, the electrical controls are mounted high enough in the pump house so that they did not sustain flood damage. There is a sewer pump station located on 13th street that did not flood during Hurricane Isabel, but the floodwaters did reach within 1-foot of the facility.

Public Boat Landings
There is one public boat landing located along the Mattaponi River on the north side of the Lord Delaware Bridge on Glass Island Road. This facility does receive minor damage to the roadway and parking areas during severe storms.

Water Body	Access Area	Barrier Free	Type	Ramps	Latitude	Longitude
Mattaponi River	West Point	Yes	Concrete Ramp	2	37° 47' 8" N 37.5406099	76° 47' 23"W -76.7896487
Directions: Town of West Point on Rt 33						
						VDGIF, 2015

Public Park Facility
On the south side of the Lord Delaware Bridge, there is a small town park with walking trails and benches adjacent to the water's edge. This is a new facility that was built in conjunction with the new bridge construction that was completed in 2006. Due to the minimal amount of infrastructure at this shoreline facility, it is an anticipated that there will be no more than minor damages from rising waters in this wetlands area adjacent to the Mattaponi River.

Repetitive and Severe Repetitive Loss Residential Structures in West Point
According to FEMA's records, the Town of West Point has 8 Single Family and 1 Non-Residential Repetitive Loss properties and zero Severe Repetitive Losses as of 5/31/15.

The properties in the 100-year floodplain and 500-year floodplain are shown in the previous set of maps that also include King William County structures in the floodplain.

Numerous homes and downtown businesses at the southern end of West Point flood during severe storms particularly as flood waters reached 8 feet 6 inches above mean low water which is 6 inches above the 8 ft 100-year flood plan elevation. Additionally winds were sustained at excess of 80 miles per hour. Of the homes that underwent repairs, 2 of them were elevated by the homeowners at their own expense.

The West Point School Complex, which serves as the town's shelter, is located on the northern side of the town and the buildings are not subjected to floodwaters. However, Chelsea Road is located along the Mattaponi River and it is 1 of 2 routes that are used to access the school complex. This roadway does flood during severe storms.

4.5.4. Gloucester Critical Facilities and Public Utilities

The county has a relatively extensive network of public water and sewer facilities in and around the Gloucester Courthouse area. The Beaverdam Reservoir, located just north of the courthouse area, serves as the drinking water source for the county's public water supply system. As discussed earlier in the Dam Impoundment Section of the plan, the dam is structurally well-built and remains fully certified by the DCR (Figure 3). Below the dam there are approximately 200 homes that would flood if the Reservoir structure failed. However, in 1999 the impoundment overflowed during Hurricane Floyd yet no flood damage to the home since the excess water flowed downstream using the emergency spillway.

Table 31 provides a list of dams within the locality that may be impacted by natural hazards as well.

Table 31: The following is a list of dams in Gloucester County that are on the Virginia Department of Conservation and Recreation's Certification List.

Dam Name	Class	Height	Capacity in Acre Feet	Water Body
Woodberry Farm	3	8	158	Jones Creek
Weaver Dam	3	6	81	Jones Creek
Haynes	3	15	366	Carter Creek
Robins Creek	3	16	219	Wilson
Cow Creek	2	16	931	Cow
Burke Stream	3	20	481	Burke Mill
Cypress Shores River	3	15	143	Piankatank
Haines Pond	3	9	50	Carter Creek
Beaverdam Reservoir	1	39	20,523	Beaverdam Creek
Wood Duck Pond	4	Unknown	Unknown	Unknown
Leigh Lake	4	12	unknown	Jones Creek

The water distribution system does not suffer damage during severe storm events since it is a closed underground system. The sewerage collection lines and pumps stations are owned and operated by Gloucester County. There are 2 pump stations in the Gloucester Courthouse area (Pump # 11 and Pump #13) that sustained damage during Hurricane Floyd in 1999. The damage was caused by floodwaters resulting from the overtopping of the Beaverdam Reservoir as previously mentioned. After the wastewater is collected, it is transported in a large force main that runs down Route 17, crosses under the York River and then flows into the York River Wastewater Treatment Plant in York County. The large force main and treatment plant are owned and operated by the Hampton Roads Sanitation District. The force main is a closed underground system that does not sustain damage during severe flooding events.

The Achilles Elementary School site, located in the southeastern section of the county, is adversely affected by flood waters from storms surges associated with a Category 1 hurricane.

According to VDOT officials, flood prone roads in Gloucester County include the following:

Table 32: Gloucester County Flood Prone Roads		
Route	**Road Name**	**Location of Floodwaters**
684	Starvation Road	From Big Oak Lane to ESM
662	Allmondsville Road	From Rte. 606 to Rte. 618
618	Chappahosic Road	From Rte. 662 to Rte. 639
636	Brays Point Road	From Eagle Lane to ESM
1303	Carmines Islands Road	From Gardner Lane to ESM
646	Jenkins Neck Road	Various spots from Owens Road to ESM
648	Maundys Creek Road	From Rte. 649 to ESM
649	Maryus Road	From Haywood Seafood Lane to ESM
652	Rowes Point Road	From 653 to ESM
649	Severn Wharf Road	Various spots from 653 to ESM

Public Boat Ramps

There are **4** public boat landings in Gloucester County that are owned and operated by the VDGIF:

Water Body	Access Area	Barrier Free	Type	Ramps	Latitude	Longitude
Piankatank River	Deep Point	Yes	Concrete Ramp	1	37° 32' 10" N 37.5361228	76° 29' 43"W -76.4953889
Directions: From Glenns, Rt 198 East (7.5 miles); Left on Rt 606 (1.5 miles)						
Porpoptank River	Tanyard	No	Concrete Ramp	1	37° 27' 17" N 37.4548078	76° 40' 5"W -76.6679753
Directions: From Gloucester, Rt 14 North (4.3 miles); Left on Rt 613 (3.3 miles); Right on Rt 610 (.6 miles); left on Rt 617 (.5 miles)						
Ware River	Warehouse	Yes	Concrete Ramp	1	37° 24' 11" N 37.4031611	76° 29' 23"W -76.4896286
Directions: East of Gloucester on Rt 621						
York River	Gloucester Point	Yes	Concrete Ramp	2	37° 14' 45" N 37.2457058	76° 30' 17"W -76.5048003
Directions: Town of Gloucester Point, Rt 1208 – TEMPORARILY CLOSED						
VDGIF, 2015						

In addition to VDGIF there is a list of other public boat ramps throughout the County, including:

- ***Cappahosic Landing Location***: End of Cappahosic Road. York River Access. Bank fishing, beach, Picnicking, limited parking, and restrooms - May thru October. Park area maintained by Gloucester County while the Landing is maintained by VDOT.
- ***Cedar Bush, Oliver's Landing Location***: End of Cedar Bush Road. York River Access. Gravel ramp and finger pier. Maintained by Gloucester County and VDOT.
- ***Field's Landing***: End of Field's Landing Road. York River Access. Car top boats only, no trailer access. Maintained by VDOT.
- ***Glass Point Landing***: End of Glass Road. Severn River Access. Car top boats only, no trailer access Maintained by Gloucester County and VDOT.
- ***Gloucester Point Beach Park Location***: End of Greate Road, next to Coleman Bridge. York River Access. Sandy beach, swimming, picnicking, outdoor showers – seasonal, restrooms, playground, fishing pier, parking and two landings. One landing is maintained by Gloucester County and one by DGIF (see above for details).
- ***John's Point Landing*** - End of John's Point Road . Small boats only, gravel ramp and sand ramp for car top boats : Fishing Parking Maintained by Gloucester County and VDOT

- ***Miller's Landing*** - car top boats only, no trailer access Location: End of Miller's Landing Road Poropotank River Access Fishing Parking Maintained by VDOT
- ***Payne's Landing***: End of Paynes Landing Road. Ware River Access. Car top boats only, no trailer access. Maintained by Gloucester County.

Repetitive and Severe Repetitive Loss Residential Structures in Gloucester County
According to FEMA's records, Gloucester County has 146 (ie.141 Single Family, 1 Non-Residential, 3 Assmd Condo, and 1 2-4 Family properties) Repetitive Loss properties and 13 (i.e. 11 Single Family and 2 non-residential properties) Severe Repetitive Losses as of 5/31/15.

Properties In 100-year Floodplain by Census Block Group
The following series of maps show the location of structures in Gloucester County that are in Flood Zone A, Flood Zone AE or Flood Zone VE. This 2004 information is the latest structure data available. The legend is color coded to indicate the specific flood zone in which each structure lies.

Figure 65:

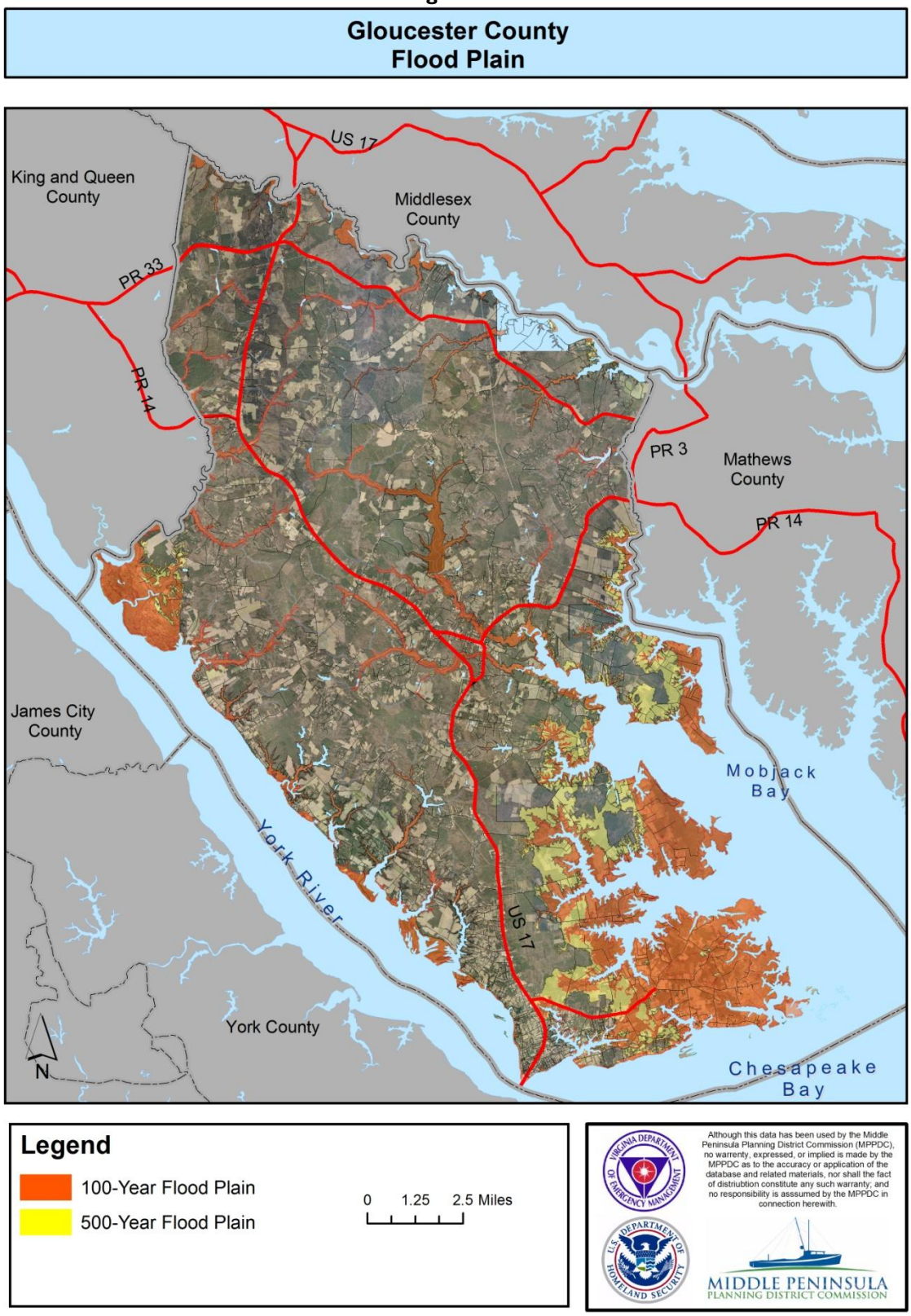

Gloucester County
Flood Plain
US 17
King and Queen County
Middlesex County
PR 33
PR 14
PR 3
Mathews County
PR 14
James City County
Mobjack Bay
York River
US 17
York County
N
Chesapeake Bay
Legend
100-Year Flood Plain
500-Year Flood Plain
0 1.25 2.5 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty, and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 66:

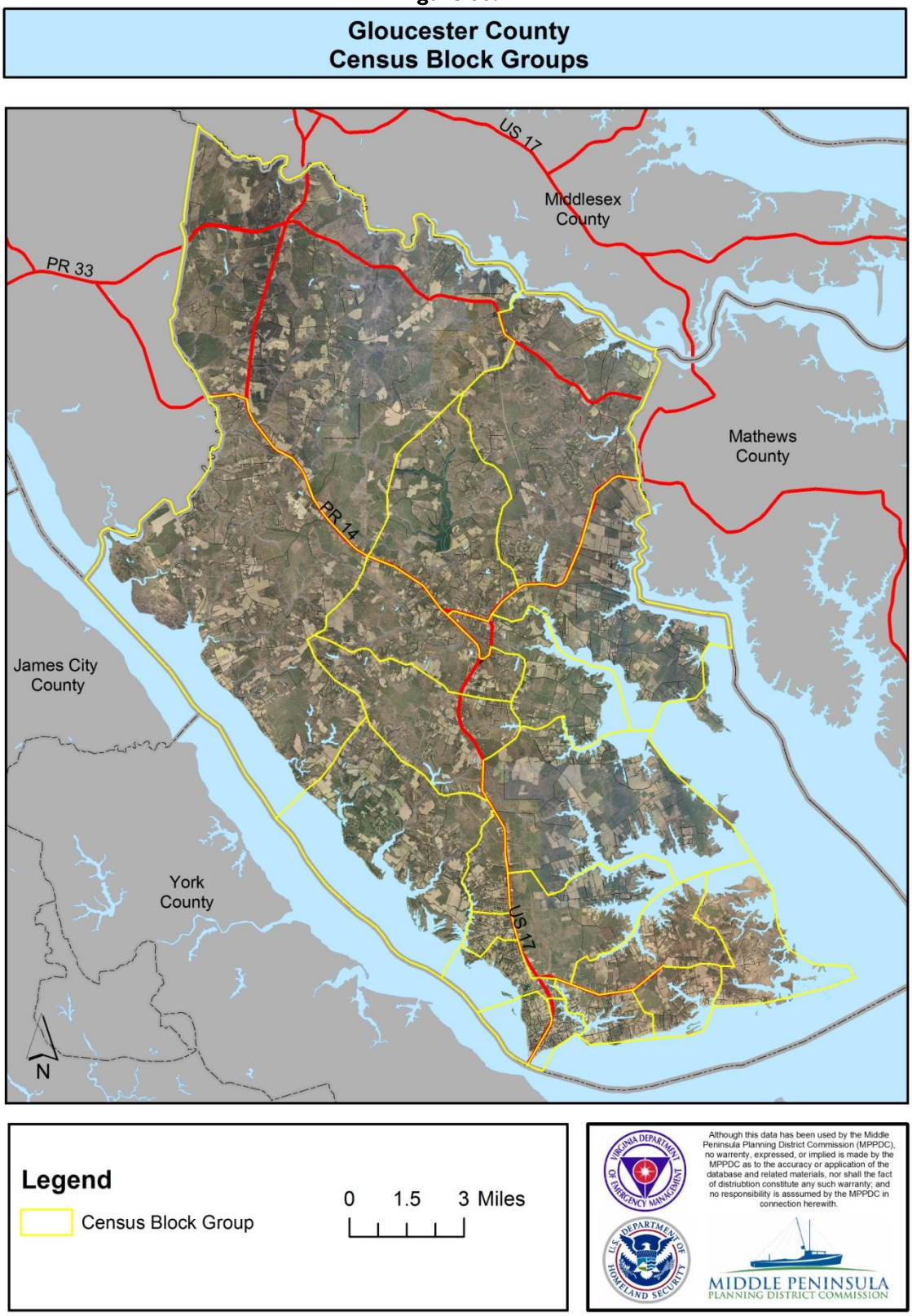

Gloucester County
Census Block Groups
US 17
Middlesex County
PR 33
Mathews County
PR 14
James City County
York County
US 17
N
Legend
Census Block Group
0 1.5 3 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty, and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 67:

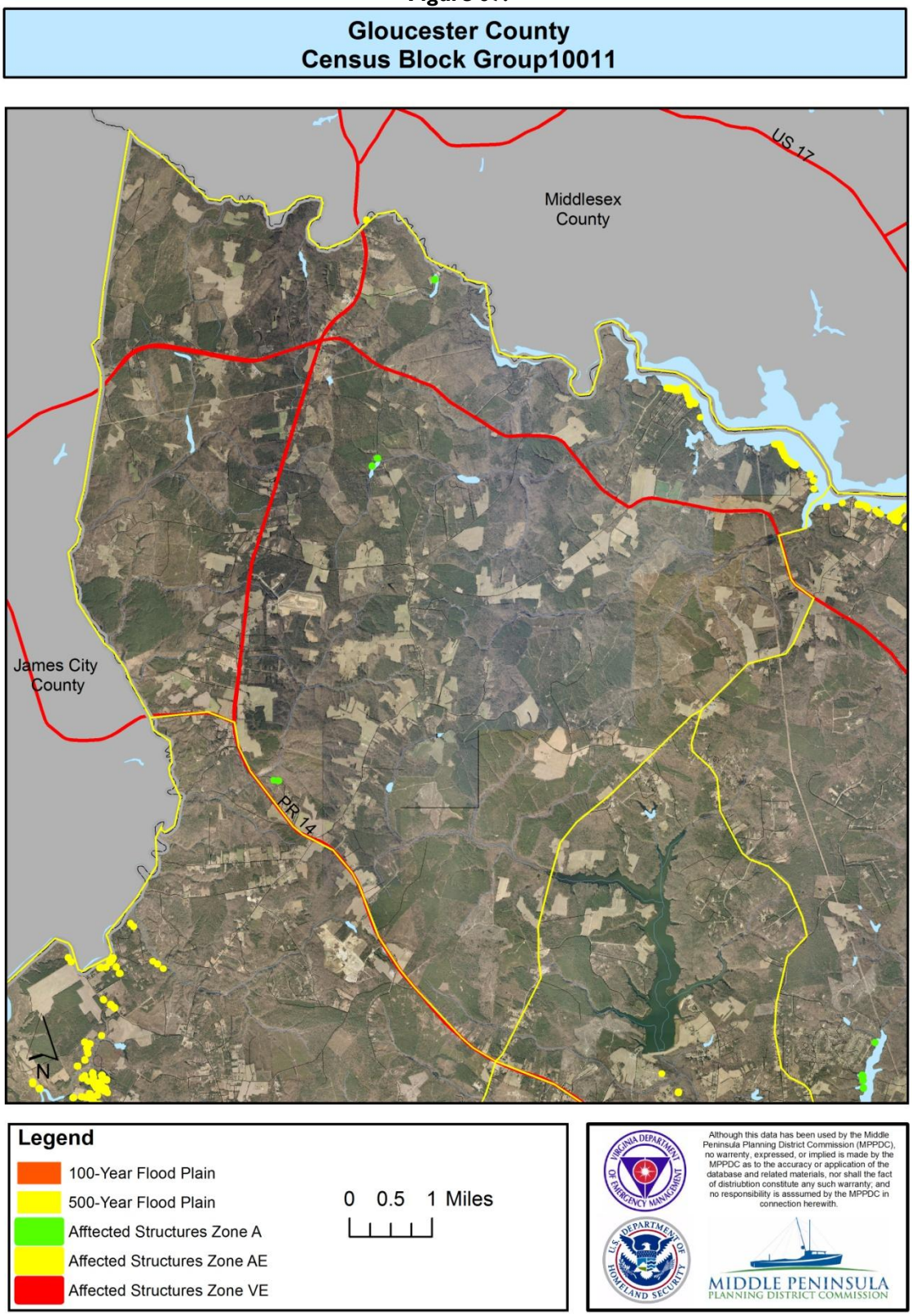

Gloucester County
Census Block Group10011
US 17
Middlesex County
James City County
PR 14
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Afftected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty, and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 68:

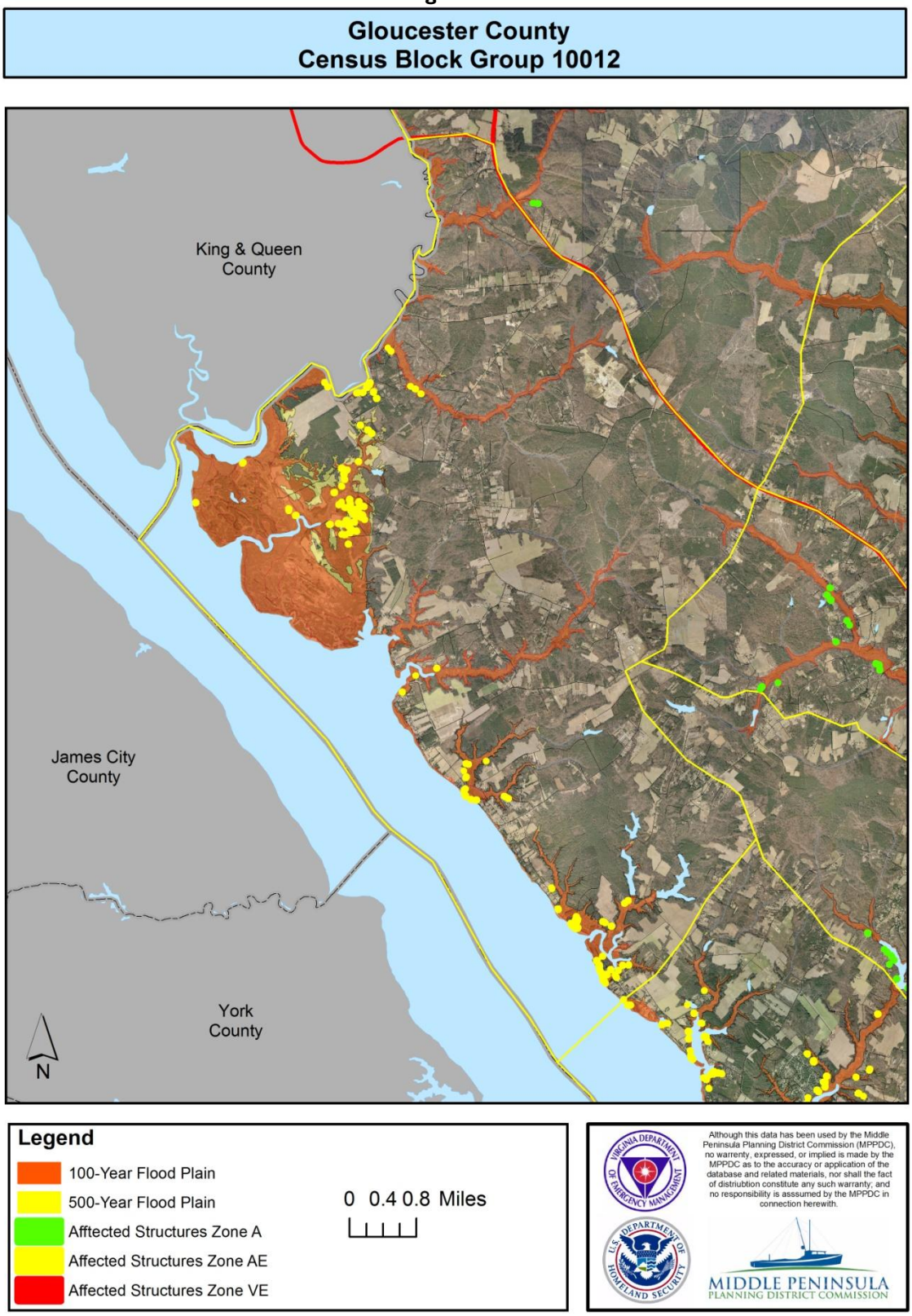

Gloucester County
Census Block Group 10012
King & Queen County
James City County
York County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Afftected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.4 0.8 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty, and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 69:

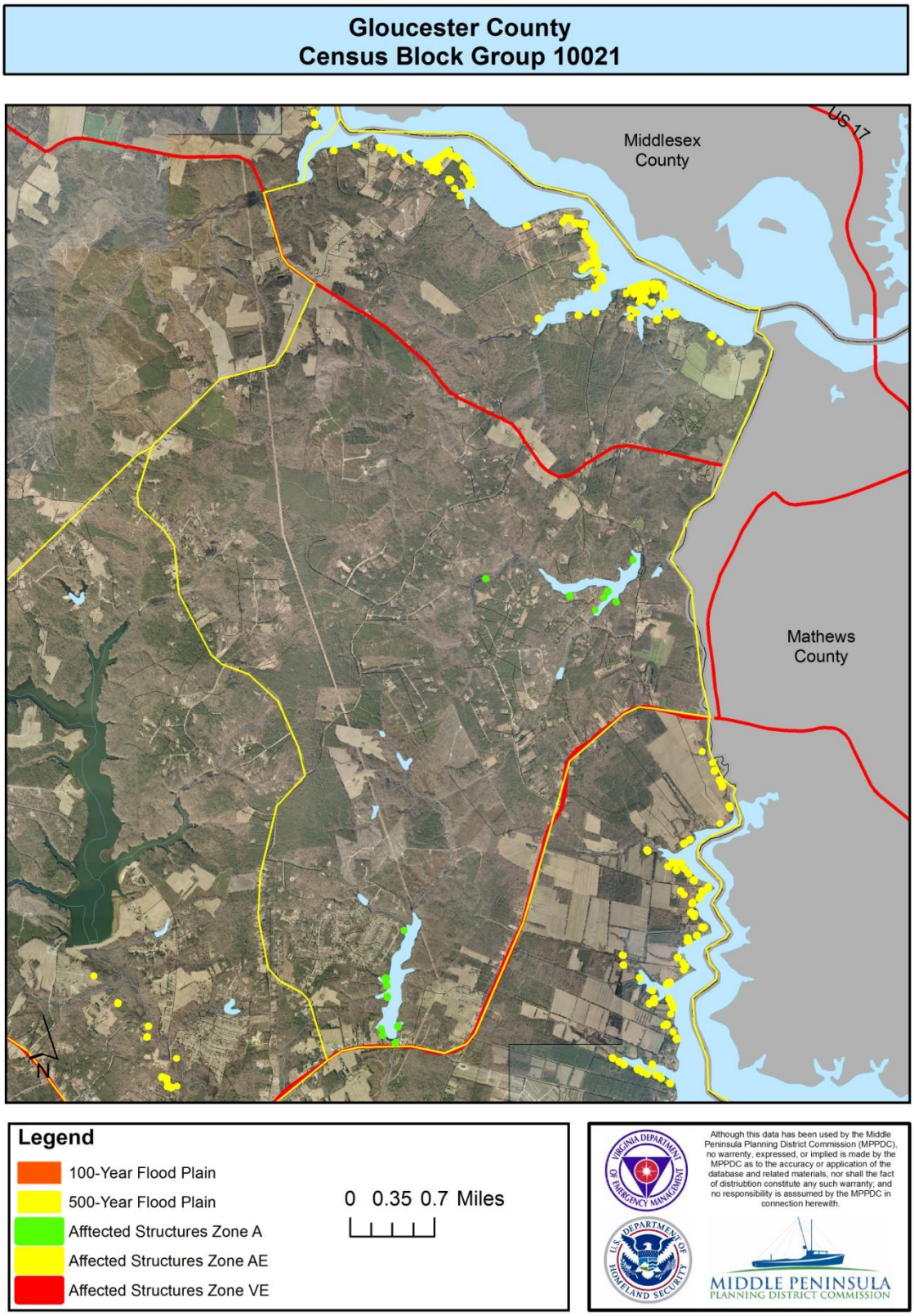

Gloucester County
Census Block Group 10021
Middlesex County
US 17
Mathews County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Afftected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.35 0.7 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty, and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 70:

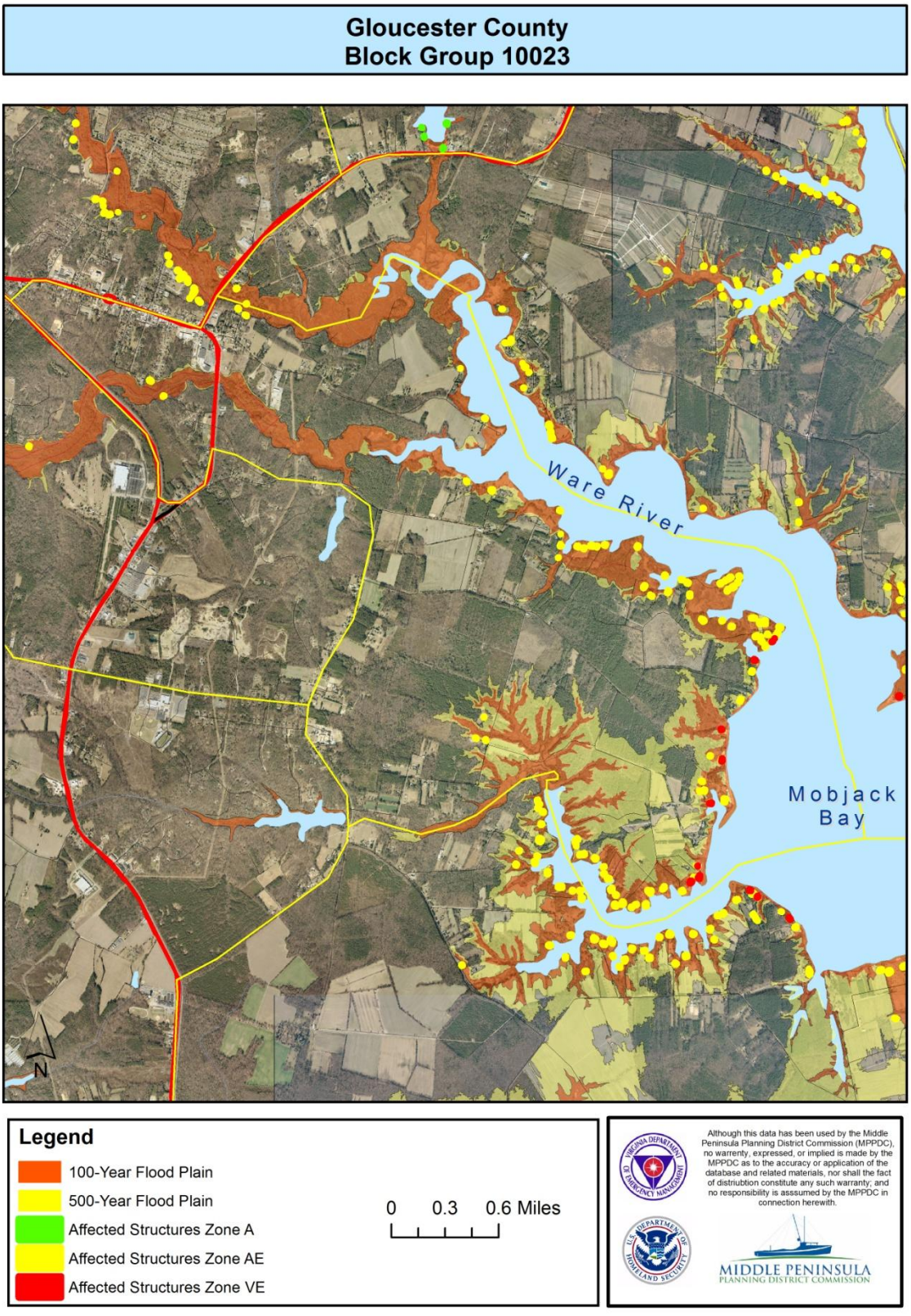

Gloucester County
Block Group 10023
Ware River
Mobjack Bay
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.3 0.6 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warranty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 71:

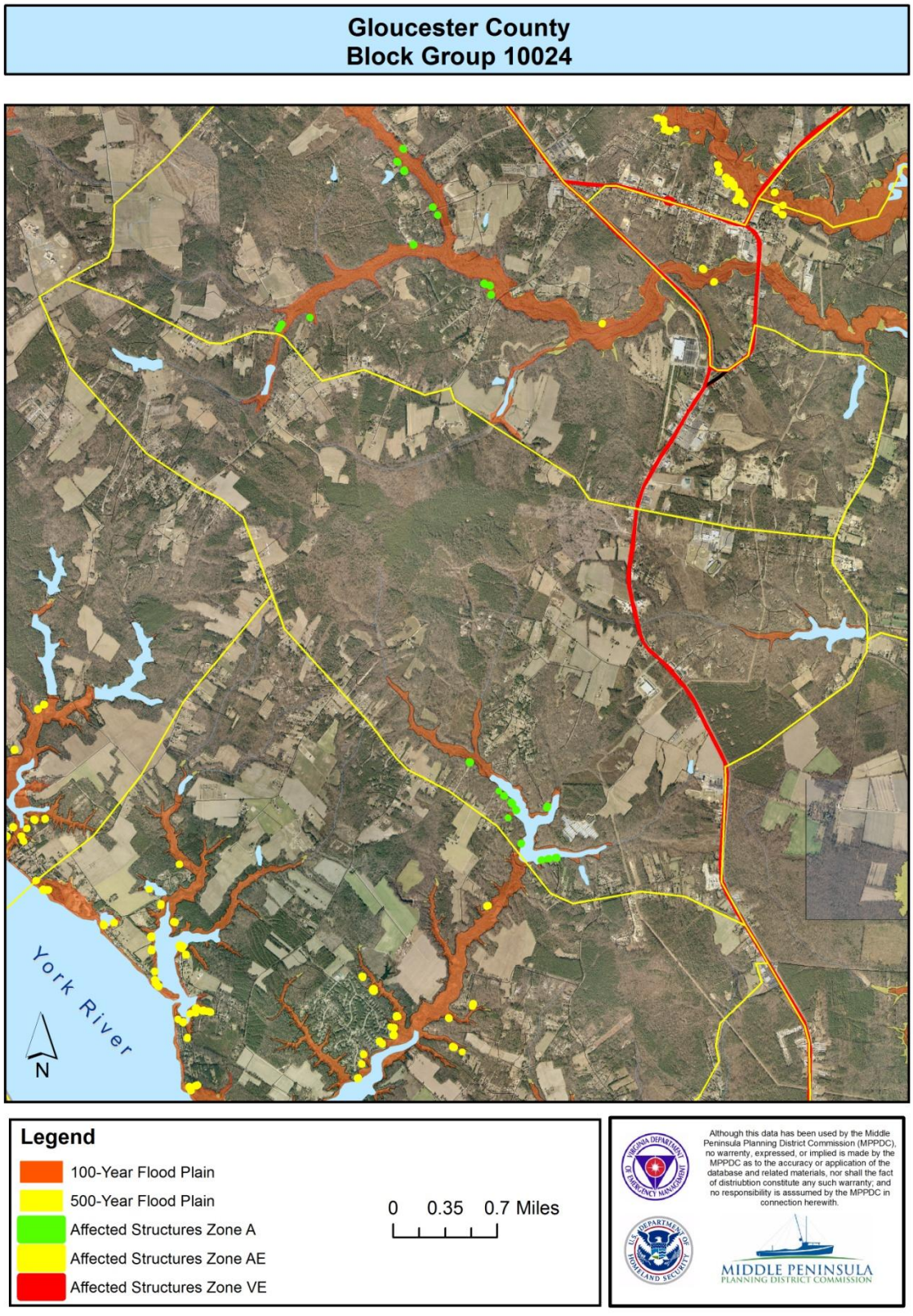

Gloucester County
Block Group 10024
York River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.35 0.7 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 72:

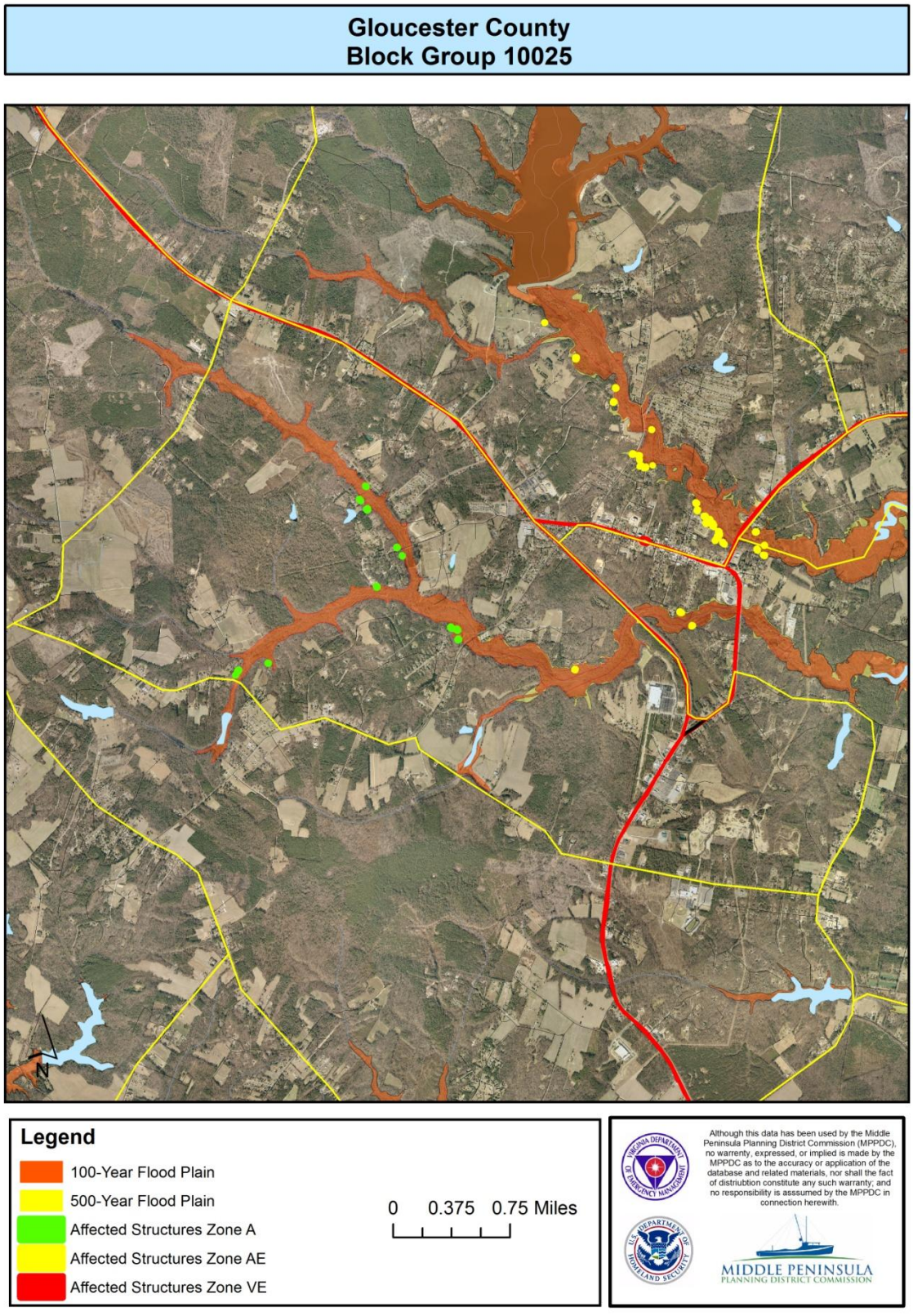

Gloucester County
Block Group 10025
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.375 0.75 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 73:

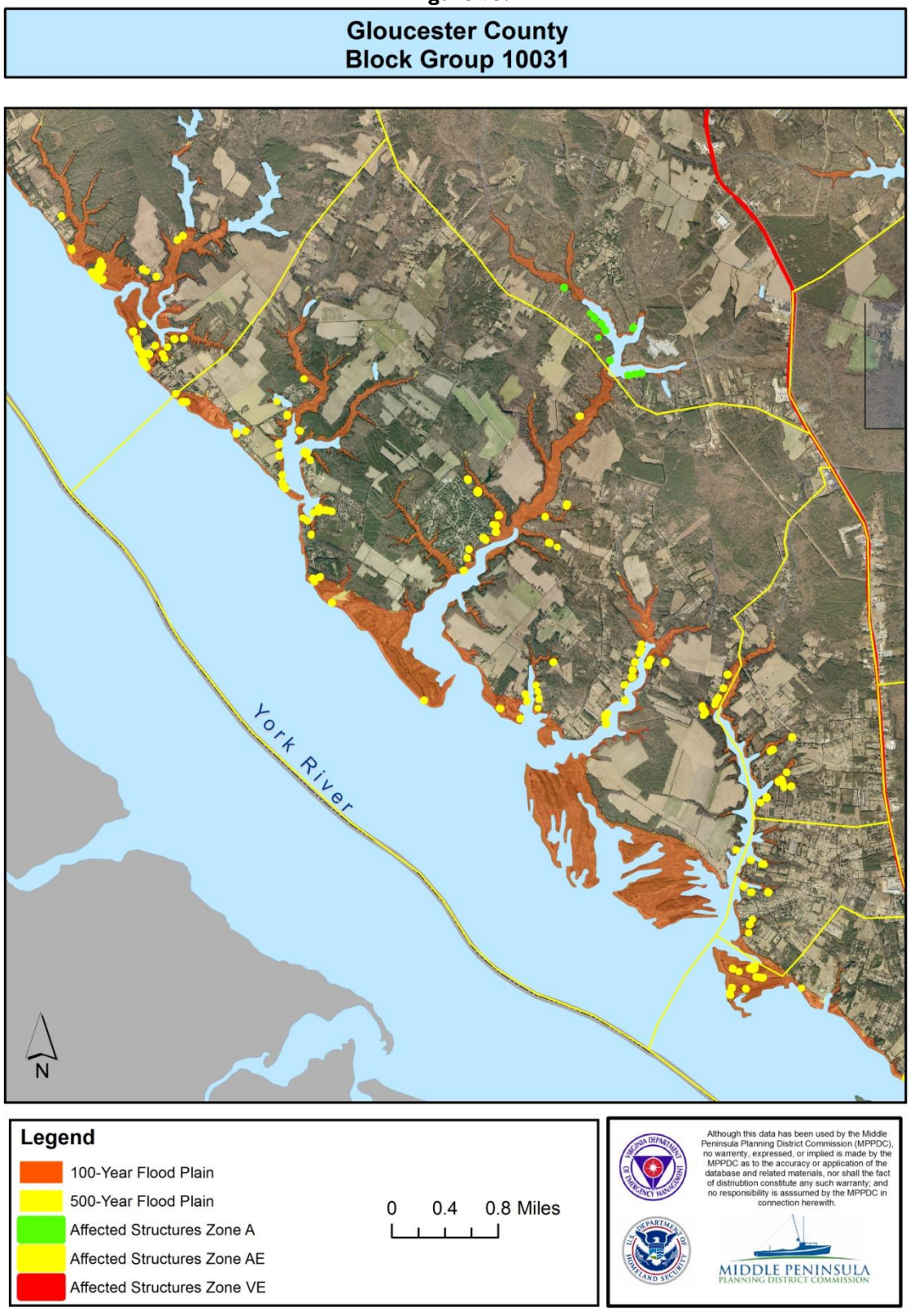

Gloucester County
Block Group 10031
York River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.4 0.8 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 74:

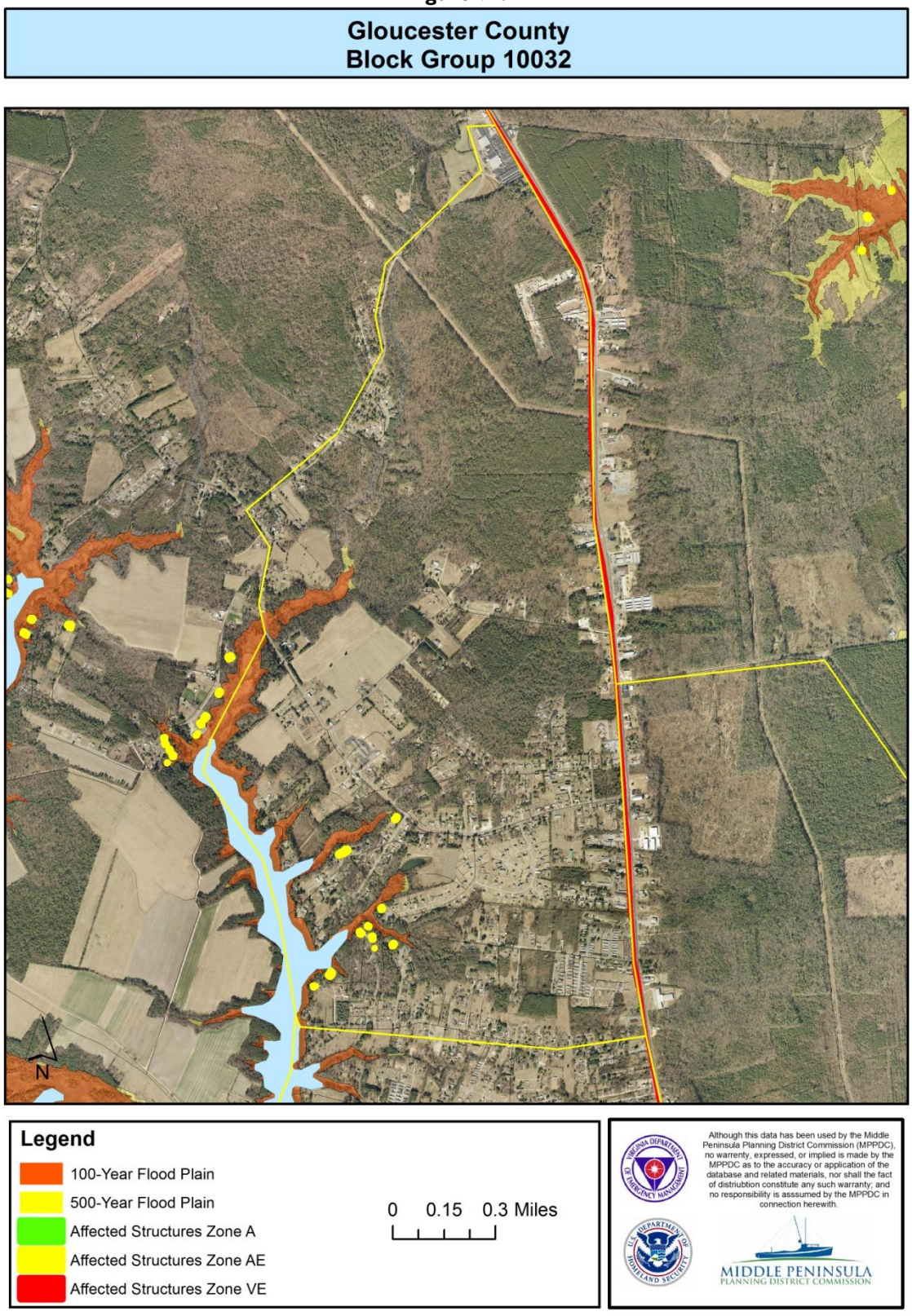

Gloucester County
Block Group 10032
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.15 0.3 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 75:

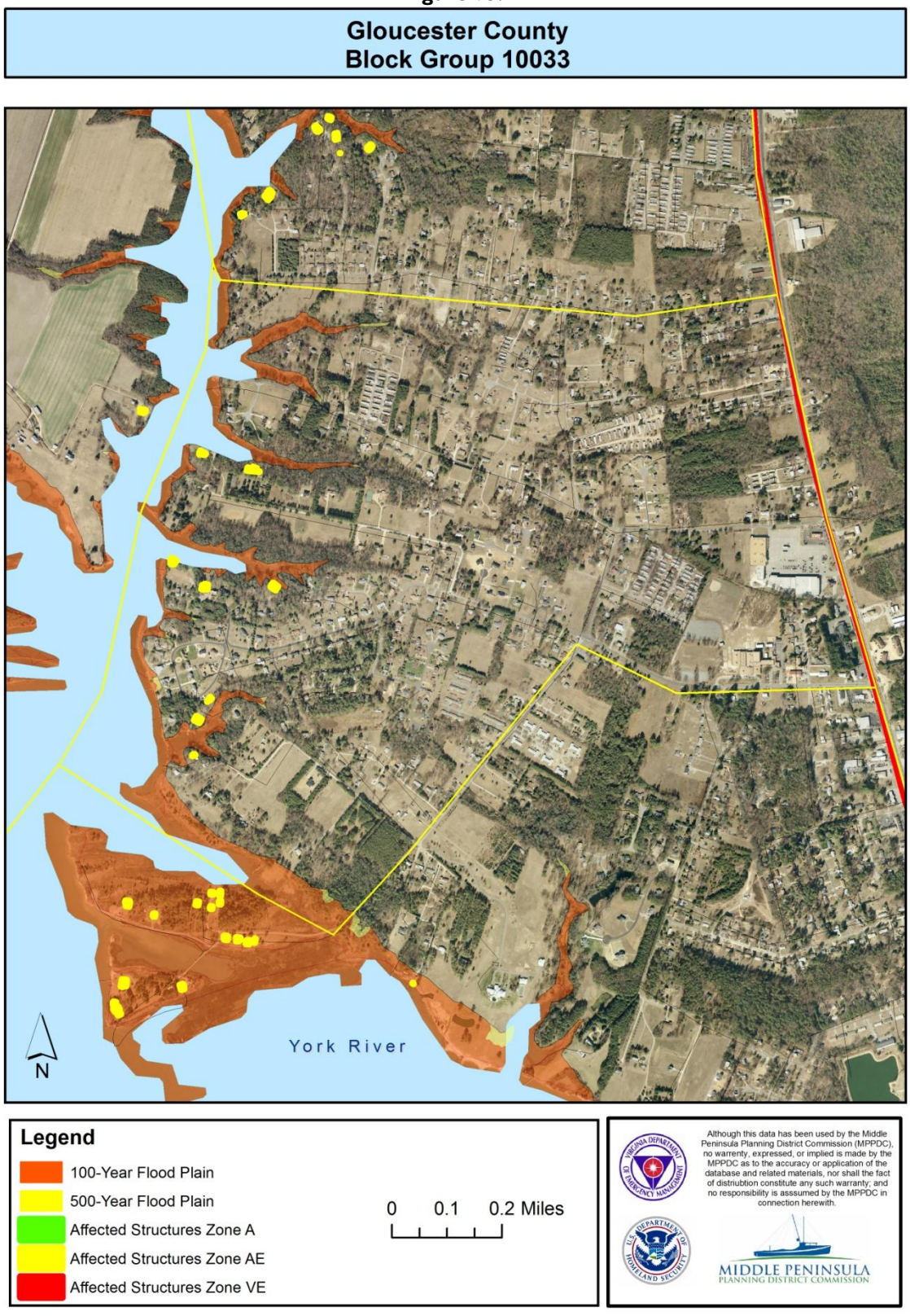

Gloucester County
Block Group 10033
York River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.1 0.2 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 76:

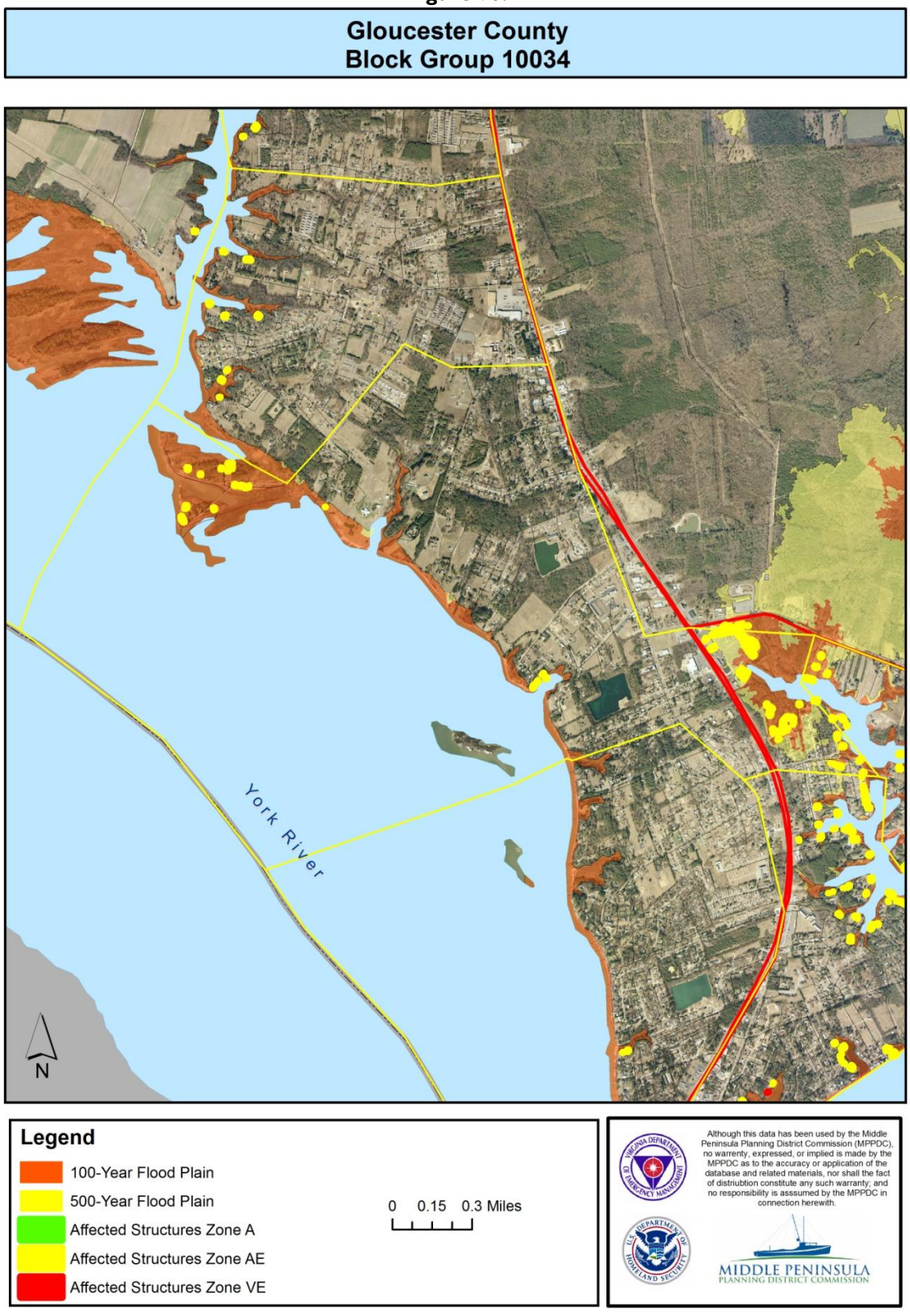

Gloucester County
Block Group 10034
York River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.15 0.3 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 77:

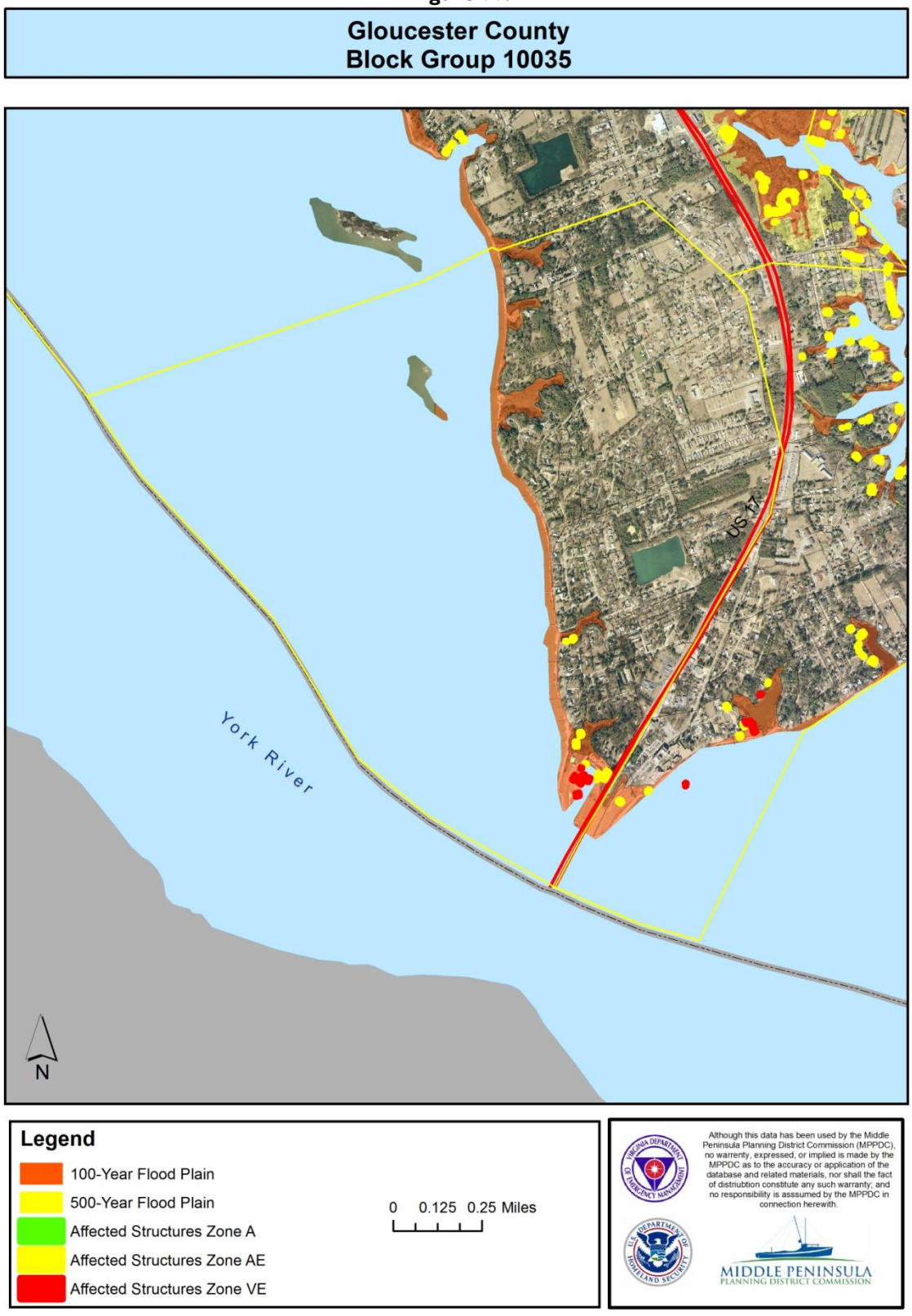

Gloucester County
Block Group 10035
US-17
York River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.125 0.25 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 78:

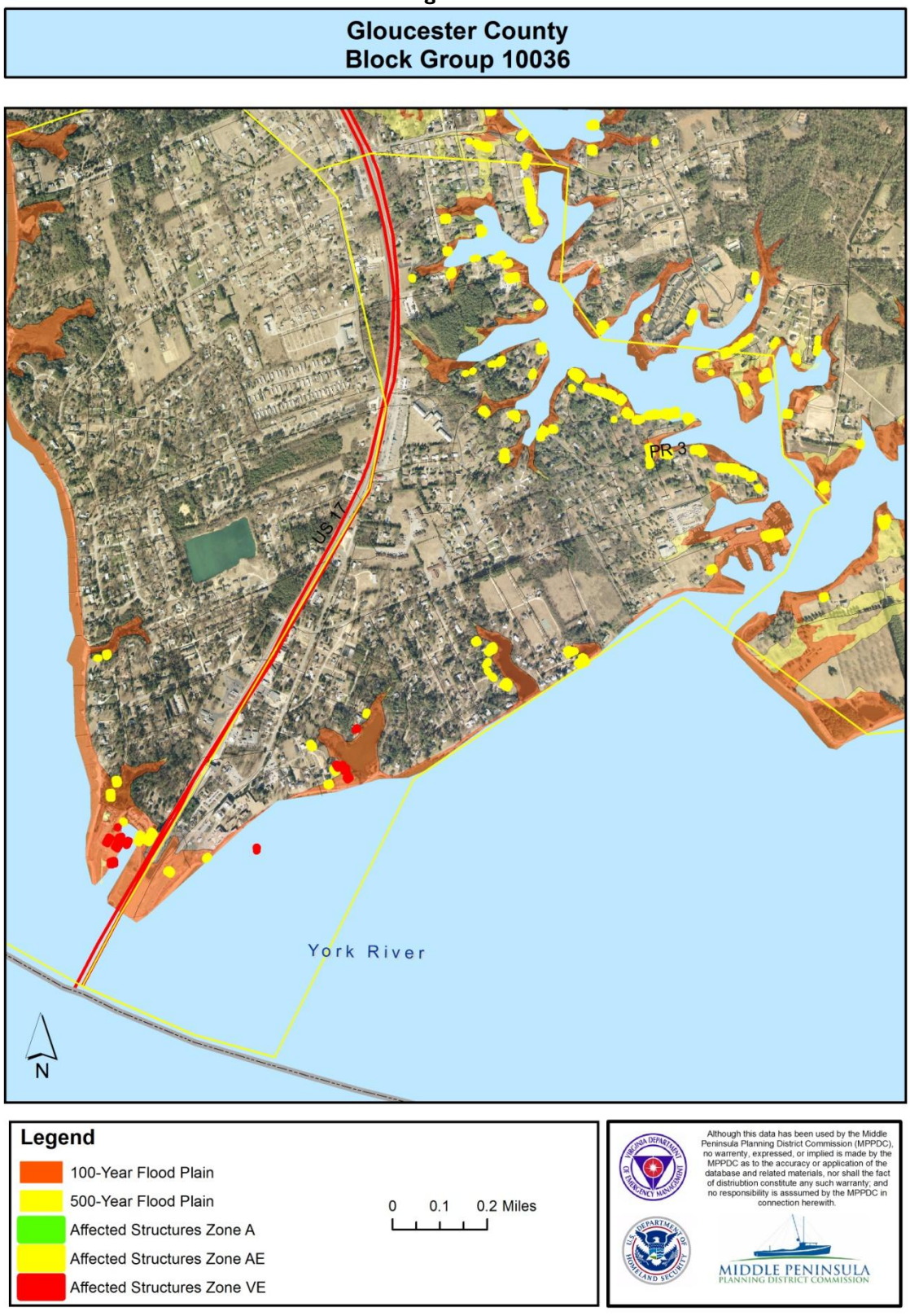

Gloucester County
Block Group 10036
US 17
PR 3
York River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.1 0.2 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 79:

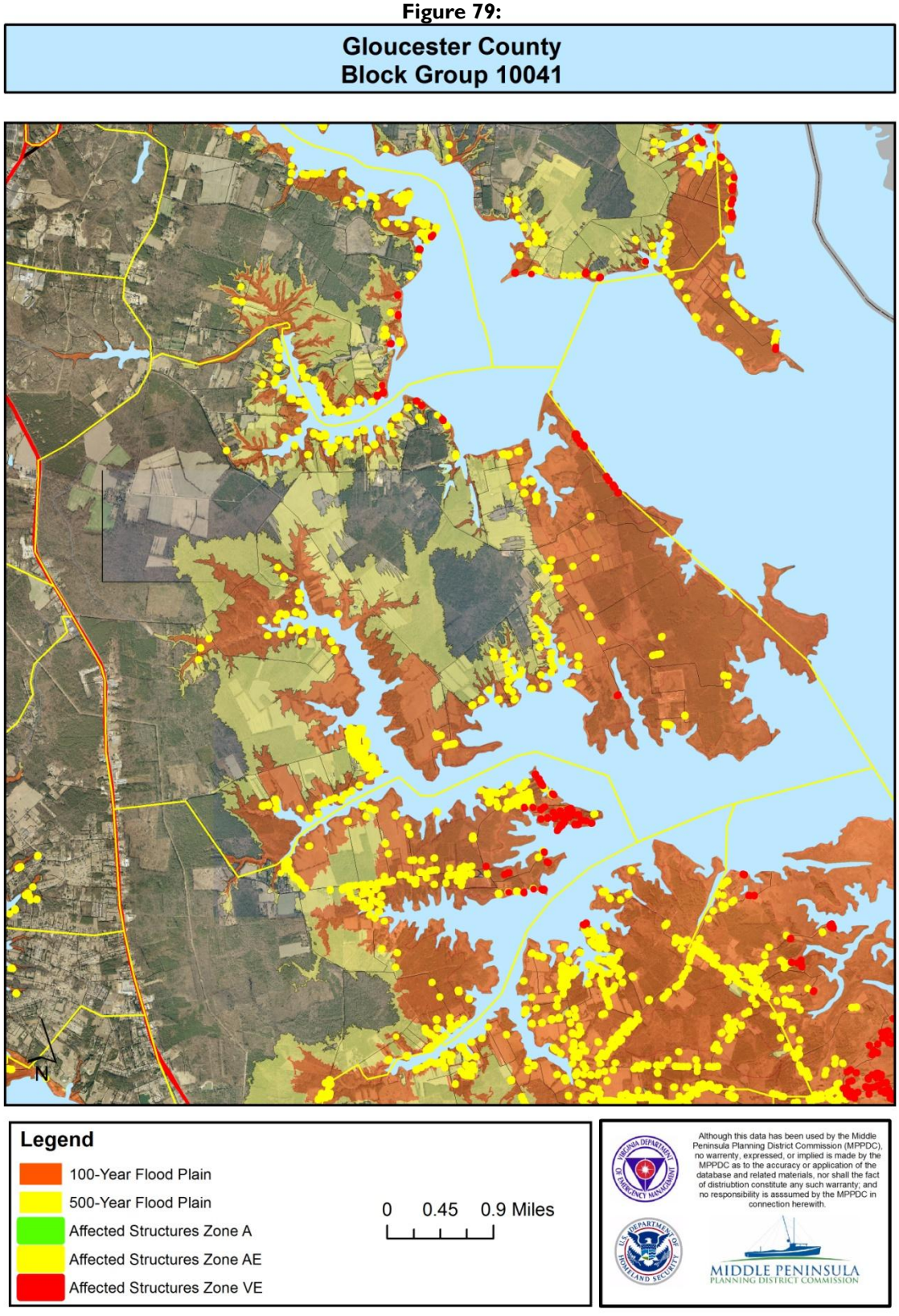

Gloucester County
Block Group 10041
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.45 0.9 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 80:

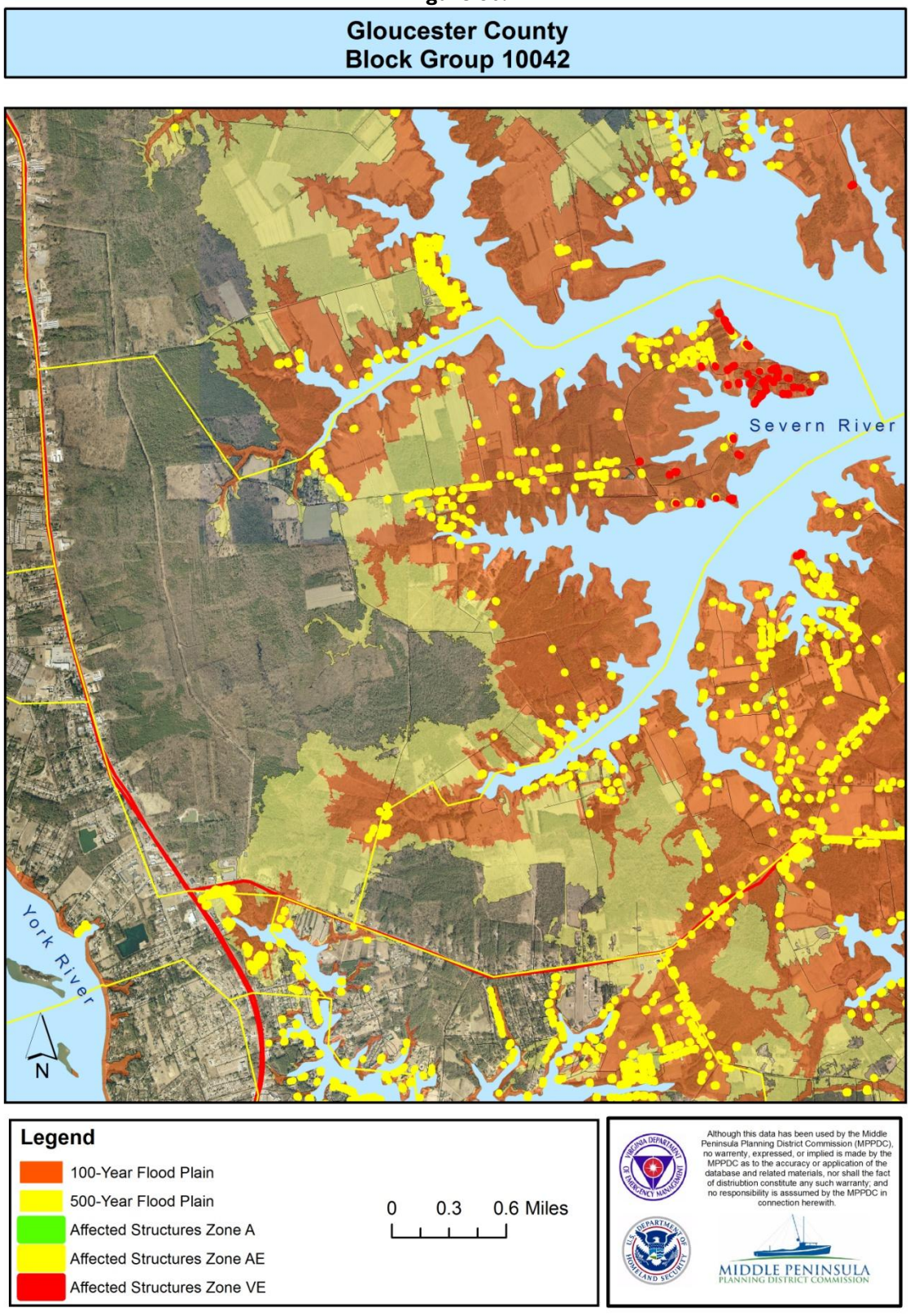

Gloucester County
Block Group 10042
Severn River
York River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.3 0.6 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 81:

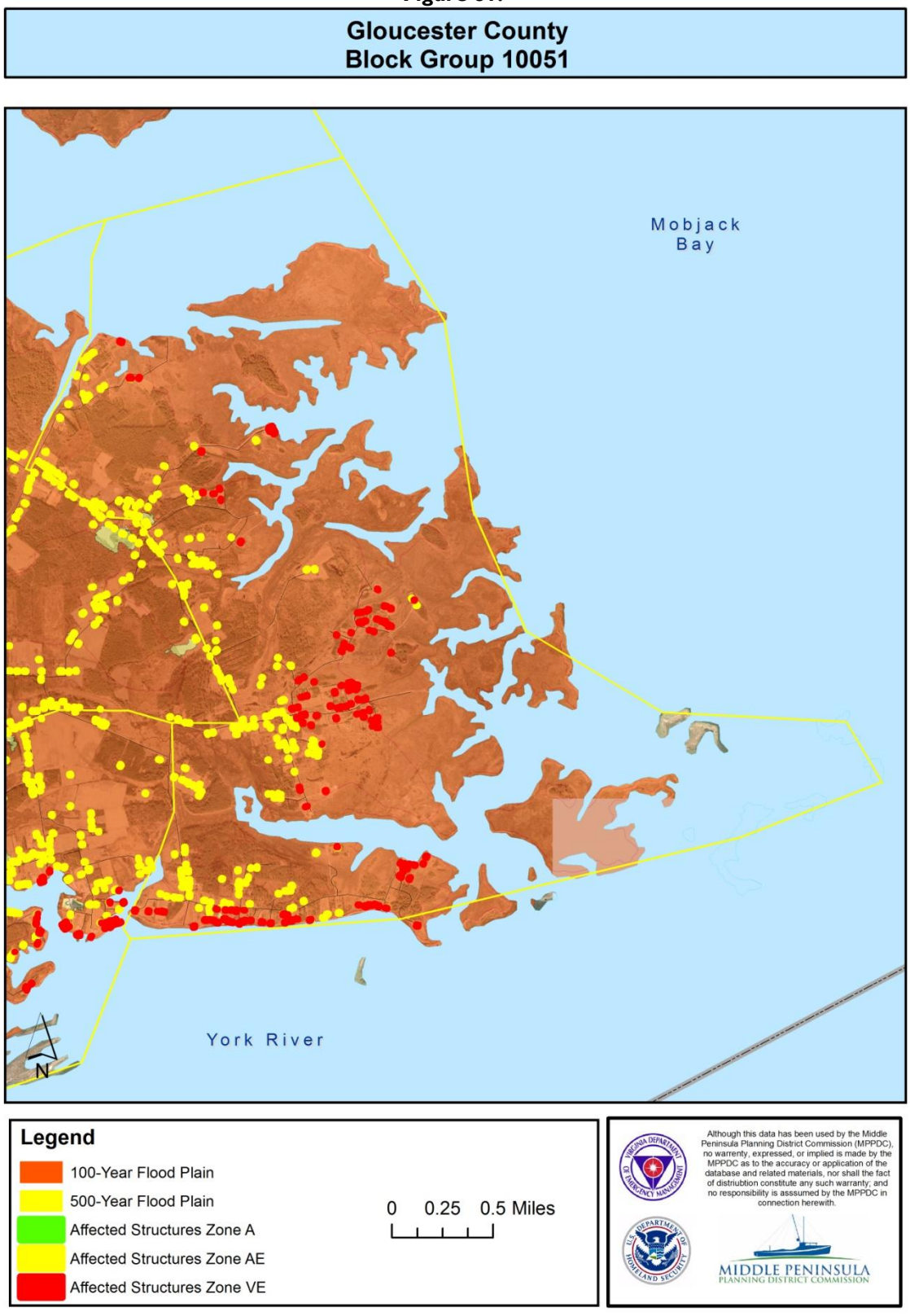

Gloucester County
Block Group 10051
Mobjack Bay
York River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.25 0.5 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 82:

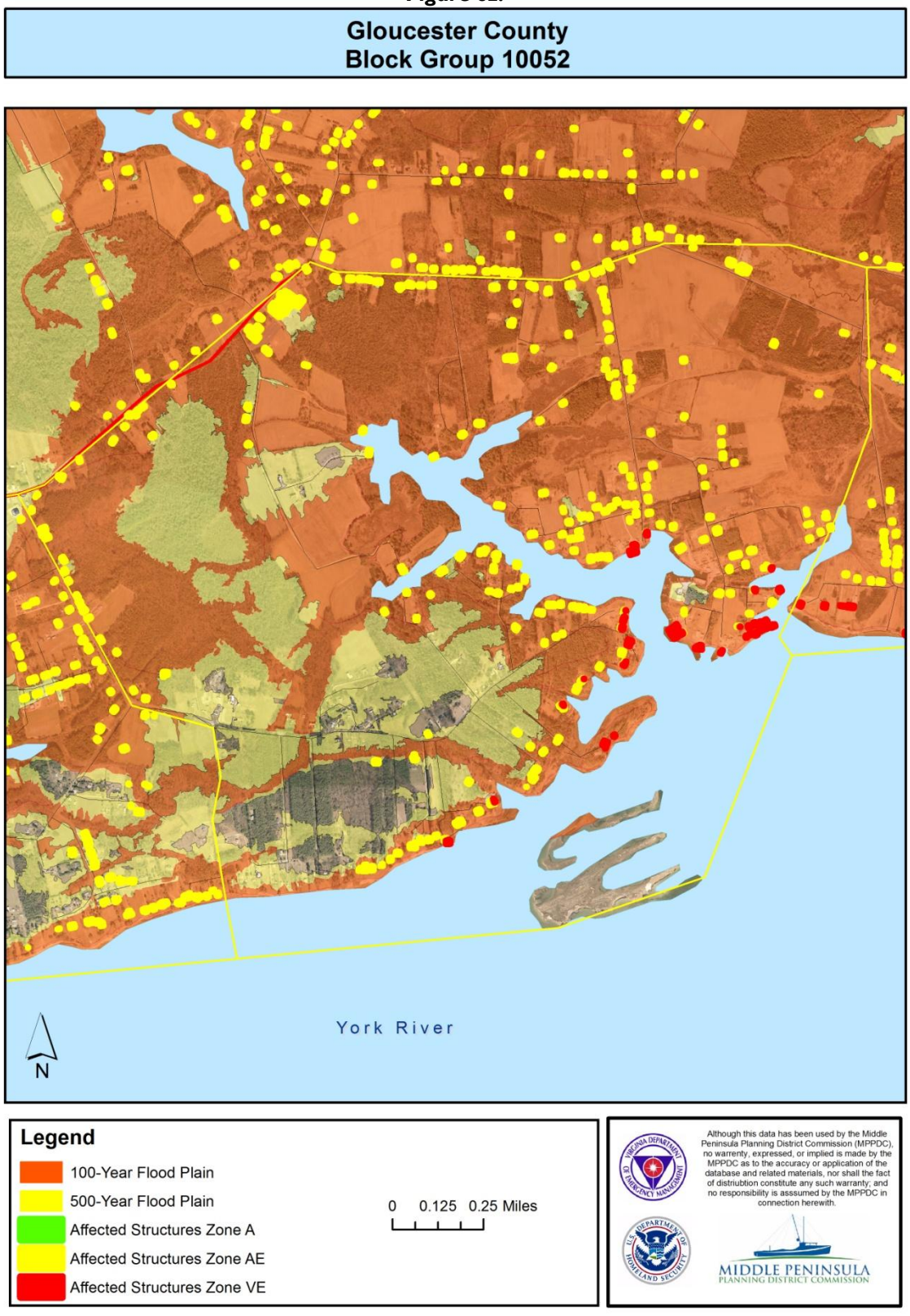

Gloucester County
Block Group 10052
York River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.125 0.25 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 83:

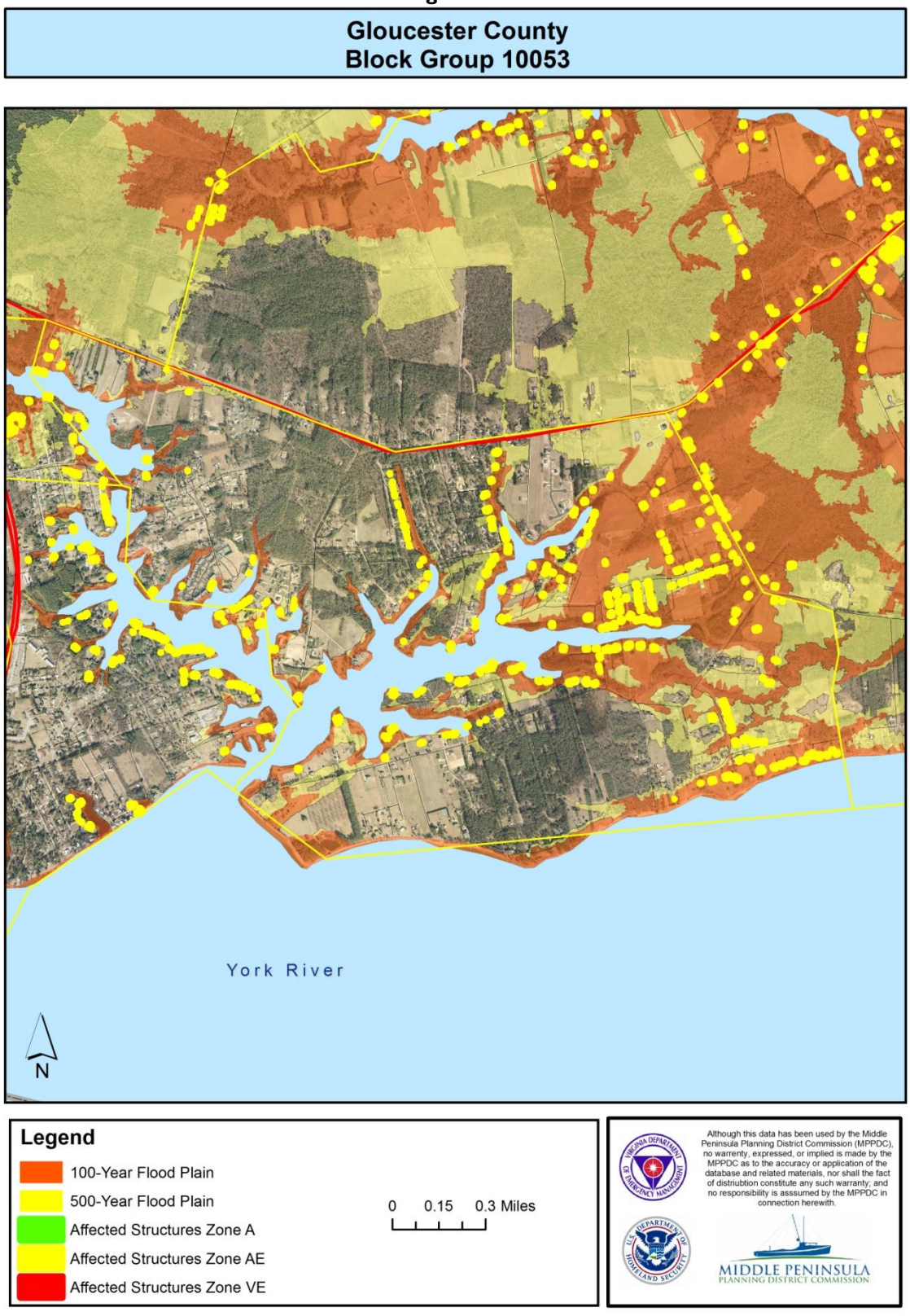
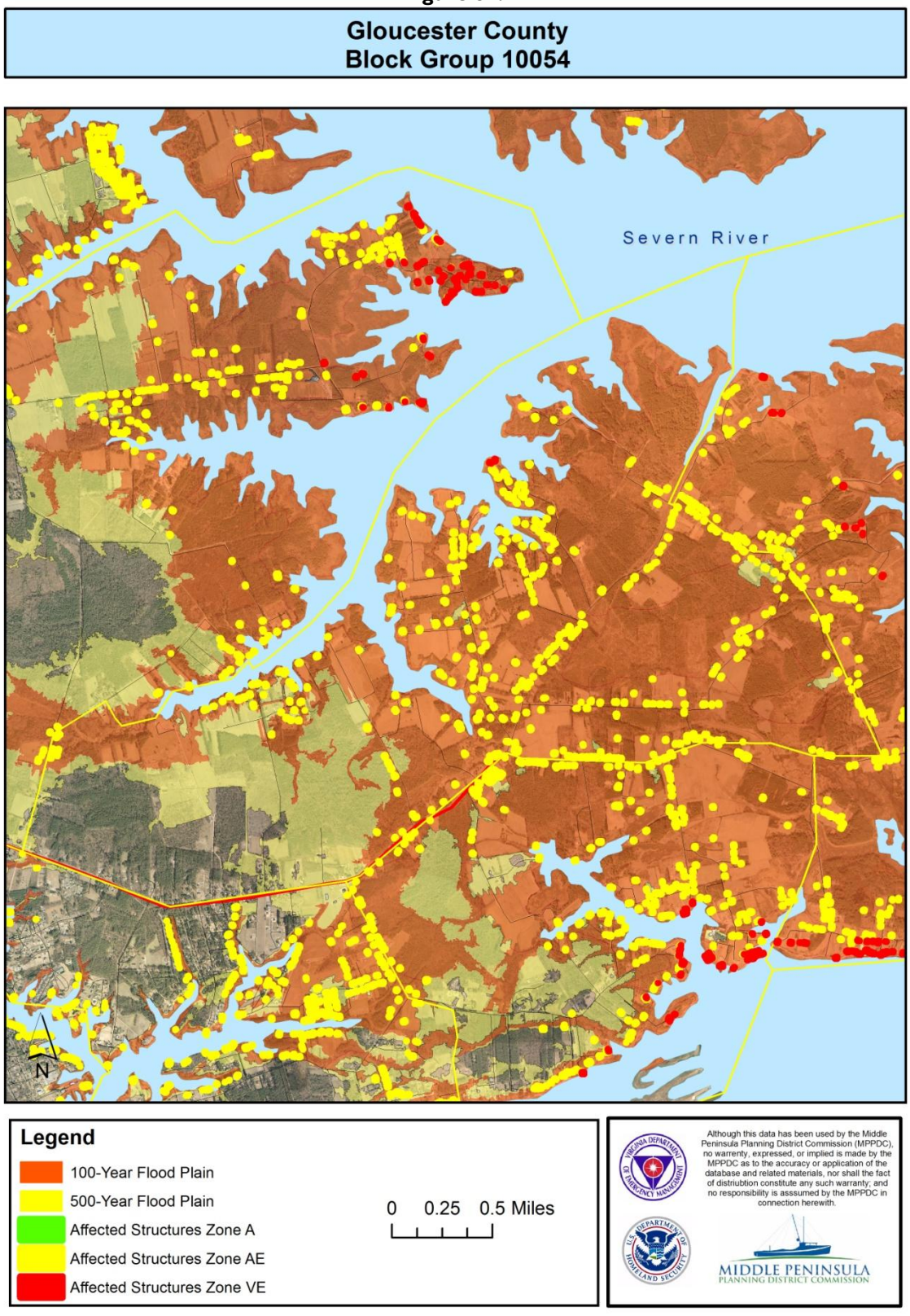

Gloucester County
Block Group 10053
York River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.15 0.3 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

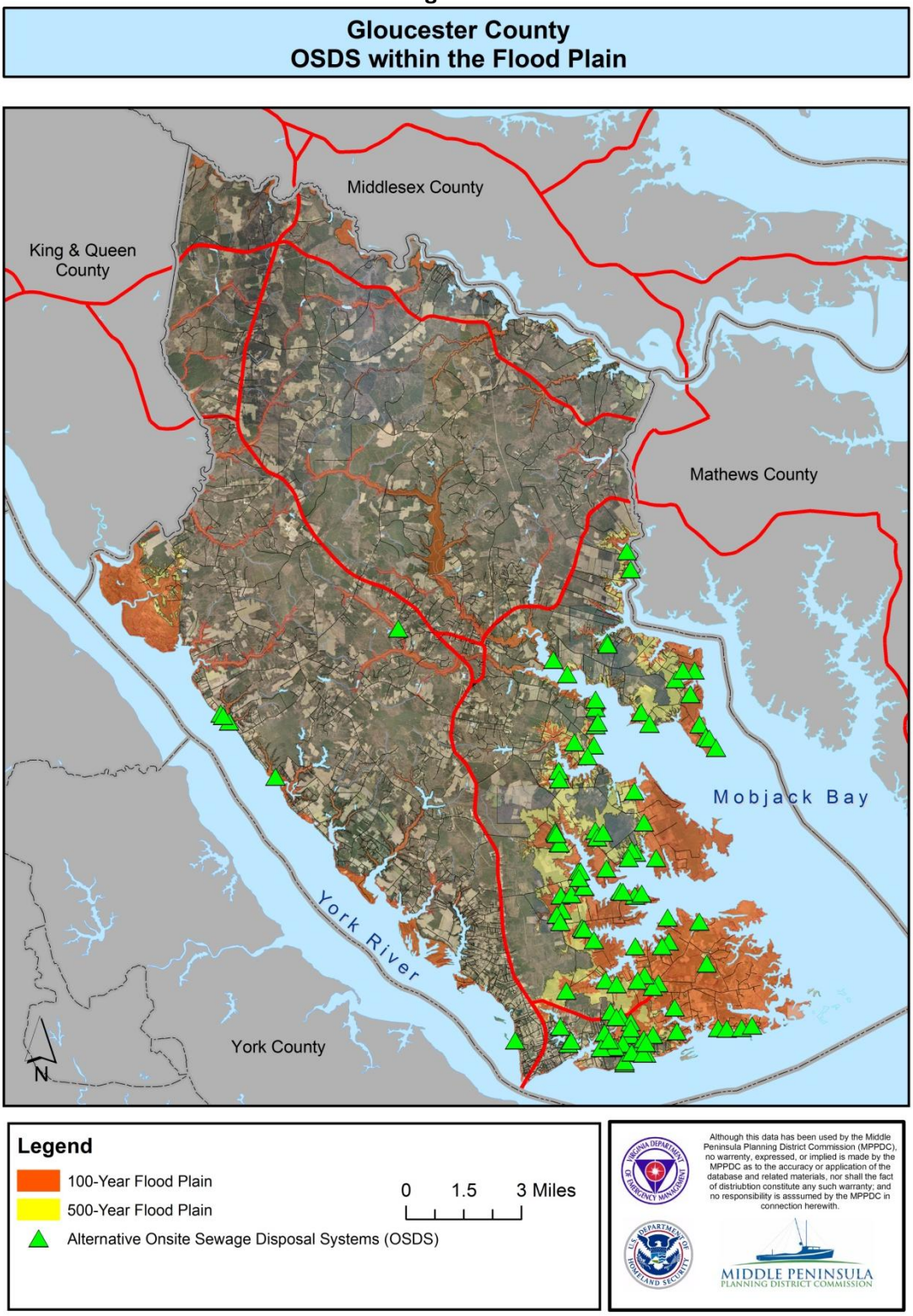
Figure 84:


Gloucester County
Block Group 10054
Severn River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures Zone A
Affected Structures Zone AE
Affected Structures Zone VE
0 0.25 0.5 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Alternative On-site Sewage Disposal Systems (OSDS)

The following maps (Figure 85) show the locations of the installed OSDS facilities constructed in the 100-year and 500-year floodplain in Gloucester County.

Figure 85:



4.5.5. Mathews Critical Facilities and Public Utilities

New Point Comfort Lighthouse, located at the southern tip of Mathews County, has undergone significant flood damage resulting from the lighthouse being separated from the mainland due to severe erosion. Mathews County owns the lighthouse facility and the locality has plans to undertake stabilization work to "weather-harden" the base/foundation of the structure.

According to VDOT officials, flood prone roads in Mathews County include the following:

Table 33: Mathews County Flood Prone Roads

Route	Road Name	Location
610	Marsh Hawk Road	From Rte. 614 to Rte. 611
600	Circle Drive	From Rte.14 to Rte. 14
600	Light House or Point Road	From Rte. 14 to ESM
611	Tabernacle Road	From Rte. 613 to Rte. 609
611	Tabernacle Road	From Rte. 610 to Rte. 609
609	Bethel Beach Road	From Rte. 610 to ESM
609	Bethel Beach Road	From Rte. 614 to Rte. 611
643	Haven Beach Road	From Rte. 704 to ESM
633	Old Ferry Road	From Rte. 704 to 636
608	Potato Neck Road	From Rte. 649 to ESM
644	Bandy Ridge Road	From Rte. 611 to Rte. 614

Public Boat Ramps

There is one public boat landing in Mathews County that is owned and operated by the VDGIF:

Water Body	Access Area	Barrier Free	Type	Ramps	Latitude	Longitude
East River	Town Point	Yes	Concrete Ramp	1	37° 24' 55" N 37.4143723	76° 20' 15"W -76.3375842
Directions: From Mathews, Rt 14 South (3.8 miles); Right onto Rt 615 (.6 miles)						
VDGIF, 2015						

Repetitive and Severe Repetitive Loss Residential Structures in Mathews County

According to FEMA's records, Mathews County has 169 (i.e. 164 Single family, 3 Non-resident, 1 Other resident, and 1 Assmd Condo) Repetitive Loss residential properties and 11Single Family Severe Repetitive Losses as of 5/31/15.

Public School Properties

During a Category 2 hurricane, the Thomas Hunter Middle School and the Lee Jackson Elementary School properties become flooded.

Properties In 100-year Floodplain by Census Block Groups

The following series of maps show the location of structures in Mathews County that are in Flood Zone AE or Flood Zone VE in the 100-year and 500-year floodplains. The legend is color coded to indicate the specific flood zone in which each structure lies.

Figure 86:

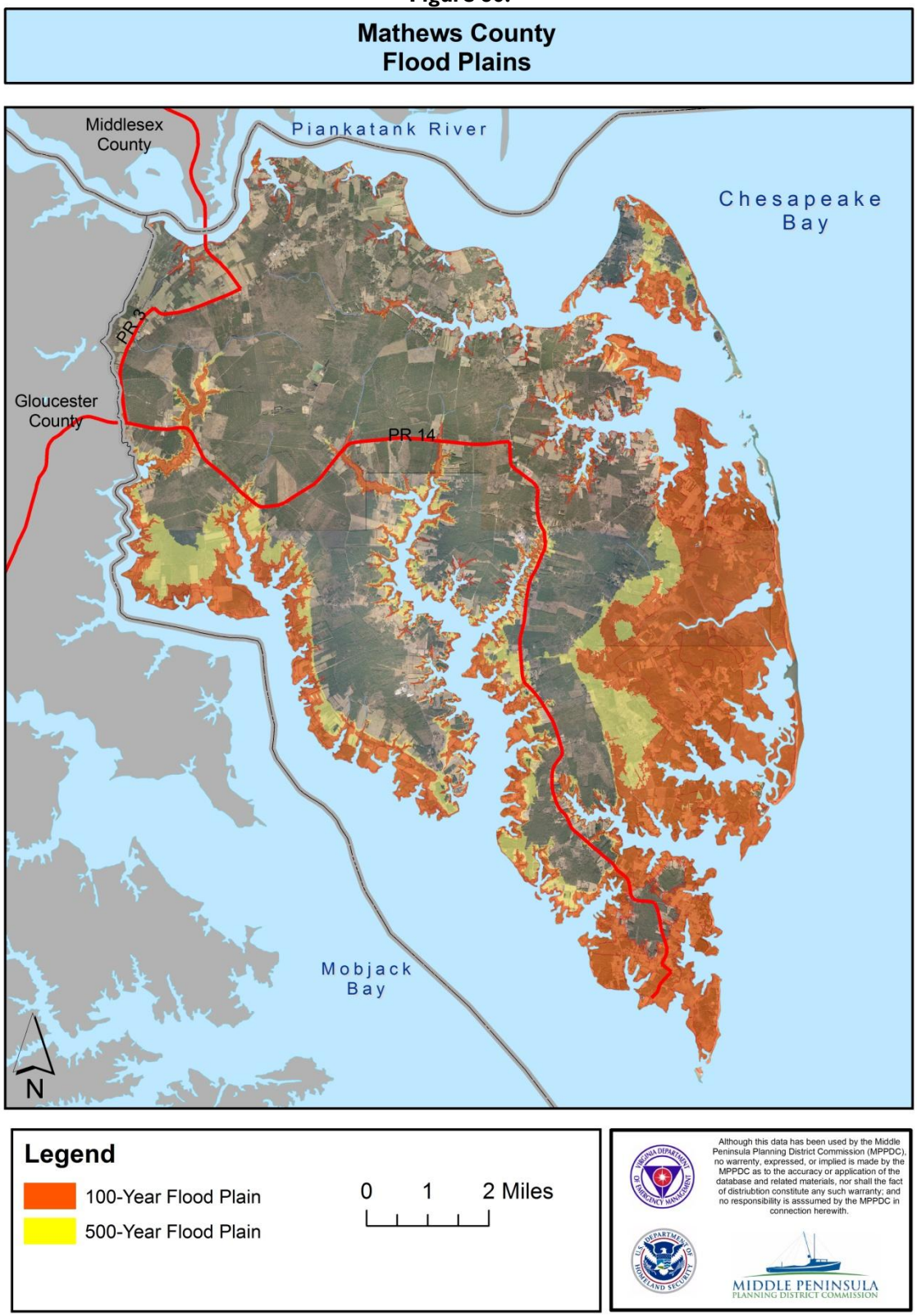

Mathews County
Flood Plains
Middlesex County
Piankatank River
Chesapeake Bay
PR 3
Gloucester County
PR 14
Mobjack Bay
N
Legend
100-Year Flood Plain
500-Year Flood Plain
0 1 2 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 87:

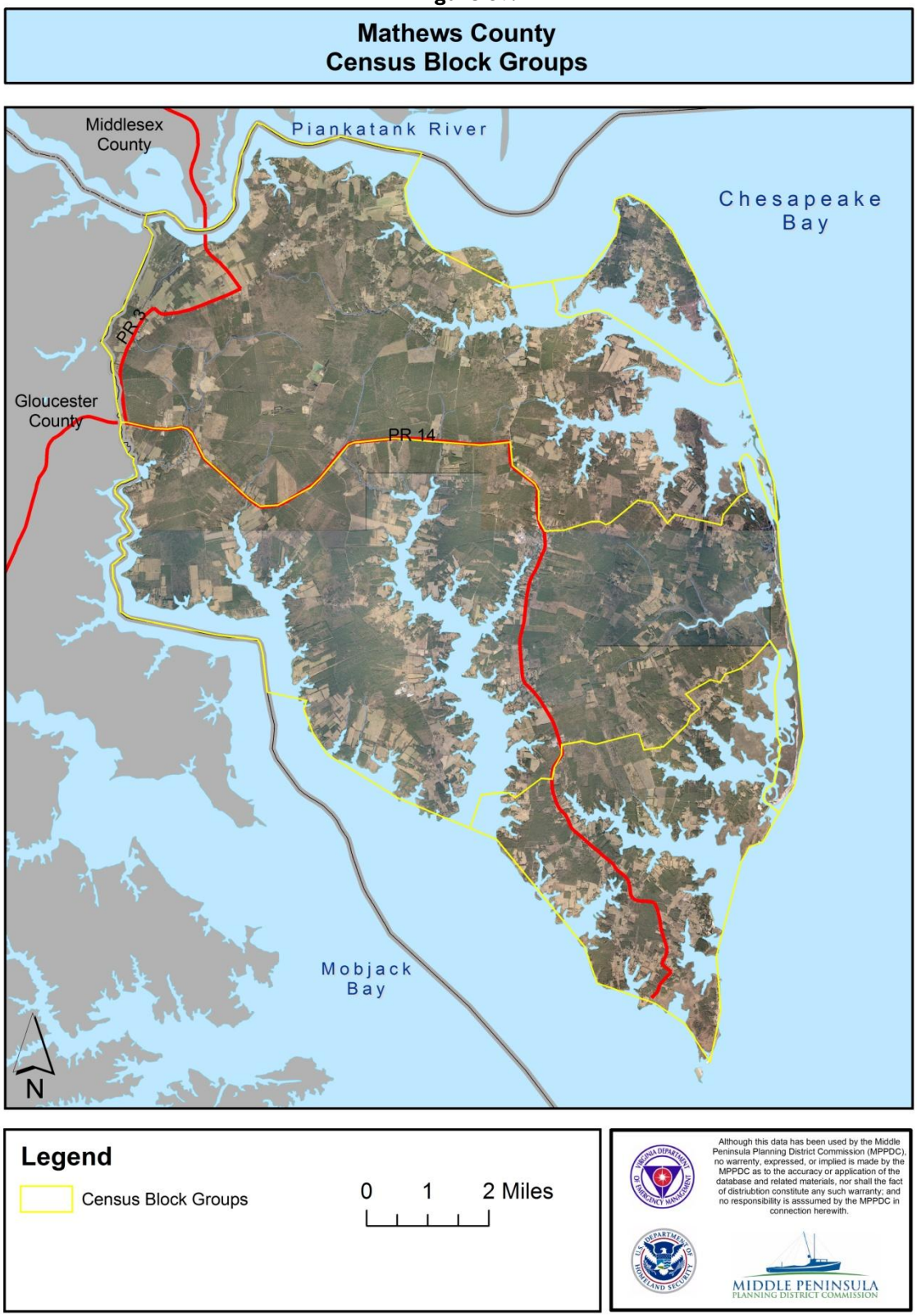

Mathews County
Census Block Groups
Middlesex County
Piankatank River
Chesapeake Bay
Gloucester County
PR 3
PR 14
Mobjack Bay
N
Legend
Census Block Groups
0 1 2 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 88:

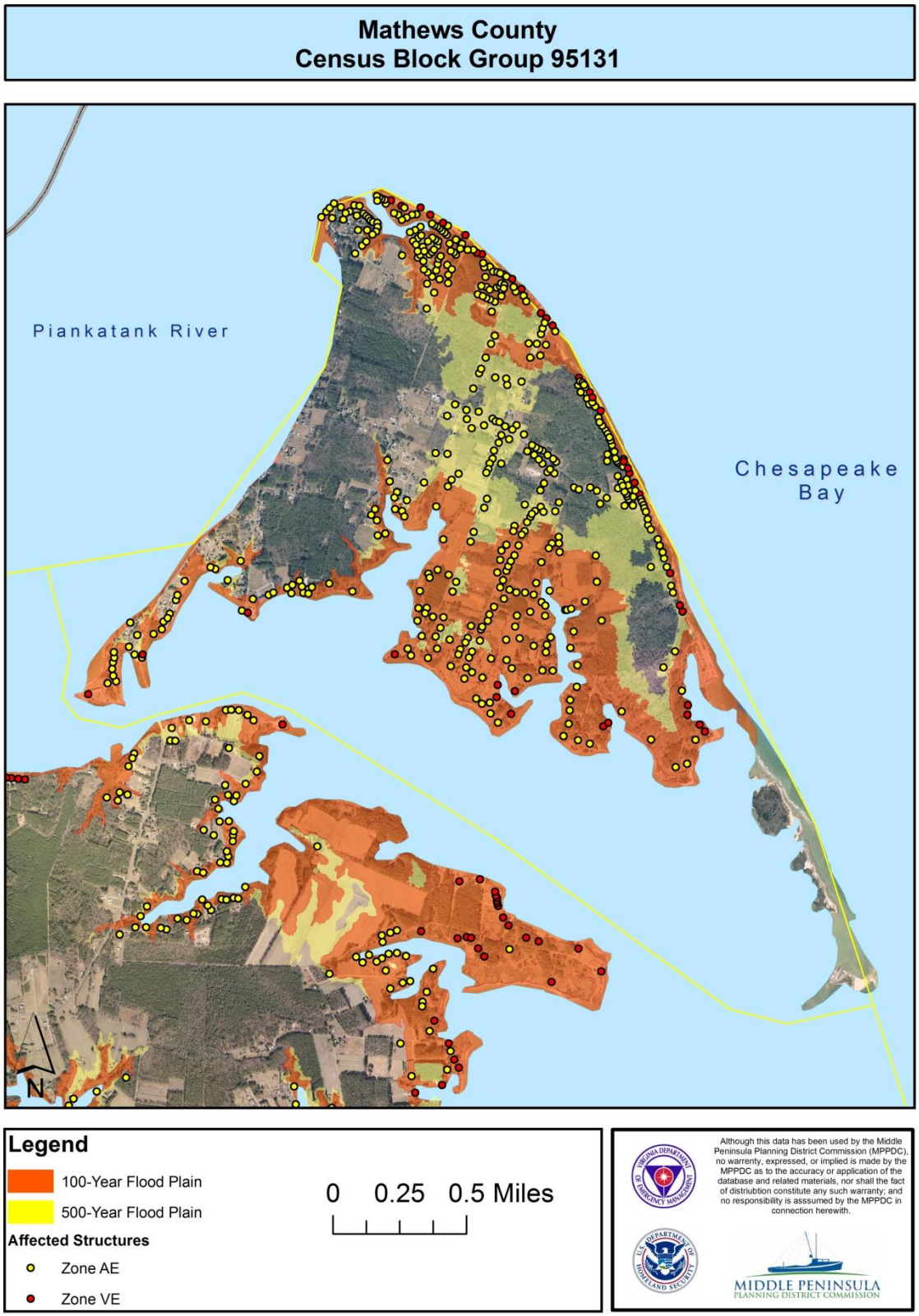

Mathews County
Census Block Group 95131
Piankatank River
Chesapeake Bay
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone AE
Zone VE
0 0.25 0.5 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 89:

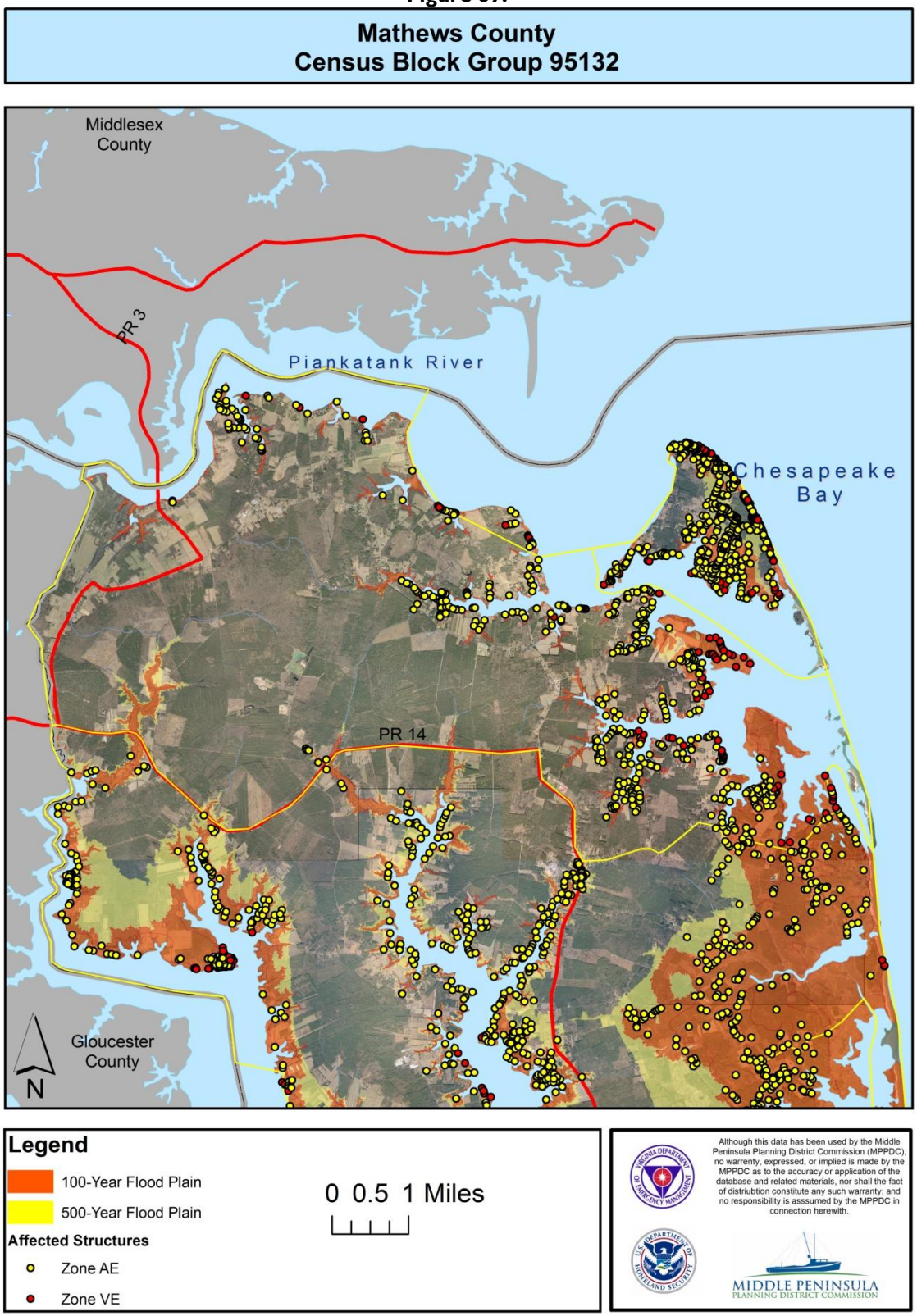

Mathews County
Census Block Group 95132
Middlesex County
PR 3
Piankatank River
Chesapeake Bay
PR 14
Gloucester County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone AE
Zone VE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 90:

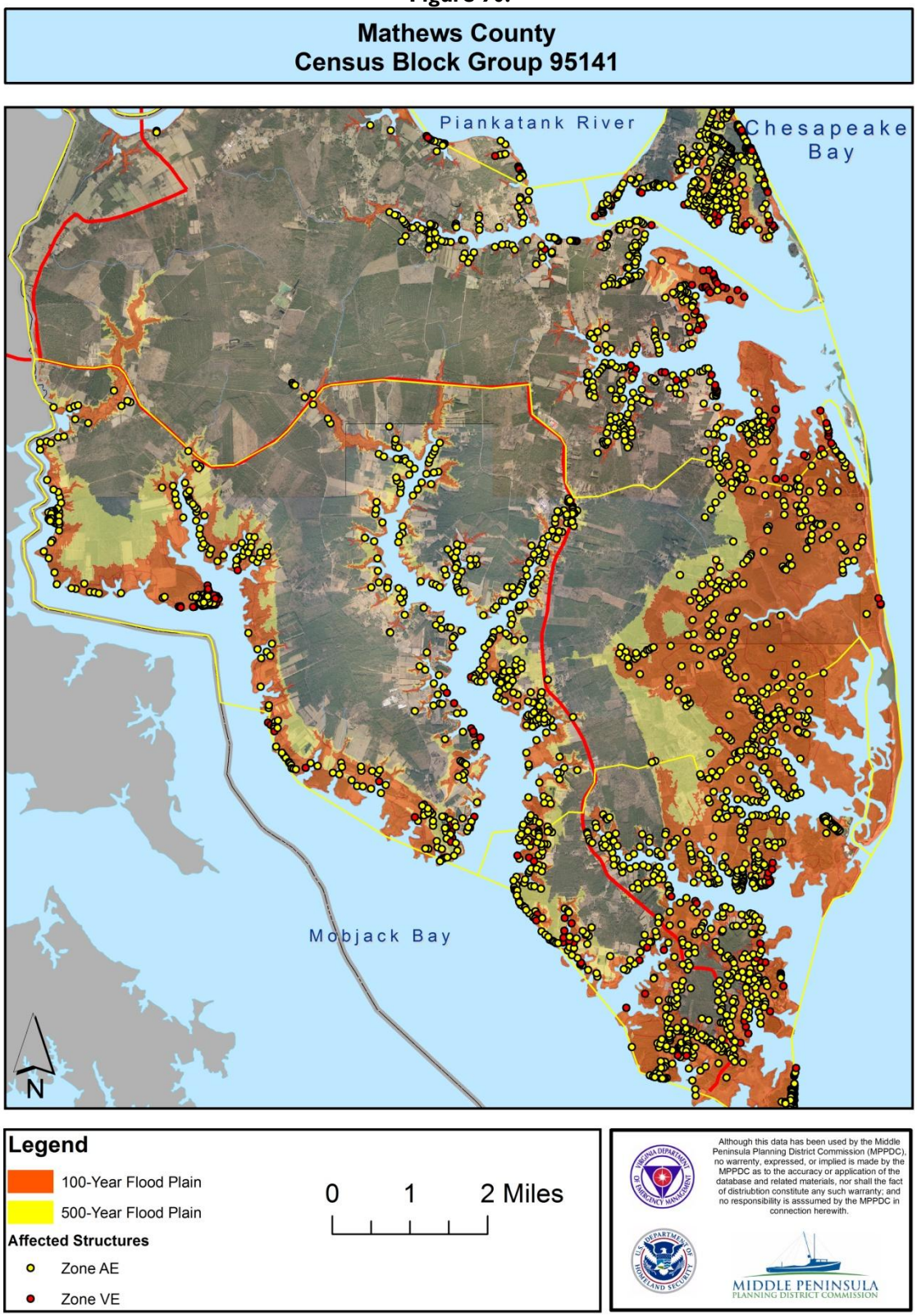
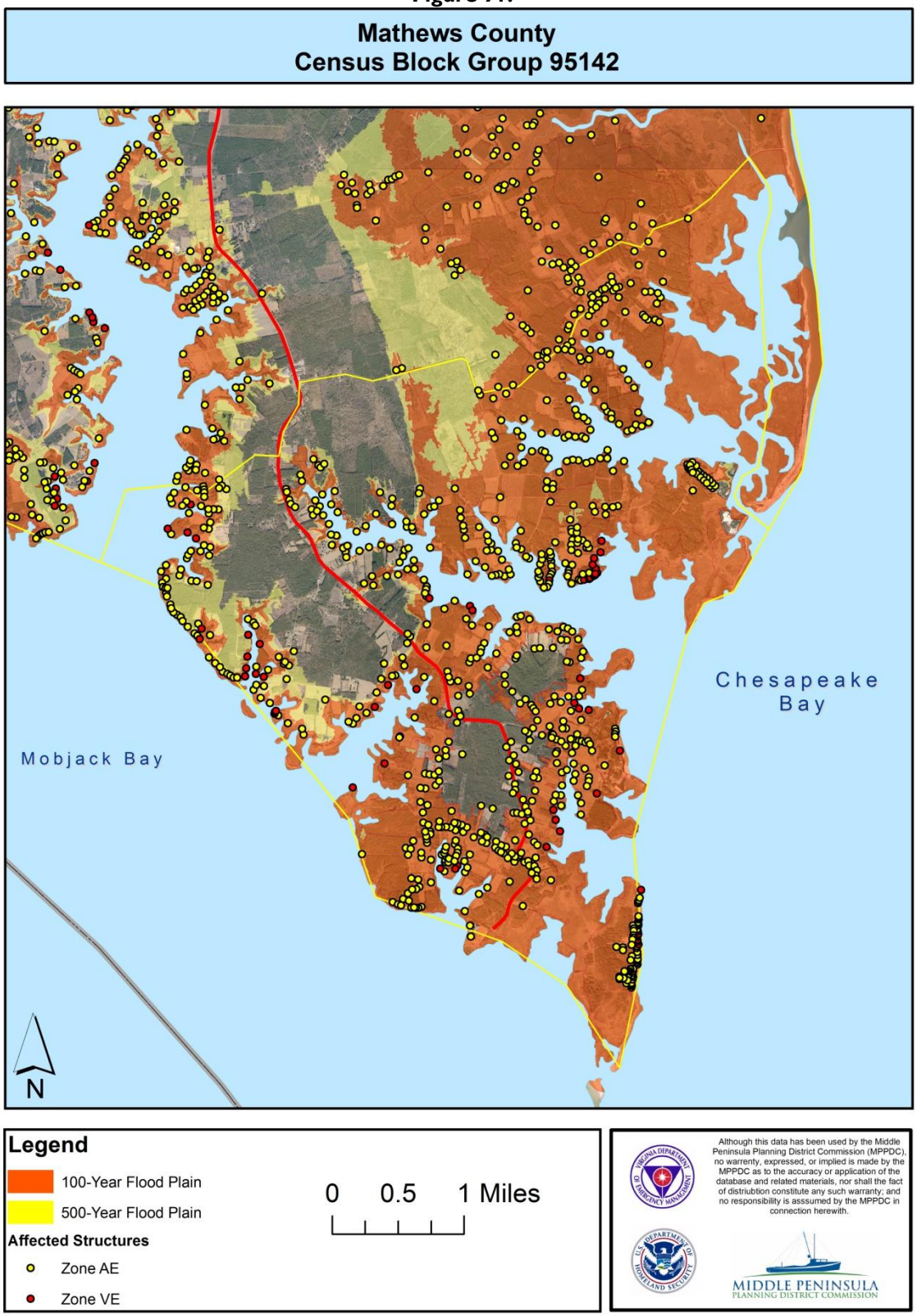

Mathews County
Census Block Group 95141
Piankatank River
Chesapeake Bay
Mobjack Bay
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone AE
Zone VE
0 1 2 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

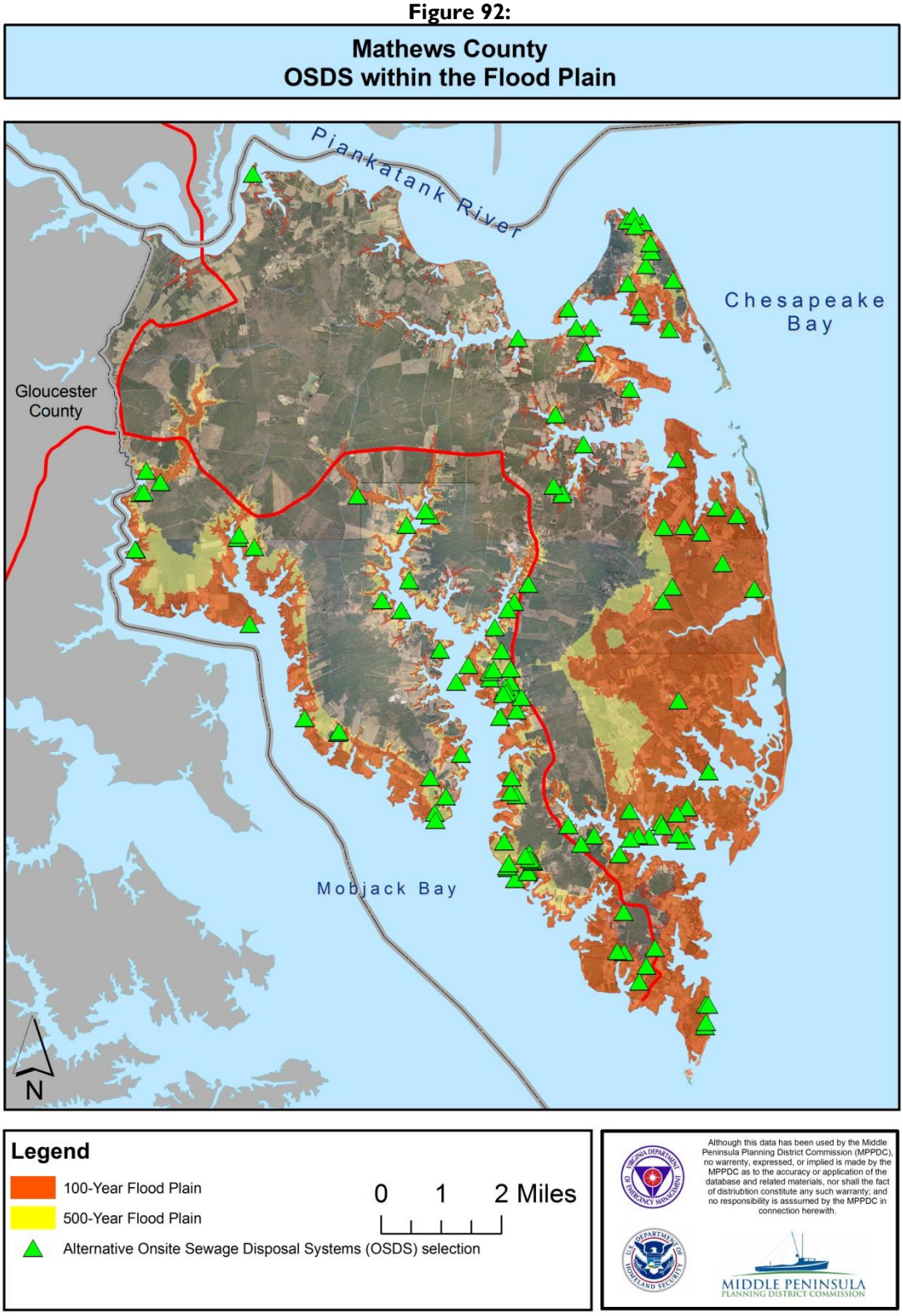
Figure 91:


Mathews County
Census Block Group 95142
Chesapeake Bay
Mobjack Bay
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone AE
Zone VE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Alternative On-site Sewage Disposal Systems (OSDS)

The following map (Figure 92) show the location of the OSDS facilities constructed in the 100-year and 500-year floodplains in Mathews County.

Figure 92:



4.5.6. Middlesex County Critical Facilities and Public Utilities

The county does not currently operate any public water systems. However, there are community water systems operated by private companies serving the Village of Saluda and some of the larger residential subdivisions in the lower portion of the county in the Hartfield and Deltaville areas. These water systems do not sustain flood damages from severe hurricanes and nor'easters.

The County does have a public sewerage system in the planning stages that will serve the Village of Saluda and properties east along the Route 33 corridor towards the Cook's Corner area. The wastewater treatment plant and outfall for this proposed system will be built along a tributary of Urbanna Creek, located between Saluda and Cook's Corner.

Since this project is in the permitting/design stage, it is assumed that the facility will be designed and constructed in a manner to avoid any future adverse impacts from floodwaters.

According to VDOT officials, flood prone roads in Middlesex County/Urbanna include the following:

Table 34: Middlesex County/Urbanna Flood Prone Roads

Route	Road Name	Location
648	Montague Island Road	From Rte.604 to ESM
651	Smokey Point	From Rte. 640 to Rte. 685
1103	Irma's Lane	From Rte. 33 to Rte. 1102
628	Mill Creek Road	From Rte. 702 to ESM
636	Timber Neck Road	From Rte. 643 to Rte. 659

Public Boat Ramps

There are 3 public boat landings in Middlesex County that are owned and operated by the VDGIF:

Water Body	Access Area	Barrier Free	Type	Ramps	Latitude	Longitude
Parrotts Creek	Mill Stone	Yes	Concrete Ramp	1	37° 43' 36" N 37.7266569	76° 37' 19"W -76.6219992
Directions: Church View, Rt 17 North (1.1 miles); Right on Rt 640 (4.4miles; Left on Rt 608 (0.8 miles)						
Rappahannock River	Mill Creek	Yes	Concrete Ramp	1	37° 35' 3" N 37.5842494	76° 25' 28"W -76.4244480
Directions: From Hartfield, Rt 3 North (0.5 miles); Right on Rt 626 (3.1 miles)						
Rappahannock River	Saluda	Yes	Concrete Ramp	1	37° 37' 21" N 37.6225893	76° 34' 54"W -76.5816117
Directions: Rt 618 North (1.4 miles) of Saluda						
VDGIF, 2015						

Repetitive and Severe Repetitive Loss Residential Structures in Middlesex County

According to FEMA's records, Middlesex County has 35 Single Family Repetitive Loss properties and 2 Single Family Severe Repetitive Loss properties as of 5/31/15.

Properties in 100-year Floodplain by Census Block Group

The following series of maps show the location of structures in Middlesex County that are in Flood Zone A, Flood Zone AE or Flood Zone VE in the 100-year and 500-year floodplains. The legend is color coded to indicate the specific flood zone in which each structure lies.

Figure 93:

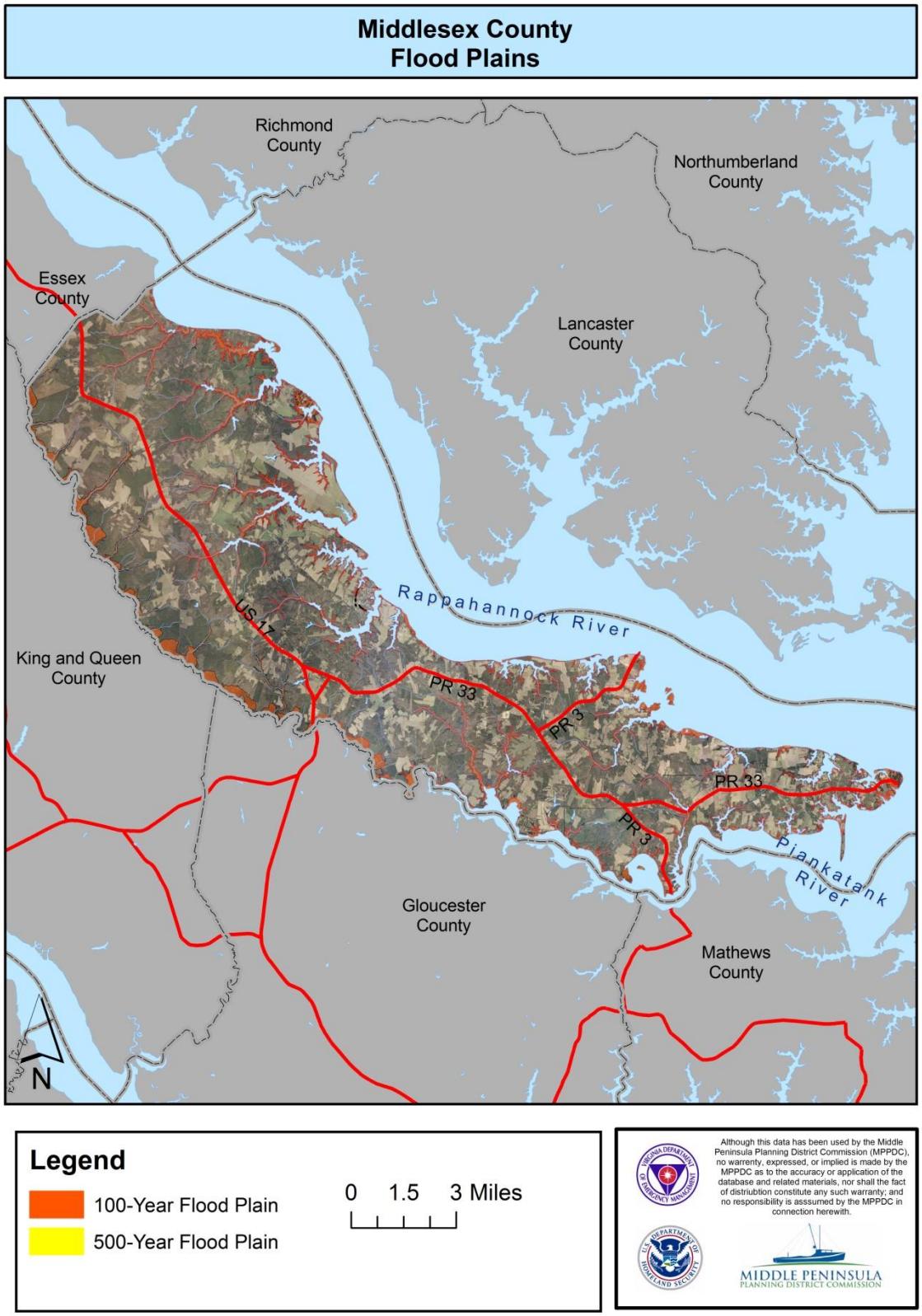

Middlesex County
Flood Plains
Richmond County
Northumberland County
Essex County
Lancaster County
Rappahannock River
US 17
King and Queen County
PR 33
PR 3
PR 33
PR 3
Piankatank River
Gloucester County
Mathews County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
0 1.5 3 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 94:

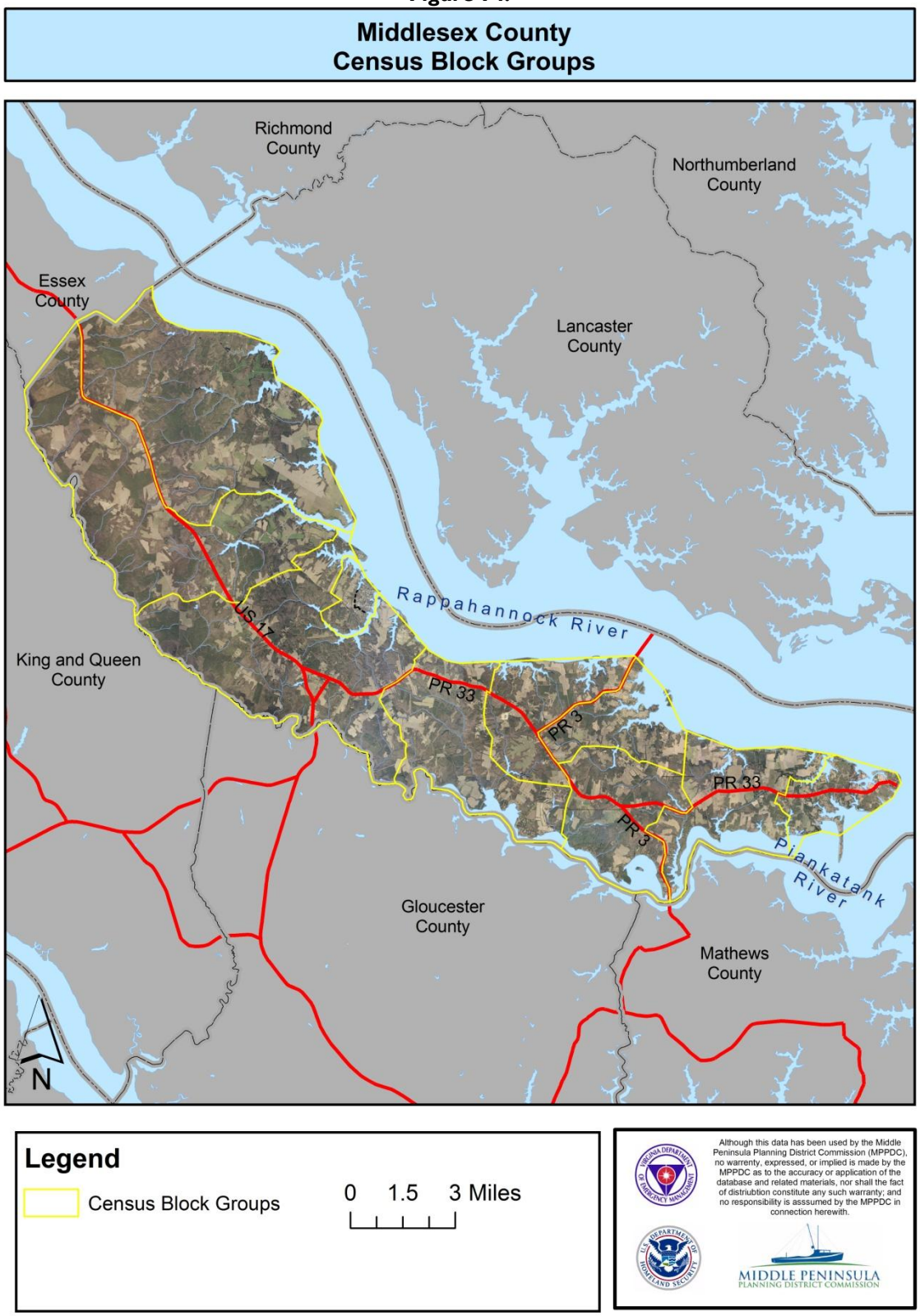

Middlesex County
Census Block Groups
Richmond County
Northumberland County
Essex County
Lancaster County
Rappahannock River
US 17
King and Queen County
PR 33
PR 3
PR 33
PR 3
Piankatank River
Gloucester County
Mathews County
N
Legend
Census Block Groups
0 1.5 3 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 95:

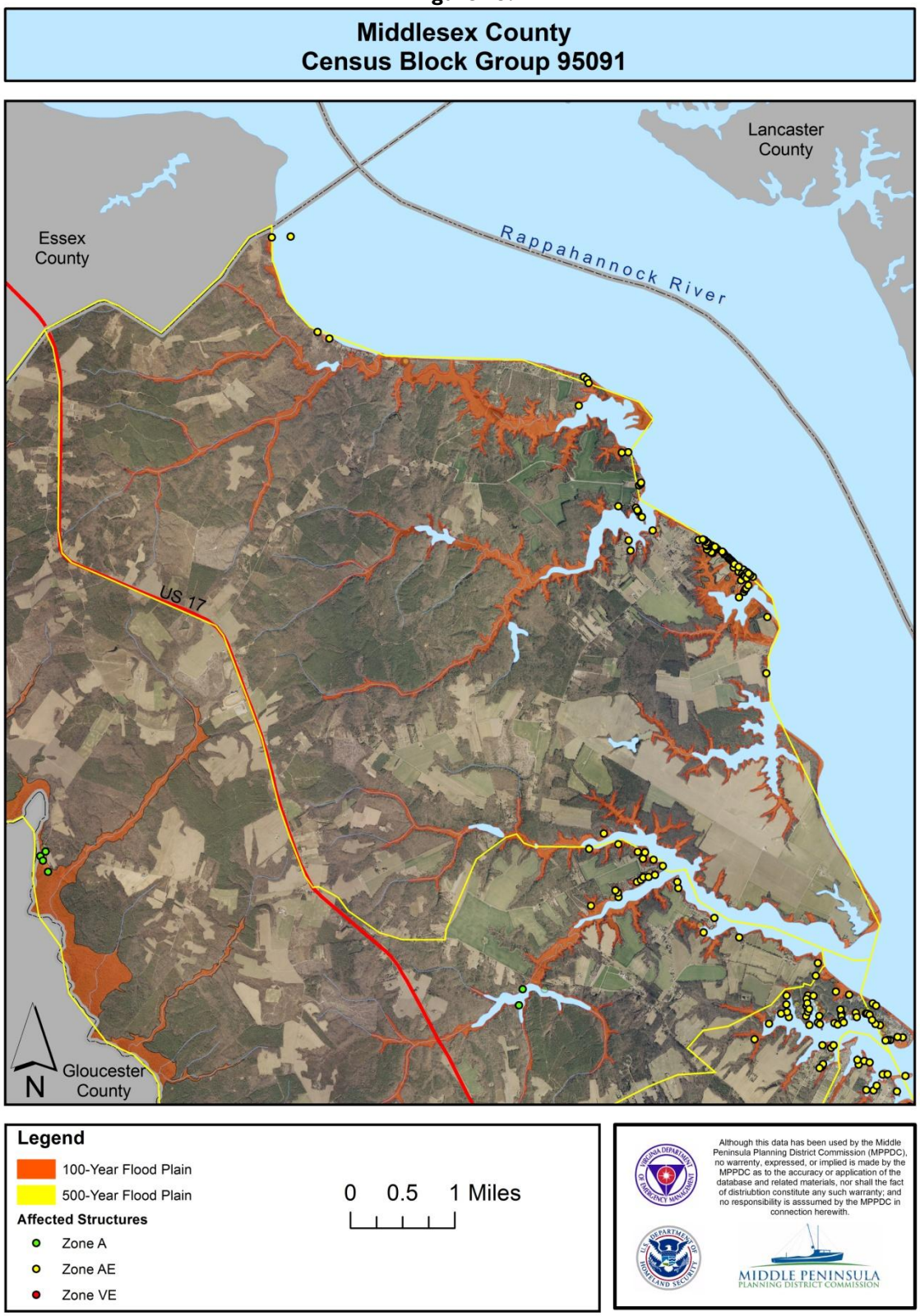

Middlesex County
Census Block Group 95091
Lancaster County
Essex County
Rappahannock River
US 17
N
Gloucester County
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
Zone VE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 96:

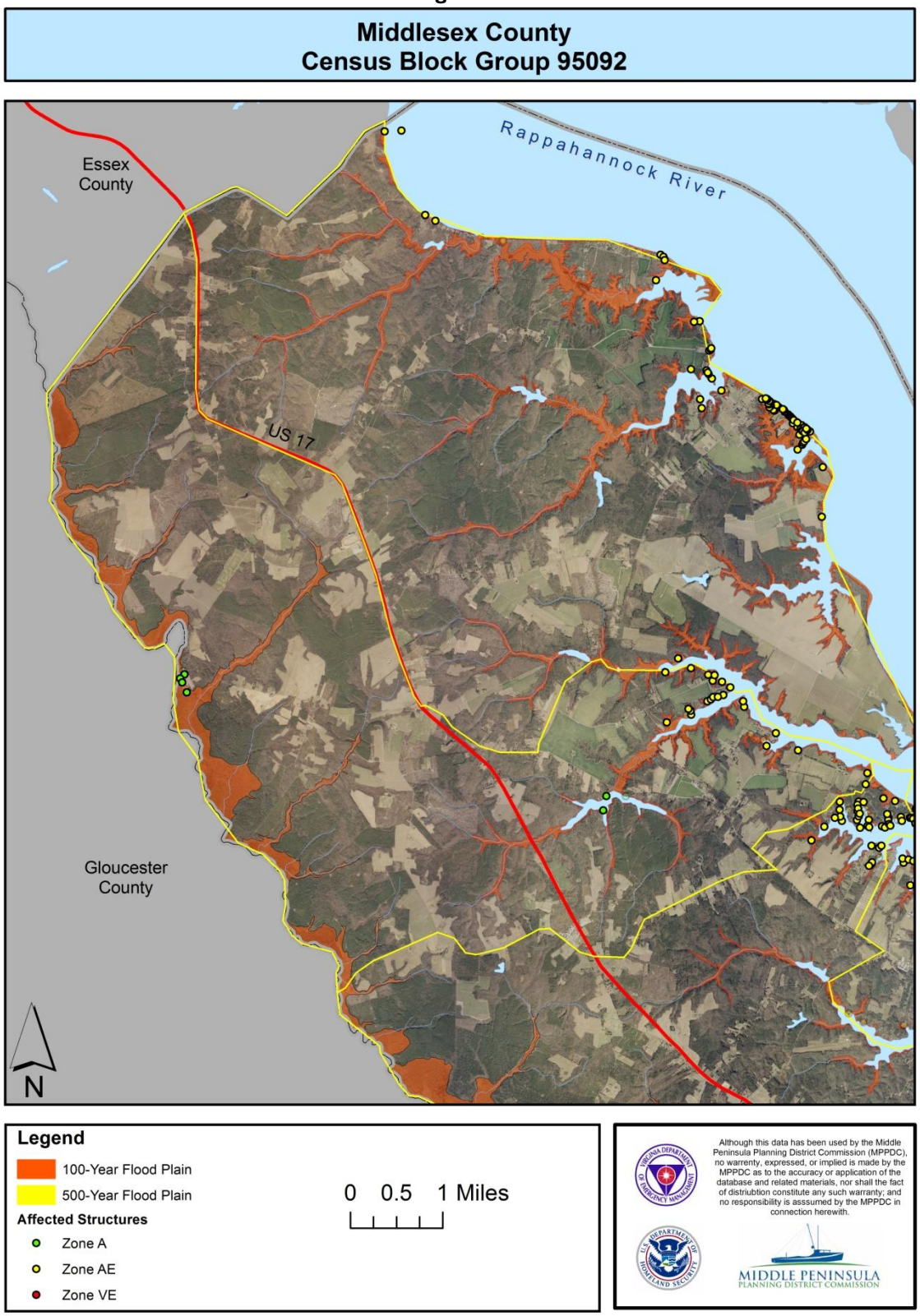

Middlesex County
Census Block Group 95092
Rappahannock River
Essex County
US 17
Gloucester County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
Zone VE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 97:

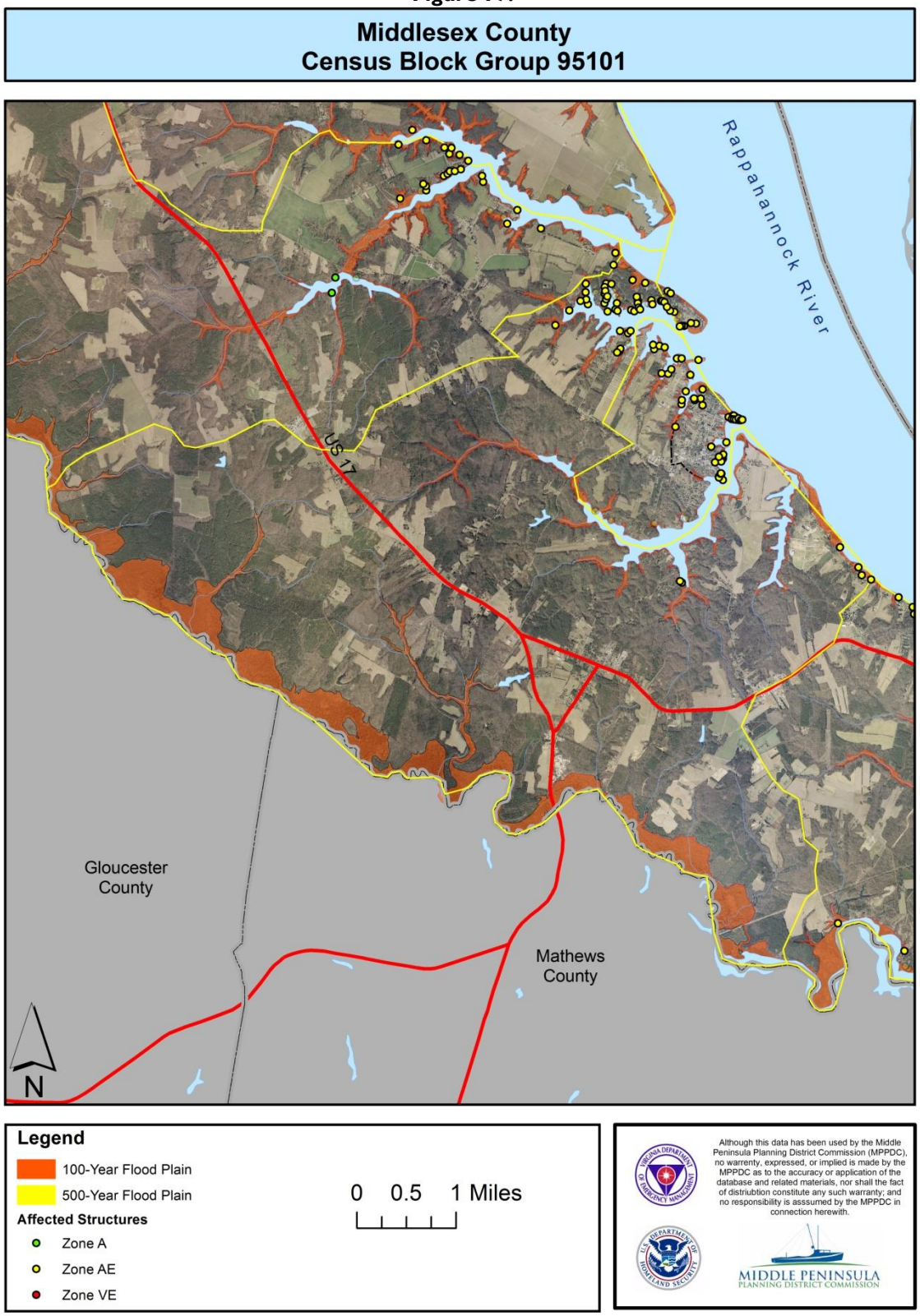

Middlesex County
Census Block Group 95101
Rappahannock River
US 17
Gloucester County
Mathews County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
Zone VE
0 0.5 1 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 98:

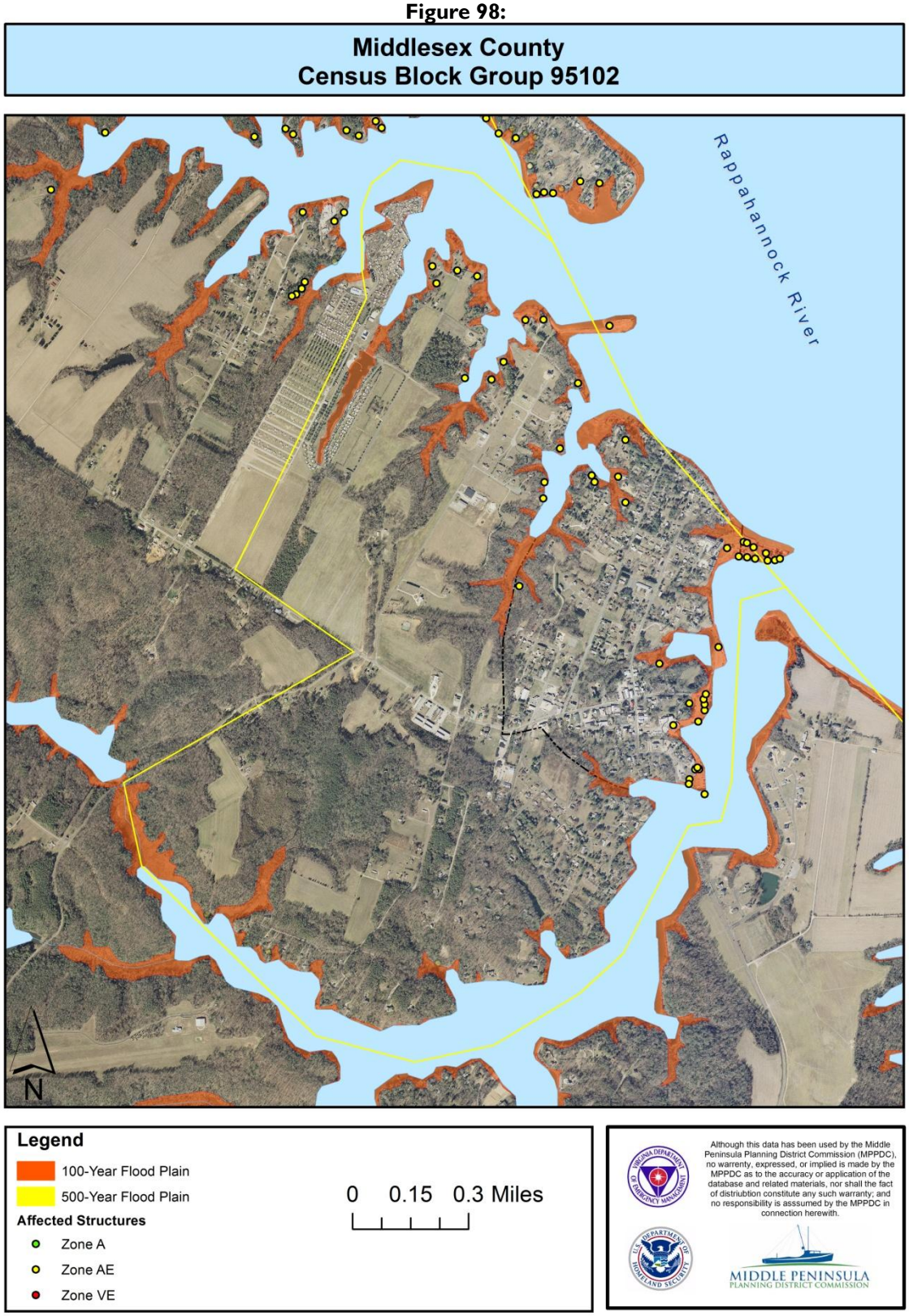

Middlesex County
Census Block Group 95102
Rappahannock River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
Zone VE
0 0.15 0.3 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 99:

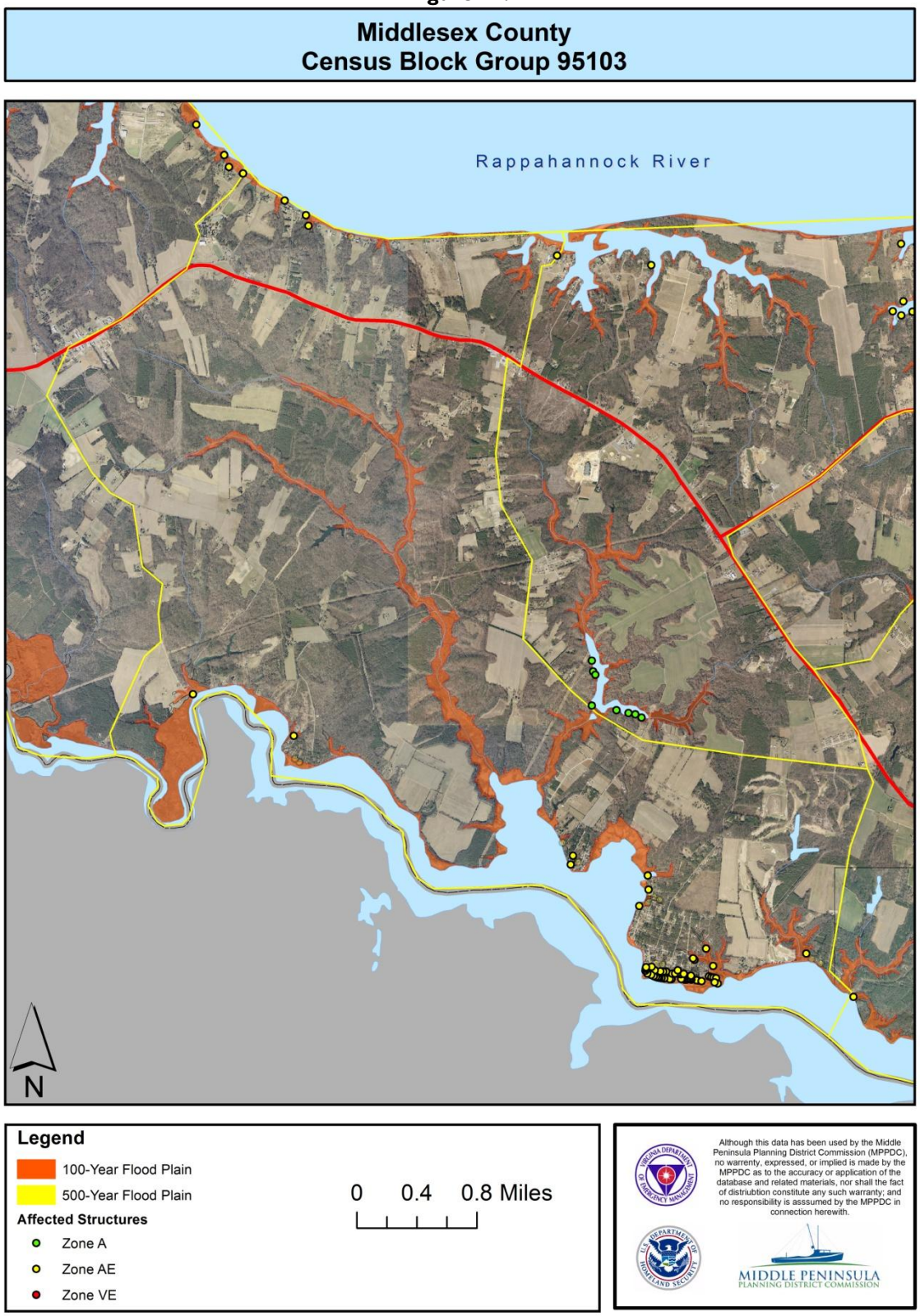

Middlesex County
Census Block Group 95103
Rappahannock River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
Zone VE
0 0.4 0.8 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 100:


Middlesex County
Census Block Group 95111
Rappahannock River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
Zone VE
0 0.3 0.6 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 101:

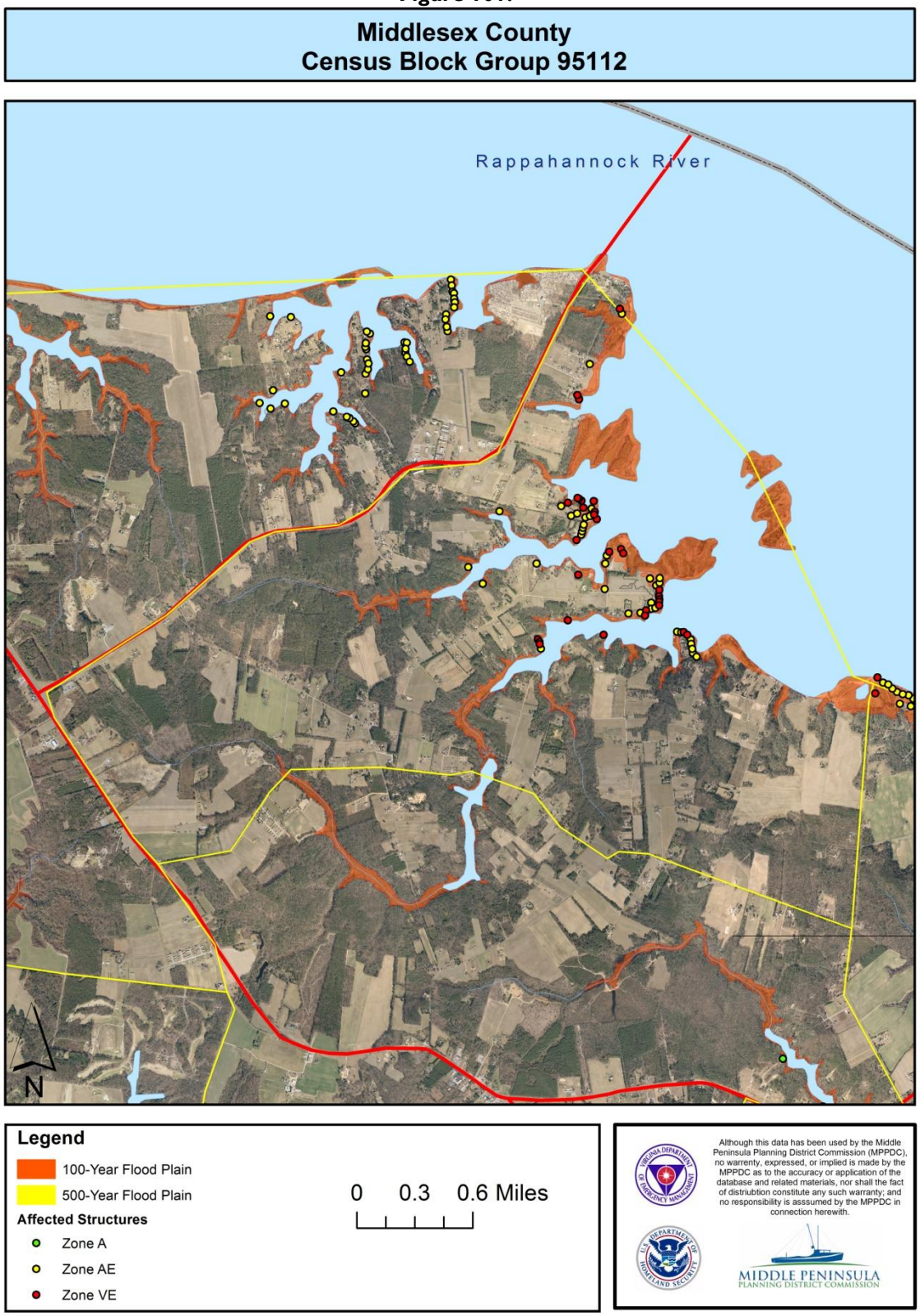

Middlesex County
Census Block Group 95112
Rappahannock River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
Zone VE
0 0.3 0.6 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 102:

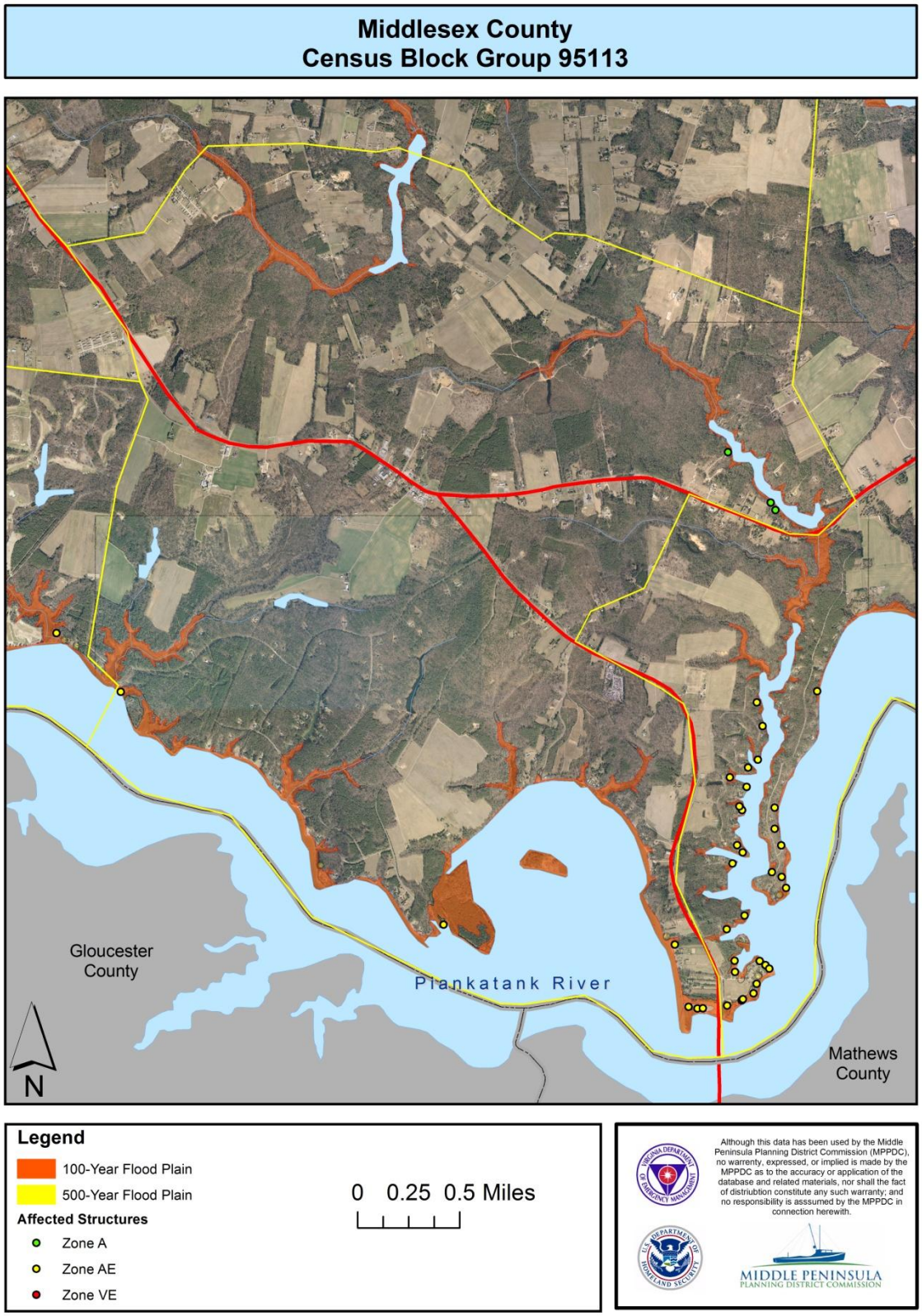
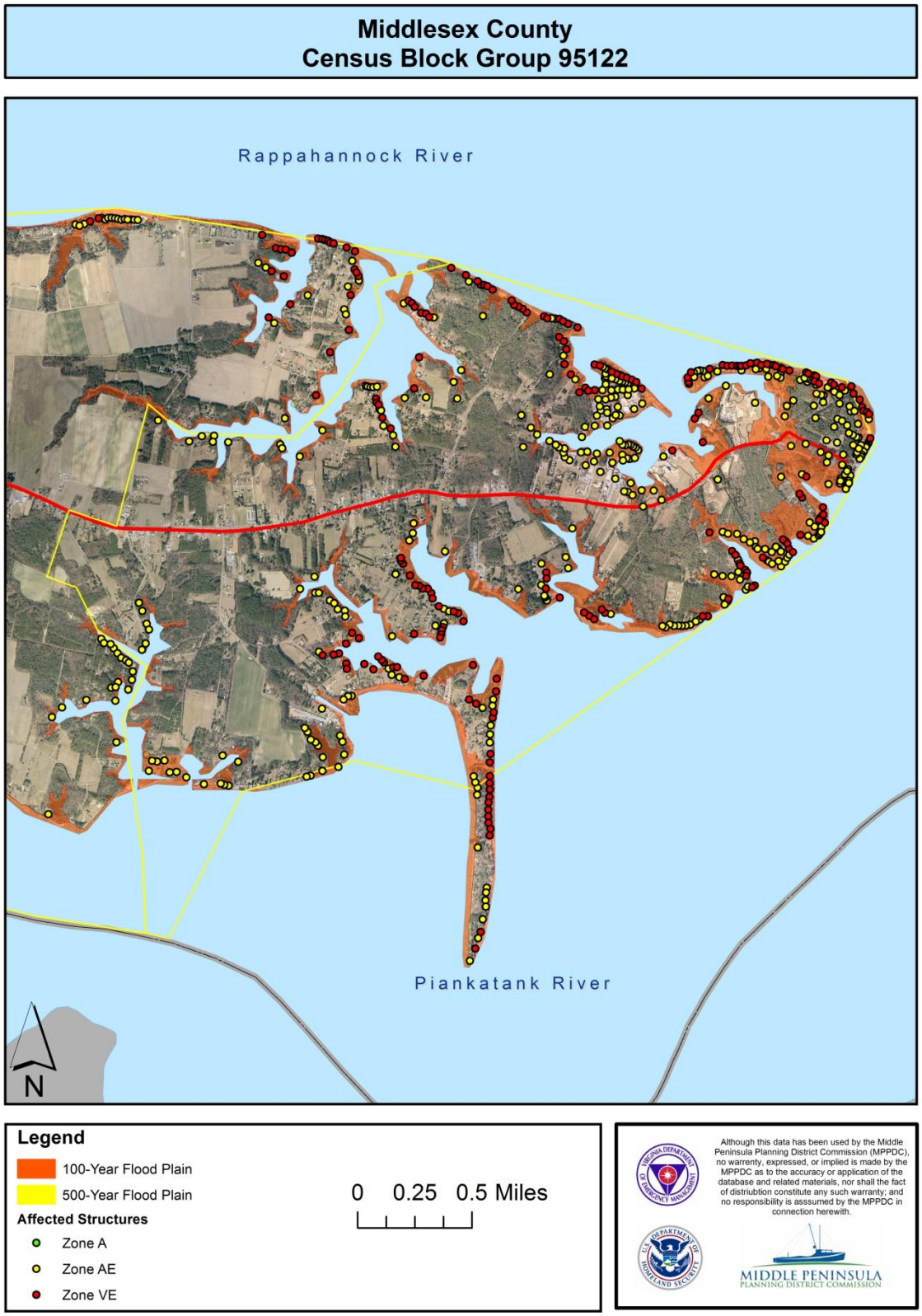

Middlesex County
Census Block Group 95113
Gloucester County
Plankatank River
Mathews County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
Zone VE
0 0.25 0.5 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Figure 103:


Middlesex County
Census Block Group 95121
Rappahannock River
Piankatank River
Mathews County
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
Zone VE
0 0.375 0.75 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

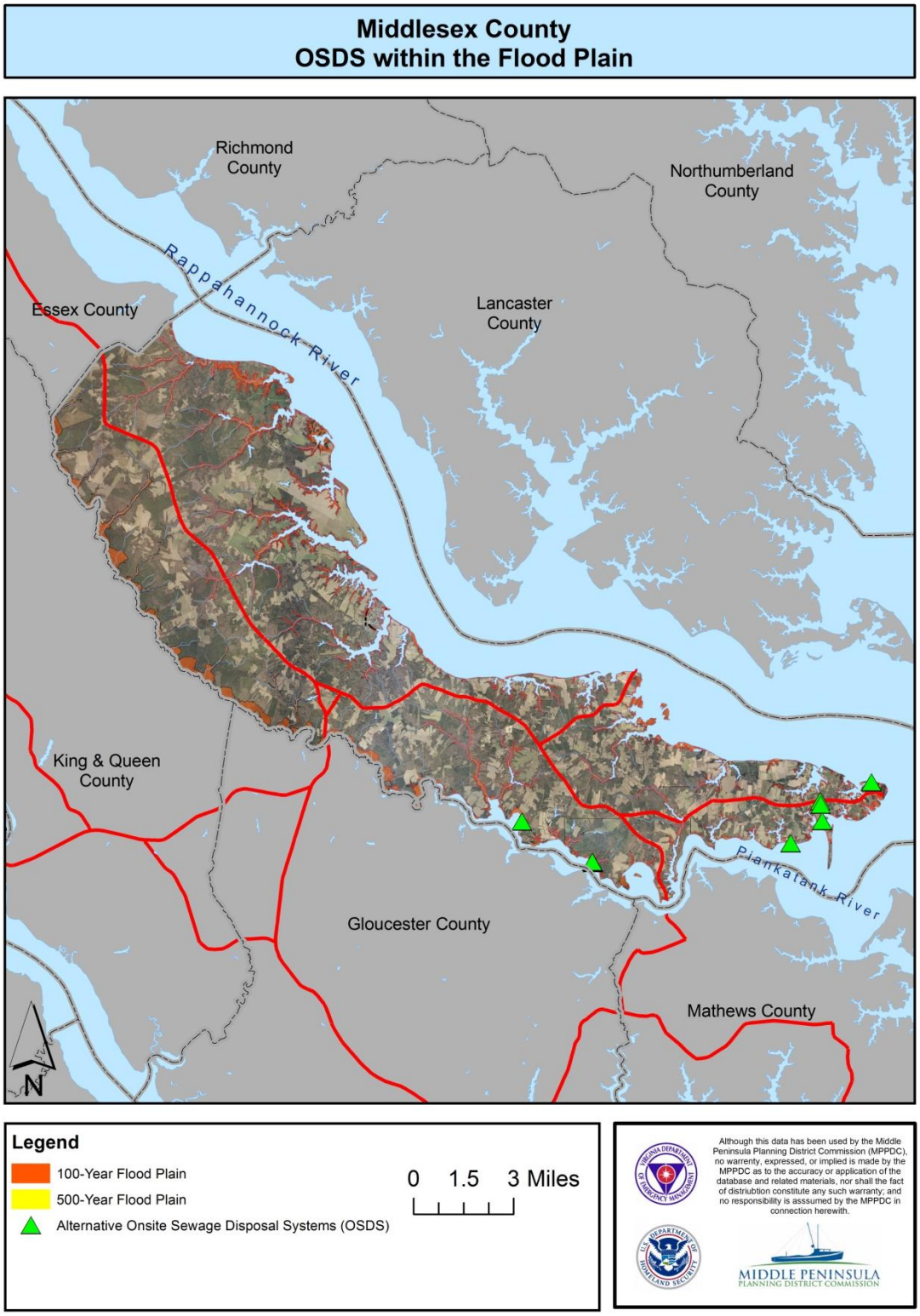
Figure 104:


Middlesex County
Census Block Group 95122
Rappahannock River
Piankatank River
N
Legend
100-Year Flood Plain
500-Year Flood Plain
Affected Structures
Zone A
Zone AE
Zone VE
0 0.25 0.5 Miles
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warrenty, expressed, or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distriubtion constitute any such warranty; and no responsibility is asssumed by the MPPDC in connection herewith.
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION

Alternate On-site Sewage Disposal Systems (OSDS)

The map (Figure 105) below show the location of the OSDS facilities constructed in the 100-year and 500-yer floodplain in Middlesex County.

Figure 105:



Urbanna Critical Facilities and Public Utilities
The Town of Urbanna provides public water and sewer service to its residents. The town operates the public water system which serves town residents as well as some nearby customers in surrounding Middlesex County.

The sewerage collection and treatment system is operated by the Hampton Roads Sanitation District (HRSD). When flood waters are anticipated, the staff at HRSD turn off the pumps at the sewerage pump stations in order to prevent pumping floodwaters into the wastewater treatment plant.

The wastewater treatment plant is located on high land next to the town's water tower, which is an area that does not flood.

The town operates the Urbanna Town Marina that includes a boat/fishing dock, a small beach area, a small park and a small operations building - all located at Upton's Point along the Rappahannock River. This facility suffered significant damage in 2003 from Hurricane Isabel and has been completely rebuilt since then at an approximate cost of $850,000.

Repetitive and Severe Repetitive Loss Residential Structures in the Town of Urbanna
According to FEMA's records, the Town of Urbanna has 2 (ie. 1 Single Family and 1 Other resident property) Repetitive Loss residential properties and zero Severe Repetitive Loss properties as of 5/31/15.

In 2003, Hurricane Isabel damaged/destroyed 5 houses along low-lying Island Drive. When these houses were re-built by the property owners, they were elevated in order to prevent future damage from flood waters along this section of the Rappahannock River.

Section 5: Risk Assessment Analysis –
Flooding, Hurricane, and Sea Level Rise

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide methodology and software application to develop multi-hazard losses at a regional scale. The loss estimates are used primarily by local, state and regional officials to plan and stimulate efforts to reduce risk from multi-hazards and prepare for emergency response and recovery[1]. For specifics regarding methodology please see Appendix J.

Potential loss estimates analyzed in Hazus-MH include:

- Physical damage to residential and commercial buildings, schools, essential facilities, and infrastructure
- Economic loss including lost jobs, business interruptions, repair and reconstruction costs.

The Hazus Flood Model analyzes both riverine and coastal flood hazards. Flood hazard is defined by a relationship between depth of flooding and the annual chance of inundation to that depth. Statistical flood frequencies were modeled in this revision to be able to determine annualized loss for each of the counties in Middle Peninsula PDC. Statistical flood frequencies are modeled by looking at the damage that is likely to occur over a given period of time, known as a return period or recurrence interval.

Depth, duration and velocity of water in the floodplain are the primary factors contributing to flood losses. Other hazards associated with flooding that contribute to flood losses include channel erosion and migration, sediment deposition, bridge scour and the impact of flood-born debris. The Hazus Flood Model allows users to estimate flood losses primarily due to flood depth to the general building stock (GBS). While velocity is also considered, it is not a separate input parameter and is accounted within depth-damage functions (i.e., expected percent damage given an expected depth) for census blocks that are defined as either coastal or riverine influenced. The agricultural component will allow the user to estimate a range of losses to account for flood duration. The flood model does not estimate the losses due to high velocity flash floods at this time[1].

Flood Analysis

The flood analysis for the HIRA was completed using the FEMA Hazus – MH V2.2 software for both riverine and coastal flood hazards. Varying flood analyses have been performed to both identify and characterize the flood hazard and the subsequent loss-potential or risk. The standard methodology of defining loss potential for any given hazard, includes annualizing the potential over a series of statistical return periods. Annualization is the mathematical method of converting individual losses to a weighted-average that may be experienced in any given year. The standard scope pertaining to flood risk corresponds to annualizing the 0.2%, 1%, 2%, 4%, and 10% flooding return periods. In layman's-terms these same annual-chance return periods are often described as the 500-year, 100-year, 50-year, 25-year and 10-year events as shown in Table 35 below:

[1] HAZUS-MH Flood User Manual

Table 35: Annual probability base on flood recurrence intervals.	
Flood Recurrence Interval	**Annual Chance of Occurrence**
10 year	10.0%
25 year	4.0%
50 year	2.0%
100 year	1.0%
500 year	0.2%

Practically, these statistical events represent the chance of being equaled or exceeded in any given year; i.e., the likelihood that a particular event with a given intensity occurs on average at least once every x-years. Once each of these statistical return periods are calculated, an annualized value is computed thus offering a perspective for any given year.

The various flood modeling performed as part of the current Plan update, along with the respective risk results, represent the primary goal of producing estimated flood losses for the aforementioned statistical return periods and then the annualized flood losses. However, it is important to note that the idiom of 'comparing apples with oranges' very-much applies to the various elements of flood modeling as well as modeling risk from flooding potential. Therefore, where appropriate differing modeling methodologies and their respective results have been separated for comparative purposes as described and highlighted in the bulleted List below. The same list also presents the order in which Hazus modeling information is presented:

The various modeling performed includes the following:

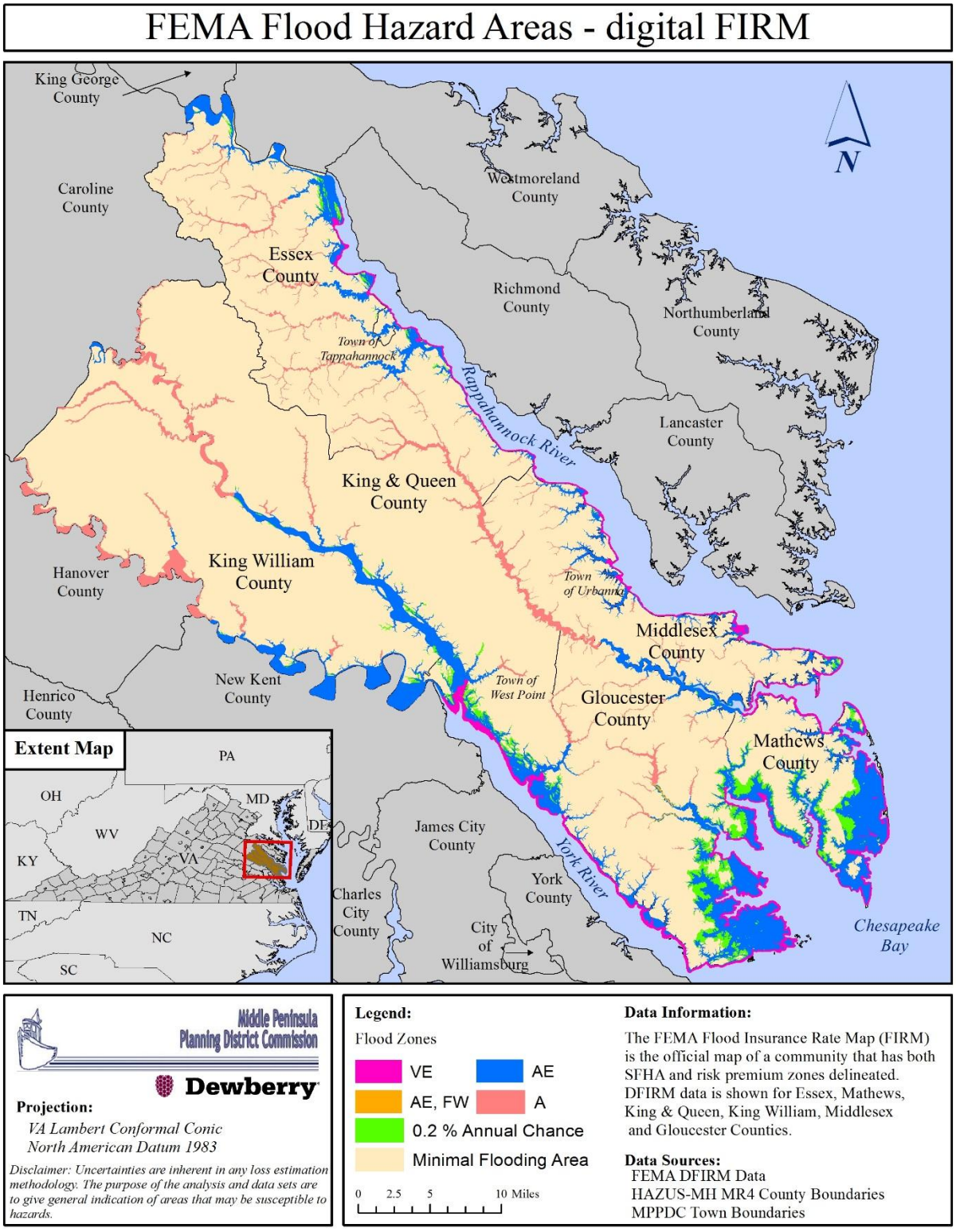
- **FEMA Floodplains and Depth Grid Information**
- **Hazus Building Stock (Inventory of Buildings)**:
  - All modeling utilized stock Hazus inventory values (Version 2.2 – Census 2010)
  - All modeling utilized Hazus Dasymetric Census Geographies
  - All modeling utilized stock Hazus facilities
- **Hazus Level 1 Multi-frequency Flood Modeling** – Hazus Level 1 methodology employed
  - Core Inputs or Parameters:
    - Digital Elevation Model (DEM) – National Elevation Dataset (NED) One-Arc Second (~30 meter resolution)
    - Frequencies (Both Riverine & Coastal) - 0.2%, 1%, 2%, 4%, and 10%
    - Riverine:
      - One-Square Mile (1 mi^2)Drainage Threshold
    - Coastal:
      - Stillwater elevations from Table 2 – Transect Data from each respective FEMA Flood Insurance Study (FIS):
        - ESSEX COUNTY – Revised May 4, 2015
        - GLOUCESTER COUNTY – Revised November 19, 2014
        - KING AND QUEEN COUNTY – Preliminary October 3, 2013
        - KING WILLIAM COUNTY – Preliminary October 3, 2013
        - MIDDLESEX COUNTY – Revised May 18, 2015
        - MATHEWS COUNTY – Revised December 9, 2014
      - NOTE: Hazus stock shoreline data was modified to extend up the York River so that Level 1 coastal modeling could be completed for King William County, King and Queen County and portions of Gloucester County upstream of the George Washington Memorial Highway Bridge (US 17).

- **Hazus Level 1 Annualized Loss** - Hazus Level 1 methodology employed (from Multi-frequency above)
- **Comparative Flood Modeling**:
    - FEMA RiskMAP 1% Coastal - Hazus Level 2 methodology employed
        - Hazus Level 2 – Only use of the updated or refined flood hazard produced and provided by Army Corps of Engineers (USACE) for FEMA Risk MAP studies
    - Hazus Level 1 – Only 1% Coastal (from Multi-frequency above)
        - Use only the Level 1 Coastal 1% frequency to compare to the FEMA RiskMAP Coastal 1% frequency

FEMA Floodplains and Depth Grid Information

FEMA initiates Flood Insurance Studies (FIS) on a national prioritization schedule. The most recent FIS's have been incorporated into this Plan as outlined by date in the list above; dates ranging from October 2013 to May 2015. These various new studies have produced updated coastal flood hazards for all of the jurisdictions in the MPPDC planning area; and riverine flood hazards remain from previous flood insurance studies. Figure 106 illustrates the extent of flood hazards as defined by the most recent FEMA flood insurance studies.

Figure 106:

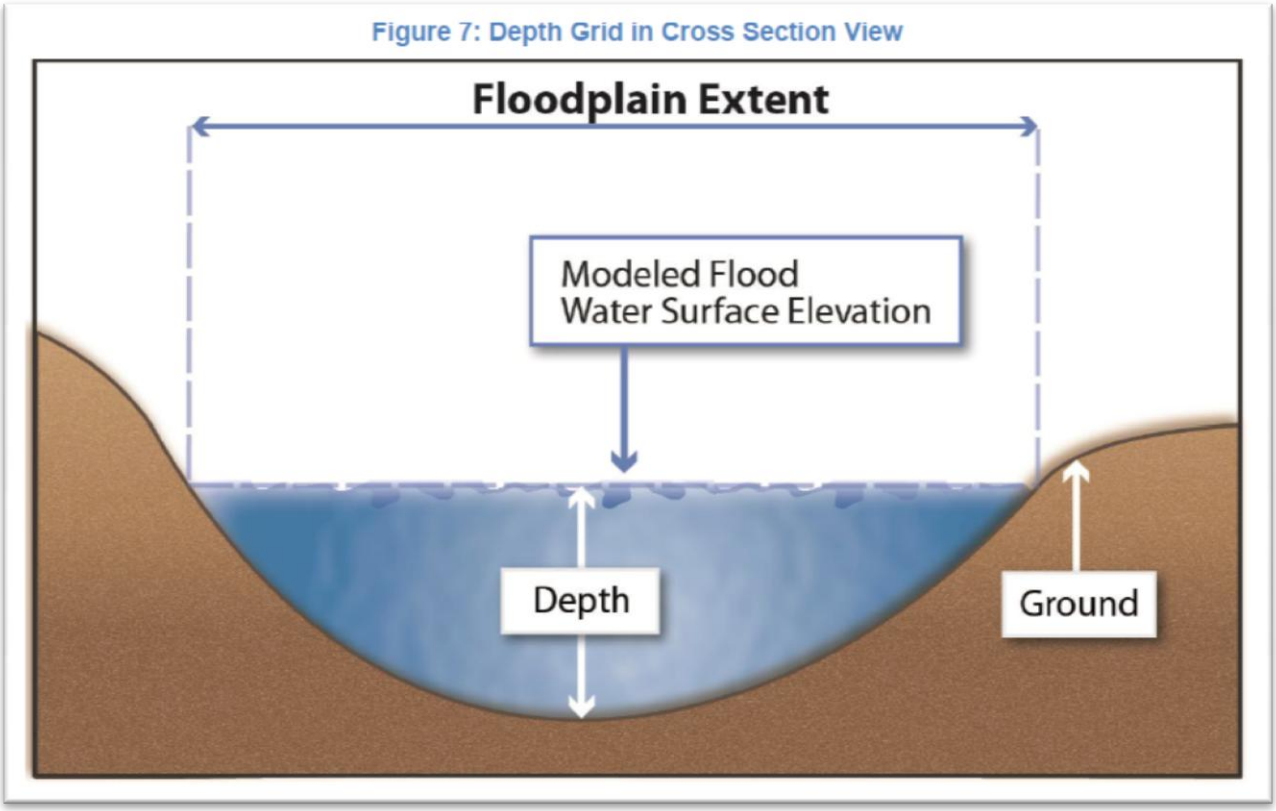


The new coastal flood hazards associated with the most recent FEMA studies have been produced under the RiskMAP Program. In short, the RiskMAP Program seeks to include risk assessments as part

of a flood insurance study to better communicate the risk of flooding. Consequently, a RiskMAP study includes all of the regulatory Flood Insurance Study products; namely engineering, floodplain mapping, digital FIRM data and report text. However, in addition to the traditional regulatory products, RiskMAP also includes new non-regulatory products aimed at communicating risk. One of the core non-regulatory datasets includes the creation of depth grids from the digital FIRM data. These new depth grids are the key to performing risk assessments in the Hazus software as they are able to be directly imported.

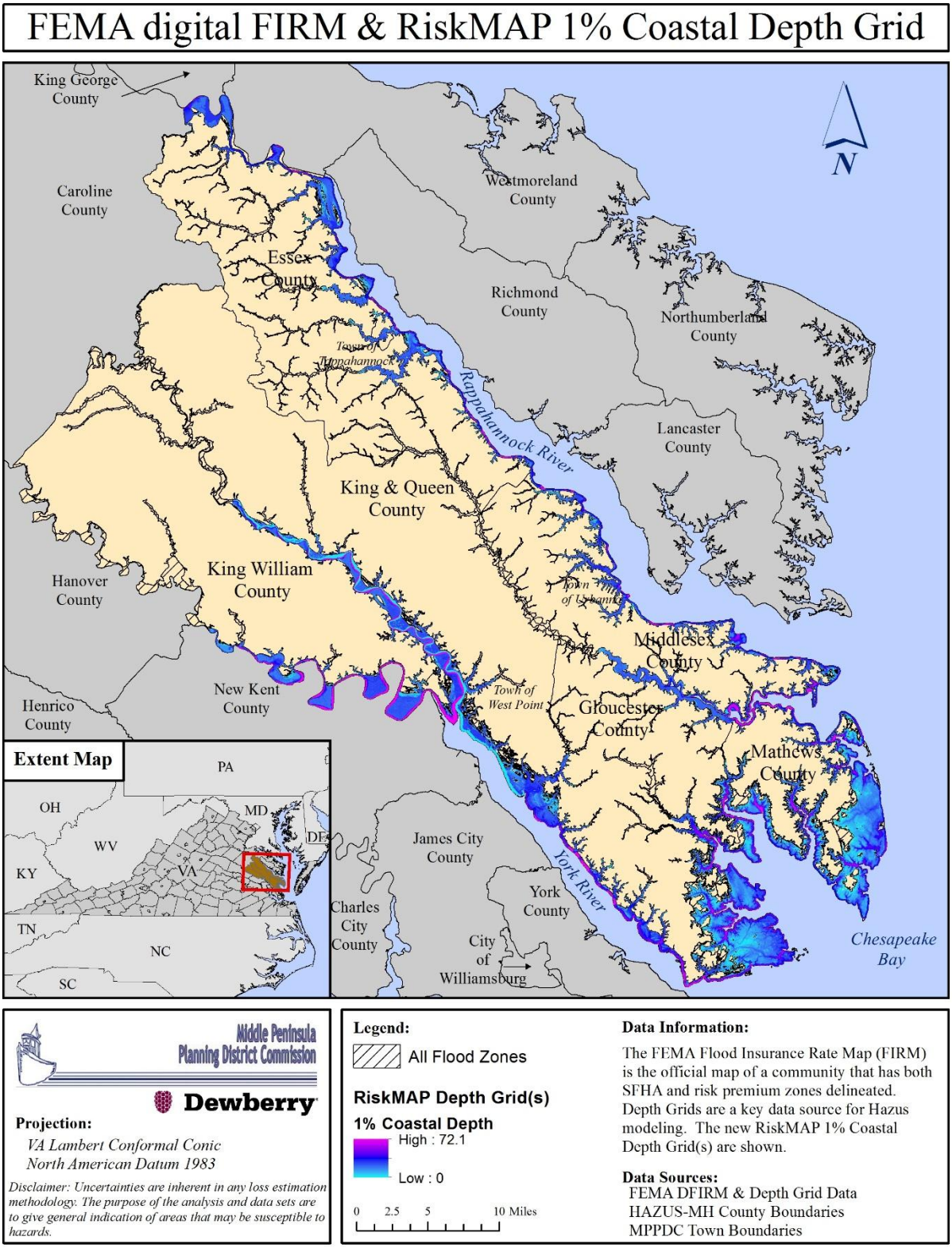
The flood hazard within Hazus is ultimately defined by a depth grid which is a representation of the difference between the estimated water surface and ground elevations for each respective flood frequency or annual chance. The following image is a simplified representation as shown in FEMA's Guidance for Flood Risk Analysis and Mapping, Flood Depth and Analysis Grids (May 2014):

Figure 7: Depth Grid in Cross Section View



The new RiskMAP projects for each of the counties in the MPPDC planning area include new coastal 1% Annual Chance depth grids. Figure 107 below shows these new coastal 1% Annual Chance depth grids and the new FEMA digital FIRM floodplains:

Figure 107:


FEMA digital FIRM & RiskMAP 1% Coastal Depth Grid
King George County
Caroline County
Essex County
Westmoreland County
Richmond County
Northumberland County
Lancaster County
Rappahannock River
King & Queen County
King William County
Hanover County
New Kent County
Henrico County
Middlesex County
Gloucester County
Mathews County
James City County
York River
York County
Charles City County
City of Williamsburg
Chesapeake Bay
Town of West Point
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
All Flood Zones
RiskMAP Depth Grid(s)
1% Coastal Depth
High : 72.1
Low : 0
0 2.5 5 10 Miles
Data Information:
The FEMA Flood Insurance Rate Map (FIRM) is the official map of a community that has both SFHA and risk premium zones delineated. Depth Grids are a key data source for Hazus modeling. The new RiskMAP 1% Coastal Depth Grid(s) are shown.
Data Sources:
FEMA DFIRM & Depth Grid Data
HAZUS-MH County Boundaries
MPPDC Town Boundaries

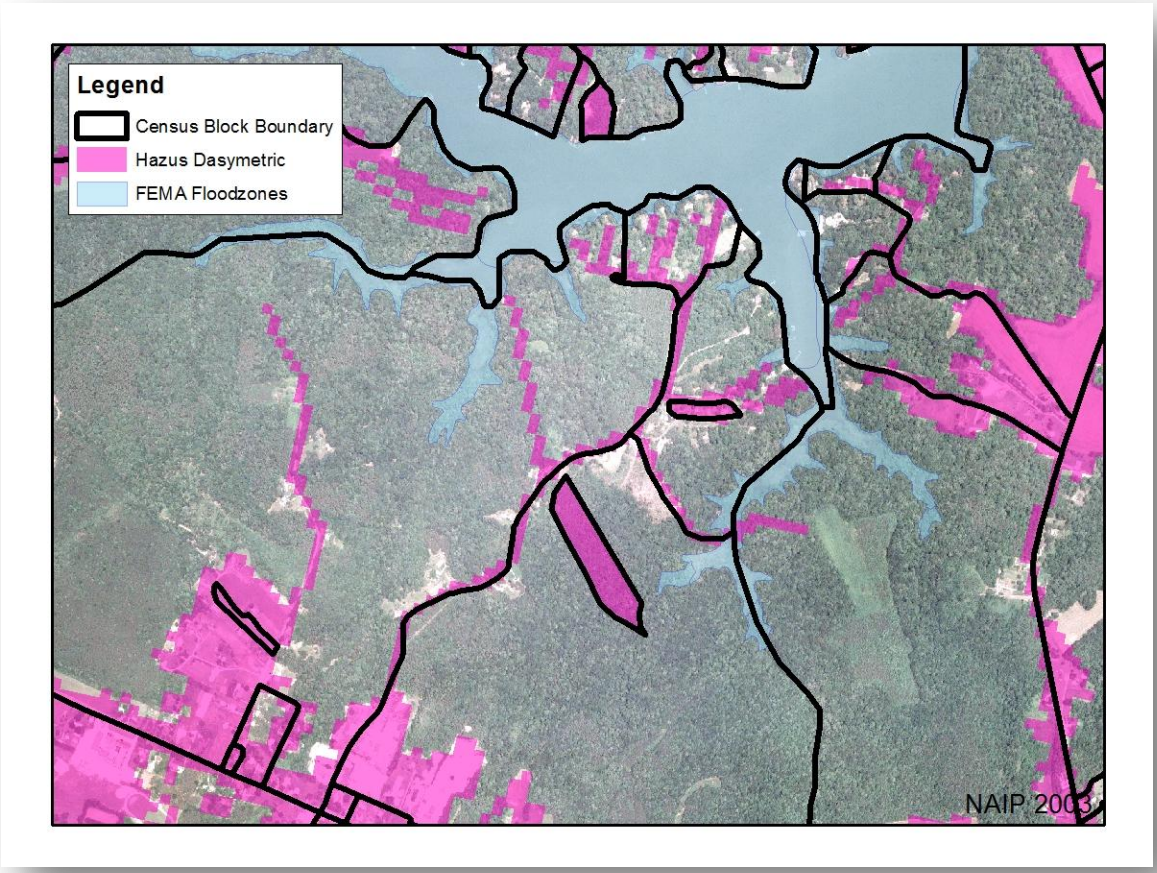
RiskMAP depth grids are considered to be superior to depth grids created from typical out-of-the-box Hazus analyses for a variety of reasons. However, users should understand that RiskMAP coastal projects are only scoped to produce 1% Annual Chance depth grids; i.e., multi-frequency depth grids are not prescribed for coastal projects. Armed with this information, it therefore becomes necessary to model multiple-frequencies in Hazus to arrive at annualized loss results. Fortunately, Hazus is a tool that offers flexibility and enables the user to provide more detailed inputs or specify input parameters that can introduce an increased level of reliability of depth values produced. Notwithstanding, RiskMAP depth grids are considered superior because of the guidelines under which they were created and the precision and accuracy of the inputs to their creation. Ultimately, where RiskMAP projects produce new multi-frequency depth grids, these grids can all be run through Hazus and a new annualized values can be produced. And where multi-frequency depth grids do not exist, it best to refrain from 'mixing apples and oranges' and rather, compare results for relative differences or similarities.

Ultimately, the Hazus flood modeling and risk assessments for this Plan update have been produced with the intent to improve upon previous Plan Hazus modeling and to incorporate any new RiskMAP-based depth grids. Riverine flood hazards were not updated in the most recent FIS's and there are no new RiskMAP depth grids. Therefore, this Plan update includes Hazus Level 1 multi-frequency modeling for both riverine and coastal. Improvements to the riverine modeling from the previous Plan are related to the drainage area threshold defined. In most cases, the FEMA flood maps have been developed for streams with contributing drainage area of 1 square mile. The previous Plan Hazus flood modeling only utilized a one-square mile drainage threshold for Mathews County and the remainder were completed at ten-square mile. However, this Plan revision has utilized one-square mile drainage threshold for all counties in the MPPDC region. As for the Level 1 multi-frequency modeling for coastal influences, the new Stillwater elevations from Table 2 – Transect Data from each respective FEMA Flood Insurance Study (FIS) was entered into the Hazus software.

Results from the various Hazus flood modeling are covered in sections below with primary focus on the annualized results. However, first the inventory of building stock is discussed.

Building Stock

Hazus building stock is the inventory of buildings (i.e., square-footage) of each respective type or sub-type of buildings in the following categories; residential, commercial, industrial, agricultural, religious, government, and education. Hazus assumes that all square-footage (i.e., buildings) are evenly distributed throughout a given census block and therefore damage is estimated as a percent and is weighted by the area of inundation at a given depth for a given census block. The methodology therefore, is known as an area-weighted methodology. FEMA has initiated recent improvements to the area-weighted methodology by further refining the distribution of building square-footage to land areas characterized by development and removing land areas typical of non-developed land classes (e.g., forests, wetlands, etc…). This refinement is called dasymetric mapping and the current Plan modeling utilizes the FEMA dasymetric building stock. The following shows a small example area in which the developed areas are pink:



Use of the new dasymetric data will typically reduce the total area subject to area-weighted loss estimations - particularly for those census blocks that have flood risk yet actual development does not exist within the floodplains. An area analysis of the dasymetric versus full stock census blocks is exemplified in the chart below:

Digital FIRM Acreage Type	Census Block Type	
	Dasymetric	**Full Stock**
Acres of 0.2% Annual Chance Floodplains (500-year)	5,909 Ac (1% of Total Acres)	14,806 Ac (2% of Total Acres)
Acres of 1% Annual Chance Floodplains (100-year)	23,216 Ac (3% of Total Acres)	85,736 Ac (11% of Total Acres)
Total Acres of Census Blocks MPPDC Region		**794,644 Ac**

A comparison of FEMA digital FIRM data intersecting the two types of Hazus census blocks reveals that an estimated four-percent (4%) of the dasymetric data is within the extents of the 0.2% Annual Chance Floodplains versus thirteen-percent (13%) when using full census blocks. And, considering the 1% Annual Chance Floodplains, there is approximately three-percent (3%) intersecting the dasymetric data versus eleven-percent (11%) when using full census blocks. Consequently, this refinement can be considered a benefit to the risk analyses in that the expectation of over-estimations are mitigated by limiting potential losses ONLY to developed areas.

As noted earlier, loss estimations are first based on inundation area for specified sub-types of building square-footage. The second type of data includes information on the local economy that is used in estimating losses. Table 36 displays the economic loss categories used to calculate annualized losses by Hazus. Data for this analysis has been provided at the census block level.

Table 36: Hazus direct economic loss categories and descriptions.

Category Name	Description of Data Input into Model	Hazus Output
Building	Cost per sq ft to repair damage by structural type and occupancy for each level of damage	Cost of building repair or replacement of damaged and destroyed buildings
Contents	Replacement value by occupancy	Cost of damage to building contents
Inventory	Annual gross sales in $ per sq ft	Loss of building inventory as contents related to business activities
Relocation	Multiple factors; primarily a function of Rental Costs ($/ft^2/month) for non-entertainment buildings where damage ≥10%	Relocation expenses (for businesses and institutions); disruption costs to building owners for temporary space.
Income	Income in $ per sq ft per month by occupancy	Capital-related incomes losses as a measure of the loss of productivity, services, or sales
Rental	Rental costs per month per sq ft by occupancy	Loss of rental income to building owners
Wage	Wages in $ per sq ft per month by occupancy	Employee wage loss as described in income loss

Middle Peninsula currently has approximately 43,501 structures with an estimated exposure value of approximately $17.7 billion. Average estimated replacement value of buildings in the study area range from approximately $94,000 to $297,000, with the mean approximation value of $134,000 [2]. Eighty-one percent of the planning district's general occupancy is categorized as residential, followed by commercial (12%). Table 37 below provides inventory information for each of the six counties that were included in the analysis. Gloucester County occupies a large percentage (40%) of the building stock exposure for the region.

Table 37: Building stock exposure for general occupancies by county.

County	Residential	Commercial	Industrial	Agriculture	Religion	Govt.	Education	Total
Gloucester	$5,698,054	$831,318	$147,429	$32,557	$84,190	$32,437	$190,065	$7,016,050
King William	$2,463,239	$274,254	$110,725	$32,549	$41,687	$24,273	$24,786	$2,971,513
Middlesex	$2,151,683	$354,607	$65,244	$14,045	$26,670	$11,736	$40,679	$2,664,664
Essex	$1,578,275	$402,650	$146,178	$25,395	$28,679	$18,661	$31,423	$2,231,261
Mathews	$1,566,770	$149,340	$45,066	$9,877	$19,875	$6,830	$12,042	$1,809,800
King & Queen	$886,914	$52,850	$29,064	$6,710	$19,927	$2,968	$7,284	$1,005,717
Total	$14,344,935	$2,065,019	$543,706	$121,133	$221,028	$96,905	$306,279	$17,699,005
All values are in thousands of dollars								

[2] Previous Plan values adjusted per BLS CPI Inflation Calculator (2000 to 2010) to match Hazus/Census years.

Building stock exposure is also classified by building type. General Building Types (GBTs) have been developed as a means to classify the different buildings types. This provides an ability to differentiate between buildings with substantially different damage and loss characteristics. Model building types represent the characteristics of core construction of buildings in a class. The damage and loss prediction models are developed for model building types and the estimated performance is based upon the "average characteristics" of the total population of buildings within each class. Five general classifications have been established, including wood, masonry, concrete, steel and manufactured homes (MH). A brief description of the building types is available in Table 38. The Hazus inventory serves as the default when a user does not have better data available.

Table 38: Hazus General Building Type classes.

General Building Type	Description
Wood	Wood frame construction
Masonry	Reinforced or unreinforced masonry construction
Steel	Steel frame construction
Concrete	Cast-in-place or pre-cast reinforced concrete construction
MH	Factory-built residential construction

Wood construction represents the majority (61%) of building types in the planning district. Masonry construction accounts for a quarter of the building type exposure. Table 39 below provides building stock exposure for the five main building types.

Table 39: Building stock exposure for general building type by county.

County	Wood	Masonry	Concrete	Steel	Manufactured Home	Total
Gloucester	$4,338,118	$1,782,044	$177,833	$591,235	$126,913	$7,016,143
King William	$1,895,656	$751,978	$61,374	$227,445	$35,155	$2,971,608
Middlesex	$1,631,388	$678,395	$67,789	$225,948	$61,315	$2,664,835
Mathews	$1,166,398	$450,836	$32,534	$113,035	$47,165	$1,809,968
Essex	$1,202,922	$558,827	$102,763	$319,225	$47,615	$2,231,352
King & Queen	$661,413	$247,318	$11,118	$49,521	$36,527	$1,005,897
Total	$10,895,895	$4,469,398	$453,411	$1,526,409	$354,690	$17,699,803
All values are in thousands of dollars						

Multi-frequency Flood Modeling – Hazus Level 1 methodology

As explained earlier, annualized loss is the preferred manner with which to express potential risk for hazard mitigation planning as it is useful for creating a common denominator by which different types of hazards can be compared. The tables below (Table 40 – Table 46) show the multi-frequency results for the MPPDC Region and each County. The following section will present details of the annualized losses; see General Building Stock Loss Estimation (Annualized Flood Loss).

Table 40: Hazus Level 1 Multi-frequency GBS Losses for the MPPDC Region.

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
MPPDC Region	Level 1 - 10YR	$107,113	$57,802	$48,644	$1,126
MPPDC Region	Level 1 - 25YR	$137,228	$74,580	$61,788	$1,375
MPPDC Region	Level 1 - 50YR	$194,731	$105,823	$87,602	$1,941
MPPDC Region	Level 1 - 100YR	$245,562	$133,342	$110,570	$2,427
MPPDC Region	Level 1 - 500YR	$842,030	$460,912	$375,607	$7,497
MPPDC Region	Level 1 - Annualized	$18,102	$9,921	$8,111	$116
		Data in Thousands of Dollars			

Table 41: Hazus Level 1 Multi-frequency GBS Losses for Essex County.

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
Essex County	Level 1 - 10YR	$7,226	$3,729	$3,432	$80
Essex County	Level 1 - 25YR	$8,994	$4,676	$4,243	$89
Essex County	Level 1 - 50YR	$12,846	$6,599	$6,126	$140
Essex County	Level 1 - 100YR	$16,813	$8,843	$7,846	$144
Essex County	Level 1 - 500YR	$31,230	$16,306	$14,666	$287
Essex County	Level 1 - Annualized	$1,047	$548	$493	$6
Data in Thousands of Dollars					

Table 42. Hazus Level 1 Multi-frequency GBS Losses for Gloucester County.

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
Gloucester County	Level 1 - 10YR	$53,037	$27,925	$24,750	$25,491
Gloucester County	Level 1 - 25YR	$68,606	$36,345	$31,788	$32,684
Gloucester County	Level 1 - 50YR	$98,481	$52,381	$45,397	$46,610
Gloucester County	Level 1 - 100YR	$121,998	$64,526	$56,568	$58,085
Gloucester County	Level 1 - 500YR	$565,571	$310,999	$251,301	$255,854
Gloucester County	Level 1 - Annualized	$9,984	$5,394	$4,552	$79
Data in Thousands of Dollars					

Table 43. Hazus Level 1 Multi-frequency GBS Losses for King & Queen County.

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
King & Queen County	Level 1 - 10YR	$3,850	$2,295	$1,512	$43
King & Queen County	Level 1 - 25YR	$5,152	$3,088	$2,011	$53
King & Queen County	Level 1 - 50YR	$7,086	$4,294	$2,735	$57
King & Queen County	Level 1 - 100YR	$7,535	$4,612	$2,878	$45
King & Queen County	Level 1 - 500YR	$19,376	$11,714	$7,506	$156
King & Queen County	Level 1 - Annualized	$585	$355	$224	$6
Data in Thousands of Dollars					

Table 44: Hazus Level 1 Multi-frequency GBS Losses for King William County.

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
King William County	Level 1 - 10YR	$12,037	$5,882	$6,084	$107
King William County	Level 1 - 25YR	$14,339	$7,084	$7,169	$124
King William County	Level 1 - 50YR	$17,689	$8,729	$8,851	$147
King William County	Level 1 - 100YR	$20,858	$10,332	$10,395	$191
King William County	Level 1 - 500YR	$65,545	$29,037	$35,462	$1,584
King William County	Level 1 - Annualized	$1,656	$797	$852	$11
Data in Thousands of Dollars					

Table 45: Hazus Level 1 Multi-frequency GBS Losses for Mathews County.

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
Mathews County	Level 1 - 10YR	$21,094	$12,426	$8,575	$104
Mathews County	Level 1 - 25YR	$29,509	$17,341	$12,025	$167
Mathews County	Level 1 - 50YR	$45,778	$26,496	$19,003	$325
Mathews County	Level 1 - 100YR	$60,800	$35,055	$25,356	$451
Mathews County	Level 1 - 500YR	$134,862	$78,353	$55,815	$798
Mathews County	Level 1 - Annualized	$3,682	$2,170	$1,500	$13
Data in Thousands of Dollars					

Table 46: Hazus Level 1 Multi-frequency GBS Losses for Middlesex County

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
Middlesex County	Level 1 - 10YR	$9,869	$5,545	$4,291	$51
Middlesex County	Level 1 - 25YR	$10,628	$6,046	$4,552	$46
Middlesex County	Level 1 - 50YR	$12,851	$7,324	$5,490	$59
Middlesex County	Level 1 - 100YR	$17,558	$9,974	$7,527	$79
Middlesex County	Level 1 - 500YR	$25,446	$14,503	$10,857	$119
Middlesex County	Level 1 - Annualized	$1,148	$657	$490	$1
Data in Thousands of Dollars					

General Building Stock Loss Estimation (Annualized Flood Loss)

Annualized loss is the preferred manner with which to express potential risk for hazard mitigation planning as it is useful for creating a common denominator by which different types of hazards can be compared. While annualized loss values in and of themselves do not necessarily determine if the values are too high or too low, when compared across a region the relative difference in values can indicate problem areas for prioritization or justification for further and more detailed analyses. Next, we consider the annualized losses of the Hazus Level 1 analyses.

Hazus Level 1 flood model annualized losses for the Middle Peninsula PDC are $18,102,000 US Dollars. Property or "capital stock" losses are $18,093,000 US Dollars and make up about 99.95% of the

damages which includes the values for building, content, and inventory. Business interruption accounts for $9,000 US Dollars (0.05%) of the annualized losses and includes relocation, income, rental and wage costs.

The flood model incorporates National Flood Insurance Program (NFIP) entry dates to distinguish Pre-FIRM and Post-FIRM census blocks. The results provided in this report show the combined total losses for both pre- and post-FIRM values combined.

Table 47 illustrates the expected annualized losses broken down by county and Table 48 includes the annualized losses along with Population and Per-Capita losses.

Table 47: County based Hazus annualized loss for both Pre- and Post-FIRM by building type.

County	Building	Content	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Gloucester	$5,394	$4,552	$31	$0	$1	$0	$6	$9,984
Mathews	$2,170	$1,500	$12	$0	$0	$0	$0	$3,682
King William	$797	$852	$5	$0	$0	$0	$2	$1,656
Middlesex	$657	$490	$1	$0	$0	$0	$0	$1,148
King & Queen	$355	$224	$6	$0	$0	$0	$0	$585
Essex	$548	$493	$6	$0	$0	$0	$0	$1,047
Total	$9,921	$8,111	$61	$0	$1	$0	$8	$18,102
All values in Thousands of Dollars								

Table 48: County based Census 2010 population, Hazus Annualized Loss & Per-Capita Loss.

County	Population[1]	Annualized Loss (US Dollar)	Per-Capita Loss (US Dollar)
Mathews	8,978	$3,682,000	$410.11
Gloucester	36,858	$9,984,000	$270.88
Middlesex	10,959	$1,148,000	$104.75
King William	15,935	$1,656,000	$103.92
Essex	11,151	$1,047,000	$93.89
King & Queen	6,945	$585,000	$84.23
MPPDC Region	**90,826**	**$18,102,000**	**$199.30**
[1] *2010 Census-based population counts - as exists within Hazus stock data.*			

Gloucester County has the highest annualized loss, $9,984,000 US Dollars, accounting for 55.2% of the total losses for Middle Peninsula and 40% of the county's building stock, and ranks second (2nd) in terms of per-capita losses at $270.88. The majority of the expected damages can be attributed to building and content value.

Mathews County has the second highest loss, $3,682,000 US Dollars, accounting for 20.34% of the total annualized losses for Middle Peninsula and 17% of the county's building stock, however has the greatest annualized per-capita loss at $410.11.

Building value loss accounts for approximately 55% of the expected annualized damages and 45% is attributed to content value loss. Table 43 summarizes the property losses and business interruption losses shown for pre- and post-FIRM structures.

Residential building damage represents the majority of the damages, followed closely by the residential content damages. Wood buildings account for $11,529,000 US Dollars, or 62.1% of the annualized damages of which the majority (54.06%) are in Gloucester County. Occupancy results indicate that agricultural, non-profit and industrial have the largest percent of exposure at risk; i.e. these are the predominant occupancy types that intersect the flood hazard. Manufactured homes only account for 5.05% of the total annualized damages but have the highest percentage of building stock at risk to yearly damages. Tables 49 and 50 summarize the property losses and business interruption losses shown by occupancy and building type. The slight differences in the annualized losses for building type and occupancy can be attributed to the Hazus classification methodology (Table 51 and 52).

Table 49: Annualized loss by building type.

Building Type	Building	Contents	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Wood	$6,886	$4,641	$2	$0	$0	$0	$0	$11,529
Masonry	$2,459	$2,122	$6	$0	$0	$0	$2	$4,589
Steel	$329	$1,088	$42	$0	$0	$0	$2	$1,461
Manufactured Housing	$444	$147	$0	$0	$0	$0	$0	$591
Concrete	$80	$289	$5	$0	$0	$0	$1	$375
Annualized Loss	$10,198	$8,287	$55	$0	$0	$0	$5	$18,545
% of Ann. Loss	54.99%	44.69%	0.30%	0%	0%	0%	0.03%	*Hazus-MH (V2.2) results*
Values In Thousands of Dollars								

Table 50: Annualized loss by general occupancy type.

Occupancy Type	Building	Contents	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Residential	$9,244	$5,732	$0	$0	$0	$0	$0	$14,976
Commercial	$426	$1,408	$19	$0	$0	$0	$2	$1,855
Industrial	$161	$352	$41	$0	$0	$0	$0	$554
Non-Profit	$36	$207	$0	$0	$0	$0	$0	$243
Agricultural	$8	$71	$1	$0	$0	$0	$0	$80
Education	$44	$321	$0	$0	$1	$0	$4	$370
Government	$2	$20	$0	$0	$0	$0	$2	$24
Annualized Loss	$9,921	$8,111	$61	$0	$1	$0	$8	$18,102
% of Ann. Loss	54.81%	44.81%	0.34%	0%	0.01%	0%	0.04%	*Hazus-MH (V2.2) results*
Values in Thousands of Dollars								

Table 51: County based Hazus annualized loss by general building type.

County	Total Exposure	Concrete	Masonry	Manufactured Homes	Steel	Wood	Annualized Loss
Gloucester	$7,016,050	$182	$2,549	$320	$904	$6,233	$10,188
Mathews	$1,809,800	$33	$907	$192	$154	$2,543	$3,829
King William	$2,971,513	$103	$440	$3	$212	$903	$1,661
Middlesex	$2,664,664	$13	$292	$23	$57	$813	$1,198
King & Queen	$1,005,717	$6	$136	$31	$25	$404	$602
Essex	$2,231,261	$38	$265	$22	$109	$633	$1,067
Annualized Loss		$375	$4,589	$591	$1,461	$11,529	$18,545
% of Annualized Loss		2.02%	24.75%	3.19%	7.88%	62.17%	*Hazus-MH (V2.2) results*
% of Total Exposure		2.56%	25.25%	2.00%	8.62%	61.56%	
All values in Thousands of Dollars							

Table 52: County based Hazus annualized loss by general occupancy type.

County	Total Exposure	Residen-tial	Comm-ercial	Indust-rial	Non-Profit	Educa-tion	Govern-ment	Agricul-ture	Annualized Loss
Gloucester	$7,016,050	$7,948	$1,227	$249	$153	$354	$8	$45	$9,984
Mathews	$2,231,261	$3,350	$139	$123	$36	$5	$3	$26	$3,682
King William	$2,971,513	$1,285	$243	$65	$39	$6	$12	$6	$1,656
Middlesex	$2,664,664	$1,017	$98	$18	$14	$1	$0	$0	$1,148
King & Queen	$1,005,717	$543	$0	$42	$0	$0	$0	$0	$585
Essex	$1,809,800	$833	$148	$57	$1	$4	$1	$3	$1,047
Annualized Loss		$14,976	$1,855	$554	$243	$370	$24	$80	$18,102
% of Annualized Loss		82.73%	10.25%	3.06%	1.34%	2.04%	0.13%	0.44%	*Hazus-MH (V2.2) results*
% of Exposure		81.05%	11.67%	3.07%	1.25%	1.73%	0.55%	0.68%	

Figures 108 through 114 on the following pages show the total annualized loss for the planning district and individual counties culminating in Figure 115 which categorizes the Total Annualized Losses by Top Ten ranking and a Hotspot overlay representing those areas throughout the MPPDC Region that may require mitigation measures.

Figure 108:

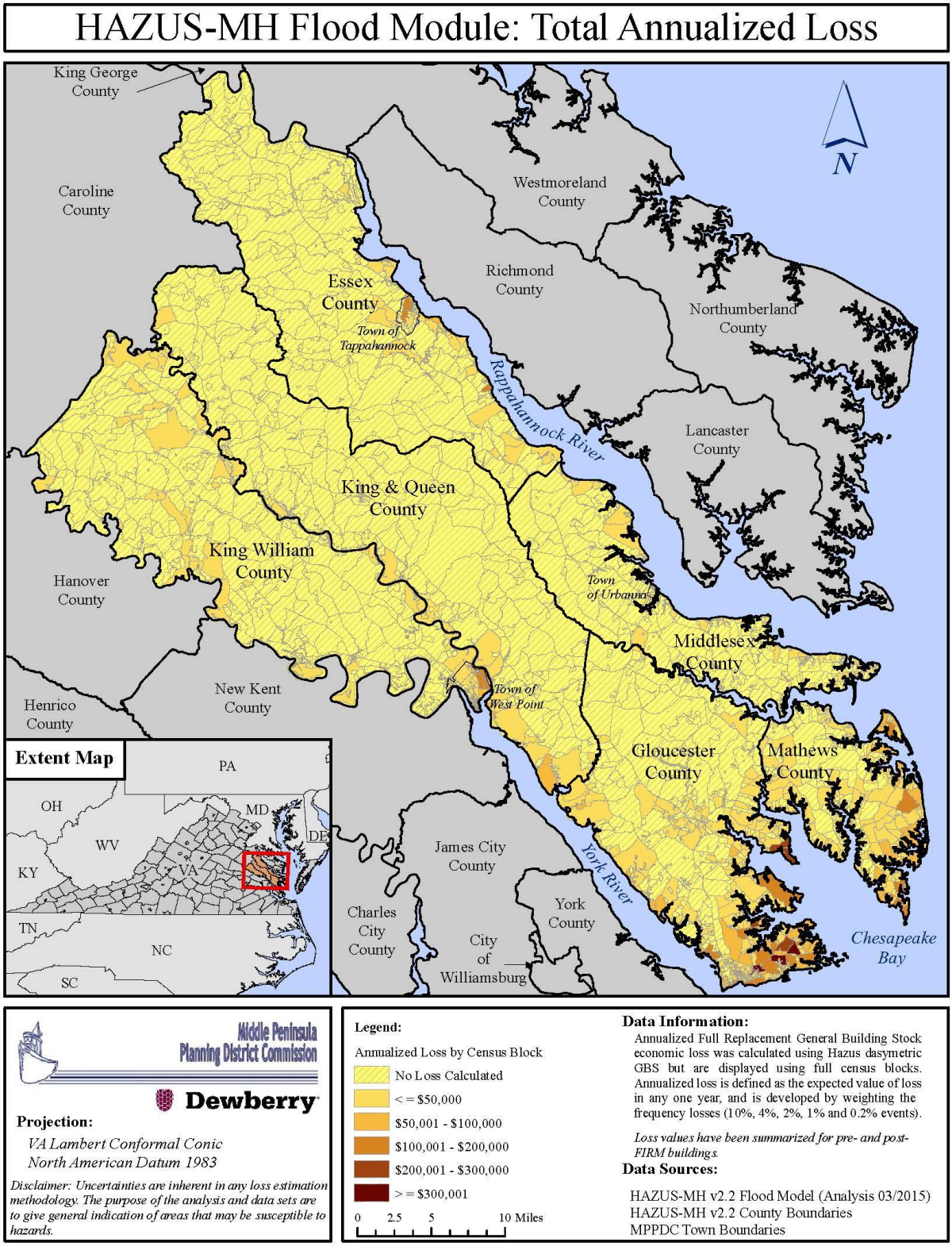

HAZUS-MH Flood Module: Total Annualized Loss
King George County
Caroline County
Westmoreland County
Richmond County
Essex County
Town of Tappahannock
Northumberland County
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
No Loss Calculated
< = $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
> = $300,001
0 2.5 5 10 Miles
Data Information:
Annualized Full Replacement General Building Stock economic loss was calculated using Hazus dasymetric GBS but are displayed using full census blocks. Annualized loss is defined as the expected value of loss in any one year, and is developed by weighting the frequency losses (10%, 4%, 2%, 1% and 0.2% events).
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 109:

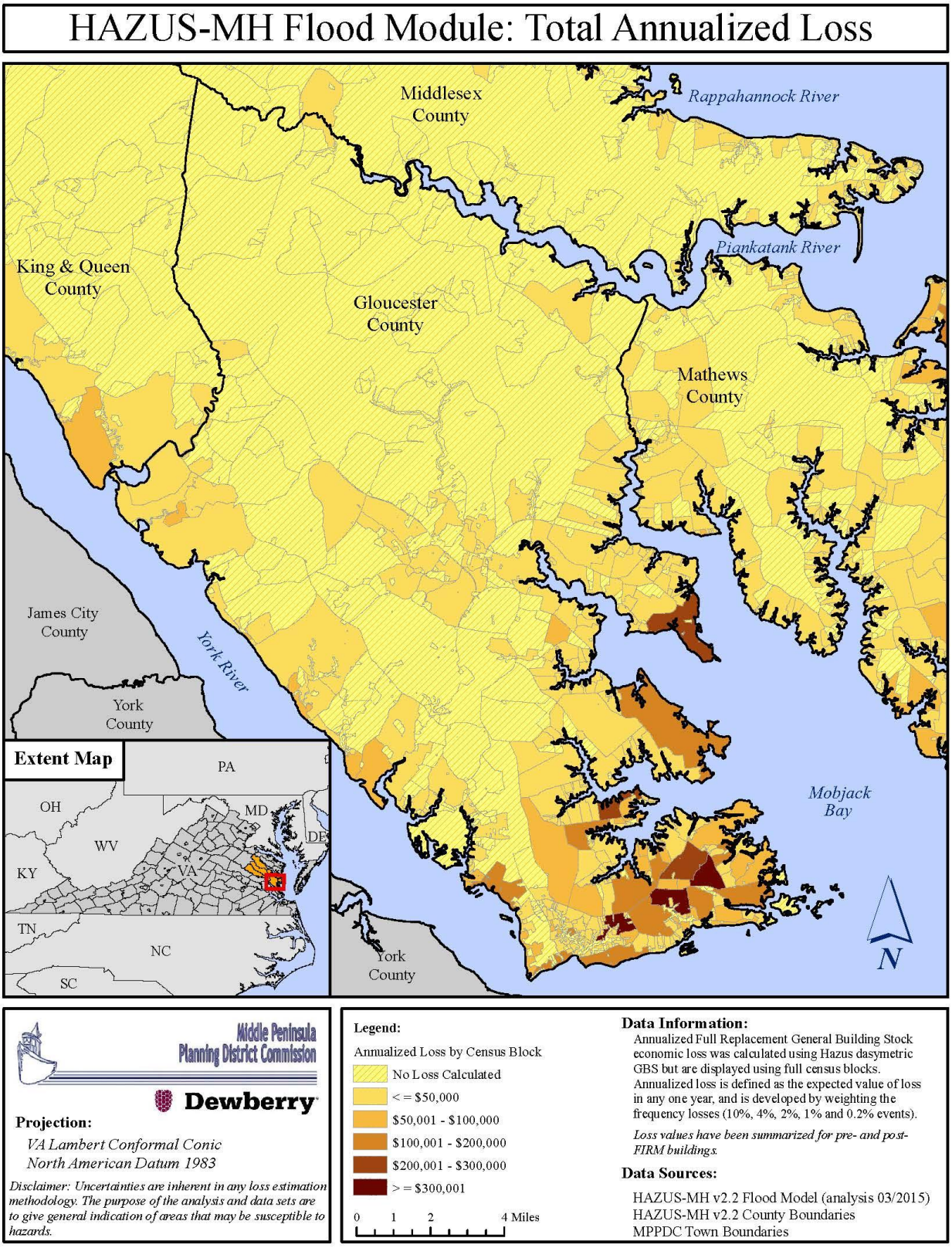

HAZUS-MH Flood Module: Total Annualized Loss
Middlesex County
Rappahannock River
Piankatank River
King & Queen County
Gloucester County
Mathews County
James City County
York River
York County
Mobjack Bay
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
N
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
No Loss Calculated
< = $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
> = $300,001
0 1 2 4 Miles
Data Information:
Annualized Full Replacement General Building Stock economic loss was calculated using Hazus dasymetric GBS but are displayed using full census blocks. Annualized loss is defined as the expected value of loss in any one year, and is developed by weighting the frequency losses (10%, 4%, 2%, 1% and 0.2% events).
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 110:

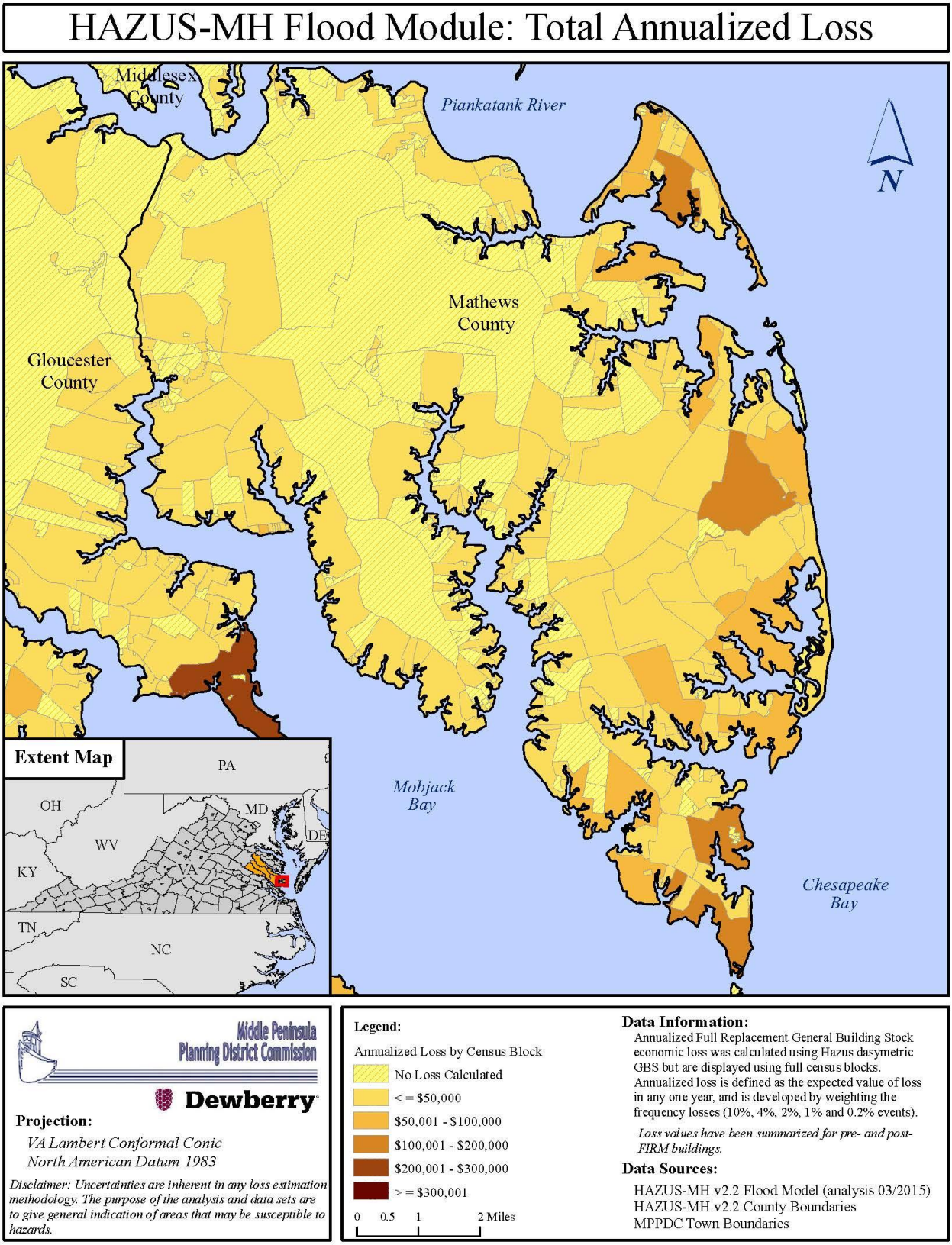

HAZUS-MH Flood Module: Total Annualized Loss
Middlesex County
Piankatank River
N
Mathews County
Gloucester County
Mobjack Bay
Chesapeake Bay
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
No Loss Calculated
< = $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
> = $300,001
0 0.5 1 2 Miles
Data Information:
Annualized Full Replacement General Building Stock economic loss was calculated using Hazus dasymetric GBS but are displayed using full census blocks. Annualized loss is defined as the expected value of loss in any one year, and is developed by weighting the frequency losses (10%, 4%, 2%, 1% and 0.2% events).
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 111:

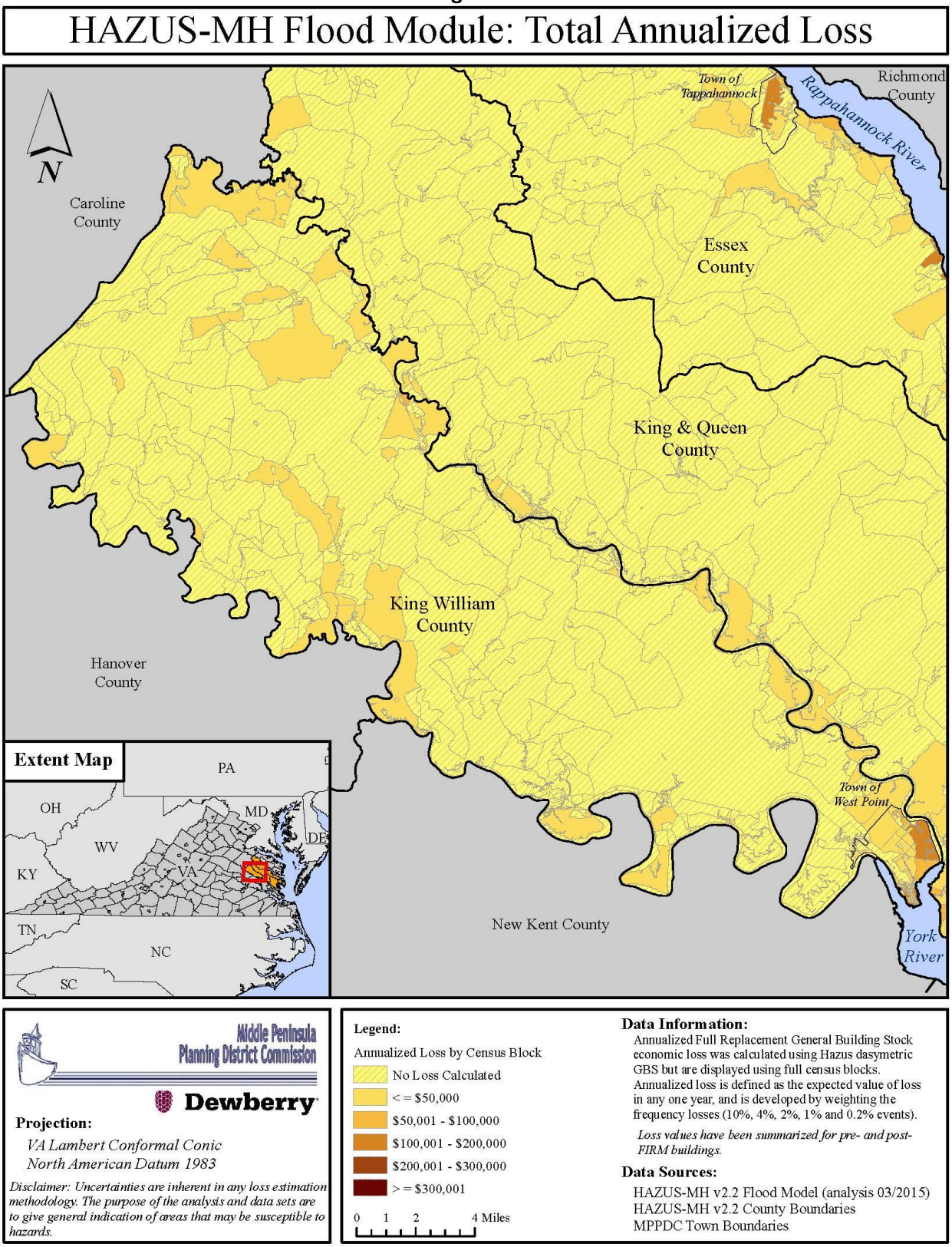

HAZUS-MH Flood Module: Total Annualized Loss
N
Caroline County
Hanover County
King William County
King & Queen County
Essex County
Richmond County
Town of Tappahannock
Rappahannock River
Town of West Point
New Kent County
York River
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
No Loss Calculated
< = $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
> = $300,001
0 1 2 4 Miles
Data Information:
Annualized Full Replacement General Building Stock economic loss was calculated using Hazus dasymetric GBS but are displayed using full census blocks. Annualized loss is defined as the expected value of loss in any one year, and is developed by weighting the frequency losses (10%, 4%, 2%, 1% and 0.2% events).
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 112:

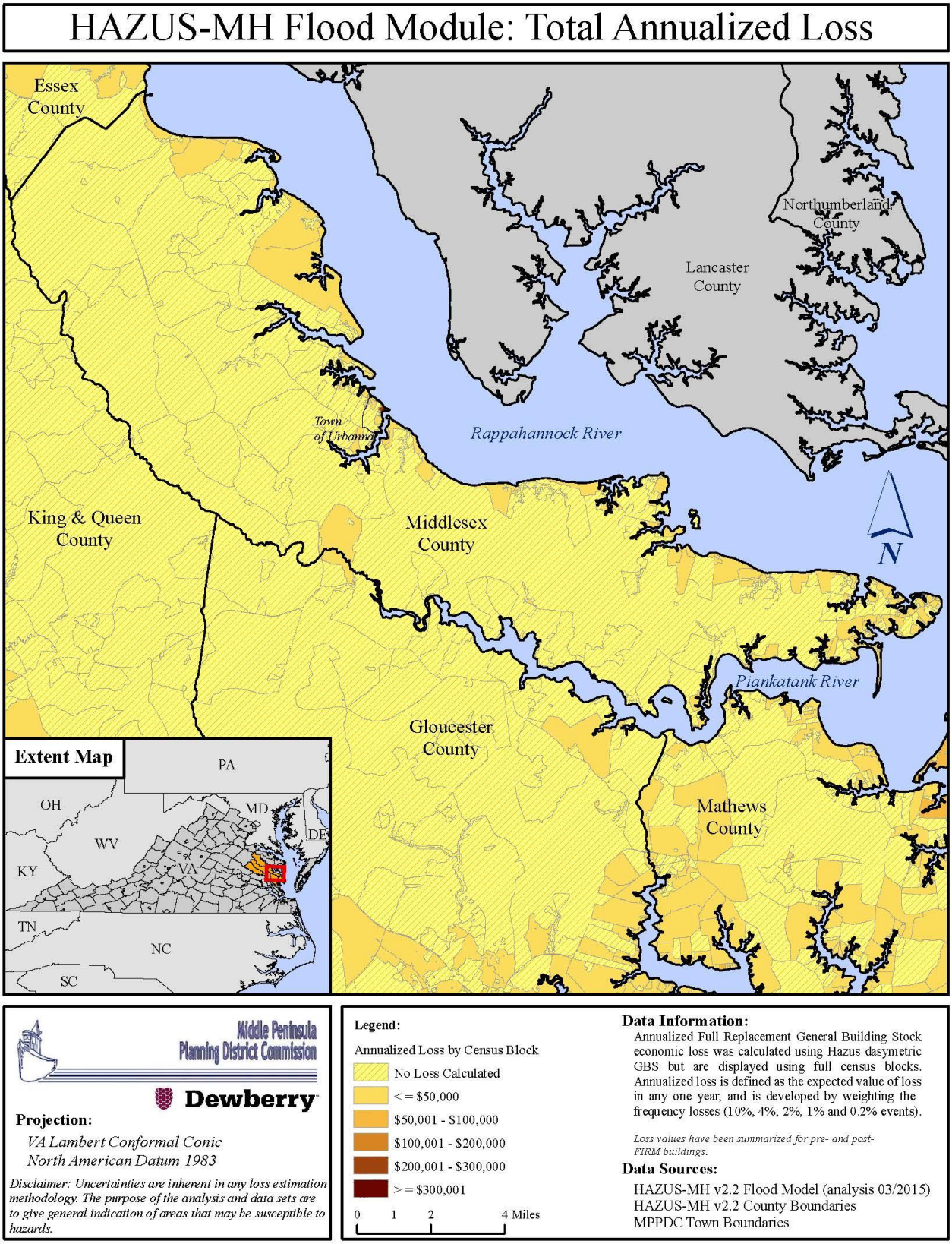

HAZUS-MH Flood Module: Total Annualized Loss
Essex County
Northumberland County
Lancaster County
Town of Urbanna
Rappahannock River
King & Queen County
Middlesex County
N
Piankatank River
Gloucester County
Mathews County
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
No Loss Calculated
< = $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
> = $300,001
0 1 2 4 Miles
Data Information:
Annualized Full Replacement General Building Stock economic loss was calculated using Hazus dasymetric GBS but are displayed using full census blocks. Annualized loss is defined as the expected value of loss in any one year, and is developed by weighting the frequency losses (10%, 4%, 2%, 1% and 0.2% events).
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 113:

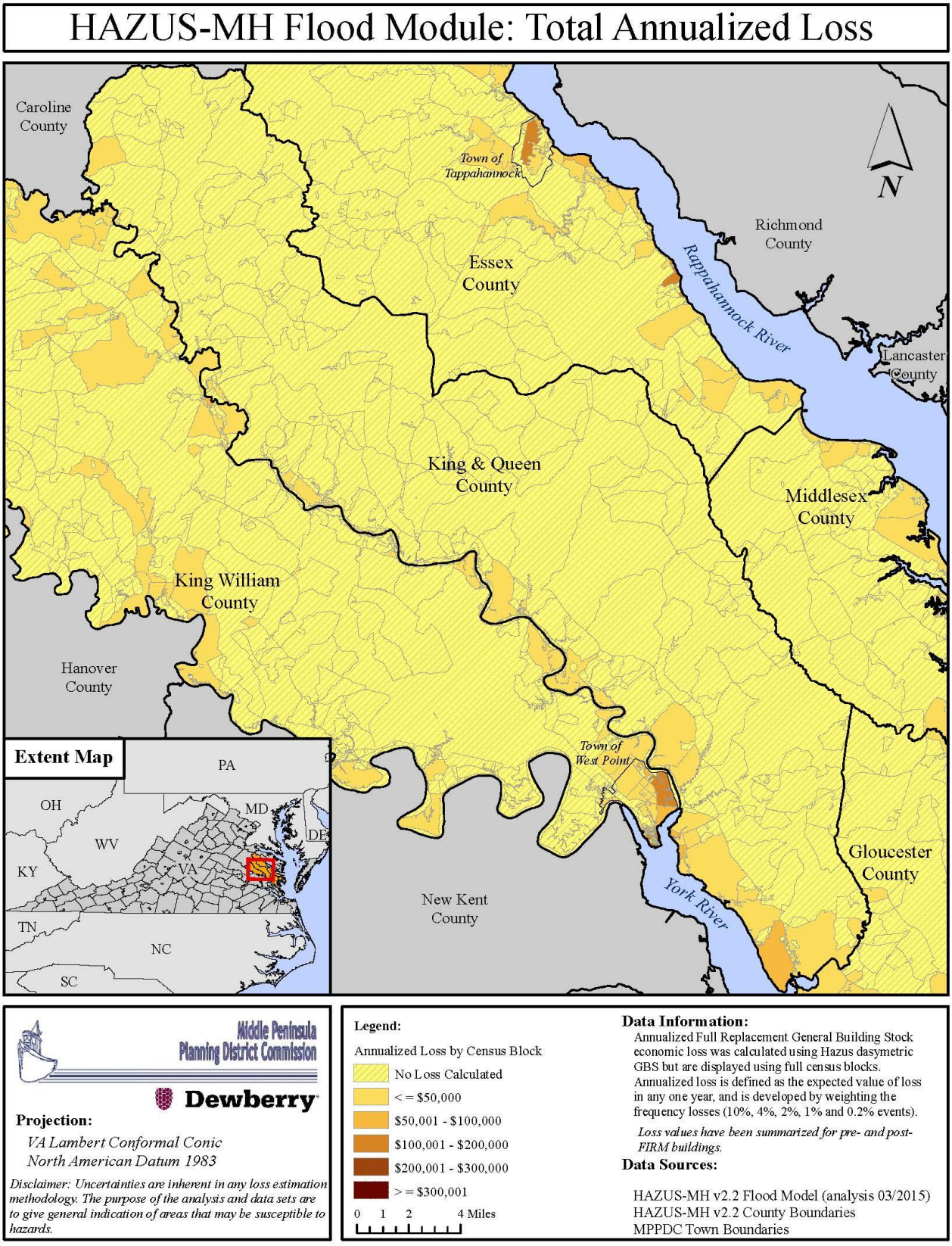

HAZUS-MH Flood Module: Total Annualized Loss
Caroline County
Town of Tappahannock
Essex County
Richmond County
Rappahannock River
Lancaster County
King & Queen County
Middlesex County
King William County
Hanover County
Town of West Point
Gloucester County
New Kent County
York River
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
No Loss Calculated
< = $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
> = $300,001
0 1 2 4 Miles
Data Information:
Annualized Full Replacement General Building Stock economic loss was calculated using Hazus dasymetric GBS but are displayed using full census blocks. Annualized loss is defined as the expected value of loss in any one year, and is developed by weighting the frequency losses (10%, 4%, 2%, 1% and 0.2% events).
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 114:

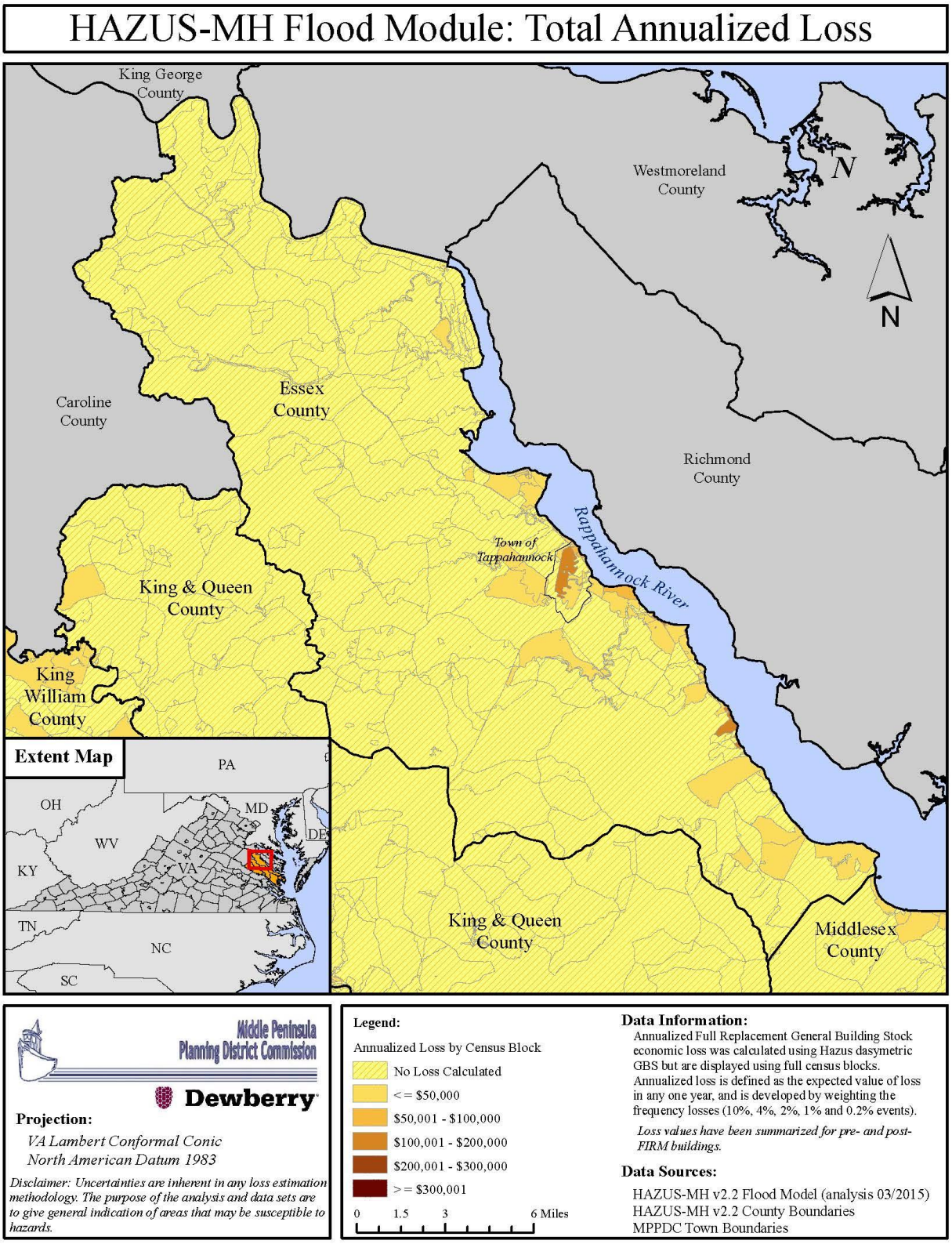
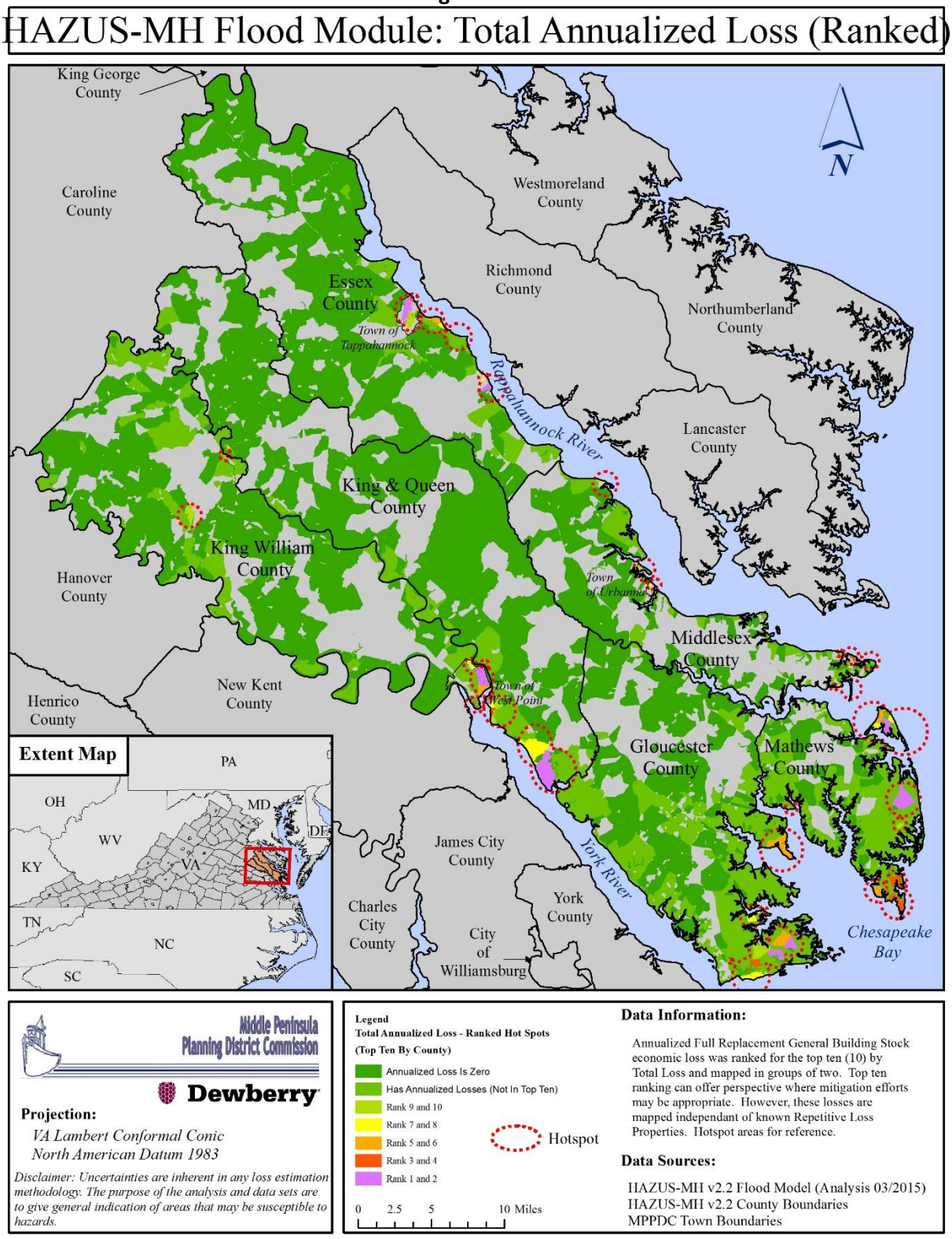

HAZUS-MH Flood Module: Total Annualized Loss
King George County
Westmoreland County
N
N
Caroline County
Essex County
Richmond County
Rappahannock River
Town of Tappahannock
King & Queen County
King William County
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
King & Queen County
Middlesex County
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
No Loss Calculated
<= $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
>= $300,001
0 1.5 3 6 Miles
Data Information:
Annualized Full Replacement General Building Stock economic loss was calculated using Hazus dasymetric GBS but are displayed using full census blocks. Annualized loss is defined as the expected value of loss in any one year, and is developed by weighting the frequency losses (10%, 4%, 2%, 1% and 0.2% events).
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 115:


HAZUS-MH Flood Module: Total Annualized Loss (Ranked)
King George County
Caroline County
Westmoreland County
Richmond County
Northumberland County
Essex County
Town of Tappahannock
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Henrico County
Town of West Point
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend
Total Annualized Loss - Ranked Hot Spots
(Top Ten By County)
Annualized Loss Is Zero
Has Annualized Losses (Not In Top Ten)
Rank 9 and 10
Rank 7 and 8
Rank 5 and 6
Rank 3 and 4
Rank 1 and 2
Hotspot
0 2.5 5 10 Miles
Data Information:
Annualized Full Replacement General Building Stock economic loss was ranked for the top ten (10) by Total Loss and mapped in groups of two. Top ten ranking can offer perspective where mitigation efforts may be appropriate. However, these losses are mapped independant of known Repetitive Loss Properties. Hotspot areas for reference.
Data Sources:
HAZUS-MH v2.2 Flood Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Gloucester County accounts for almost 55.15% of the planning district's annualized losses. The census blocks bordering the York River and Mobjack Bay have higher loss values as compared to the larger census blocks in the northwest portions of the county. Collective damages between both the York River and Mobjack Bay are nearly equivalent. The southeast portion of the County contains the greatest concentration of loss. The vicinity of Guinea Road and Kings Creek Road; beginning in the locale of Hayes and heading east to Kings Creek being bordered on the north by the Severn River and on the south by the York River exhibits the greatest concentration of loss. Additionally, the land area of Saddlers Neck to Stump Point being bounded on the north by the Northwest Branch Severn River and Willetts Creek to the south exhibits a second concentration of risk. Finally, the peninsula and vicinity of Ware Neck Point -where the Ware River and North River converge – is another location exhibiting a concentration of losses.

Losses in Mathews County are spread throughout the county with a high frequency of census block having damages greater than $50,000 US Dollars along the Chesapeake Bay to include the various harbor/haven inlets and also at the confluences of the Piankatank River in the north as well as Mobjack Bay in the south. Another location that exhibits relatively higher loss estimates includes Roys Point in the area around Daniel Avenue. Ultimately, Mathews County ranks second of the six counties and accounts for 20.4% of the total annualized losses in the MPPDC planning district.

The census blocks bordering the Pamunkey and Mattaponi rivers contain almost all of the annualized damages for King William County with the greatest concentration of losses in the Town of West Point. Wood framed structures across the county account for more than 50% of the losses. The total annualized damages for the Town of West Point is approximately $1.3 million US Dollars. Total annualized losses of the Pamunkey Indian Reservation is approximately $40,000 US Dollars and the Mattaponi Indian Reservation is $14,000 US Dollars. Two (2) locations in the northwestern portion of the County exhibit relatively higher annualized loss values; the two areas are in the vicinity of both Manquin and Aylett with Aylett experiencing the greater losses near $145,000 US Dollars and Manquin having estimated losses of $40,000 US Dollars.

Middlesex County's annualized losses account for 6.3% of the total risk with wood framed structures accounting for nearly 68% of the losses. The census blocks along the Rappahannock River collectively account for the greatest amount of losses within the County. Losses in the vicinity of Mud Creek, Balls Point, The Town of Urbanna, and the confluence with the Chesapeake Bay constitute the areas having the highest loss values. The Town of Urbana has an estimated $300,000 US Dollars in annualized damages and includes the census block having the highest estimated loss ($226,000 US Dollars) within the County. The second highest census block loss ($70,000) is located at the confluence between the Rappahannock River and the Chesapeake Bay in the southeastern portion of the County.

King and Queen County has the lowest annualized loss values for the region, accounting for 3.2% of the total damages. Residential occupancy makes up the majority of the losses in the county. A relatively small group of census blocks along the York River account for most of the damages near $400,000 US Dollars. In comparison, along the Mattaponi River damages are in the range of near $100,000 or roughly one-quarter of the expected damages along the York River. Notwithstanding, a small pocket of development at the end of Limehouse Road along the Mattaponi River downstream of Muddy Point and opposite the Town of West Point is an area with annualized losses near $20,000 US Dollars. The majority of damage within Essex County is along the Rappahannock River with the greatest concentration of annualized losses from the Town of Tappahannock in the north, extending downstream to the vicinity of Wares Warf. Total annualized damages along the length of the Rappahannock are approximately $1.34 million. The concentrated damages from Tappahannock to Wares Point is approximately $0.67 million or nearly one-half of the expected damages along the Rappahannock River.

The Town of Tappahannock accounts for approximately $0.34 million or nearly one-half of the expected damages in the area of concentrated damages along the Rappahannock. The county and town combined, account for approximately 5.8% of annualized damages for the MPPDC region.

Comparative Flood Modeling:

Noting the existence of new RiskMAP-based depth grids from recent FEMA studies, presented below are results of running the new coastal-only 1% Annual Chance Flood Hazard (Tables 53-59). As discussed earlier, the new RiskMAP-based depth grid was not utilized to replace the Hazus Level 1 depth grids. However, the study data (i.e., the same study data that would have been used to create the RiskMAP-based depth grid) was utilized in the Level 1 analysis. Again, this included use of the Stillwater Elevations reported for coastal transects in Table 2 – Transect Data for each FEMA Flood Insurance Study. Consequently, the loss values presented below for general comparison, effectually exhibit that losses are relatively close. Consequently, knowing that losses are relatively close is confirmation that the Hazus Level 1 methodology is quite reasonable for the regional estimations and analyses presented. However, in the event that further analyses at smaller mapping scales (e.g., Parcel-level) are warranted in other projects, it would be advisable to use the RiskMAP-based data.

Table 53: MPPDC Loss Comparison – 1% Coastal (RiskMAP vs. Level 1 Methodology).

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
MPPDC Region	100YR_RiskMapCstlOnly [A]	$233,744	$128,057	$104,166	$2,220
MPPDC Region	100YR_LVL1CstlOnly [B]	$236,591	$128,430	$106,547	$2,389
Data in Thousands of Dollars					
Notes:					
[A] Scenario uses depth grids produced for FEMA RiskMAP Studies by USACE circa March 2015.					
[B] Scenario uses depth grids produced from Hazus Level 1 methodology; NED 1-Arc DEMs, 1 mi² Drainage Threshold, most recent coastal water surfaces from FEMA FIS text (Table 2 – Transect Data) for each respective county.					

Table 54: Essex County Loss Comparison – 1% Coastal (RiskMAP vs. Level 1 Methodology).

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
Essex County	100YR_RiskMapCstlOnly [A]	$14,695	$7,541	$7,014	$162
Essex County	100YR_LVL1CstlOnly [B]	$16,421	$8,637	$7,663	$141
Data in Thousands of Dollars					
Notes:					
[A] Scenario uses depth grids produced for FEMA RiskMAP Studies by USACE circa March 2015.					
[B] Scenario uses depth grids produced from Hazus Level 1 methodology; NED 1-Arc DEMs, 1 mi² Drainage Threshold, most recent coastal water surfaces from FEMA FIS text (Table 2 – Transect Data) for each respective county.					

Table 55: Gloucester County Loss Comparison – 1% Coastal (RiskMAP vs. Level 1 Methodology).

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
Gloucester County	100YR_RiskMapCstlOnly [A]	$108,158	$58,259	$49,148	$50,416
Gloucester County	100YR_LVL1CstlOnly [B]	$118,631	$62,714	$55,018	$56,528
Data in Thousands of Dollars					
Notes:					
[A] Scenario uses depth grids produced for FEMA RiskMAP Studies by USACE circa March 2015.					
[B] Scenario uses depth grids produced from Hazus Level 1 methodology; NED 1-Arc DEMs, 1 mi² Drainage Threshold, most recent coastal water surfaces from FEMA FIS text (Table 2 – Transect Data) for each respective county.					

Table 56: King & Queen County Loss Comparison – 1% Coastal (RiskMAP vs. Level 1 Methodology).

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
King Queen County	100YR_RiskMapCstlOnly [A]	$5,152	$3,094	$2,004	$54
King Queen County	100YR_LVL1CstlOnly [B]	$7,140	$4,375	$2,720	$45
Data in Thousands of Dollars					
Notes:					
[A] Scenario uses depth grids produced for FEMA RiskMAP Studies by USACE circa March 2015.					
[B] Scenario uses depth grids produced from Hazus Level 1 methodology; NED 1-Arc DEMs, 1 mi² Drainage Threshold, most recent coastal water surfaces from FEMA FIS text (Table 2 – Transect Data) for each respective county.					

Table 57: King William County Loss Comparison – 1% Coastal (RiskMAP vs. Level 1 Methodology).

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
King William County	100YR_LVL1CstlOnly [B]	$16,553	$7,961	$8,489	$163
King William County	100YR_RiskMapCstlOnly [A]	$18,428	$8,564	$9,737	$194
Data in Thousands of Dollars					
Notes:					
[A] Scenario uses depth grids produced for FEMA RiskMAP Studies by USACE circa March 2015.					
[B] Scenario uses depth grids produced from Hazus Level 1 methodology; NED 1-Arc DEMs, 1 mi² Drainage Threshold, most recent coastal water surfaces from FEMA FIS text (Table 2 – Transect Data) for each respective county.					

Table 58: Mathews County Loss Comparison – 1% Coastal (RiskMAP vs. Level 1 Methodology).

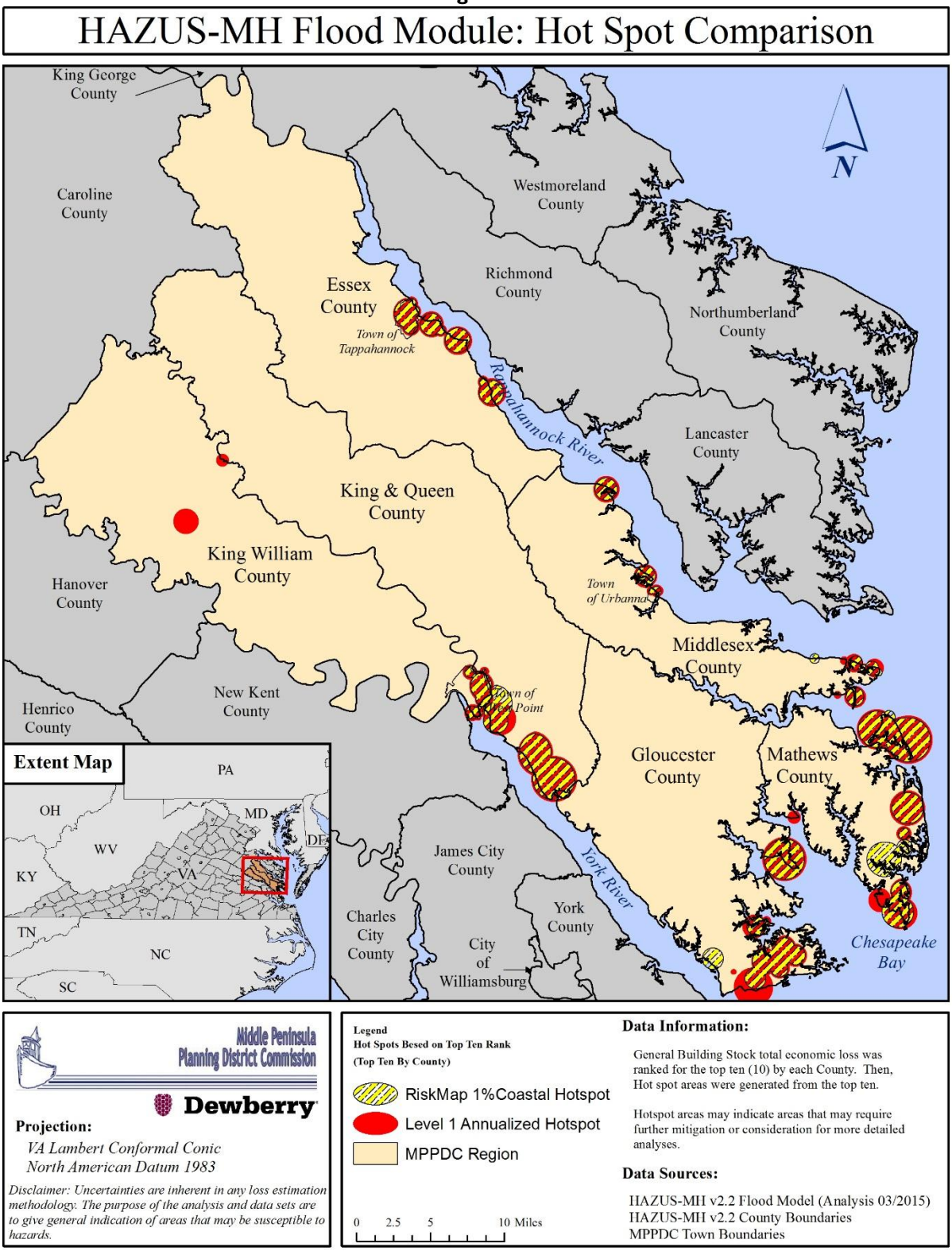
Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
Mathews County	100YR_LVL1CstlOnly [B]	$60,614	$34,946	$25,279	$451
Mathews County	100YR_RiskMapCstlOnly [A]	$65,453	$37,867	$27,188	$466
Data in Thousands of Dollars					
Notes:					
[A] **Scenario uses depth grids produced for FEMA RiskMAP Studies by USACE circa March 2015.**					
[B] **Scenario uses depth grids produced from Hazus Level 1 methodology; NED 1-Arc DEMs, 1 mi² Drainage Threshold, most recent coastal water surfaces from FEMA FIS text (Table 2 – Transect Data) for each respective county.**					

Table 59: Middlesex County Loss Comparison – 1% Coastal (RiskMAP vs. Level 1 Methodology).

Area	Scenario	Total Loss	Building Loss	Contents Loss	Business Disruption
Middlesex County	100YR_LVL1CstlOnly [B]	$17,232	$9,797	$7,378	$79
Middlesex County	100YR_RiskMapCstlOnly [A]	$21,858	$12,732	$9,075	$76
Data in Thousands of Dollars					
Notes:					
[A] **Scenario uses depth grids produced for FEMA RiskMAP Studies by USACE circa March 2015.**					
[B] **Scenario uses depth grids produced from Hazus Level 1 methodology; NED 1-Arc DEMs, 1 mi² Drainage Threshold, most recent coastal water surfaces from FEMA FIS text (Table 2 – Transect Data) for each respective county.**					

A comparison of the "hot spots" that exist form the Level 1 Annualized and the new RiskMAP-based 1% Annual Chance loss estimates reveals very similar results. Figure 116 below, shows the hot spots generated from the two different types of modeling. It can be seen that the new RiskMAP-based analysis shows a number of similarities in the potential flood losses. Any location where the two hot spot types overlap, are locations where the relative risk is considered to be comparative or relatively similar. However, it is important to note that the two (2) Level 1 Annualized Hotspots in northwestern King William County (vicinity of Manquin and Aylett) are areas attributed to Riverine flooding influence. Therefore, the RiskMAP 1% Coastal Hotspots will not reveal these same areas as potential hot spots. Consequently, the RiskMAP 1% Coastal Hotspots will reveal the addition of other new areas given the extents of the costal flood hazard (see Figure 117 – FEMA digital FIRM & RiskMAP 1% Coastal Depth Grid).

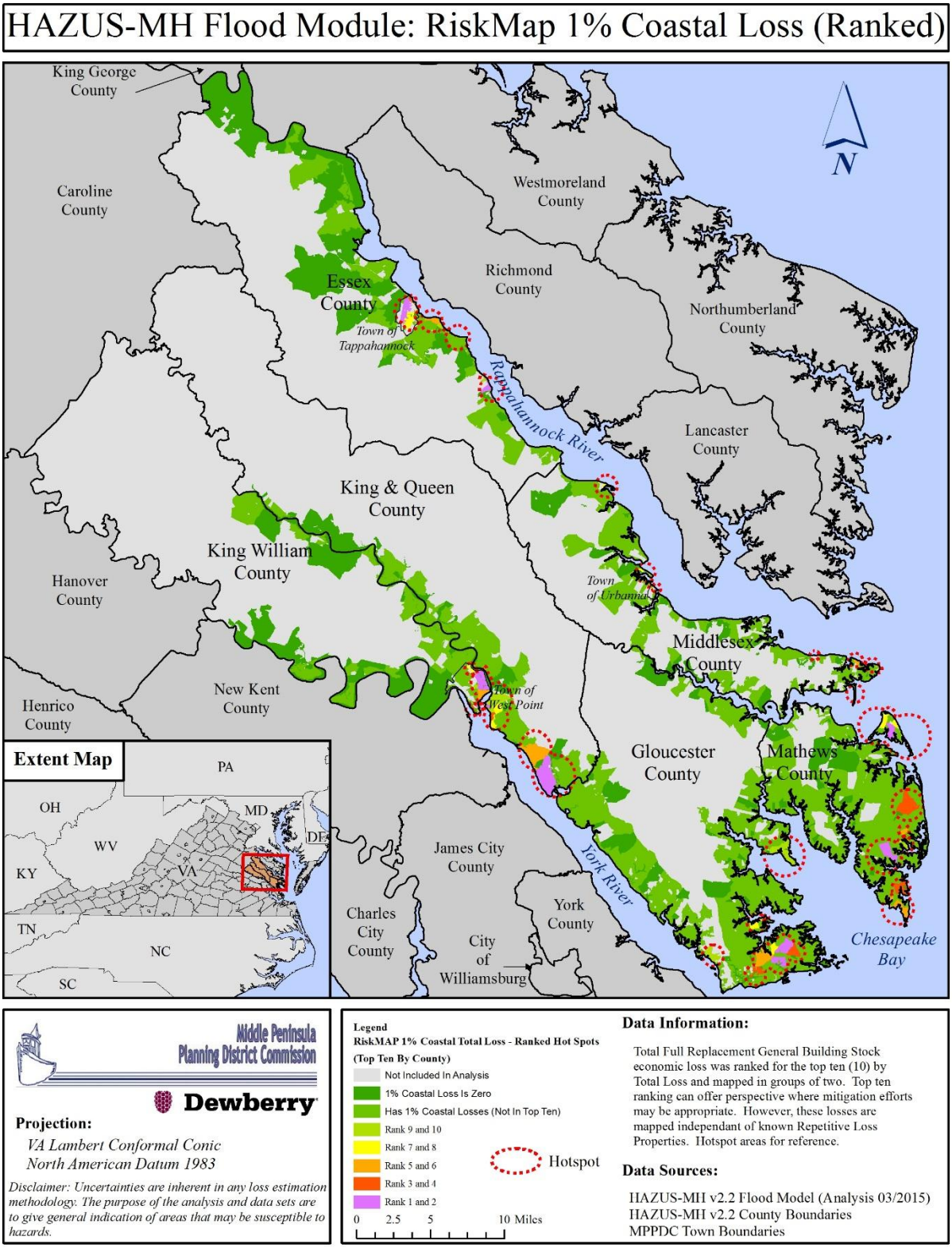
Figure 116:


HAZUS-MH Flood Module: Hot Spot Comparison
King George County
Caroline County
Westmoreland County
Richmond County
Essex County
Town of Tappahannock
Northumberland County
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend
Hot Spots Besed on Top Ten Rank
(Top Ten By County)
RiskMap 1%Coastal Hotspot
Level 1 Annualized Hotspot
MPPDC Region
0 2.5 5 10 Miles
Data Information:
General Building Stock total economic loss was ranked for the top ten (10) by each County. Then, Hot spot areas were generated from the top ten.
Hotspot areas may indicate areas that may require further mitigation or consideration for more detailed analyses.
Data Sources:
HAZUS-MH v2.2 Flood Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Given the coastal focus of the RiskMAP study, it can be seen that a few new areas of consideration include the following:

- Middlesex County – an area along the Rappahannock River where the River confluences with Woods Creek.
- Gloucester County – an area along the York River, east of the Carmines Islands and situated between Carmines Island Road (in the west) and Pigeon Hill Road (in the east).
- Mathews County – portions of land on the northern banks of Horn Harbor and also along Winter Harbor.
- King and Queen County – a greater area (as compared to the Level 1 Annualized Hot Spot) in the vicinity of Mattaponi; i.e., confluence of Mattaponi and York Rivers near State Highway 33 (Lewis B. Puller Memorial Highway).

Figure 117:


HAZUS-MH Flood Module: RiskMap 1% Coastal Loss (Ranked)
King George County
Caroline County
Westmoreland County
Richmond County
Essex County
Town of Tappahannock
Northumberland County
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend
RiskMAP 1% Coastal Total Loss - Ranked Hot Spots
(Top Ten By County)
Not Included In Analysis
1% Coastal Loss Is Zero
Has 1% Coastal Losses (Not In Top Ten)
Rank 9 and 10
Rank 7 and 8
Rank 5 and 6
Rank 3 and 4
Rank 1 and 2
Hotspot
0 2.5 5 10 Miles
Data Information:
Total Full Replacement General Building Stock economic loss was ranked for the top ten (10) by Total Loss and mapped in groups of two. Top ten ranking can offer perspective where mitigation efforts may be appropriate. However, these losses are mapped independant of known Repetitive Loss Properties. Hotspot areas for reference.
Data Sources:
HAZUS-MH v2.2 Flood Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Essential Facilities

Level 1 analysis of essential facilities typically involves using the data provided with Hazus (i.e., Out-of-the-Box). This means the Hazus data of Essential Facilities is used as-is and no local data inputs are utilized. Essential facilities were modeled in this manner which includes the following feature types:

- Medical Care Facilities
- Emergency Operation Centers
- Fire Stations
- Police Stations
- Schools

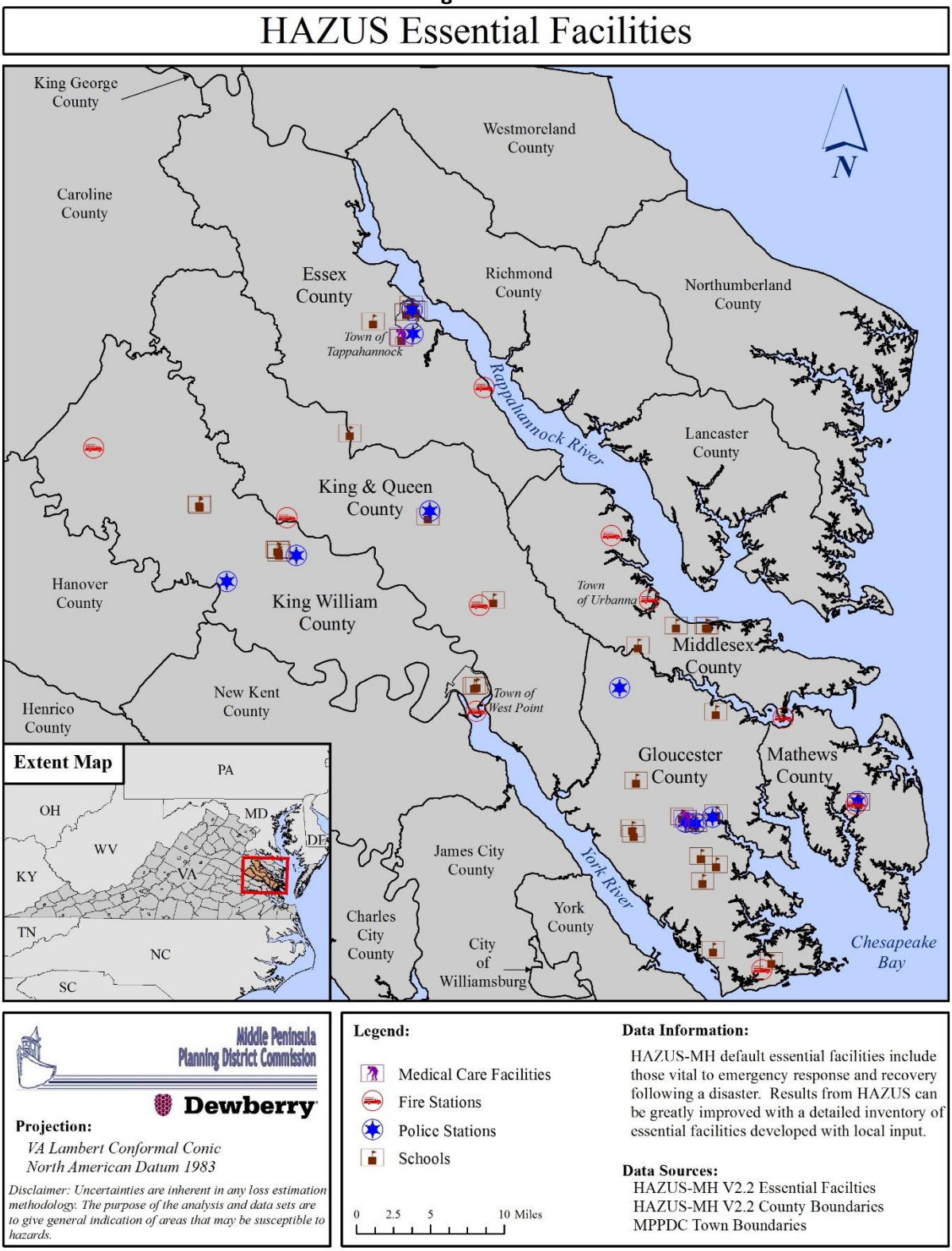
Essential facilities are typically those facility types that are vital to emergency response and recovery following a disaster. School buildings are included in this category because of the key role they often play in sheltering people displaced from damaged homes. Generally there are very few of each type of essential facilities in a census tract, making it easier to obtain site-specific information for each facility. Thus, damage and loss-of-function are evaluated on a building-by-building basis for this class of structures, even though the uncertainty in each such estimate is large[3].

Figure 118 displays the spatial location of the mapped essential facilities as provided with the Hazus software. Thereafter, Figure 114 highlights those facilities that are damaged by the Hazus Level 1 multi-frequency flood hazard(s) – thus experiencing estimated damage and loss.

Future versions of this plan can be enhanced, as illustrated in the mitigation actions, with further Level 2 refinements and Level 3 analyses.

[3] Multi-hazard Loss Estimation Methodology HAZUS-MH V2.2, Chapter 1: Introduction, 1-6

Figure 118:

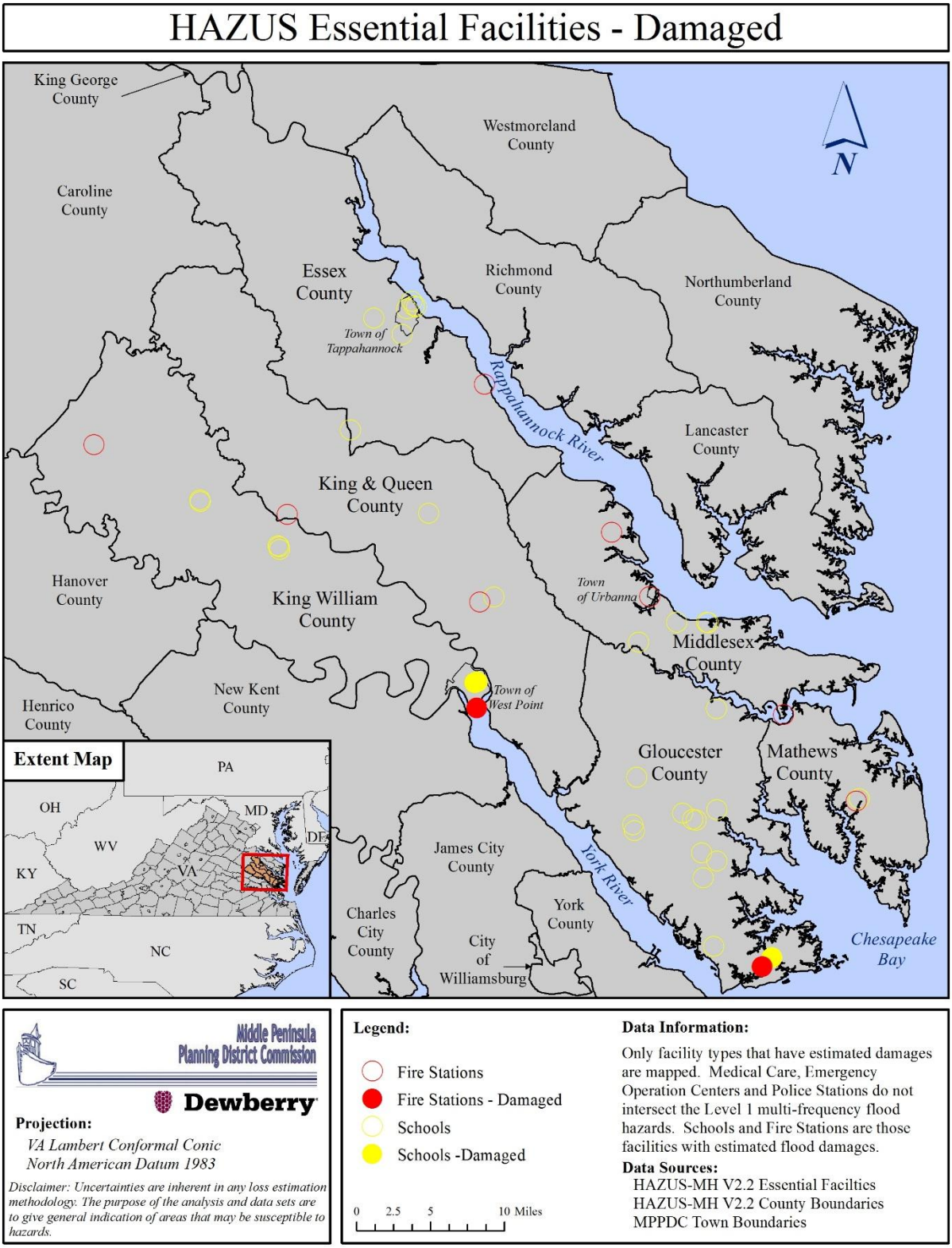

HAZUS Essential Facilities
King George County
Westmoreland County
Caroline County
Essex County
Richmond County
Northumberland County
Town of Tappahannock
Rappahannock River
Lancaster County
King & Queen County
Hanover County
King William County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Medical Care Facilities
Fire Stations
Police Stations
Schools
0 2.5 5 10 Miles
Data Information:
HAZUS-MH default essential facilities include those vital to emergency response and recovery following a disaster. Results from HAZUS can be greatly improved with a detailed inventory of essential facilities developed with local input.
Data Sources:
HAZUS-MH V2.2 Essential Facilties
HAZUS-MH V2.2 County Boundaries
MPPDC Town Boundaries

Name	City	Return Period	Control Hazard	Bldg DmgPct	Bldg Loss (US Dollar)	Contents DmgPct	Cont Loss (US Dollar)	MaxTime toFull Restoration
ACHILLES ELEM.	Hayes	50-YR	Coastal	4.9	$190,476	26.2	$1,028,573	480 days
ACHILLES ELEM.	Hayes	100-YR	Coastal	6.7	$261,818	36.2	$1,420,380	480 days
ACHILLES ELEM.	Hayes	500-YR	Coastal	18.8	$737,641	81.4	$3,194,153	720 days
WEST POINT MIDDLE	West Point	500-YR	Coastal	5.5	$133,548	29.8	$722,392	480 days
WEST POINT ELEM.	West Point	500-YR	Coastal	3.1	$124,359	16.5	$671,537	481 days
WEST POINT HIGH	West Point	500-YR	Coastal	0.5	$15,976	2.4	$86,268	482 days
West Point Volunteer Fire Department & R	West Point	500-YR	Coastal	1.8	$ -	2.0	$ -	483 days
Abingdon Volunteer Fire and Rescue Inc.	Hayes	25-YR	Coastal	9.9	$ -	19.4	$ -	484 days
Abingdon Volunteer Fire and Rescue Inc.	Hayes	50-YR	Coastal	10.9	$ -	35.8	$ -	485 days
Abingdon Volunteer Fire and Rescue Inc.	Hayes	100-YR	Coastal	11.2	$ -	42.0	$ -	486 days
Abingdon Volunteer Fire and Rescue Inc.	Hayes	500-YR	Coastal	27.7	$ -	100.0	$ -	720 days

NOTES:

Fire Station facilities in the stock Hazus Data do not have estimated replacement values associated with the facilities; therefore estimated dollar losses are NULL or void of any valid values.

Figure 119:


HAZUS Essential Facilities - Damaged
King George County
Westmoreland County
Caroline County
Essex County
Richmond County
Northumberland County
Town of Tappahannock
Rappahannock River
Lancaster County
King & Queen County
Hanover County
King William County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Fire Stations
Fire Stations - Damaged
Schools
Schools -Damaged
0 2.5 5 10 Miles
Data Information:
Only facility types that have estimated damages are mapped. Medical Care, Emergency Operation Centers and Police Stations do not intersect the Level 1 multi-frequency flood hazards. Schools and Fire Stations are those facilities with estimated flood damages.
Data Sources:
HAZUS-MH V2.2 Essential Facilties
HAZUS-MH V2.2 County Boundaries
MPPDC Town Boundaries

Potential Mitigation Actions:
The potential mitigation actions noted are those that are Hazus-specific and would benefit refinement of Hazus analyses. The previous Plan update included the following items (below). Those items that have been accomplished in the current Plan update are symbolized with a check-mark (☑) and those that still remain for future efforts (☐). New potential Hazus Mitigation actions are denoted with the following (➢).

- ☑ Complete Hazus flood runs for the 1 sq mi threshold. In most cases, this will need to be done on priority stream reaches as the program does not run efficiently at this level.
- ☑ Re-run Hazus for plan update to reflect 2010 census data.
- ☐ Refine and update data sets for GBS and essential facilities.
    - Improvements in the future should aim to further refine the building stock. Notably, one improvement should include adding any new development that may not have been in the land use/land cover data; e.g., new housing developments, new construction, etc…
    - Perform localized building-level assessments in known areas of loss and or areas subject to likely losses.

Hurricane Wind Analysis

The hurricane wind analysis for the HIRA was completed using the FEMA Hazus – MH V2.2 software. The model uses state of the art wind field models, calibrated and validated hurricane data. Wind speed has been calculated as a function of central pressure, translation speed, and surface roughness. This assessment has been completed for Probabilistic Level 1 analysis. The standard methodology of defining loss potential for any given hazard, includes annualizing the potential over a series of statistical return periods. Annualization is the mathematical method of converting individual losses to a weighted-average that may be experienced in any given year. The standard probabilistic scope pertaining to Hazus Level 1 hurricane wind risk corresponds to annualizing the 0.1%, 0.2%, 0.5%, 1%, 2%, 5%, and 10% wind return periods. In layman's-terms these same annual-chance return periods are often described as the 1,000-year, 500-year, 200-year, 100-year, 50-year, 20-year and 10-year events as shown in Table 60 below:

Table 60: Annual probability based on wind recurrence intervals.

Wind Recurrence Interval	Annual Chance of Occurrence
10 year	10.0%
20 year	5.0%
50 year	2.0%
100 year	1.0%
200 year	0.5%
500 year	0.2%
1000 year	0.1%

Practically, these statistical events represent the chance of being equaled or exceeded in any given year; i.e., the likelihood that a particular event with a given intensity occurs on average at least once every x-years. Once each of these statistical return periods are calculated, an annualized value is computed thus offering a perspective for any given year.

In addition to the Level 1 probabilistic methodology employed, Level 1 analysis is performed on stock data provided with the Hazus software; i.e., no local data inputs. This is an acceptable level of information for mitigation planning; future versions of this plan can be enhanced, as illustrated in the mitigation actions, with additional Level 1 scenarios and/or Level 2 and 3 analyses. Dollar values shown

in this report should only be used to represent cost of large aggregations of building types. Highly detailed, building specific, loss estimations have not been completed for this analysis as they require additional local data inputs. Note that combined wind, storm surge and wave-type scenarios have not been implemented in this Plan update however, the Flood modeling includes various scenarios that include the effects of storm surge and wave-action. Storm surge risk and coastal flooding is discussed in Section 4.

Loss estimation for this Hazus module is based on specific input data. The first type of data includes square footage of buildings for specified types or population. The second type of data includes information on the local economy that is used in estimating losses. Table 61 displays the economic loss categories used to calculate annualized losses by Hazus.

Table 61: Hazus direct economic loss categories and descriptions.

Category Name	Description of Data Input into Model	Hazus Output
Building	Cost per sq ft to repair damage by structural type and occupancy for each level of damage	Cost of building repair or replacement of damaged and destroyed buildings
Contents	Replacement value by occupancy	Cost of damage to building contents
Inventory	Annual gross sales in $ per sq ft	Loss of building inventory as contents related to business activities
Relocation	Multiple factors; primarily a function of Rental Costs ($/ft^2/month) for non-entertainment buildings where damage ≥10%	Relocation expenses (for businesses and institutions); disruption costs to building owners for temporary space.
Income	Income in $ per sq ft per month by occupancy	Capital-related incomes losses as a measure of the loss of productivity, services, or sales
Rental	Rental costs per month per sq ft by occupancy	Loss of rental income to building owners
Wage	Wages in $ per sq ft per month by occupancy	Employee wage loss as described in income loss

A probabilistic scenario Hazus analysis was completed using the planning district as the study area. The individual county results have been derived from this data set.

Middle Peninsula currently has approximately 43,501 structures with an estimated exposure value of approximately $17.7 billion. Average estimated replacement value of buildings in the study area range from $94,000 to $297,000, with the mean approximation value of $134,000 [4]. Eighty-one percent of the planning district's general occupancy is categorized as residential, followed by commercial (12%). Table 62 below provides inventory information for each of the six counties that were included in the analysis. Gloucester County occupies a large percentage (40%) of the building stock exposure for the region.

[4] Previous Plan values adjusted per BLS CPI Inflation Calculator (2000 to 2010) to match Hazus/Census years.

Table 62: Building stock exposure for general occupancies by county.

County	Residential	Commercial	Industrial	Agriculture	Religion	Govt.	Education	Total
Gloucester	$5,698,054	$831,318	$147,429	$32,557	$84,190	$32,437	$190,065	$7,016,050
King William	$2,463,239	$274,254	$110,725	$32,549	$41,687	$24,273	$24,786	$2,971,513
Middlesex	$2,151,683	$354,607	$65,244	$14,045	$26,670	$11,736	$40,679	$2,664,664
Essex	$1,578,275	$402,650	$146,178	$25,395	$28,679	$18,661	$31,423	$2,231,261
Mathews	$1,566,770	$149,340	$45,066	$9,877	$19,875	$6,830	$12,042	$1,809,800
King & Queen	$886,914	$52,850	$29,064	$6,710	$19,927	$2,968	$7,284	$1,005,717
Total	$14,344,935	$2,065,019	$543,706	$121,133	$221,028	$96,905	$306,279	$17,699,005
All values are in thousands of dollars								

Building stock exposure is also classified by building type. General Building Types (GBTs) have been developed as a means to classify the different buildings types. This provides an ability to differentiate between buildings with substantially different damage and loss characteristics. Model building types represent the average characteristics of buildings in a class. The damage and loss prediction models are developed for model building types and the estimated performance is based upon the "average characteristics" of the total population of buildings within each class. Five general classifications have been established, including wood, masonry, concrete, steel and manufactured homes (MH). A brief description of the building types is available in Table 63.

Table 63: Hazus General Building Type classes.

General Building Type	Description
Wood	Wood frame construction
Masonry	Reinforced or unreinforced masonry construction
Steel	Steel frame construction
Concrete	Cast-in-place or pre-cast reinforced concrete construction
MH	Factory-built residential construction

Wood construction represents the majority (61%) of building types in the planning district. Masonry construction accounts for a quarter of the building type exposure. Table 64 below provides building stock exposure for the five main building types.

Table 64: Building stock exposure for general building type by county.

County	Wood	Masonry	Concrete	Steel	Manufactured Home	Total
Gloucester	$4,338,118	$1,782,044	$177,833	$591,235	$126,913	$7,016,143
King William	$1,895,656	$751,978	$61,374	$227,445	$35,155	$2,971,608
Middlesex	$1,631,388	$678,395	$67,789	$225,948	$61,315	$2,664,835
Essex	$1,202,922	$558,827	$102,763	$319,225	$47,615	$2,231,352
Mathews	$1,166,398	$450,836	$32,534	$113,035	$47,165	$1,809,968
King & Queen	$661,413	$247,318	$11,118	$49,521	$36,527	$1,005,897
Total	$10,895,895	$4,469,398	$453,411	$1,526,409	$354,690	$17,699,803
All values are in thousands of dollars						

Multi-frequency Hurricane Modeling – Probabilistic Level 1 methodology

Annualized loss is defined as the expected value of loss in any one year, and is developed by aggregating the losses and exceedance probabilities for the 10-, 20-, 50-, 100-, 200-, 500-, and 1000-year return periods. The following figures illustrate the 3-second peak gust wind speeds for the 100-, 500-, and 1000-year return periods. Wind speeds are based on estimated 3-second gusts in open terrain at 10 meters above the ground at the centroid of each census track. Buildings that must be designed for a 100-year mean recurrence interval wind event include[5]:

- Buildings where more than 300 people congregate in one area
- Buildings that will be used for hurricane or other emergency shelter
- Buildings housing a day care center with capacity greater than 150 occupants
- Buildings designed for emergency preparedness, communication, or emergency operation center or response
- Buildings housing critical national defense functions
- Buildings containing sufficient quantities of hazardous materials

[5] Whole Building Design Guide (WBDG) Wind Safety of the Building Envelop by Tom Smith 5/26/2008

Figure 120:

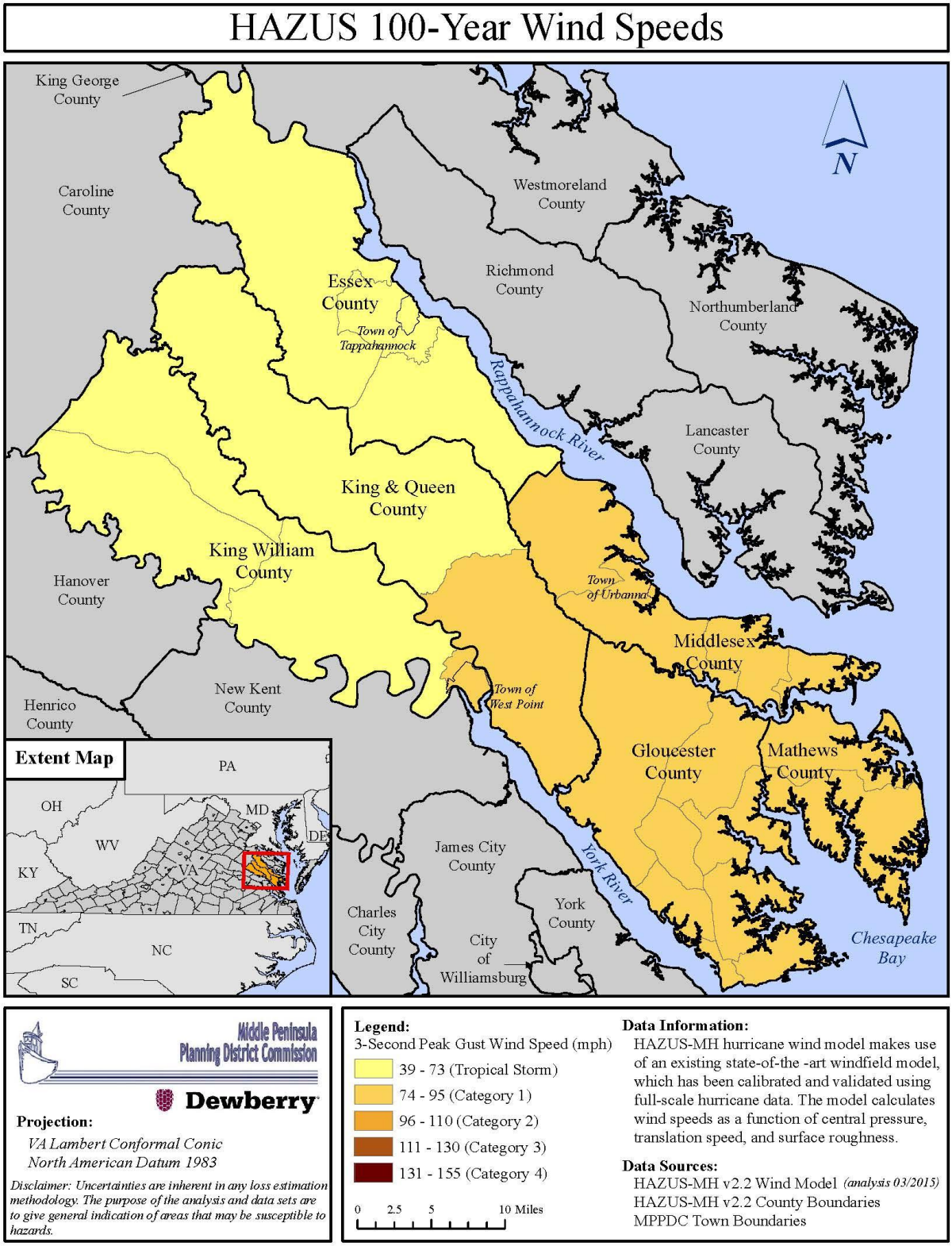

HAZUS 100-Year Wind Speeds
King George County
Caroline County
Westmoreland County
Richmond County
Essex County
Town of Tappahannock
Northumberland County
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
Town of West Point
New Kent County
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
3-Second Peak Gust Wind Speed (mph)
39 - 73 (Tropical Storm)
74 - 95 (Category 1)
96 - 110 (Category 2)
111 - 130 (Category 3)
131 - 155 (Category 4)
0 2.5 5 10 Miles
Data Information:
HAZUS-MH hurricane wind 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 calculates wind speeds as a function of central pressure, translation speed, and surface roughness.
Data Sources:
HAZUS-MH v2.2 Wind Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 121:

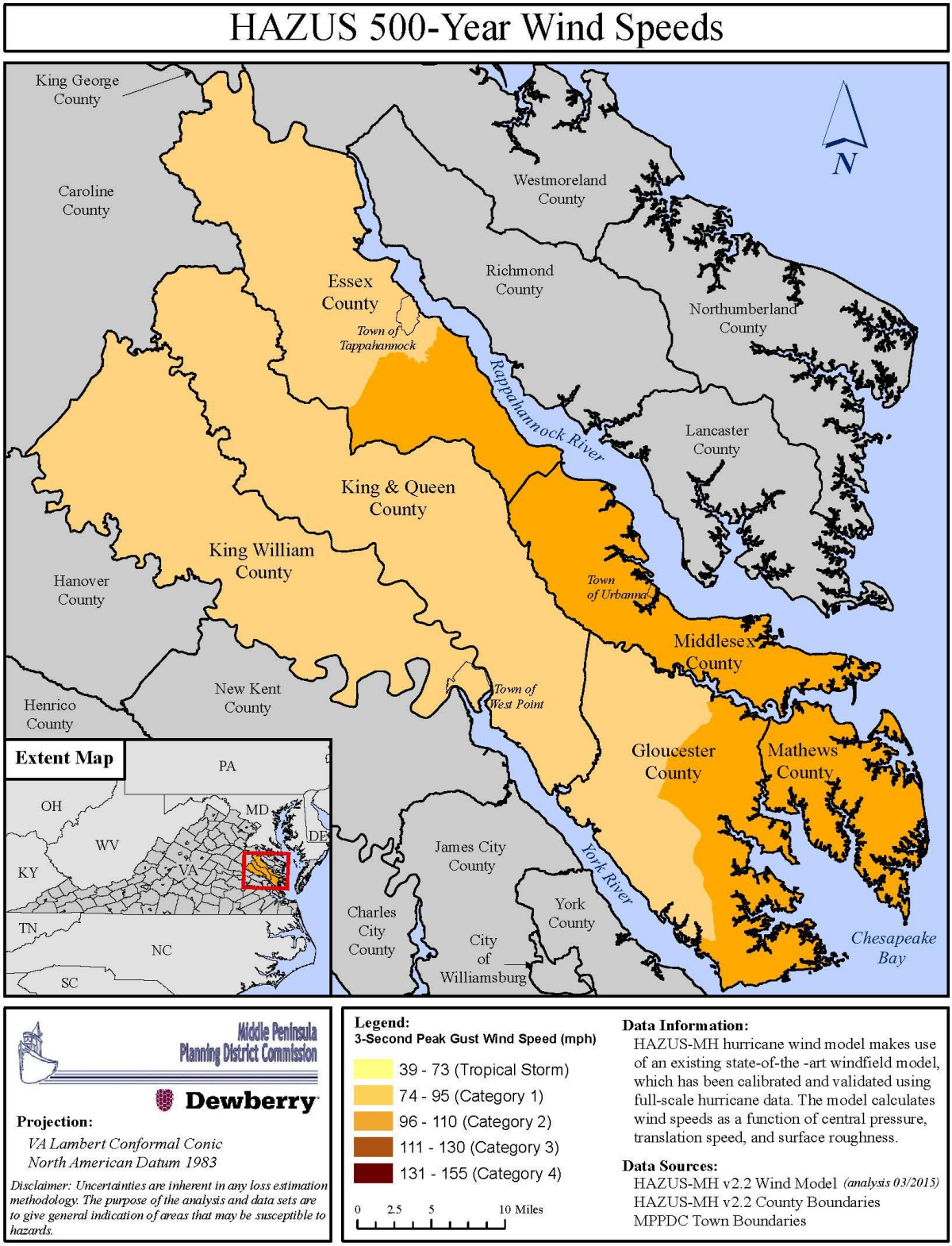
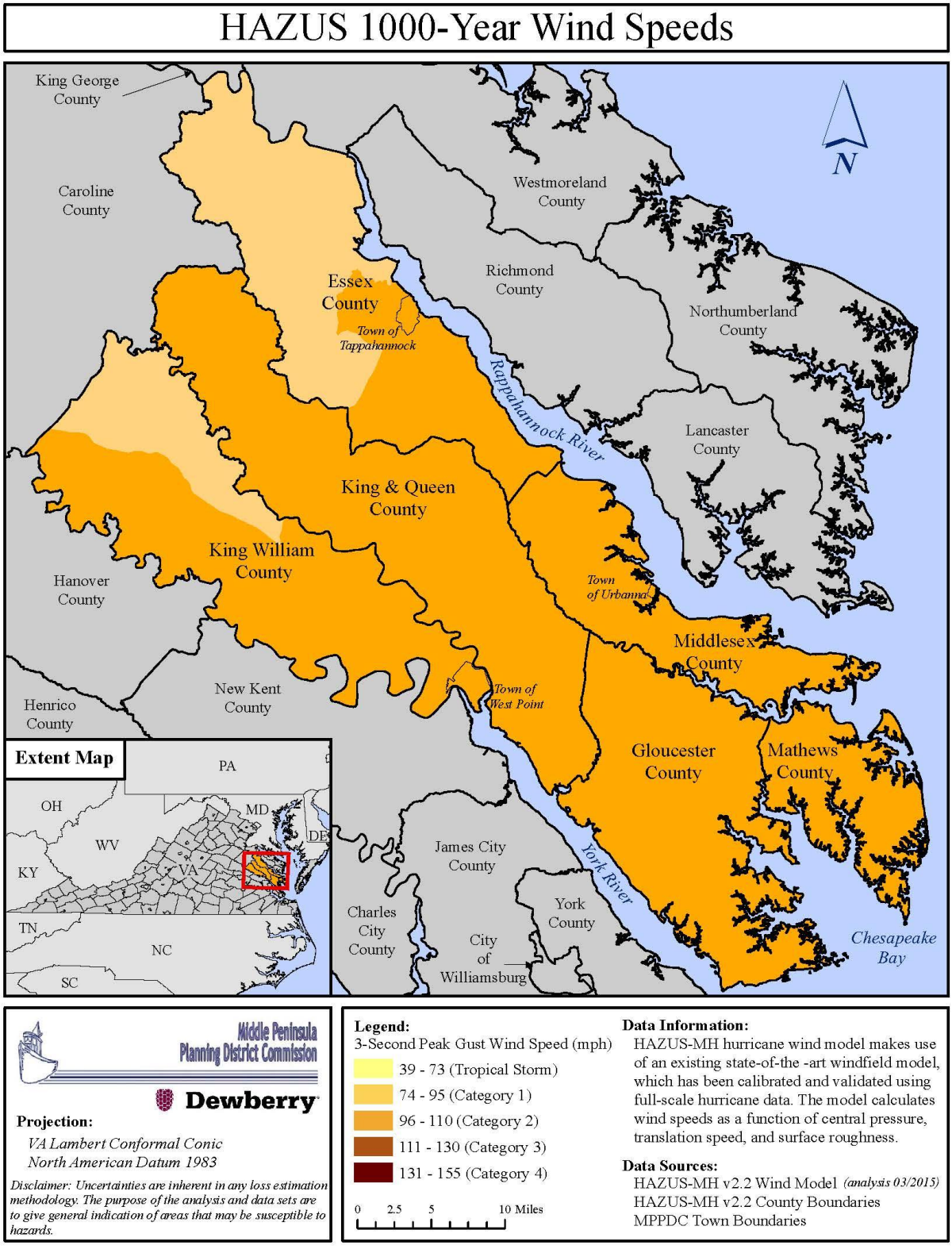

HAZUS 500-Year Wind Speeds
King George County
Caroline County
Westmoreland County
Richmond County
Essex County
Town of Tappahannock
Northumberland County
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
3-Second Peak Gust Wind Speed (mph)
39 - 73 (Tropical Storm)
74 - 95 (Category 1)
96 - 110 (Category 2)
111 - 130 (Category 3)
131 - 155 (Category 4)
0 2.5 5 10 Miles
Data Information:
HAZUS-MH hurricane wind 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 calculates wind speeds as a function of central pressure, translation speed, and surface roughness.
Data Sources:
HAZUS-MH v2.2 Wind Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 122:


HAZUS 1000-Year Wind Speeds
King George County
Caroline County
Westmoreland County
Richmond County
Essex County
Town of Tappahannock
Northumberland County
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
3-Second Peak Gust Wind Speed (mph)
39 - 73 (Tropical Storm)
74 - 95 (Category 1)
96 - 110 (Category 2)
111 - 130 (Category 3)
131 - 155 (Category 4)
0 2.5 5 10 Miles
Data Information:
HAZUS-MH hurricane wind 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 calculates wind speeds as a function of central pressure, translation speed, and surface roughness.
Data Sources:
HAZUS-MH v2.2 Wind Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

General Building Stock Loss Estimation

The probabilistic Hazus-MH hurricane analysis predicts that the Middle Peninsula can annually expect close to $2,516,200 US Dollars in damages due to hurricane wind events. Property or "capital stock" losses of $2,359,300 US Dollars make up about 94% of the damages. This includes the values for buildings, contents, and inventory. Business interruption accounts for approximately $156,900 US Dollars of the annualized losses, or 6%, and includes relocation, income, rental, and wage costs.

Table 65 illustrates the expected annualized losses broken down by county. Gloucester County has the highest annualized loss, $1,242,600 US Dollars, accounting for 49% of the total losses for Middle Peninsula. The majority of the expected damages can be attributed to building and content value.

Mathews County has the second highest loss, $464,930 US Dollars, accounting for 18% of the total annualized losses for Middle Peninsula.

Building value accounts for approximately 66% of the expected annualized damages; residential occupancy makes up the vast majority of these losses. More than 70% of the buildings are categorized as wood frame and 22% masonry construction. Tables 66 and 67 summarize the property losses and business interruption losses shown by occupancy and building type. The slight differences in the annualized losses for building type and occupancy can be attributed to the Hazus classification methodology.

Table 65: County based Hazus annualized loss by all building and occupancy types.

County	Building	Content	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Gloucester	$801.30	$371.43	$0.67	$45.98	$2.89	$15.13	$5.22	$1,242.61
Mathews	$291.59	$145.16	$0.22	$19.93	$0.76	$6.31	$0.96	$464.93
King William	$121.47	$37.33	$0.22	$6.17	$0.27	$2.04	$0.76	$168.26
Middlesex	$263.93	$69.84	$0.25	$24.91	$1.11	$8.21	$1.60	$369.86
King & Queen	$66.90	$27.37	$0.09	$3.70	$0.08	$1.07	$0.13	$99.35
Essex	$111.93	$49.34	$0.27	$6.40	$0.38	$2.19	$0.69	$171.21
Annualized Loss	**$1,657.12**	**$700.47**	**$1.73**	**$107.10**	**$5.49**	**$34.96**	**$9.35**	**$2,516.23**
All values are in thousands of dollars								

Table 66: Annualized loss by general building type in the Middle Peninsula Region.

Building Type	Building	Contents	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Wood	$1,207.35	$550.42	$0.18	$71.02	$1.19	$22.84	$1.76	**$1,853.00**
Masonry	$368.21	$126.01	$0.35	$26.27	$1.62	$8.91	$2.85	**$531.38**
MH	$49.06	$10.01	$0	$4.41	$0	$0.67	$0	**$64.14**
Steel	$26.61	$11.64	$0.99	$4.28	$2.20	$1.85	$3.72	**$47.57**
Concrete	$5.89	$2.39	$0.21	$1.12	$0.48	$0.69	$1.03	**$10.79**
Annualized Loss	**$1,657.12**	**$700.47**	**$1.73**	**$107.10**	**$5.49**	**$34.96**	**$9.35**	**$2,506.88**
% of Ann. Loss	**66.10%**	**27.94%**	**0.07%**	**4.27%**	**0.22%**	**1.39%**	**0.37%**	*Hazus-MH (V2.2) results*
All values (except percentages) are in thousands of dollars								

Table 67: Annualized loss by general occupancy type in the Middle Peninsula Region.

Occupancy Type	Building	Contents	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Residential	$1,585.15	$671.08	$0	$97.18	$0.05	$31.23	$0.11	**$2,384.69**
Commercial	$39.99	$14.15	$0.37	$6.25	$4.30	$3.36	$4.88	**$68.42**
Industrial	$10.77	$7.10	$1.24	$0.71	$0.14	$0.11	$0.23	**$20.08**
Non-Profit	$5.47	$0.90	$0	$0.91	$0.54	$0.08	$1.27	**$7.90**
Education	$5.42	$3.09	$0	$1.08	$0.35	$0.08	$0.83	**$10.04**
Government	$1.42	$0.62	$0	$0.28	$0.02	$0.06	$1.83	**$2.40**
Agricultural	$2.09	$1.64	$0.12	$0.40	$0.01	$0.02	$0.01	**$4.28**
Annualized Loss	**$1,650.32**	**$698.58**	**$1.73**	**$106.81**	**$5.41**	**$34.95**	**$9.17**	**$2,497.81**
% of Ann. Loss	**65.83%**	**27.97%**	**0.07%**	**4.28%**	**0.22%**	**1.40%**	**0.37%**	*Hazus-MH (V2.2) results*
All values (except percentages) are in thousands of dollars								

Residential occupancy accounts for the majority of the damages. Tables 68 and 69 summarize the annualized loss values by county. These values are broken down by building type and general occupancy for comparison. Total exposure has been included as a reference point for damages. Wood structures account for the greatest percentage (62%) of the total annualized damages, with masonry structures next representing near 25% of the total annualized damages.

Table 68: County based Hazus annualized loss by general building type.

County	Total Exposure	Concrete	Masonry	Manufactured Homes	Steel	Wood	Annualized Loss
Gloucester	$7,016,050	$6.27	$257.37	$27.17	$26.51	$925.30	$1,242.61
Mathews	$1,809,800	$1.26	$93.60	$14.09	$6.15	$349.84	$464.93
Middlesex	$2,664,664	$1.99	$87.52	$12.50	$9.04	$258.82	$369.86
Essex	$2,231,261	$1.20	$37.51	$4.48	$5.01	$123.01	$171.21
King William	$2,971,513	$0.90	$38.42	$2.38	$3.56	$123.01	$168.26
King & Queen	$1,005,717	$0.19	$19.81	$3.53	$1.03	$74.79	$99.35
Annualized Loss		$11.82	$534.23	$64.14	$51.29	$1,854.75	$2,516.23
% of Annualized Loss		0.5%	21.2%	2.5%	2.0%	73.7%	*Hazus-MH (V2.2) results*
% of Total Exposure		< 1%	< 1%	< 1%	< 1%	< 1%	
All values (except percentages) are in thousands of dollars							

Table 69: County based Hazus annualized loss by general occupancy type.

County	Total Exposure	Residential	Commercial	Industrial	Non-Profit	Education	Gov.	Agriculture	Annualized Loss
Gloucester	$7,016,050	$1,174.83	$37.91	$7.07	$4.62	$11.14	$2.20	$1.67	$1,239.45
Essex	$2,231,261	$449.32	$8.26	$3.26	$1.41	$0.38	$0.31	$0.70	$463.63
Middlesex	$2,664,664	$345.81	$15.04	$3.02	$1.40	$1.29	$0.60	$0.63	$367.80
Mathews	$1,809,800	$159.34	$6.92	$3.25	$0.50	$0.45	$0.36	$0.55	$171.37
King William	$2,971,513	$158.87	$4.08	$2.63	$0.80	$0.35	$0.72	$0.59	$168.03
King and Queen	$1,005,717	$96.63	$1.09	$1.08	$0.44	$0.05	$0.05	$0.14	$99.49
Annualized Loss		$2,384.80	$73.30	$20.32	$9.17	$13.66	$4.23	$4.29	$2,509.77
% of Annualized Loss		95.02%	2.92%	0.81%	0.37%	0.54%	0.17%	0.17%	*Hazus-MH (V2.2) results*
% of Exposure		< 1%	< 1%	< 1%	< 1%	< 1%	< 1%	< 1%	
All values (except percentages) are in thousands of dollars									

Figures 123 through 130 on the following pages show the total annualized losses mapped for the planning district and individual counties.

Figure 123:

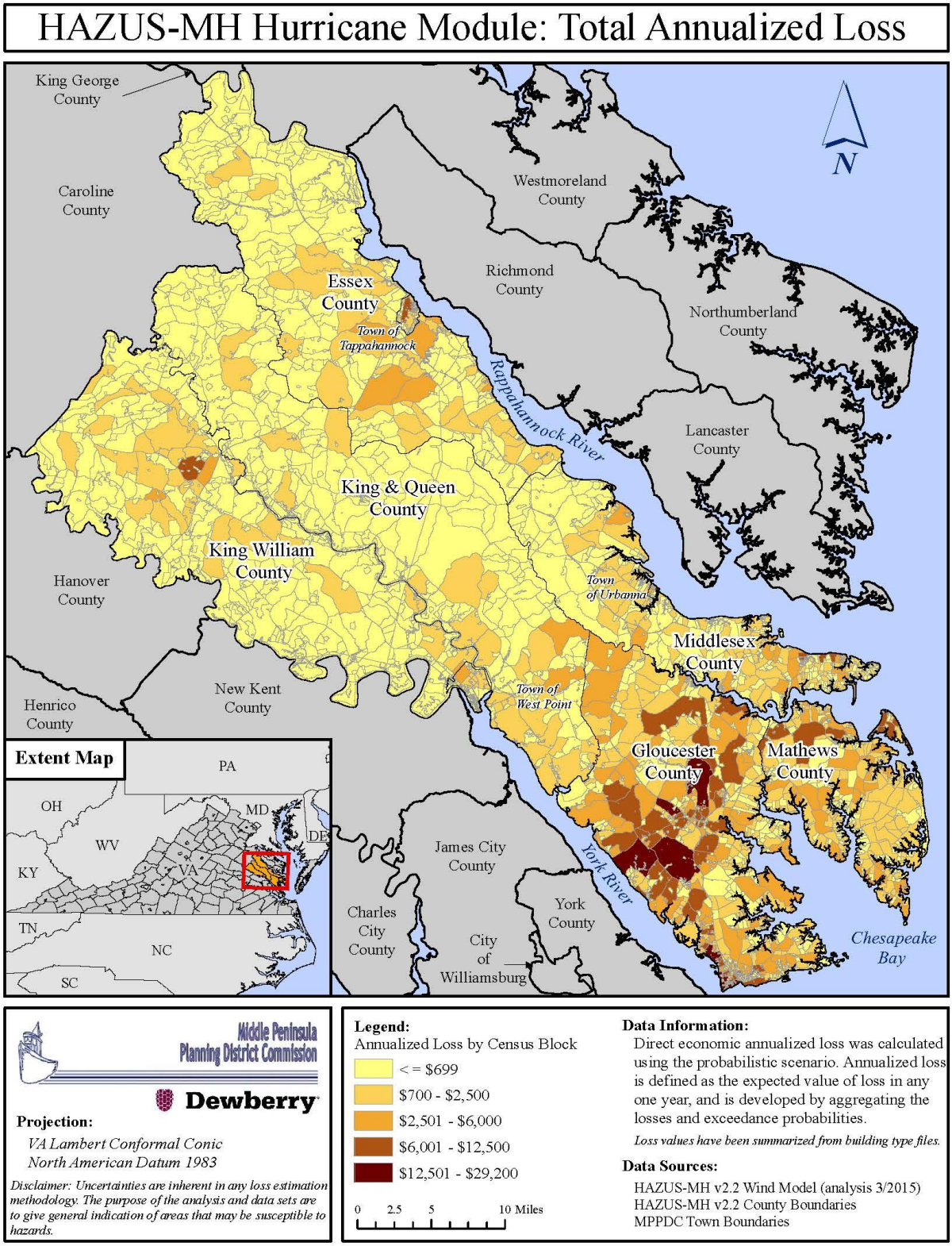

HAZUS-MH Hurricane Module: Total Annualized Loss
King George County
Caroline County
Westmoreland County
Richmond County
Northumberland County
Essex County
Town of Tappahannock
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
<= $699
$700 - $2,500
$2,501 - $6,000
$6,001 - $12,500
$12,501 - $29,200
0 2.5 5 10 Miles
Data Information:
Direct economic annualized loss was calculated using the probabilistic scenario. Annualized loss is defined as the expected value of loss in any one year, and is developed by aggregating the losses and exceedance probabilities.
Loss values have been summarized from building type files.
Data Sources:
HAZUS-MH v2.2 Wind Model (analysis 3/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 124:

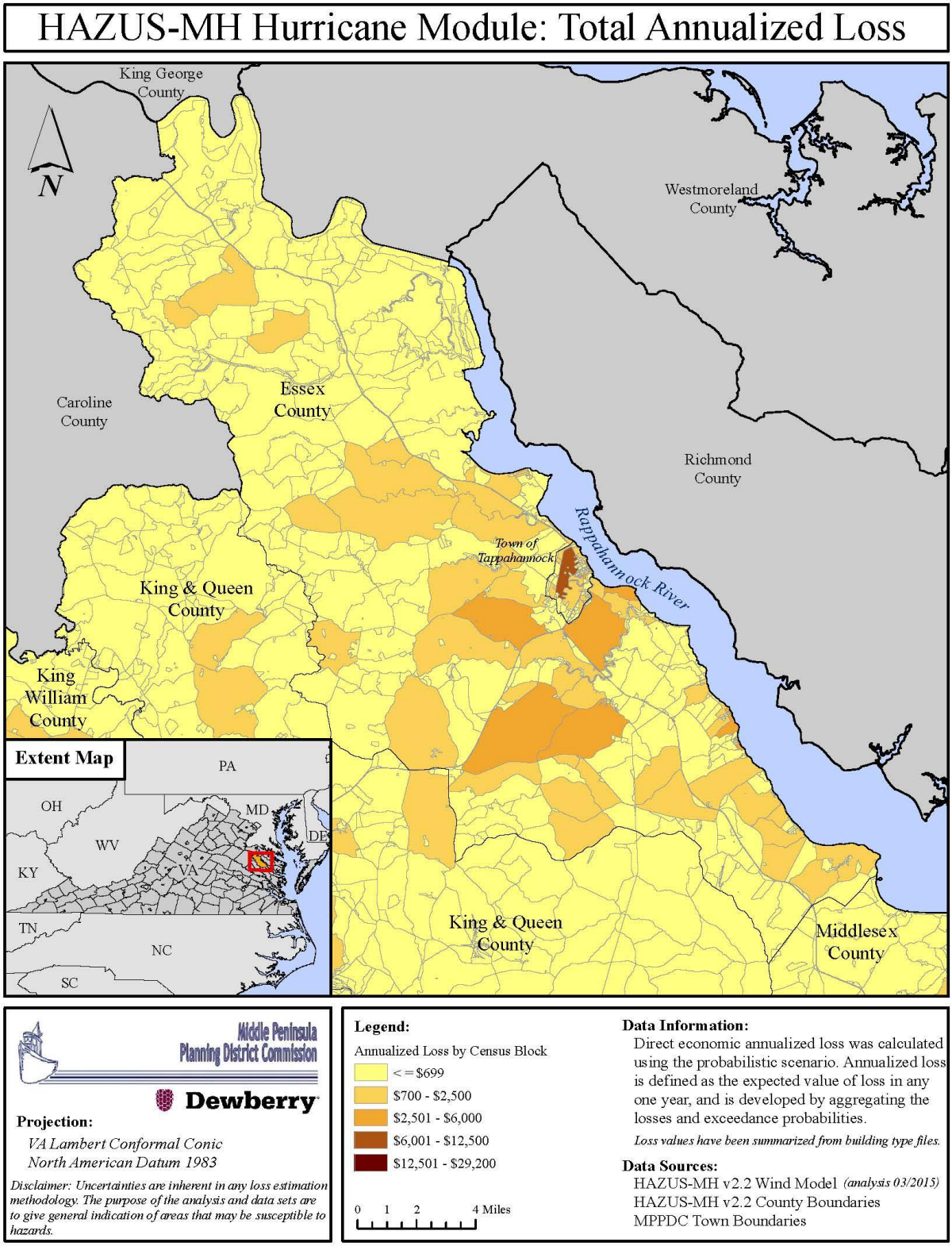

HAZUS-MH Hurricane Module: Total Annualized Loss
King George County
N
Westmoreland County
Caroline County
Essex County
Richmond County
Rappahannock River
Town of Tappahannock
King & Queen County
King William County
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
King & Queen County
Middlesex County
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
< = $699
$700 - $2,500
$2,501 - $6,000
$6,001 - $12,500
$12,501 - $29,200
0 1 2 4 Miles
Data Information:
Direct economic annualized loss was calculated using the probabilistic scenario. Annualized loss is defined as the expected value of loss in any one year, and is developed by aggregating the losses and exceedance probabilities.
Loss values have been summarized from building type files.
Data Sources:
HAZUS-MH v2.2 Wind Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 125:

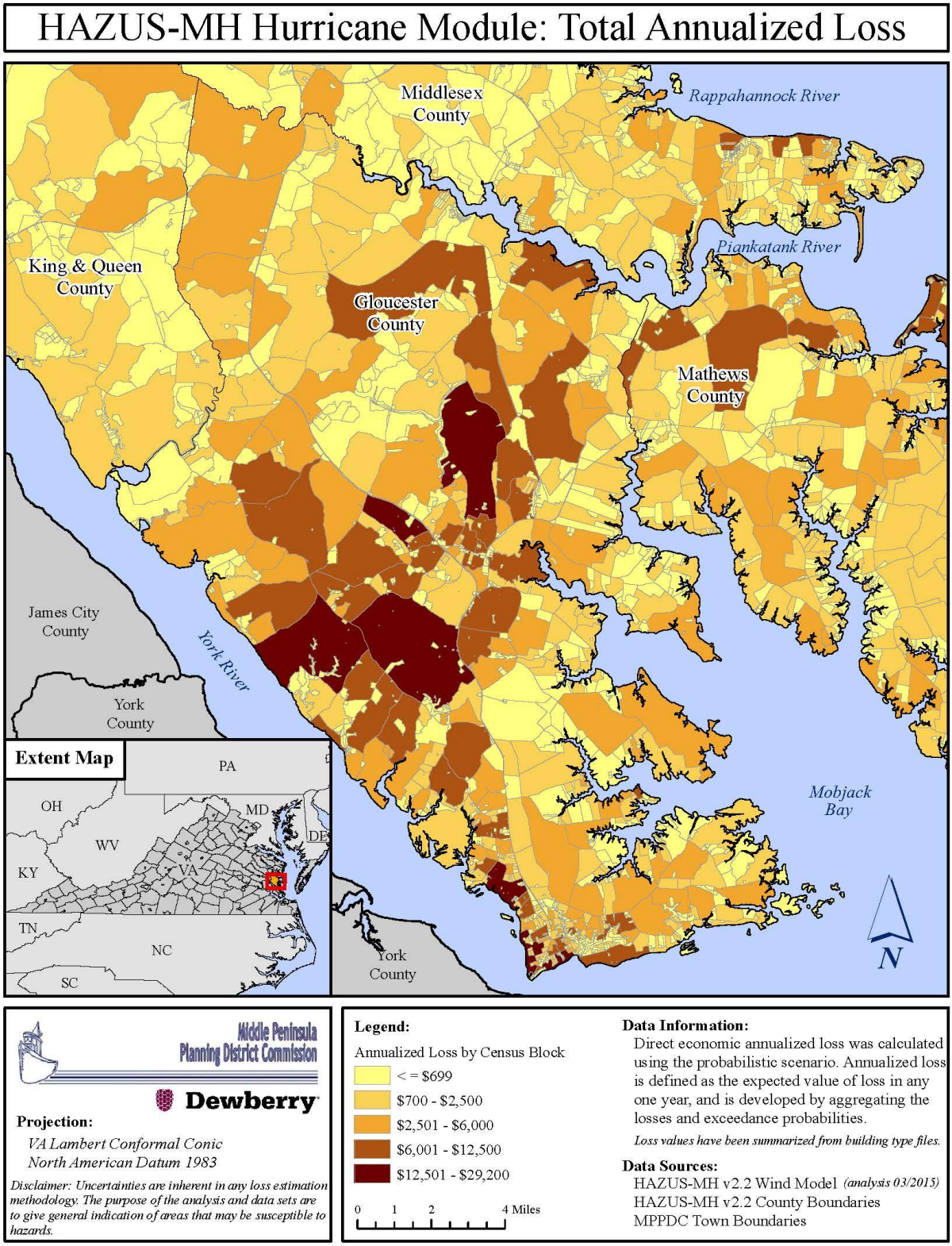

HAZUS-MH Hurricane Module: Total Annualized Loss
Middlesex County
Rappahannock River
Piankatank River
King & Queen County
Gloucester County
Mathews County
James City County
York River
York County
Mobjack Bay
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
N
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
< = $699
$700 - $2,500
$2,501 - $6,000
$6,001 - $12,500
$12,501 - $29,200
0 1 2 4 Miles
Data Information:
Direct economic annualized loss was calculated using the probabilistic scenario. Annualized loss is defined as the expected value of loss in any one year, and is developed by aggregating the losses and exceedance probabilities.
Loss values have been summarized from building type files.
Data Sources:
HAZUS-MH v2.2 Wind Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 126:

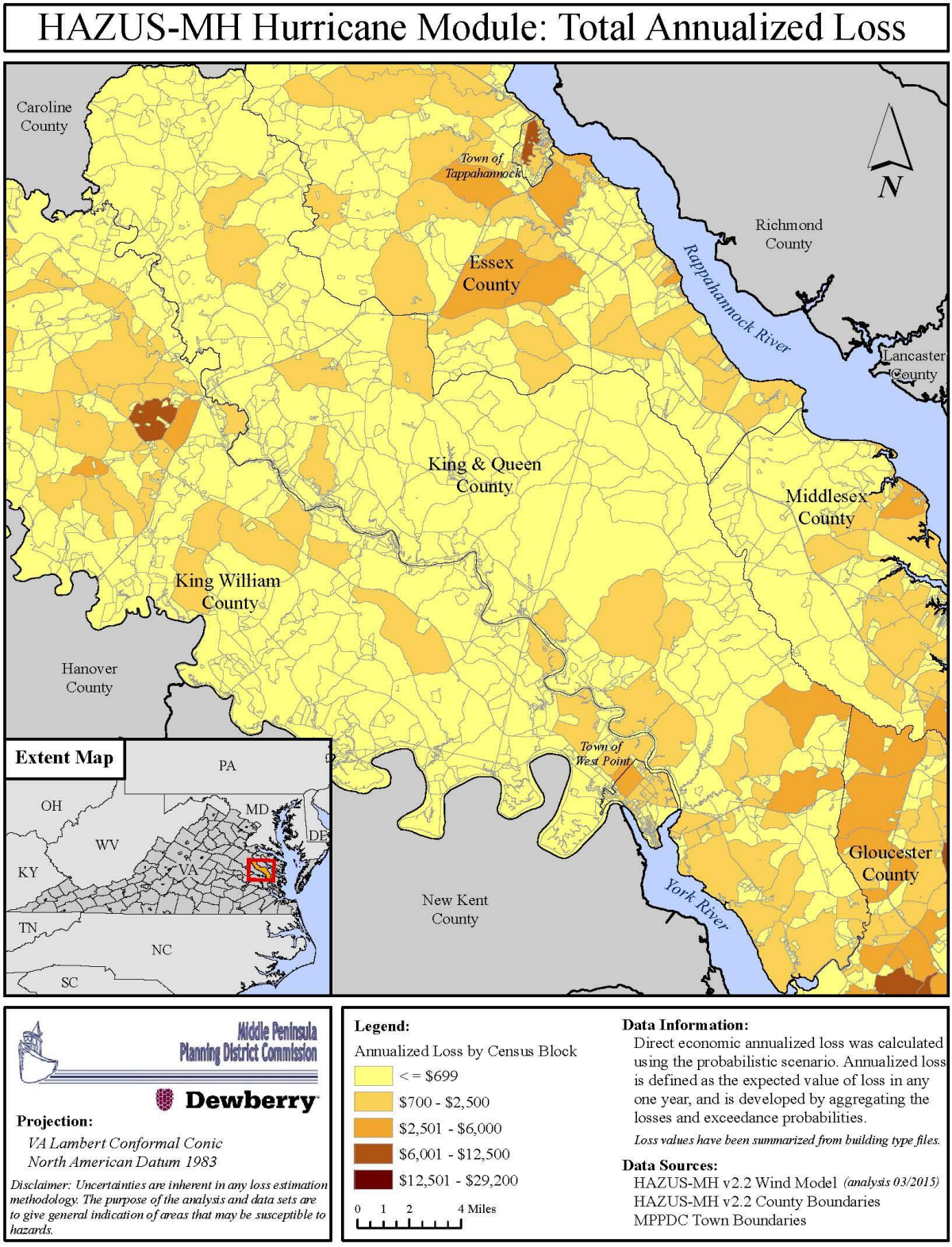

HAZUS-MH Hurricane Module: Total Annualized Loss
Caroline County
Town of Tappahannock
Essex County
Richmond County
Rappahannock River
Lancaster County
King & Queen County
Middlesex County
King William County
Hanover County
Town of West Point
Gloucester County
New Kent County
York River
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
<= $699
$700 - $2,500
$2,501 - $6,000
$6,001 - $12,500
$12,501 - $29,200
0 1 2 4 Miles
Data Information:
Direct economic annualized loss was calculated using the probabilistic scenario. Annualized loss is defined as the expected value of loss in any one year, and is developed by aggregating the losses and exceedance probabilities.
Loss values have been summarized from building type files.
Data Sources:
HAZUS-MH v2.2 Wind Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 127:

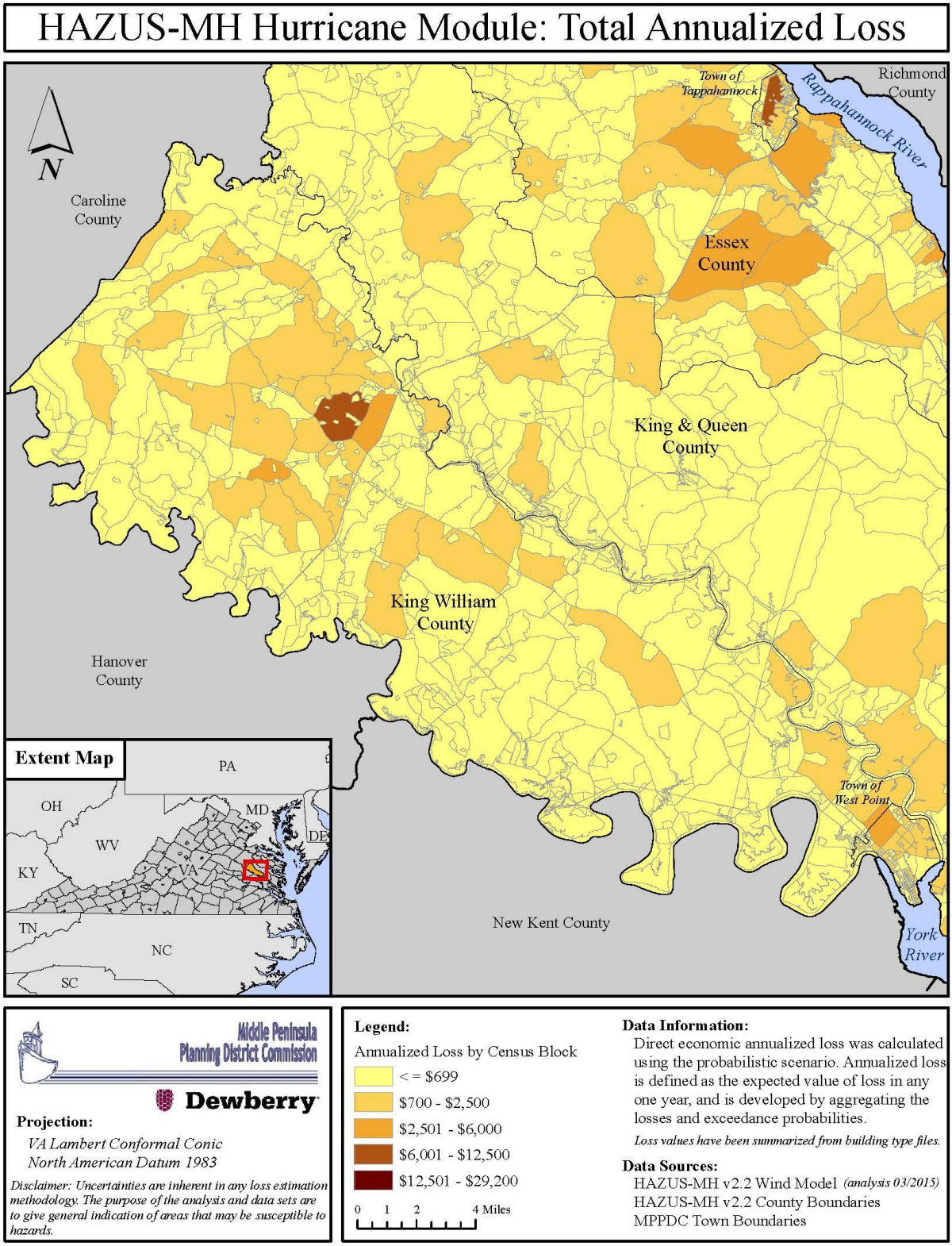

HAZUS-MH Hurricane Module: Total Annualized Loss
N
Caroline County
Town of Tappahannock
Richmond County
Rappahannock River
Essex County
King & Queen County
King William County
Hanover County
New Kent County
Town of West Point
York River
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
<= $699
$700 - $2,500
$2,501 - $6,000
$6,001 - $12,500
$12,501 - $29,200
0 1 2 4 Miles
Data Information:
Direct economic annualized loss was calculated using the probabilistic scenario. Annualized loss is defined as the expected value of loss in any one year, and is developed by aggregating the losses and exceedance probabilities.
Loss values have been summarized from building type files.
Data Sources:
HAZUS-MH v2.2 Wind Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 128:

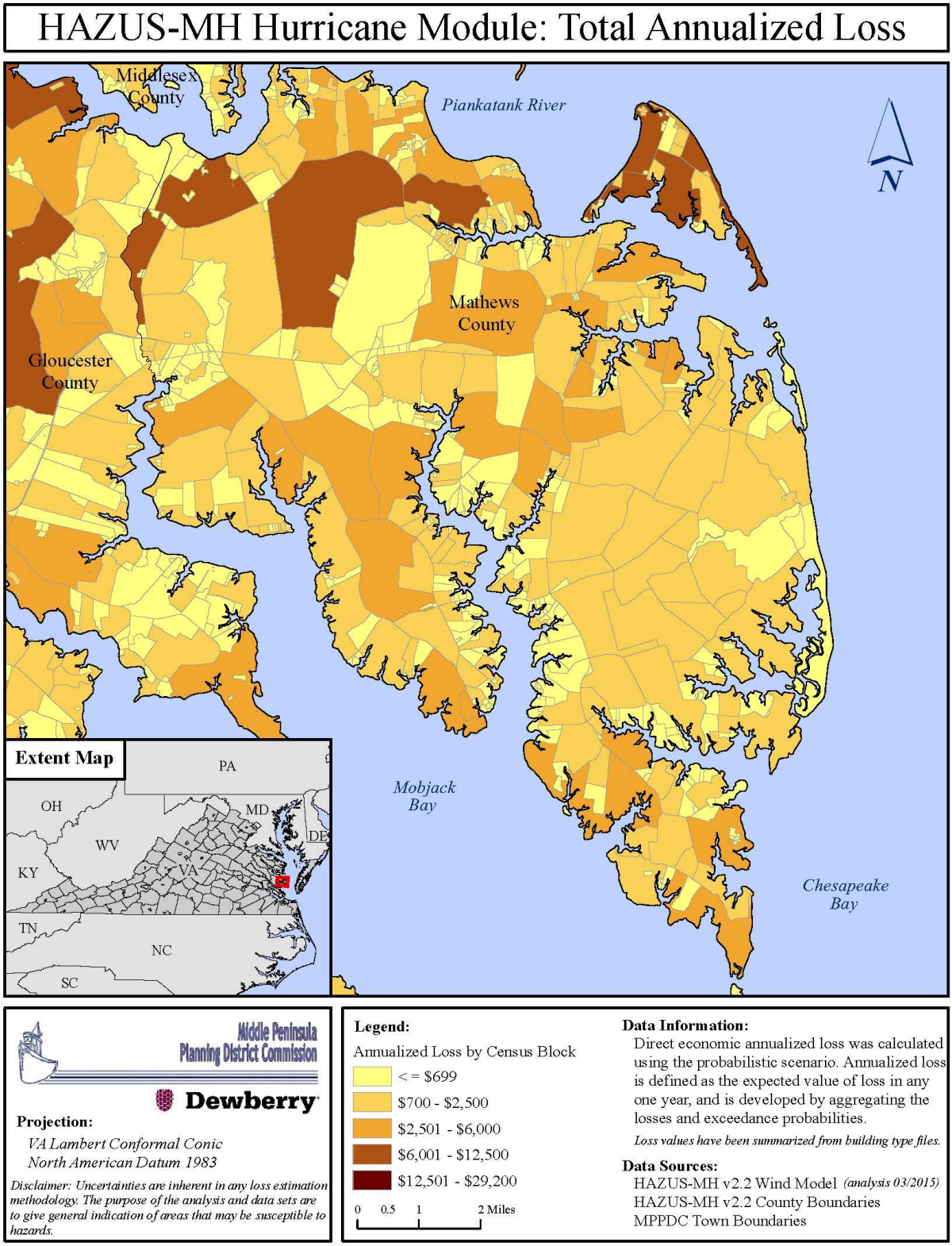

HAZUS-MH Hurricane Module: Total Annualized Loss
Middlesex County
Piankatank River
N
Mathews County
Gloucester County
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Mobjack Bay
Chesapeake Bay
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
<= $699
$700 - $2,500
$2,501 - $6,000
$6,001 - $12,500
$12,501 - $29,200
0 0.5 1 2 Miles
Data Information:
Direct economic annualized loss was calculated using the probabilistic scenario. Annualized loss is defined as the expected value of loss in any one year, and is developed by aggregating the losses and exceedance probabilities.
Loss values have been summarized from building type files.
Data Sources:
HAZUS-MH v2.2 Wind Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 129:

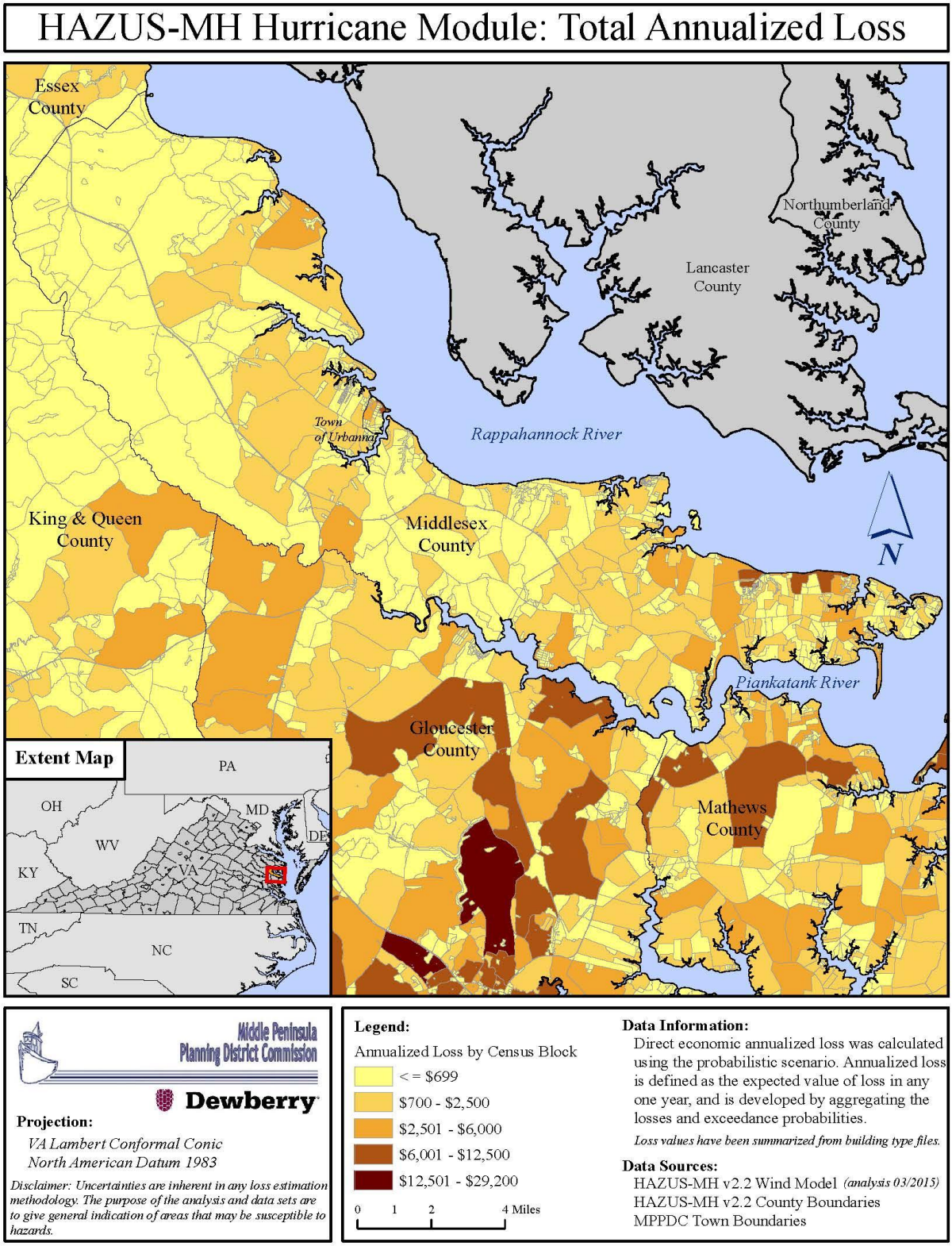
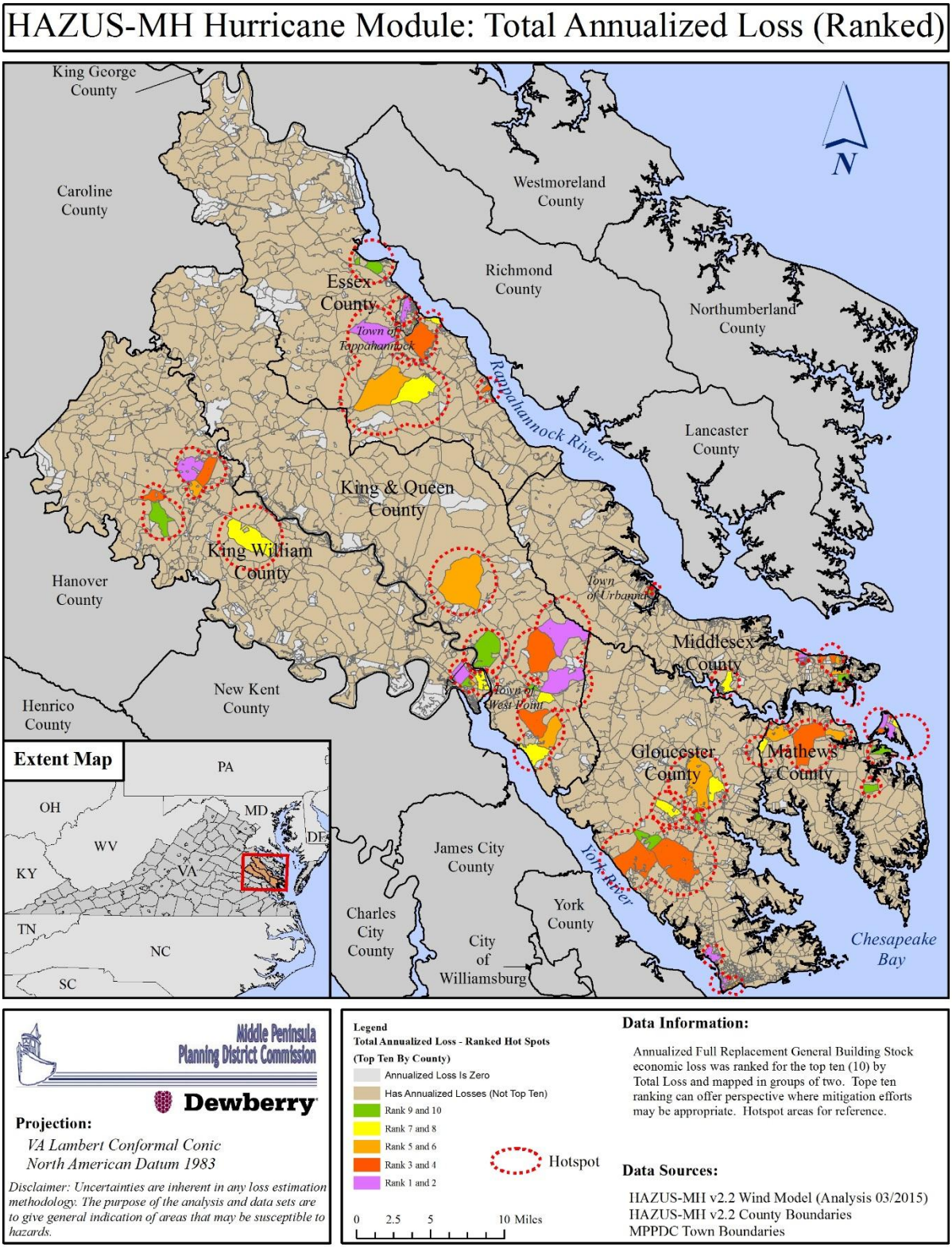

HAZUS-MH Hurricane Module: Total Annualized Loss
Essex County
Northumberland County
Lancaster County
Town of Urbanna
Rappahannock River
King & Queen County
Middlesex County
N
Piankatank River
Gloucester County
Mathews County
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Annualized Loss by Census Block
<= $699
$700 - $2,500
$2,501 - $6,000
$6,001 - $12,500
$12,501 - $29,200
0 1 2 4 Miles
Data Information:
Direct economic annualized loss was calculated using the probabilistic scenario. Annualized loss is defined as the expected value of loss in any one year, and is developed by aggregating the losses and exceedance probabilities.
Loss values have been summarized from building type files.
Data Sources:
HAZUS-MH v2.2 Wind Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 130:


HAZUS-MH Hurricane Module: Total Annualized Loss (Ranked)
King George County
Caroline County
Westmoreland County
Richmond County
Northumberland County
Essex County
Town of Tappahannock
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Henrico County
Town of West Point
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend
Total Annualized Loss - Ranked Hot Spots
(Top Ten By County)
Annualized Loss Is Zero
Has Annualized Losses (Not Top Ten)
Rank 9 and 10
Rank 7 and 8
Rank 5 and 6
Rank 3 and 4
Rank 1 and 2
Hotspot
0 2.5 5 10 Miles
Data Information:
Annualized Full Replacement General Building Stock economic loss was ranked for the top ten (10) by Total Loss and mapped in groups of two. Tope ten ranking can offer perspective where mitigation efforts may be appropriate. Hotspot areas for reference.
Data Sources:
HAZUS-MH v2.2 Wind Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Gloucester County accounts for almost 50% of the planning district's annualized losses. While losses are distributed throughout the County a few patterns of concentration can be identified. Many of the census blocks exhibiting annualized losses of $10,000 or greater appear to be on either side of State Route 17, clustered and radiating around Gloucester Courthouse. More specifically, from Gloucester Courthouse to the York River being bounded on the North by County 606 or Ark Road and bounded on the south by Nursery Lane, Haynes Pond, and Carter Creek – this area accounts for approximately $226,000 (or approximately 18%) of expected annualized damages. On the northern side of Gloucester Courthouse the area generally bounded in the west by Beech Swamp and Cow Creek in the east, and being traversed by Indian Road through the middle and extending north-east to the Piankatank River in the vicinity of Ferry Creek at Hell Neck – this area accounts for approximately $131,000 (or approximately 11%) of expected annualized damages. Finally, those census blocks having the greatest expected annualized losses are in the vicinity of Hayes and Gloucester Point along the York River where as much as $285,000-plus (or approximately 23% - and greater) of annualized damages are estimated. Losses in Mathews County are also spread throughout the county with pockets of higher loss in the northern one-third of the county. Approximately $210,000 US Dollars (or 45%) of estimated annualized damages can be attributed to the northern one-third of the County; versus approximately $145,000 US Dollars (or 31%) in the center and $109,000 US Dollars (or 24%) in the southern one-third. Compared to Gloucester County, Mathews only has two (2) census blocks having expected annualized losses of $10,000 or greater, versus eighteen (18) such blocks in Gloucester. Mathews County accounts for approximately $464,000 or 18% of the total annualized losses in the planning district.

Middlesex County accounts for 15% of the total losses. The greatest concentration of estimated annualized loss is in the lower-eastern portion of the County; Gray's Point Road and south-eastward. This south-eastern portion of the County includes approximately $240,000 US Dollars (or 65%) of the estimated damages for the County. Other concentrations of estimated damages are distributed between Saluda, Urbanna and Water View. Urbanna accounts for approximately 6% of the annualized losses at approximately $24,000 US Dollars. Urbanna also includes two (2) census blocks within the top ten ranked blocks within the County accounting for $11,400 US Dollars or 48% of the losses in Urbanna.

Seven-percent of the total annualized damages ($168,260) for the region are attributed to King William County. King William exhibits four (4) primary areas where losses are concentrated. The first being the Town of West Point which can be attributed with thirty-one percent (31%) of the damages within the County having approximately $51,800 US Dollars of annualized loss. Next, there are two (2) areas near both Aylett and Manquin on the northern side of US 360 (Richmond-Tappahannock Highway). These two areas combined account for approximately $25,100 of annualized losses or fifteen-percent (15%). Last, the central portion of the County includes an area on either side of King William Road from West River Road in the north to Horse Landing Road in the south and accounting for roughly $7,500 US Dollars or four-percent (4%) of losses. The remainder of losses are distributed throughout the county with the greatest concentration of loss in the northwest quarter of the County. The Pamunkey Indian Reservation is estimated to have annualized loss values of approximately $1,100 US Dollars and the Mattaponi Reservation close to $830 US Dollars; combined the Indian Reservation losses account for approximately 1.2% of the losses throughout the County.

Essex County accounts for 7% of the total annualized losses. The greatest concentration of potential annualized wind damage exists in the central portion of the County – to include the Town of Tappahannock. This central area is traversed by three (3) of the primary roads being, US 360 (Richmond Highway), US 17 (Tidewater Trail) and Tappahannock Boulevard – running through the Town of Tappahannock. The combined annualized losses for this general area is approximately $71,000 US Dollars or forty-one percent (41%) of the losses within the County. The Town of Tappahannock

accounts for twenty-percent (20%) of the damages in the County and an estimated $34,700 in annualized damages. Two pockets of development along the Rappahannock River (one south of Tappahannock and the other on the north side) represent clusters of potential damages. The area to the south of Tappahannock exists in the vicinity of River Landing Road in the north and Mill Swamp Road in the south having potential damages of $8,500 annually. The area north of Tappahannock is the vicinity near Woodside Country Club having potential damages of $7,300 annually.

King and Queen County has the lowest annualized loss values for the region, accounting for 4% of the total damages. Residential occupancy makes up the majority of the losses in the county. The southern one-third of the county, from roughly Dragon Run State Forest southward, has the greatest concentration of losses across the entire County accounting for nearly $59,500 or 60% of the losses. The remaining 40% of potential losses are distributed through the remainder of the county to the north and west with approximately $14,000 or 14% existing north of the Richmond-Tappahannock Highway and twenty-six percent (26%) distributed between the Richmond-Tappahannock Highway in the north to roughly Dragon Run State Forest in the south; note that this area includes locales such as Bruington, King and Queen Courthouse as well as Walkerton.

Building Damage

Hazus calculates expected damage percentages for each probabilistic return period. This represents the percentage of building square footage in each damage state. Five damage states have been specified in Hazus and are outlined in Table 70.

Table 70: Hazus-MH damage state thresholds.

Damage State	Qualitative Damage Description
None (Livable)	Little or no visible damage from the outside. No broken windows, or failed roof deck. Minimal loss of roof over, with no or very limited water penetration.
Minor (Livable)	Maximum of one broken window, door or garage door. Moderate roof cover loss that can be covered to prevent additional water entering the building. Marks or dents on wall requiring painting or patching for repair.
Moderate (Typically still livable)	Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water.
Severe (Typically non-livable but repairable)	Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.
Destruction (Non-livable)	Complete roof failure and/or, failure of wall frame. Loss of more than 50% of roof sheathing.
Hazus-MH V2.2 Technical Manual	

Building Damage by Annual Chance Frequency (i.e., Multi-frequency Building Damages)

- **10 Year** - Hazus estimates that about 1 building will have minor damage. No buildings (0) are expected to be at least moderately damaged and no buildings (0) are expected to be completely destroyed during the 10-year event, or 10% annual chance.
- **20 Year** - Hazus estimates that about 7 buildings will have minor damage. No buildings (0) are expected to be at least moderately damaged and no buildings (0) are expected to be completely destroyed during the 20-year event, or 5% annual chance.

- **50 Year** - Hazus estimates that about 5 buildings will be at least moderately damaged and no buildings (0) are expected to be completely destroyed during the 50-year event, or 2% annual chance.
- **100 Year** - Hazus estimates that about 42 buildings will be at least moderately damaged and a single building (1) is expected to have severe damage – potentially another single (1) building may be expected to be completely destroyed during the 100-year event, or 1% annual chance.
- **200 Year** - Hazus estimates that about 131 buildings will be at least moderately damaged, approximately two (2) buildings are expected to be severely damaged, and four (4) buildings are expected to be completely destroyed during the 200-year event, or 0.5% annual chance.
- **500 Year** - Hazus estimates that about 740 buildings will be at least moderately damaged, approximately forty-one (41) buildings are expected to be severely damaged, and forty-seven (47) buildings are expected to be completely destroyed during the 500-year event, or 0.2% annual chance.
- **1000 Year** - Hazus estimates that about 1,523 buildings will be at least moderately damaged, approximately 127 buildings are expected to be severely damaged, and 133 buildings are expected to be completely destroyed during the 1,000-year event, or 0.1% annual chance.

Table 71 and Appendix J provide detailed information on the damage state percentages and number of buildings damaged for each of the probabilistic return periods.

The default data and parameters that Hazus utilizes are capable of producing crude estimates of losses. Building damages, for each building stock category, are calculated based on the probabilities of the four different damage states for each wind building type as a function of peak gust wind speed. It should be noted that the results in Table 71 are based solely on the modeled direct economic loss for the study region with the simulated hurricane activity for each of the independent return periods. It is possible, and not uncommon, to see reversals in damage state percentages, and there is no guarantee that the non-economic results will increase monotonically with return period.

Table 71: Building Damage by County.

Essex County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	**100.00%**	-	-	-	-
20-year Event	**99.98%**	**0.02%**	-	-	-
50-year Event	**98.49%**	**1.46%**	**0.05%**	-	-
100-year Event	**99.97%**	**0.03%**	-	-	-
200-year Event	**98.82%**	**1.14%**	**0.04%**	-	-
500-year Event	**99.77%**	**0.23%**	-	-	-
1000-year Event	**94.26%**	**5.36%**	**0.35%**	**0.01%**	**0.01%**

King William County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	**99.99%**	**0.01%**	-	-	-
20-year Event	**99.99%**	**0.01%**	-	-	-
50-year Event	**98.94%**	**1.04%**	**0.02%**	-	-
100-year Event	**99.93%**	**0.06%**	-	-	-
200-year Event	**98.67%**	**1.28%**	**0.05%**	-	-
500-year Event	**98.78%**	**1.15%**	**0.07%**	-	-
1000-year Event	**97.01%**	**2.79%**	**0.18%**	-	**0.01%**

Gloucester County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	**100.00%**	-	-	-	-
20-year Event	**99.97%**	**0.03%**	-	-	-
50-year Event	**99.95%**	**0.05%**	-	-	-
100-year Event	**96.96%**	**2.86%**	**0.17%**	-	-
200-year Event	**92.95%**	**6.50%**	**0.53%**	**0.02%**	**0.01%**
500-year Event	**81.28%**	**15.90%**	**2.48%**	**0.18%**	**0.15%**
1000-year Event	**78.04%**	**18.14%**	**3.28%**	**0.30%**	**0.25%**

Mathews County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	**100.00%**	-	-	-	-
20-year Event	**99.99%**	**0.01%**	-	-	-
50-year Event	**99.99%**	**0.01%**	-	-	-
100-year Event	**96.53%**	**3.31%**	**0.15%**	-	-
200-year Event	**95.89%**	**3.90%**	**0.20%**	-	-
500-year Event	**85.73%**	**12.67%**	**1.45%**	**0.075%**	**0.08%**
1000-year Event	**66.06%**	**26.15%**	**6.23%**	**0.81%**	**0.76%**

King & Queen County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	**100.00%**	-	-	-	-
20-year Event	**100.00%**	-	-	-	-
50-year Event	**98.90%**	**1.08%**	**0.02%**	-	-
100-year Event	**99.88%**	**0.12%**	-	-	-
200-year Event	**97.79%**	**2.14%**	**0.07%**	-	-
500-year Event	**97.12%**	**2.73%**	**0.14%**	-	-
1000-year Event	**93.54%**	**6.03%**	**0.40%**	**0.01%**	**0.01%**

Middlesex County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	**100.00%**	-	-	-	-
20-year Event	**99.99%**	**0.01%**	-	-	-
50-year Event	**99.90%**	**0.10%**	-	-	-
100-year Event	**98.70%**	**1.26%**	**0.04%**	-	-
200-year Event	**94.75%**	**4.95%**	**0.29%**	-	**0.01%**
500-year Event	**83.23%**	**14.25%**	**2.15%**	**0.17%**	**0.20%**
1000-year Event	**73.66%**	**20.86%**	**4.39%**	**0.53%**	**0.56%**

Debris Generation

Hazus estimates the amount of debris that will be generated by a hurricane. The model breaks the debris into three general categories: Brick/Wood, Reinforced Concrete/Steel, and Trees. Tree debris makes up the majority of tonnage generated in the hurricane analysis. Brick and wood debris makes up the remainder and a very small percentage (0.01%) associated with Concrete and Steel; i.e., not shown in Table. Table 72 summarizes, by return period, the total generated debris by Type.

Table 72: Hurricane debris generation.

Return Period	Total Debris (tons)	Tree Debris (tons)	% Tree Debris	Brick & Wood (tons)	% Brick and Wood
10-year Event	84	84	100%	0	0.00%
20-year Event	31,872	31,867	99.98%	5	0.02%
50-year Event	155,202	154,721	99.69%	481	0.31%
100-year Event	136,004	134,162	98.65%	1,842	1.35%
200-year Event	322,936	318,532	98.64%	4,400	1.36%
500-year Event	376,818	363,772	96.54%	12,930	3.43%
1000-year Event	705,647	682,410	96.71%	22,801	3.23%

Essential Facilities

Essential facilities, including medical care facilities, emergency response facilities and schools, are those vital to emergency response and recovery following a disaster. School buildings are included in this category because of the key role they often play in sheltering people displaced from damaged homes. Generally there are very few of each type of essential facilities in a census tract, making it easier to obtain site-specific information for each facility. Thus, damage and loss-of-function are evaluated on a building-by-building basis for this class of structures; even through the uncertainty in each such estimate is large[6].

The Hazus essential facilities database includes default data for Medical Care Facilities, Emergency Response Facilities (fire stations, polices stations, EOCs) and schools. Table 73 shows the functionality, by return period for each essential facility type. The region's essential facilities are able to remain functional for the 10-, 20-, 50-, and 100-yr recurrence interval. Functionality begins to decline at the 100-year event. All of the facilities have zero functionality during a 1000-year event.

[6] Multi-hazard Loss Estimation Methodology Hurricane Model User Manual, HAZUS-MH V2.2, Chapter 1: Introduction, 1-6

Table 73: Essential facility functionality for specified return periods.

Return Period	Fire Stations	Hospitals	Police Stations	Schools
10-year Event	100%	100%	100%	100%
20-year Event	100%	100%	100%	100%
50-year Event	100%	100%	100%	100%
100-year Event	90%	100%	100%	92%
200-year Event	70%	100%	91%	84%
500-year Event	50%	62%	55%	40%
1000-year Event	0%	0%	0%	0%

Potential Mitigation Actions:

The potential mitigation actions noted are those that are Hazus-specific and would benefit refinement of Hazus analyses.

- ☐ Perform Hazus analyses based on the same data resources used to develop the inundation areas mapped in the report submitted to the Virginia General Assembly in January 2013 titled – RECURRENT FLOODING STUDY FOR TIDEWATER VIRGINIA by the Virginia Institute of Marine Science, Center for Coastal Resources Management at the College of William & Mary. This study appears to include the most widely accepted Sea Level Rise plus Storm Surge Scenario facing coastal Virginia. It would therefore be appropriate to consider 1.) The creation of depth grids from the study data and then 2.) Hazus Risk Assessment. It would also be beneficial to incorporate elements of the design storm into a combined Hazus Flood and Hurricane Scenario - in this manner benefits of the combined methodology can be realized – which includes methods to guard against over-counting or double-counting losses by simply adding damages from each respective Hazus model.
- ☐ Perform Hurricane analysis for a known and historic storm that affected the MPPDC area for comparative purposes.
- ☐ Refine and update data sets for GBS and essential facilities.
    - Improvements in the future should aim to further refine the building stock. Notably, one improvement should include adding any new development that may not have been in the land use/land cover data; e.g., new housing developments, new construction, etc…
    - Perform localized building-level assessments in known areas of loss and or areas subject to likely losses.

Sea Level Rise

The Hazus Flood Model analyzes both riverine and coastal flood hazards. Flood hazard within Hazus is defined by depth of flooding. Other contributing factors of damage include the duration and velocity of water in the floodplain. Other hazards associated with flooding that may contribute to flood losses include channel erosion and migration, sediment deposition, bridge scour and the impact of flood-born debris. The Hazus Flood Model allows users to estimate flood losses primarily due to flood depth to the general building stock (GBS). While velocity is also considered, it is not a separate input parameter and is accounted within depth-damage functions (i.e., expected percent damage given an expected depth) for census blocks that are defined as either coastal or riverine influenced.

Flood-specific modeling was performed in this Plan revision to determine annualized flood loss however it is important to note that the Sea Level Rise analyses while similar is not 100% the same as the multi-frequency analyses performed and presented in the Flood Section; see Flood Analysis. While this section does not intend to fully explain detailed elements of coastal flood modeling, a basic amount of information is offered to differentiate between the two report sections.

Coastal flood modeling typically includes identifying baseline tidal water levels and then computing additions or increases to water surface levels from various natural forces such as storm surge effects (i.e., water level increases as the result of a storm pushing landward) as well as other wave-related effects such as increased wave heights and the run-up of waves over the land as waves crash. Other factors of coastal storms play a part in estimating increased water surface levels such as shoreline and/or dune erosion. Consequently, each of the scenarios presented in the Flood Analysis section , includes depth grids produced from modeling that takes into account increases to water surface levels from the various forces typical of coastal storm events – a.k.a. Storm Surge.

In contrast, the Hazus analysis performed for the Sea Level Rise scenarios (this section) DO NOT include the use of depth grids that include storm surge. Rather, this Sea Level Rise section uses depth grids that 1.) Are depths from the baseline tidal water levels (Mean Higher High Water or MHHW) and 2.) Includes the addition of six-feet of water – as if the new baseline tidal water level were increased by simply adding more water into the same 'bathtub' - as it were. The two depth grids run through Hazus represent these two aforementioned scenarios developed by NOAA - Office for Coastal Management for the on-line application known as Sea Level Rise and Coastal Flooding Impacts v2.0.

Multiple resources were consulted for data that would support Sea Level Rise (SLR) risk assessments across the Middle Peninsula planning district. Primary focus was placed on the existence of Hazus-ready inputs, which would include the existence and availability of depth grids. Depth grids are able to be directly imported into the Hazus Flood model and eliminates the need to pre-process other modeling or Geographic Information Systems (GIS) data. Generally-speaking, the creation of depth grids require GIS data that represents an estimated water surface along with an associated ground surface. Thereafter, the difference between the two surfaces represents the estimated depth of flooding for a given location; i.e., water elevation less ground elevation equals depth; see Depth Grid Graphic in the Flood Analysis Section.

Considering the SLR resources researched, depth grids were only available from NOAA's Office for Coastal Management (see http://coast.noaa.gov/slr/) as part of its Sea Level Rise and Coastal Flooding Impacts v2.0 Application. An additional resource was available from VIMS – The Virginia Institute of Marine Science at the College of William & Mary, however the resource is NOT depth grids but rather a GIS mapping product that delineates the inundation areas of 1.5 Feet of Sea Level Rise plus an additional 3-Feet of storm surge.
To exemplify the various resources consulted in search of the priority SLR depth grids, the following list offers an itemization and brief description(s):

- **US EPA** - Titus, J.G., D.E. Hudgens, C.Hershner, J.M. Kassakian, P.R. Penumalli , M. Berman, and W.H. Nuckols. 2010. "Virginia". In James G. Titus and Daniel Hudgens (editors). *The Likelihood of Shore Protection along the Atlantic Coast of the United States. Volume 1: Mid-Atlantic.* Report to the U.S. Environmental Protection Agency. Washington, D.C.
    - [The] *"…study develops maps that distinguish the areas likely to be protected from erosion and inundation as the sea rises from those areas that are likely to be left to retreat naturally assuming that current policies and economics trends continue*." – page 709.
    - The study claims to be *"…literally a "first approximation" of the likelihood of shore protection.*" – page 710.

    - The study report includes a variety of tables culminating in and seeking to describe AREA OF LAND VULNERABLE TO SEA LEVEL RISE. However, a number of MPPDC jurisdictions are void of results with the authors citing the following:
        - "*Value omitted because the topographic information Titus and Wang used for this jurisdiction had poor vertical resolution.*" – page 777 (Note [e] of TABLE 8-10).
    - The study includes GIS data that distinguishes between three (3) primary land classes; Tidal Wetlands, Tidal Open Water and Uplands. An overlay Digital Elevation Model (DEM) is also included that indicates a series of elevation bands at half-foot elevation intervals ranging from zero-feet (0.0 Ft.) to three-feet (3.0 Ft.) above the delineation of Tidal Wetlands.
    - The study includes additional analyses in cooperation with Virginia Institute of Marine Science (VIMS) and mapping that characterizes the likelihood of shoreline protection; see VIMS below.
    - No depth grid data available.
- **VIMS** – Virginia Institute of Marine Science, College of William & Mary.
    - RECURRENT FLOODING STUDY FOR TIDEWATER VIRGINIA. Report submitted to the Virginia General Assembly. January 2013.
        - The study, in-part, developed mapping of areas affected (i.e., expected inundation) by:
            - Projected Sea Level Rise of 1.5 Feet with…
            - Projected Storm Surge of an additional 3.0 Feet
        - The study suggests that the scenario elements noted above (SLR of 1.5 feet and Surge of +3 feet) "…*represent very moderate assumptions*…" and that the values are "…*within the range*…" of best available forecasts; - page 8.
        - Inquiry also revealed that depth grid data was not produced as part of the study.
    - Comprehensive Coastal Resource Management Tool
        - No depth grids.
- **US Fish and Wildlife Services (USFWS) (and partners)** – SLAMM View Application (Sea Level Affecting Marshes Model)
    - No depth grids.
- **Climate Central** – Surging Seas Application (Sea Level Affecting Marshes Model)
    - No depth grids.
- **The Nature Conservancy (and partners)** - Coastal Resilience Tool
    - Application utilizes the same data used in the National Oceanic and Atmospheric Administration (NOAA) Sea Level Rise and Coastal Flooding Impacts v2.0 Application; see below (NOAA – Office for Coastal Management).
    - Application does not cover Virginia.
- **NOAA** - Office for Coastal Management
    - Sea Level Rise and Coastal Flooding Impacts v2.0
        - Sea Level Rise based on Mean Higher High Water (MHHW) conditions and the addition of incremental 1-foot SLR increases to include Plus 1-Foot to Plus 6-Foot.
        - Depth grids available.
        - Depth grids obtained and used for this Plan; this Plan utilizes the Base Scenario of Mean Higher High Water (MHHW) conditions and also the Plus 6-Foot Scenario. Other scenarios were not utilized; namely the Plus 1-Foot, Plus 2-Foot, Plus 3-Foot, Plus 4-Foot and Plus 5-Foot.

Building Stock

The same dasymetric building stock (i.e., square-footage inventory of buildings) that was utilized for the Flood Analysis was also used for Sea Level Rise.

All building inventory statistics (i.e., building stock exposure by county or general building type) that were used for the Sea Level Rise Hazus scenarios are the same as defined in the Flood Analysis section. Please see Flood Analysis, Table 39. Building stock exposure for general occupancies by county and Table 37. Building stock exposure for general building type by county.

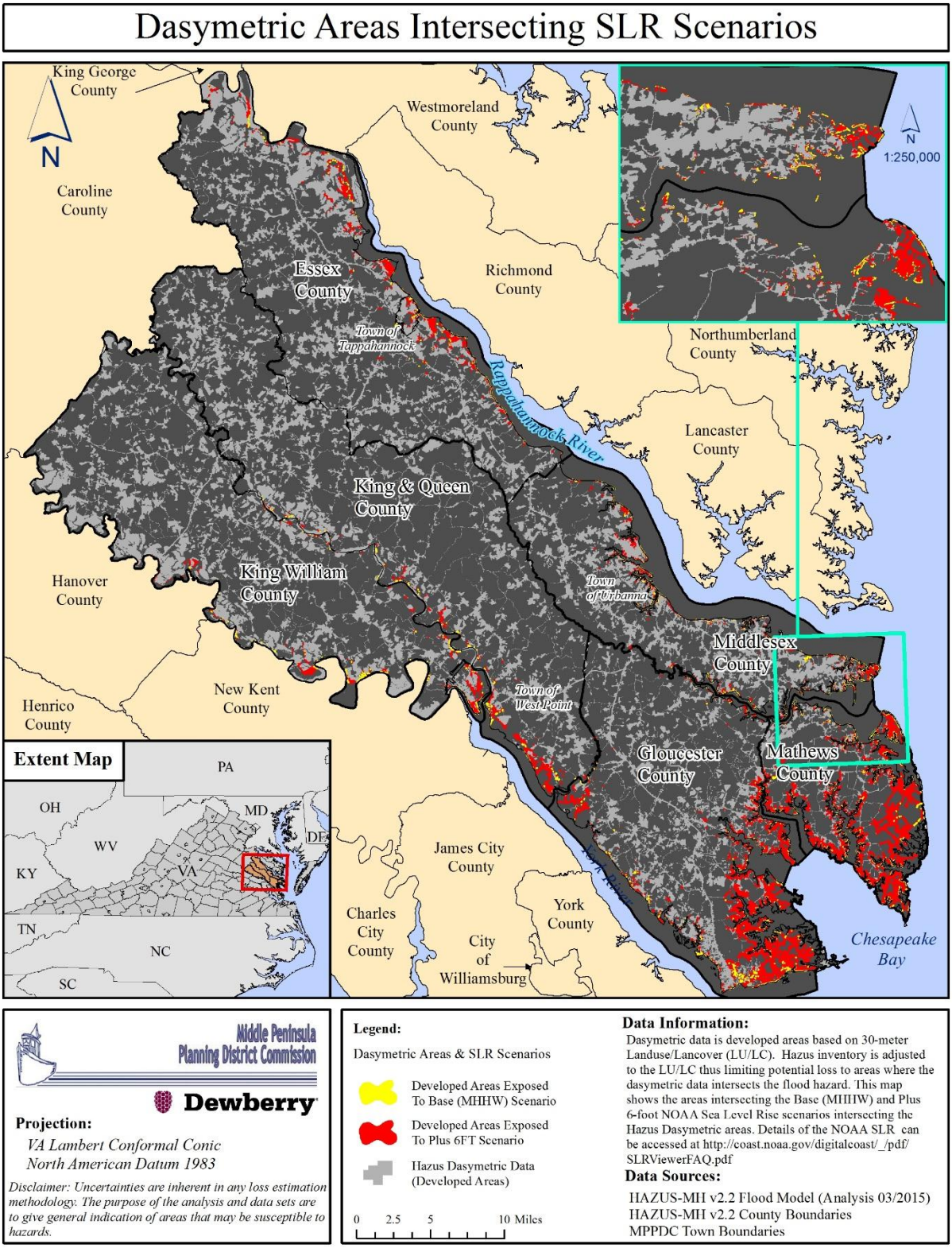
Dynamics of exposure (and also loss) are dependent on a number of variables. A key variable, for example, includes the spatial accuracy (30-meter) of the land-use/land-cover data used to create the developed areas of the dasymetric building stock inventory. Another key variable includes the spatial accuracy (i.e., horizontal accuracy) and also the vertical accuracy of the topographic data used to delineate flood inundation areas. Therefore, detailed site analyses may be appropriate and necessary to further understand local dynamics. However, noting the regional nature of the risk assessments performed, a few tables for reference are provided of the Sea Level Rise scenarios to help better understand the dasymetric building stock that is 1.) Potentially exposed and 2.) May experience potential loss. First, acreage of developed land intersecting the SLR scenarios is captured in Table 74 below:

Table 74: Acreage of Dasymetric Areas (30m Developed Areas) intersecting SLR Scenarios.

Base (MHHW) Sea Level Rise Scenario			Plus 6-Feet Sea Level Rise Scenario		
Rank MHHW	County	Acreage of Dasymetric Developed Areas	Rank Plus 6FT	County	Acreage of Dasymetric Developed Areas
1	Mathews	105	1	Mathews	4,817
2	Middlesex	96	2	Gloucester	4,155
3	Gloucester	63	3	Essex	837
4	King William	30	4	Middlesex	585
5	King and Queen	28	5	King and Queen	454
6	Essex	22	6	King William	393
	Total	**344**		**Total**	**11,242**

Figure 131 - Dasymetric Areas Intersecting SLR Scenarios (next page) shows the dasymetric developed areas intersecting both the Base (MHHW) and the Plus 6-Foot Scenario's. The map also shows an example area in closer detail (scale of 1:250,000).

Figure 131:


Dasymetric Areas Intersecting SLR Scenarios
King George County
Westmoreland County
Caroline County
Essex County
Richmond County
Town of Tappahannock
Rappahannock River
Northumberland County
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
Charles City County
York County
City of Williamsburg
Chesapeake Bay
York River
N
1:250,000
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Dasymetric Areas & SLR Scenarios
Developed Areas Exposed To Base (MHHW) Scenario
Developed Areas Exposed To Plus 6FT Scenario
Hazus Dasymetric Data (Developed Areas)
0 2.5 5 10 Miles
Data Information:
Dasymetric data is developed areas based on 30-meter Landuse/Lancover (LU/LC). Hazus inventory is adjusted to the LU/LC thus limiting potential loss to areas where the dasymetric data intersects the flood hazard. This map shows the areas intersecting the Base (MHHW) and Plus 6-foot NOAA Sea Level Rise scenarios intersecting the Hazus Dasymetric areas. Details of the NOAA SLR can be accessed at http://coast.noaa.gov/digitalcoast/_/pdf/SLRViewerFAQ.pdf
Data Sources:
HAZUS-MH v2.2 Flood Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Next, Table 75 and Table 76 show the Total Exposure In the Flood Hazard Area of the Hazus Dasymetric Data by General Occupancy Type for both of the Sea Level Rise scenarios.

Table 75: Exposed General Occupancy by County – Sea Level Rise Base Scenario (MHHW).

County	Residential	Commercial	Industrial	Agriculture	Religion	Govt.	Education	Total Exposure
Middlesex	$24,347	$1,121	$303	$32	$257	$15	$17	$26,092
Mathews	$19,910	$1,199	$285	$132	$95	$36	$45	$21,702
Gloucester	$17,251	$1,793	$415	$40	$176	$19	$83	$19,777
Essex	$5,553	$516	$75	$14	$34	$0	$88	$6,280
King William	$4,065	$409	$58	$13	$2	$1	$0	$4,549
King and Queen	$2,361	$1	$477	$0	$0	$0	$-0	$2,840
Total	$73,488	$5,040	$1,613	$231	$565	$70	$233	$81,241
All values in Thousands of Dollars								

Table 76: Exposed General Occupancy by County – Sea Level Rise Plus 6FT Scenario.

County	Residential	Commercial	Industrial	Agriculture	Religion	Govt.	Education	Total Exposure
Gloucester	$590,313	$72,485	$17,186	$2,934	$8,721	$653	$14,805	$707,095
Mathews	$601,918	$25,535	$15,695	$4,401	$4,251	$958	$724	$653,482
Middlesex	$156,312	$8,602	$2,355	$193	$1,800	$167	$160	$169,587
Essex	$87,087	$12,067	$4,404	$559	$221	$68	$371	$104,776
King William	$61,575	$13,675	$1,950	$70	$1,369	$426	$807	$79,873
King and Queen	$33,313	$23	$1,358	$0	$10	$4	$-0	$34,708
Total	$1,530,517	$132,388	$42,948	$8,156	$16,372	$2,275	$16,867	$1,749,521
All values in Thousands of Dollars								

Users are encouraged to consider that while one County may have a greater area of developed land intersecting the SLR flood inundation, the square-footage and/or value of structures within the developed areas may have very different value estimates. Consequently, it can be seen that Middlesex County has a great deal of development in close proximity to the Base (MHHW) Scenario flood hazard – particularly in the Residential category ($24.3 Million). However, as was mentioned earlier, the resolution or spatial accuracy of the 30-meter land-use/land-cover data used to create the dasymetric developed areas does not take into account elevation. There are areas within the District that have development on high ground near flooding sources. Middlesex County has a number of these areas. This combination in conjunction with higher residential exposure ($24.3 Million) shows Middlesex as more susceptible to the Base (MHHW) Sea Level Rise Scenario.

In contrast, development patterns in the eastern-most portion of Middlesex as well as the two most eastern counties of Gloucester and Mathews, exhibit development that is set-back away from areas of open and tidal waters – thus exhibiting less exposure to the Base (MHHW) SLR Scenario. However, as water levels rise, as would be the case of the Plus 6-Foot Scenario, the development along the low-lying fringes of the coastal plain become more susceptible to the flood hazard and therefore includes a greater proportion of building inventory exposed to the potential rising water levels.

Sea Level Rise – Hazus Level 1 Methodology General Building Stock Loss Estimation
Losses are presented similar to the Flood Analysis however, only the combined Total losses of all building categories are presented in an effort to keep the results as simple as possible for relative comparison to the more detailed multi-frequency flood analysis. To reiterate, the multi-frequency analysis (Flood Analysis) DOES include water surface levels that take into account storm surge.

Hazus Level 1 flood model losses for the Middle Peninsula planning district from the Base Sea Level Rise scenario (MHHW) are approximately $10.2 Million US Dollars and the Plus 6-Foot of Sea Level Rise are approximately $283.5 Million US Dollars which is a 96% increase in the expected Total damages. Property or "capital stock" losses of the Base Sea Level Rise accounts for all of the expected loss ($10.2 Million) whereas the Plus 6-Foot of Sea Level Rise scenario is estimated to be approximately $283.1 Million or 99.86% of the damages which includes the values for building, content, and inventory. Business interruption of the Plus 6-Foot of Sea Level Rise scenario accounts for $386,000 US Dollars (0.14%) of the losses and includes relocation, income, rental and wage costs.

Table 77 and Table 78 illustrate the expected losses broken down by county from the Sea Level Rise scenarios. Middlesex County, having the highest level of estimated exposure ($26.092 Million US Dollars) within the Base Sea Level Rise inundation area, also has the highest loss from the Base Sea Level Rise scenario at approximately $3.02 Million US Dollars which accounts for 30% of the total losses for the Middle Peninsula[7]. Gloucester County is attributed with 27% of total losses at approximately $2.76 Million, and Mathews County has losses of approximately $2.5 Million or 25% of the total – followed by King William (9%), Essex (7%) and last King and Queen (2%). The relatively higher loss percentages attributed to Middlesex, Gloucester and Mathews counties suggests that the distribution of development at-risk includes the low-lying coastal plains along the Chesapeake and Mobjack Bays as well as the York River.

The Plus 6-Foot of Sea Level Rise scenario also shows the greater combined losses in the down-east area however, Gloucester and Mathews account for the greatest combined losses (75%). Gloucester County has the highest loss from the Plus 6-Foot of Sea Level Rise scenario at approximately $116.6 Million US Dollars, accounting for 41% of the total losses for the Middle Peninsula. The Plus 6-Foot of Sea Level Rise scenario shows Mathews County at approximately $96.9 Million and ranked second (34% of Total) – followed by Middlesex County at approximately $29.2 Million (10% of Total) – and then King William (6%), Essex (6%) and last King and Queen (2%). Again, the relatively higher loss percentages attributed to Gloucester and Mathews counties suggests that the distribution of development at-risk includes the low-lying coastal plains along the Chesapeake and Mobjack Bays as well as the York River. Figure XX exemplifies the differences between the inundation extents of the SLR Base and Plus 6-Foot scenarios; the mapping of the depth grids represented by red/orange areas are the increased inundation areas of the Plus 6-Foot scenario. Development in these areas would be susceptible to greater potential losses.

[7] Readers are reminded due to the regional nature of the analysis, detailed site analyses may be entirely appropriate and necessary to fully understand local dynamics. Especially in areas where development is in close proximity to flooding sources and also marked topographic elevation changes.

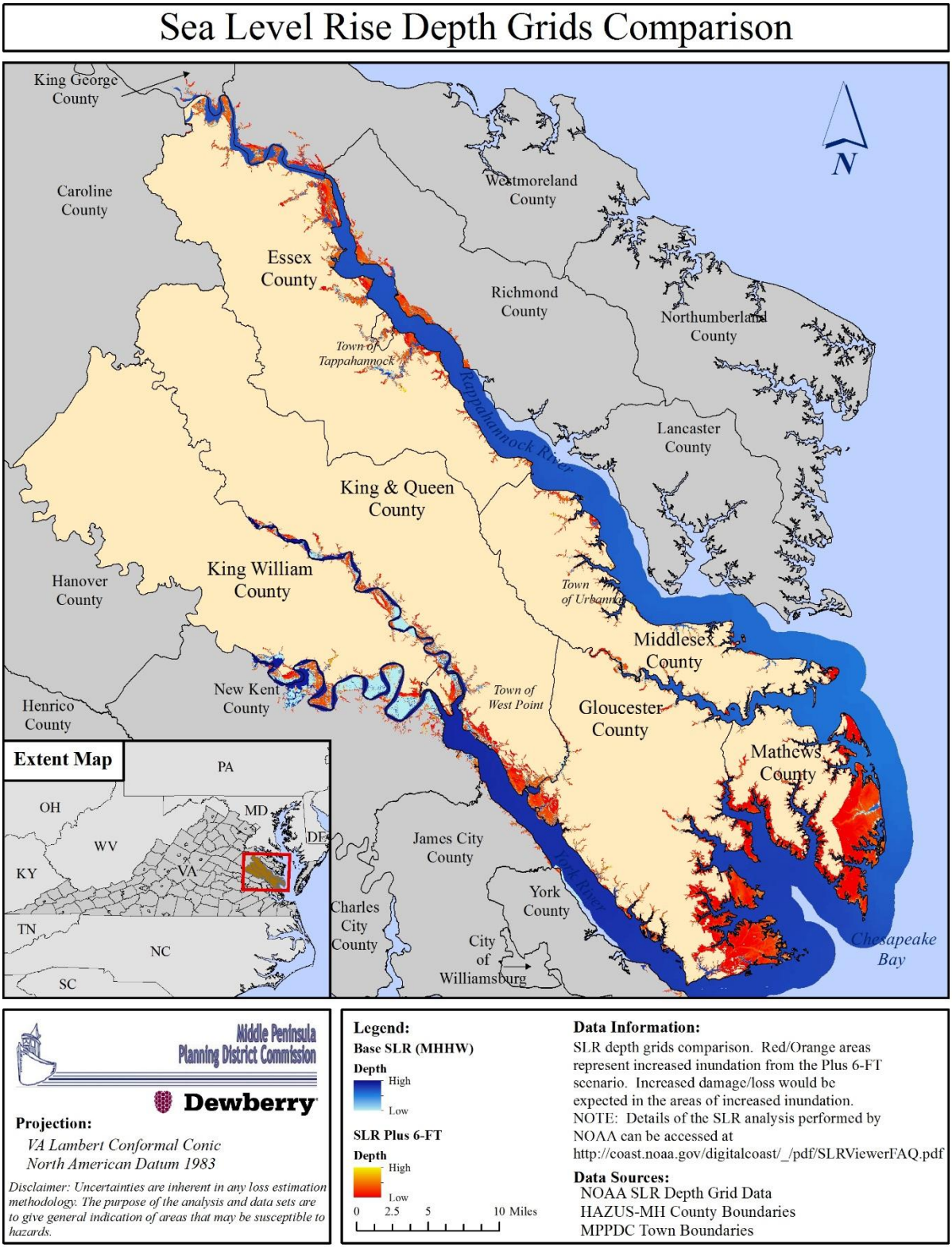
Table 77: County based Hazus loss for both Pre- and Post-FIRM – Sea Level Rise Base.

County	Building	Content	Inventory	Relocation	Income	Rental	Wage	Total Loss
Middlesex	$1,805	$1,209	$1	$0	$0	$0	$0	$3,015
Gloucester	$1,638	$1,120	$2	$0	$0	$0	$0	$2,760
Mathews	$1,494	$1,002	$0	$0	$0	$0	$0	$2,496
King William	$532	$406	$0	$0	$0	$0	$0	$938
Essex	$391	$331	$0	$0	$0	$0	$0	$722
King and Queen	$150	$97	$7	$0	$0	$0	$0	$254
Total	$6,010	$4,165	$10	$0	$0	$0	$0	$10,185
All values in Thousands of Dollars								

Table 78: County based Hazus loss for both Pre- and Post-FIRM – Sea Level Rise Plus 6FT.

County	Building	Content	Inventory	Relocation	Income	Rental	Wage	Total Loss
Gloucester	$63,431	$52,381	$607	$70	$38	$5	$93	$116,625
Mathews	$55,754	$40,566	$492	$73	$8	$7	$18	$96,918
Middlesex	$16,772	$12,342	$66	$13	$5	$0	$6	$29,204
King William	$8,561	$9,603	$89	$2	$12	$0	$22	$18,289
Essex	$8,202	$7,511	$140	$8	$1	$0	$4	$15,866
King and Queen	$3,999	$2,561	$61	$1	$0	$0	$0	$6,622
Total	$156,719	$124,964	$1,455	$167	$64	$12	$143	$283,524
All values in Thousands of Dollars								

Figure 132:


Sea Level Rise Depth Grids Comparison
King George County
Caroline County
Essex County
Westmoreland County
Richmond County
Northumberland County
Lancaster County
Town of Tappahannock
Rappahannock River
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Gloucester County
Henrico County
Mathews County
James City County
York River
York County
Charles City County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Base SLR (MHHW)
Depth
High
Low
SLR Plus 6-FT
Depth
High
Low
0 2.5 5 10 Miles
Data Information:
SLR depth grids comparison. Red/Orange areas represent increased inundation from the Plus 6-FT scenario. Increased damage/loss would be expected in the areas of increased inundation.
NOTE: Details of the SLR analysis performed by NOAA can be accessed at http://coast.noaa.gov/digitalcoast/_/pdf/SLRViewerFAQ.pdf
Data Sources:
NOAA SLR Depth Grid Data
HAZUS-MH County Boundaries
MPPDC Town Boundaries

Figures 133 through 143 on the following pages show the total losses for the planning district for both SLR scenarios, Ranking of the top ten loss of census blocks (Ranked within each respective County) and last, a map showing the comparative differences in the ranked hot spot areas representing those areas throughout the MPPDC Region that may require mitigation measures. County-specific maps are shown of the Plus 6-Foot SLR scenario.

Again, users of these maps are reminded that the scenarios shown in the following maps DO NOT include increases to water surface levels from the various natural forces typical of coastal storm events (e.g., Storm Surge). The following results are intended to offer perspective on potential damage/loss in the event that the baseline water surface were to increase by 6-Feet.

Another factor to consider while viewing Maps and Tables is that the Base Scenario is essentially the average of the highest tide that is experienced on a daily-basis over a long period of time. Typical there are two high tides in a given day, the MHHW represents the mean (or average) of the higher of the two tides as recorded over a period of record. The definition as provided by NOAA – Tides & Currents states, "The average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch."[8]

[8] NOAA – Tides & Currents (http://tidesandcurrents.noaa.gov/datum_options.html), accessed April 22, 2015.

Figure 133:

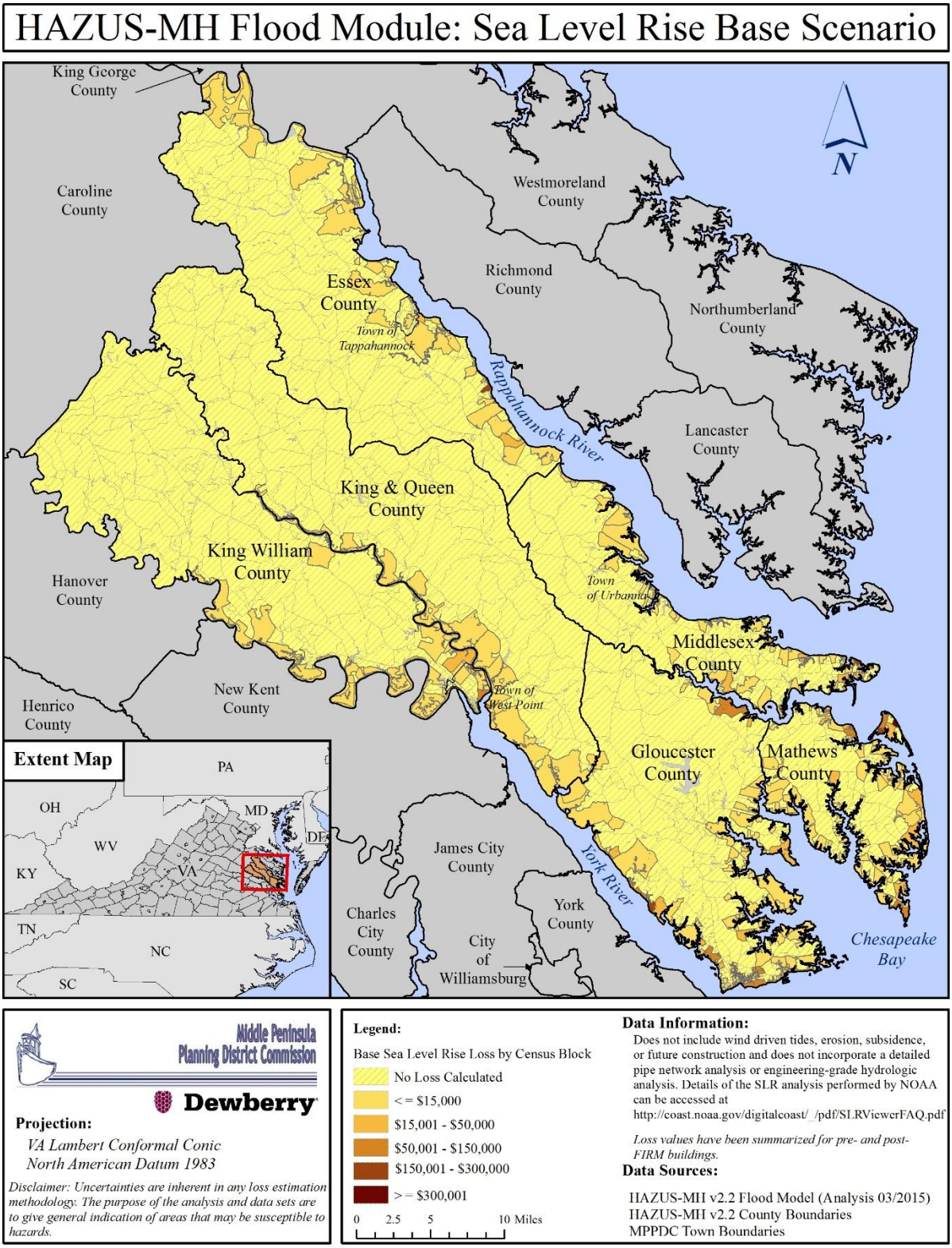

HAZUS-MH Flood Module: Sea Level Rise Base Scenario
King George County
Caroline County
Westmoreland County
Richmond County
Northumberland County
Essex County
Town of Tappahannock
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Base Sea Level Rise Loss by Census Block
No Loss Calculated
< = $15,000
$15,001 - $50,000
$50,001 - $150,000
$150,001 - $300,000
> = $300,001
0 2.5 5 10 Miles
Data Information:
Does not include wind driven tides, erosion, subsidence, or future construction and does not incorporate a detailed pipe network analysis or engineering-grade hydrologic analysis. Details of the SLR analysis performed by NOAA can be accessed at http://coast.noaa.gov/digitalcoast/_/pdf/SLRViewerFAQ.pdf
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 134:

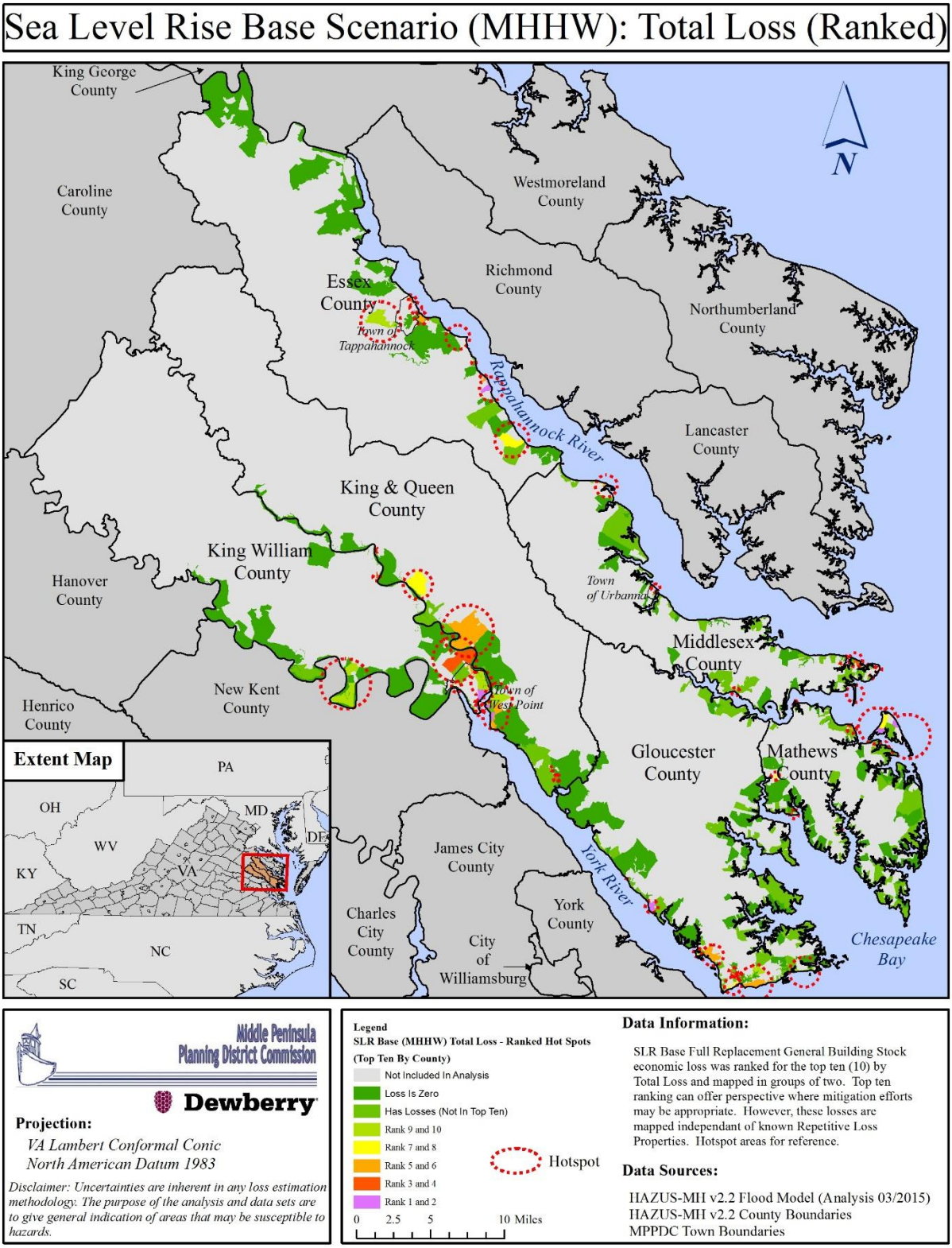

Sea Level Rise Base Scenario (MHHW): Total Loss (Ranked)
King George County
Caroline County
Westmoreland County
Richmond County
Essex County
Town of Tappahannock
Northumberland County
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend
SLR Base (MHHW) Total Loss - Ranked Hot Spots
(Top Ten By County)
Not Included In Analysis
Loss Is Zero
Has Losses (Not In Top Ten)
Rank 9 and 10
Rank 7 and 8
Rank 5 and 6
Rank 3 and 4
Rank 1 and 2
Hotspot
0 2.5 5 10 Miles
Data Information:
SLR Base Full Replacement General Building Stock economic loss was ranked for the top ten (10) by Total Loss and mapped in groups of two. Top ten ranking can offer perspective where mitigation efforts may be appropriate. However, these losses are mapped independant of known Repetitive Loss Properties. Hotspot areas for reference.
Data Sources:
HAZUS-MH v2.2 Flood Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 135:

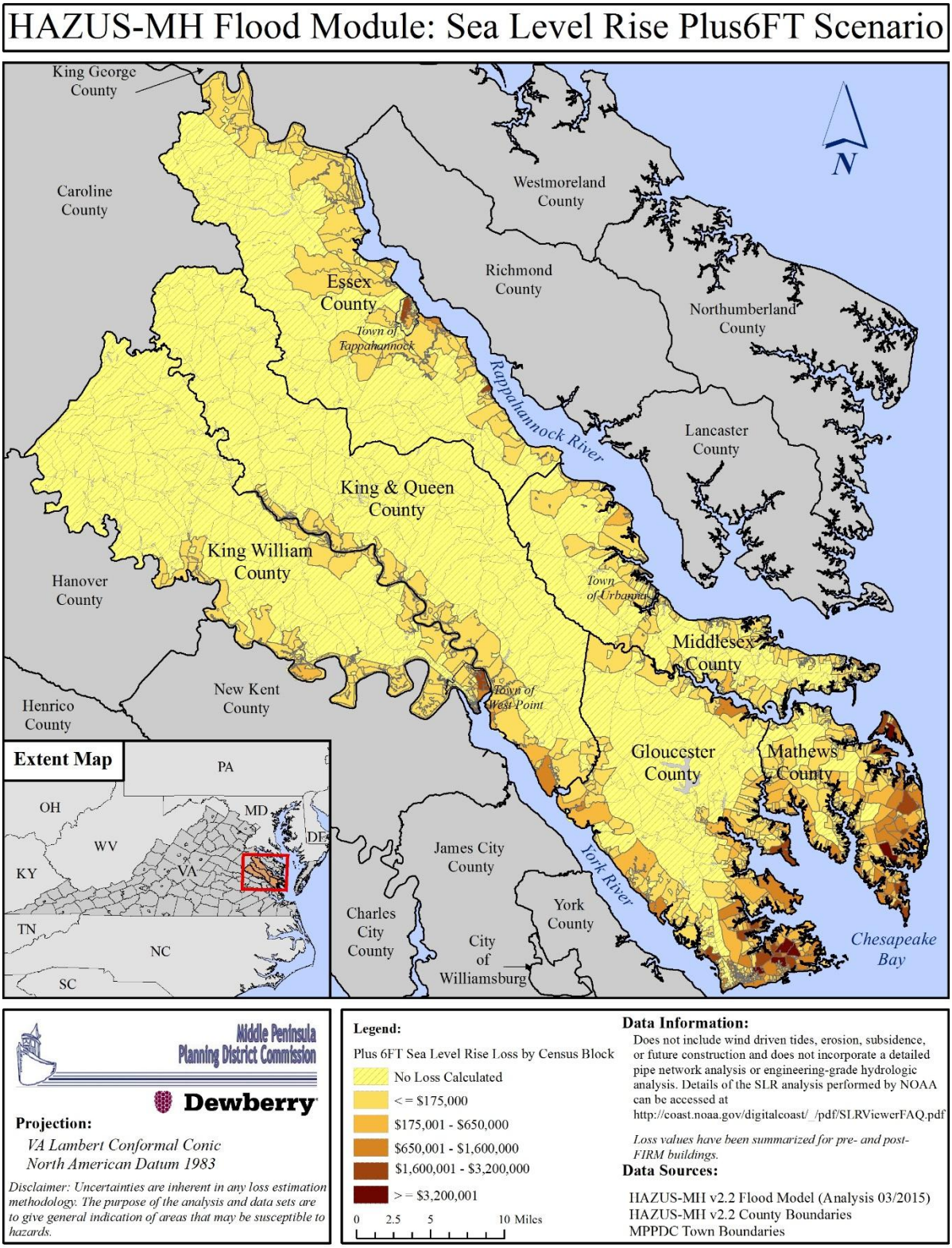

HAZUS-MH Flood Module: Sea Level Rise Plus6FT Scenario
King George County
Caroline County
Westmoreland County
Richmond County
Essex County
Town of Tappahannock
Northumberland County
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Plus 6FT Sea Level Rise Loss by Census Block
No Loss Calculated
< = $175,000
$175,001 - $650,000
$650,001 - $1,600,000
$1,600,001 - $3,200,000
> = $3,200,001
0 2.5 5 10 Miles
Data Information:
Does not include wind driven tides, erosion, subsidence, or future construction and does not incorporate a detailed pipe network analysis or engineering-grade hydrologic analysis. Details of the SLR analysis performed by NOAA can be accessed at http://coast.noaa.gov/digitalcoast/_/pdf/SLRViewerFAQ.pdf
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 136:

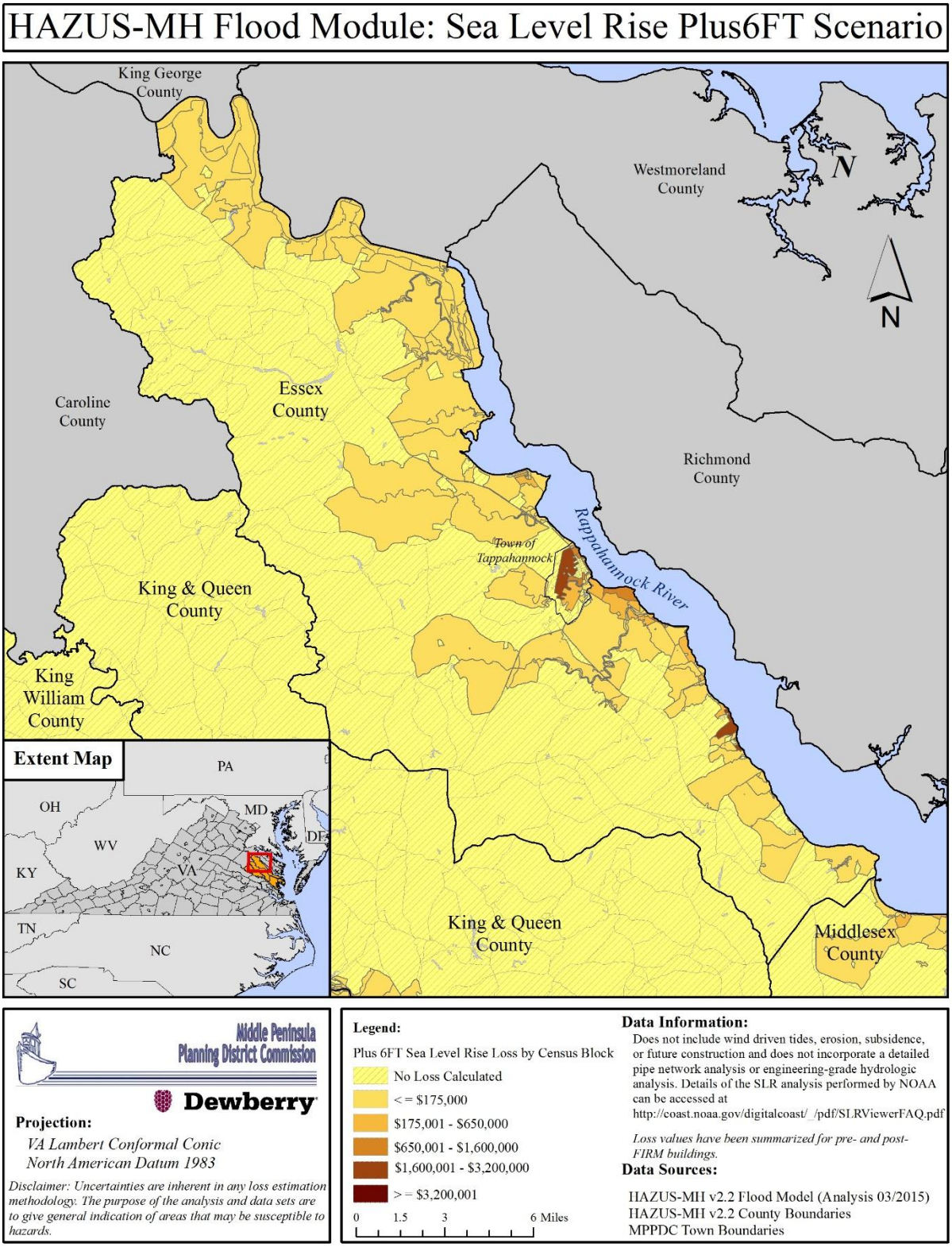

HAZUS-MH Flood Module: Sea Level Rise Plus6FT Scenario
King George County
Westmoreland County
N
N
Caroline County
Essex County
Richmond County
Rappahannock River
Town of Tappahannock
King & Queen County
King William County
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
King & Queen County
Middlesex County
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Plus 6FT Sea Level Rise Loss by Census Block
No Loss Calculated
<= $175,000
$175,001 - $650,000
$650,001 - $1,600,000
$1,600,001 - $3,200,000
>= $3,200,001
0 1.5 3 6 Miles
Data Information:
Does not include wind driven tides, erosion, subsidence, or future construction and does not incorporate a detailed pipe network analysis or engineering-grade hydrologic analysis. Details of the SLR analysis performed by NOAA can be accessed at http://coast.noaa.gov/digitalcoast/_/pdf/SLRViewerFAQ.pdf
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 137:

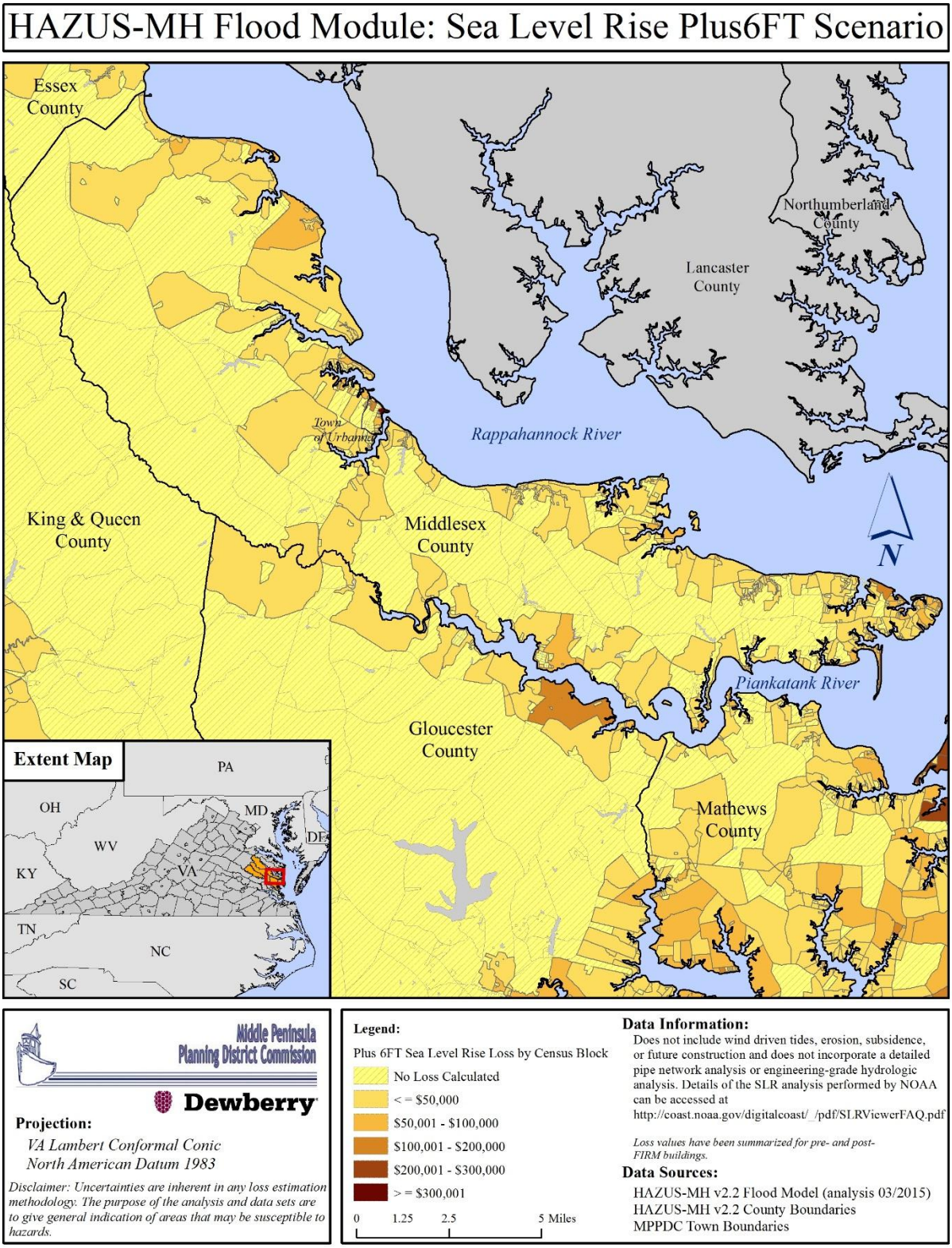

HAZUS-MH Flood Module: Sea Level Rise Plus6FT Scenario
Essex County
Northumberland County
Lancaster County
Town of Urbanna
Rappahannock River
King & Queen County
Middlesex County
N
Piankatank River
Gloucester County
Mathews County
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Plus 6FT Sea Level Rise Loss by Census Block
No Loss Calculated
< = $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
> = $300,001
0 1.25 2.5 5 Miles
Data Information:
Does not include wind driven tides, erosion, subsidence, or future construction and does not incorporate a detailed pipe network analysis or engineering-grade hydrologic analysis. Details of the SLR analysis performed by NOAA can be accessed at http://coast.noaa.gov/digitalcoast/_/pdf/SLRViewerFAQ.pdf
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 138:

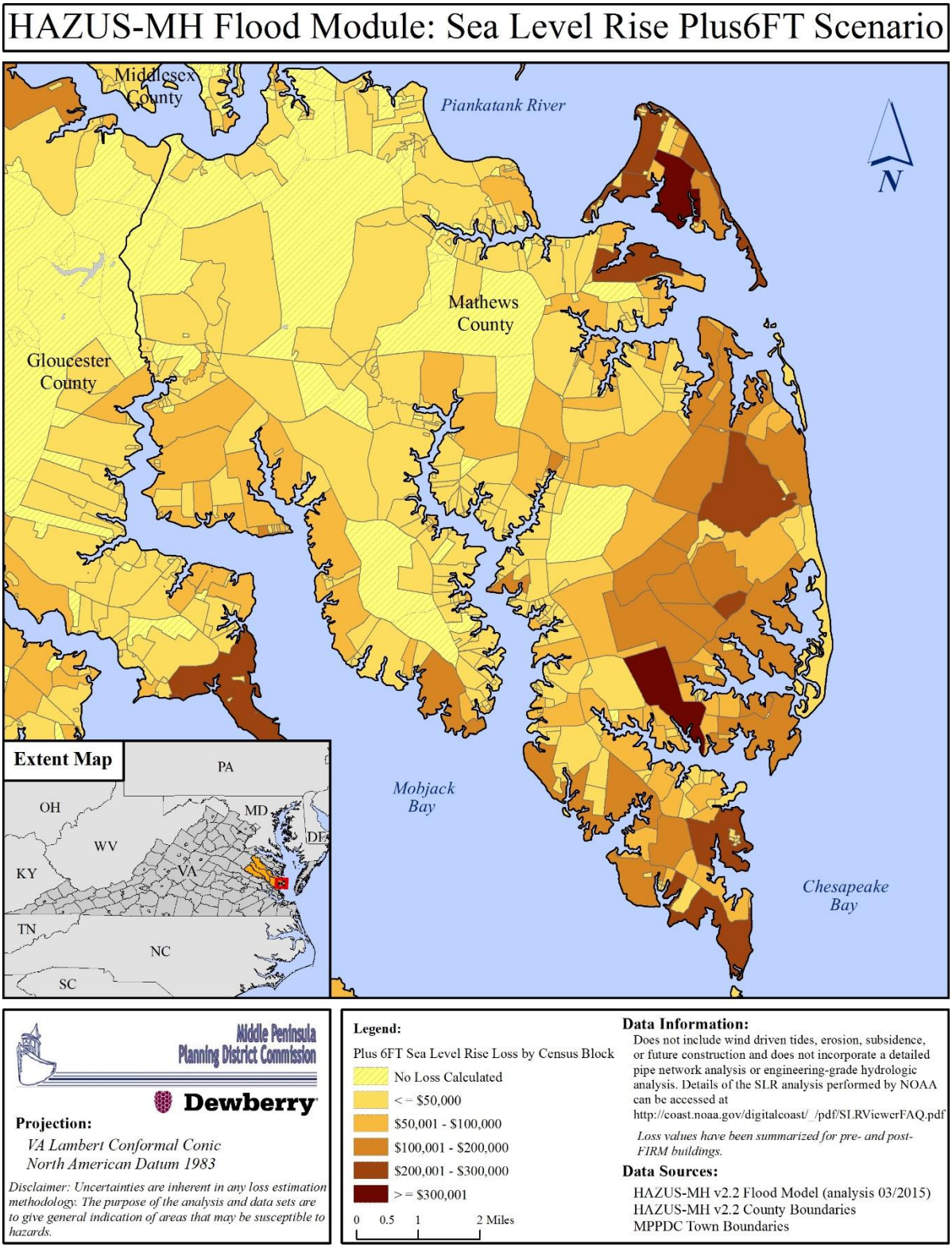

HAZUS-MH Flood Module: Sea Level Rise Plus6FT Scenario
Middlesex County
Piankatank River
N
Mathews County
Gloucester County
Mobjack Bay
Chesapeake Bay
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Plus 6FT Sea Level Rise Loss by Census Block
No Loss Calculated
< = $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
> = $300,001
0 0.5 1 2 Miles
Data Information:
Does not include wind driven tides, erosion, subsidence, or future construction and does not incorporate a detailed pipe network analysis or engineering-grade hydrologic analysis. Details of the SLR analysis performed by NOAA can be accessed at http://coast.noaa.gov/digitalcoast/_/pdf/SLRViewerFAQ.pdf
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 139:

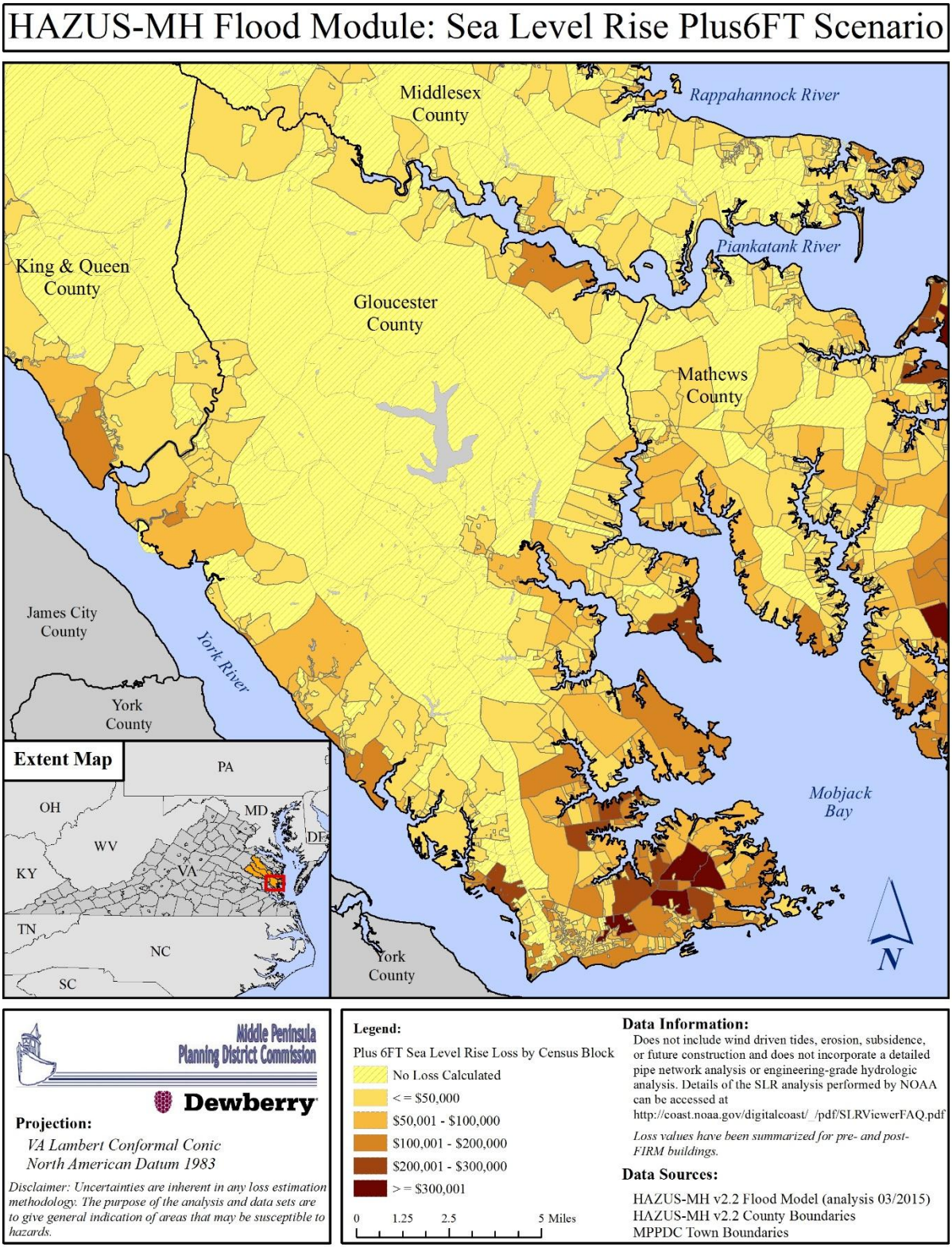

HAZUS-MH Flood Module: Sea Level Rise Plus6FT Scenario
Middlesex County
Rappahannock River
King & Queen County
Piankatank River
Gloucester County
Mathews County
James City County
York River
York County
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Mobjack Bay
York County
N
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Plus 6FT Sea Level Rise Loss by Census Block
No Loss Calculated
< = $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
> = $300,001
0 1.25 2.5 5 Miles
Data Information:
Does not include wind driven tides, erosion, subsidence, or future construction and does not incorporate a detailed pipe network analysis or engineering-grade hydrologic analysis. Details of the SLR analysis performed by NOAA can be accessed at http://coast.noaa.gov/digitalcoast/_/pdf/SLRViewerFAQ.pdf
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 140:

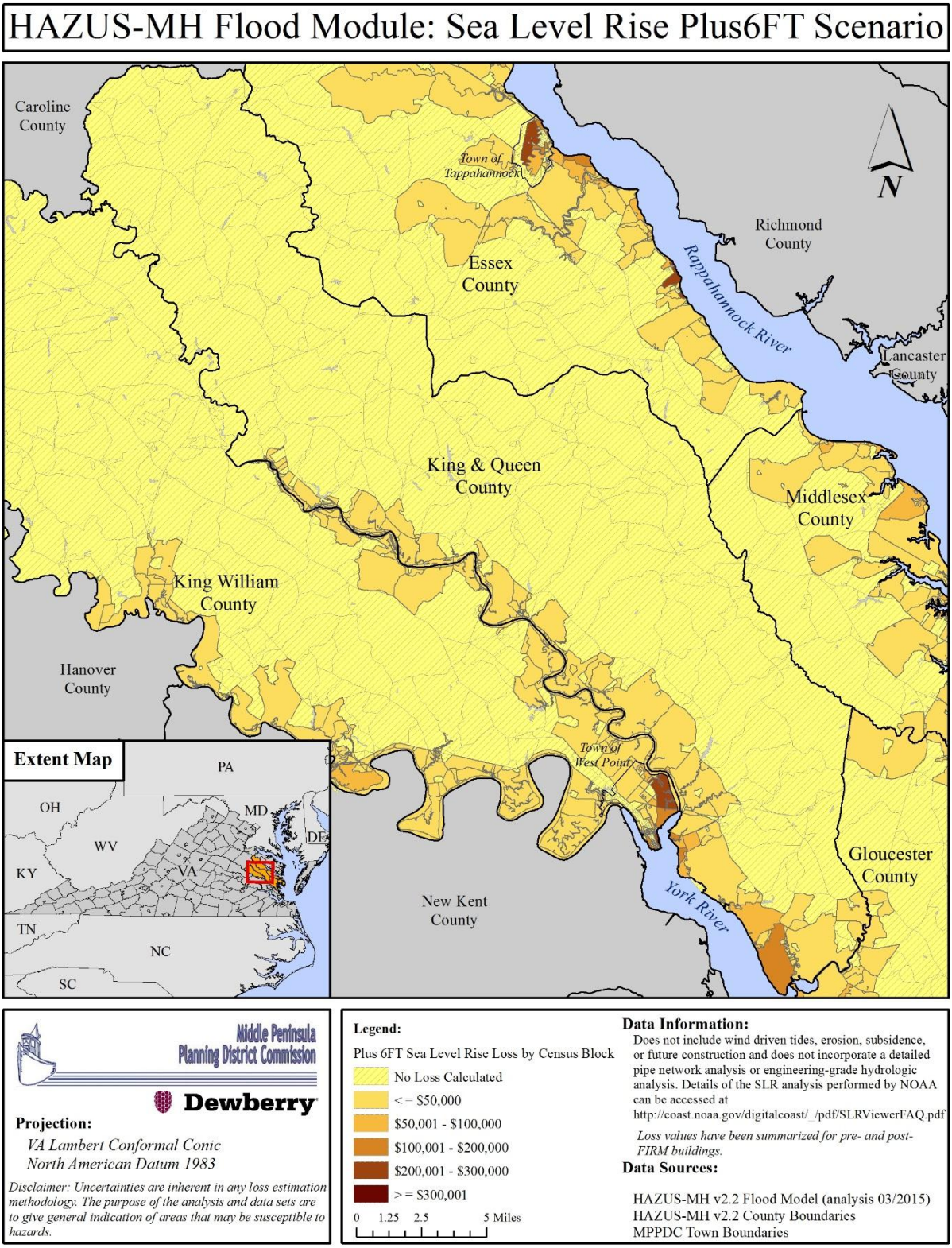

HAZUS-MH Flood Module: Sea Level Rise Plus6FT Scenario
Caroline County
Town of Tappahannock
Essex County
Richmond County
Rappahannock River
Lancaster County
King & Queen County
Middlesex County
King William County
Hanover County
Town of West Point
New Kent County
York River
Gloucester County
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Plus 6FT Sea Level Rise Loss by Census Block
No Loss Calculated
< = $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
> = $300,001
0 1.25 2.5 5 Miles
Data Information:
Does not include wind driven tides, erosion, subsidence, or future construction and does not incorporate a detailed pipe network analysis or engineering-grade hydrologic analysis. Details of the SLR analysis performed by NOAA can be accessed at http://coast.noaa.gov/digitalcoast/_/pdf/SLRViewerFAQ.pdf
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 141:

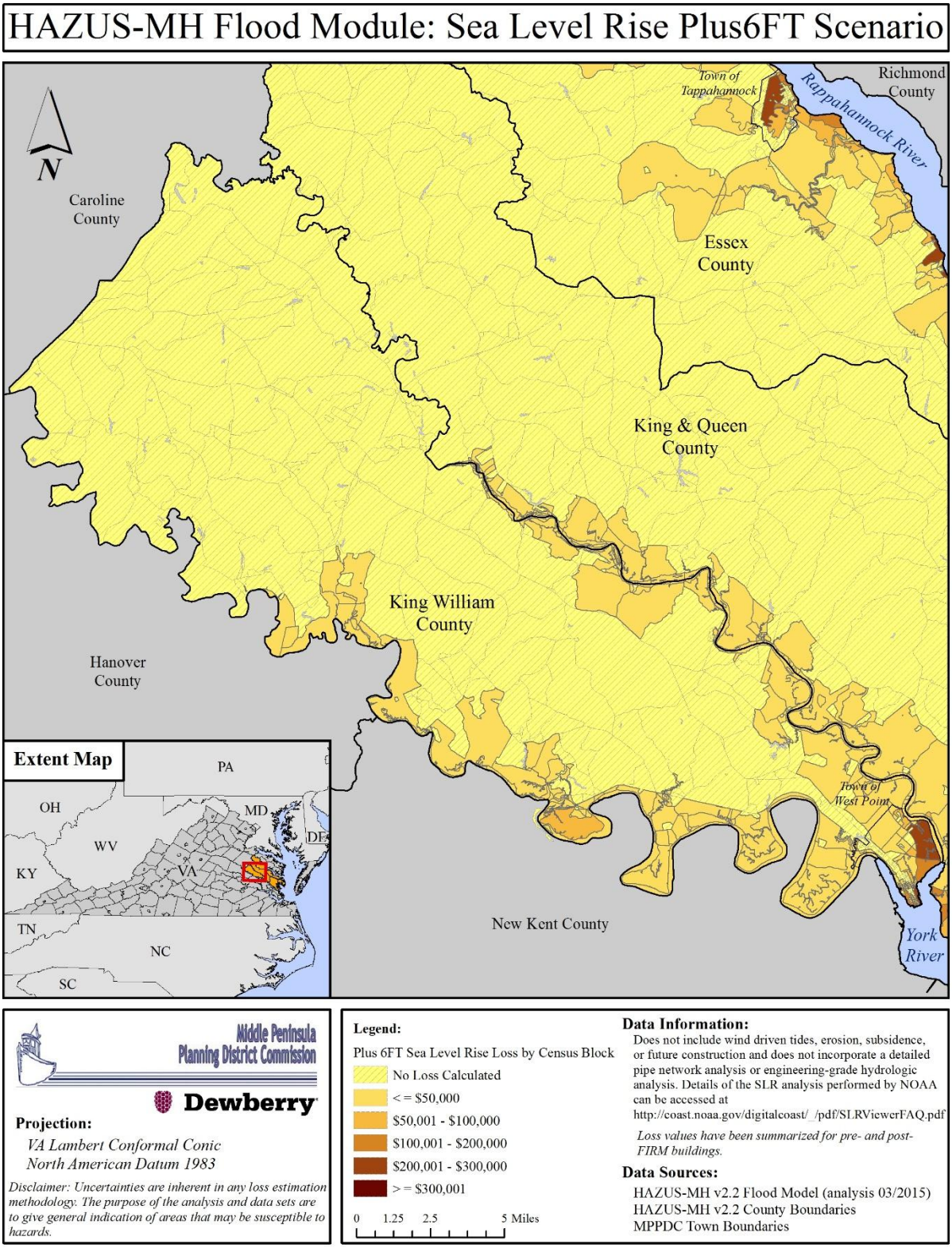

HAZUS-MH Flood Module: Sea Level Rise Plus6FT Scenario
N
Caroline County
Hanover County
King William County
King & Queen County
Essex County
Richmond County
Town of Tappahannock
Rappahannock River
Town of West Point
New Kent County
York River
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend:
Plus 6FT Sea Level Rise Loss by Census Block
No Loss Calculated
< = $50,000
$50,001 - $100,000
$100,001 - $200,000
$200,001 - $300,000
> = $300,001
0 1.25 2.5 5 Miles
Data Information:
Does not include wind driven tides, erosion, subsidence, or future construction and does not incorporate a detailed pipe network analysis or engineering-grade hydrologic analysis. Details of the SLR analysis performed by NOAA can be accessed at http://coast.noaa.gov/digitalcoast/_/pdf/SLRViewerFAQ.pdf
Loss values have been summarized for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH v2.2 Flood Model (analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 142:

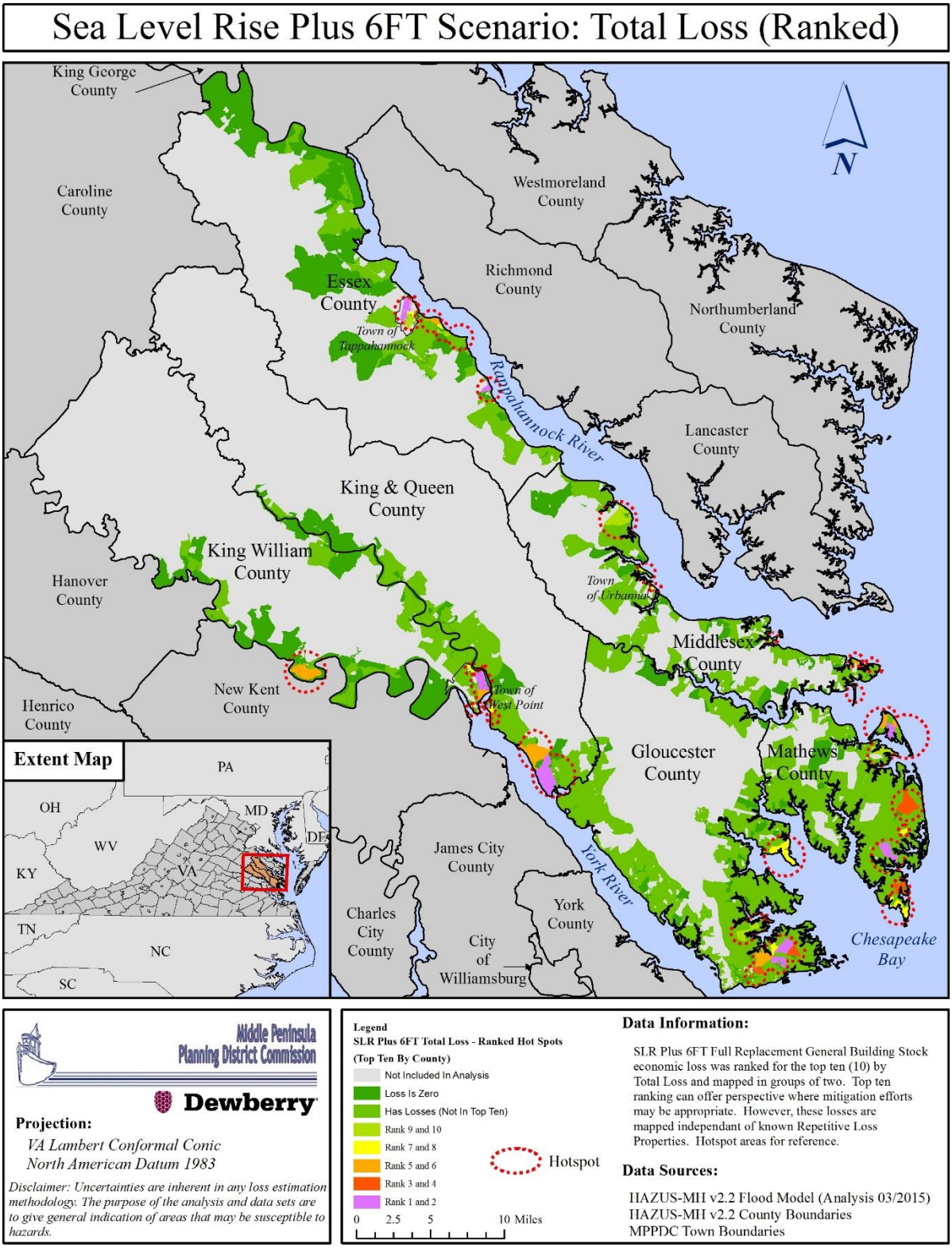
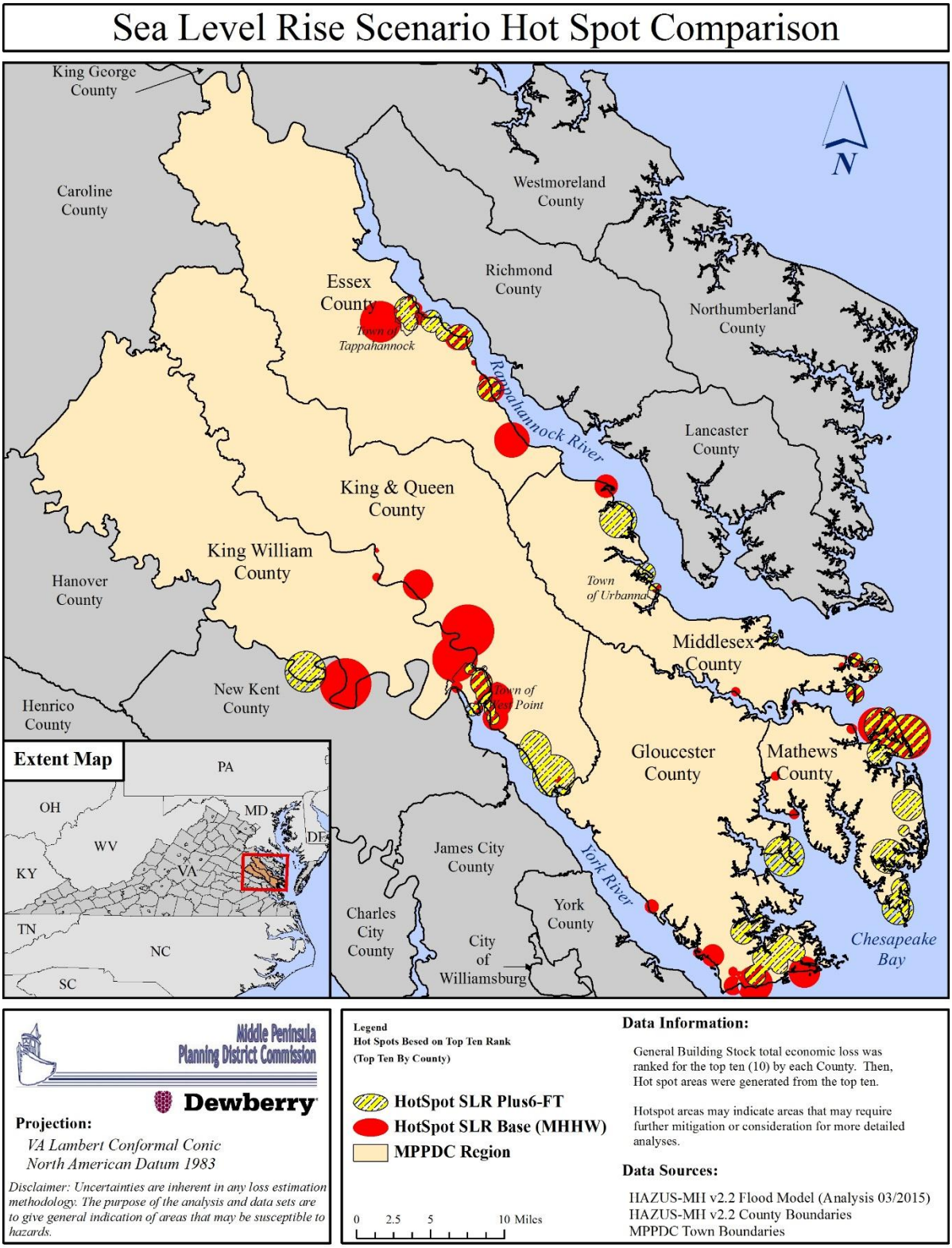

Sea Level Rise Plus 6FT Scenario: Total Loss (Ranked)
King George County
Caroline County
Westmoreland County
Richmond County
Essex County
Town of Tappahannock
Northumberland County
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend
SLR Plus 6FT Total Loss - Ranked Hot Spots
(Top Ten By County)
Not Included In Analysis
Loss Is Zero
Has Losses (Not In Top Ten)
Rank 9 and 10
Rank 7 and 8
Rank 5 and 6
Rank 3 and 4
Rank 1 and 2
Hotspot
0 2.5 5 10 Miles
Data Information:
SLR Plus 6FT Full Replacement General Building Stock economic loss was ranked for the top ten (10) by Total Loss and mapped in groups of two. Top ten ranking can offer perspective where mitigation efforts may be appropriate. However, these losses are mapped independant of known Repetitive Loss Properties. Hotspot areas for reference.
Data Sources:
HAZUS-MH v2.2 Flood Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Figure 143:


Sea Level Rise Scenario Hot Spot Comparison
King George County
Caroline County
Westmoreland County
Richmond County
Essex County
Town of Tappahannock
Northumberland County
Rappahannock River
Lancaster County
King & Queen County
King William County
Hanover County
Town of Urbanna
Middlesex County
New Kent County
Town of West Point
Henrico County
Gloucester County
Mathews County
James City County
York River
Charles City County
York County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
DE
WV
KY
VA
TN
NC
SC
Middle Peninsula Planning District Commission
Dewberry
Projection:
VA Lambert Conformal Conic
North American Datum 1983
Disclaimer: Uncertainties are inherent in any loss estimation methodology. The purpose of the analysis and data sets are to give general indication of areas that may be susceptible to hazards.
Legend
Hot Spots Besed on Top Ten Rank
(Top Ten By County)
HotSpot SLR Plus6-FT
HotSpot SLR Base (MHHW)
MPPDC Region
0 2.5 5 10 Miles
Data Information:
General Building Stock total economic loss was ranked for the top ten (10) by each County. Then, Hot spot areas were generated from the top ten.
Hotspot areas may indicate areas that may require further mitigation or consideration for more detailed analyses.
Data Sources:
HAZUS-MH v2.2 Flood Model (Analysis 03/2015)
HAZUS-MH v2.2 County Boundaries
MPPDC Town Boundaries

Sea Level Rise Scenario Comparison Tables:

Table 79: Hazus loss for both Pre- and Post-FIRM – Sea Level Rise Base (MHHW) and Plus 6-Feet.

Area	Scenario [A]	Total Loss	Building Loss	Contents Loss	Business [B] Disruption
MPPDC Region	SLR_Base	$10,185	$6,010	$4,165	$11
MPPDC Region	SLR_Plus6	$283,524	$156,719	$124,964	$2,660
Essex County	SLR_Base	$722	$391	$331	$1
Essex County	SLR_Plus6	$15,866	$8,202	$7,511	$178
Gloucester County	SLR_Base	$2,760	$1,638	$1,120	$1,122
Gloucester County	SLR_Plus6	$116,625	$63,431	$52,381	$53,751
King and Queen County	SLR_Base	$254	$150	$97	$7
King and Queen County	SLR_Plus6	$6,622	$3,999	$2,561	$62
King William County	SLR_Base	$938	$532	$406	$0
King William County	SLR_Plus6	$18,289	$8,561	$9,603	$208
Mathews County	SLR_Base	$2,496	$1,494	$1,002	$0
Mathews County	SLR_Plus6	$96,918	$55,754	$40,566	$711
Middlesex County	SLR_Base	$3,015	$1,805	$1,209	$1
Middlesex County	SLR_Plus6	$29,204	$16,772	$12,342	$131
		Data in Thousands of Dollars			

Notes:

[A] Scenario does not include wind driven tides nor consider natural processes such as erosion, subsidence, or future construction and does not incorporate a detailed pipe network analysis or engineering-grade hydrologic analysis. Details of the SLR analysis performed by NOAA can be accessed at http://coast.noaa.gov/digitalcoast/_/pdf/SLRViewerFAQ.pdf

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

Potential Mitigation Actions:

The potential mitigation actions noted are those that are Hazus-specific and would benefit refinement of Hazus analyses.

- ☐ Perform Hazus analyses based on the same data resources used to develop the inundation areas mapped in the report submitted to the Virginia General Assembly in January 2013 titled – RECURRENT FLOODING STUDY FOR TIDEWATER VIRGINIA by the Virginia Institute of Marine Science, Center for Coastal Resources Management at the College of William & Mary. This study appears to include the most widely accepted Sea Level Rise plus Storm Surge Scenario facing coastal Virginia. It would therefore be appropriate to consider 1.) The creation of depth grids from the study data and then 2.) Hazus Risk Assessment. It would also be beneficial to incorporate elements of the design storm into a combined Hazus Flood and Hurricane Scenario - in this manner benefits of the combined methodology can be realized – which includes methods to guard against over-counting or double-counting losses by simply adding damages from each respective Hazus model.
- ☐ Refine and update data sets for GBS and essential facilities.
    - Improvements in the future should aim to further refine the building stock. Notably, one improvement should include adding any new development that may not have been in the land use/land cover data; e.g., new housing developments, new construction, etc…
    - Perform localized building-level assessments in known areas of loss and or areas subject to likely losses.

Section 6 - Capability Assessment

According to the FEMA Local Mitigation Planning Handbook, *Each community has a unique set of capabilities, including authorities, policies, programs, staff, funding another resources available to accomplish mitigation and reduce long-term vulnerability.* In an effort to access these capabilities within each Middle Peninsula localities the regional preparedness planner worked with the AHMP Steering Committee to gather the necessary information. To provide consistency amongst the localities, the regional preparedness planner provided each locality with a Capability Assessment Worksheet to fill out. This work sheet requested feedback on the primary types of capability for reducing long-term vulnerability including planning and regulatory, administrative and technical, financial, and education and outreach.

While each locality has a variety of tools (i.e. authorities, polices, programs, staff, and funding sources) to implement mitigation goals, objectives, and strategies, each locality functions differently and therefore has a different capacity to implement such tools. Below is a breakdown of the capabilities within in each jurisdiction as it relates to planning and regulatory, administrative and technical, financial, and education and outreach.

Planning and regulatory capabilities are the plans, policies, coeds and ordinances that prevent and reduce the impacts of hazards. Table 80 shows the types of plans within each Middle Peninsula locality. This table also identifies, in green, those plans that address hazards to some degree.

Table 80: This a summary table of the plans that are implemented within their locality. The green squares indicate that plans within the localities that address hazards.

Plans	Essex	Gloucester	King & Queen	King William	Mathews	Middlesex	Town of Tappahannock	Town of Urbanna	Town of West Point
Comprehensive Plan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capital Improvements Plan	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Economic Development Plan	Yes	Yes		No	No	Yes	No	Yes	No
Local Emergency Operations Plan	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Continuity of Operations Plan		In Progress		No	In Progress	Yes	No	No	Yes
Transportation Plan	Yes	No	Yes	Yes	Yes	No	No	No	No
Stormwater Management Plan	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Community Wildfire Protection Plan		No	No	No	No	No	No	No	No
Other special plans (e.g. Brownfield's redevelopment, disaster recovery, coastal zone management, climate change adaptation)		Yes		No	No	No	No		No

**Note: Each locality had the opportunity to provide responses to available capabilities. Therefore empty squares represent no response from the locality.*

Table 81: ESSEX COUNTY		
Land Use Planning and Ordinances	**Yes/No**	**1. Is the ordinance an effective measure for reducing hazard impacts? 2. Is the ordinances adequately administered and enforced?**
Zoning ordinance	Yes	1. Yes 2. Yes
Subdivision ordinance	Yes	1. Yes 2. Yes
Floodplain ordinance	Yes	1. Yes 2. Yes
Natural hazard specific ordinance (stormwater, steep slope, wildfire)		1. Yes 2. Yes
Flood insurance rate maps	Yes	1. Yes 2. Yes
Acquisition of land for open space and public recreation uses	Yes	Landuse, parks and recreation

Table 82: GLOUCESTER COUNTY		
Land Use Planning and Ordinances	**Yes/No**	**1. Is the ordinance an effective measure for reducing hazard impacts? 2. Is the ordinances adequately administered and enforced?**
Zoning ordinance	Yes	1. Yes 2. Yes
Subdivision ordinance	Yes	1. Yes 2. Yes
Floodplain ordinance	Yes	1. Yes 2. Yes
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Yes	1. Yes 2. Y Yes
Flood insurance rate maps	Yes	1. Yes 2. Yes
Acquisition of land for open space and public recreation uses	Yes	1. Yes 2. Yes
Other	Yes	1. Yes 2. Y Yes

Table 83: KING & QUEEN COUNTY		
Land Use Planning and Ordinances	**Yes/No**	**1. Is the ordinance an effective measure for reducing hazard impacts?** **2. Is the ordinances adequately administered and enforced?**
Zoning ordinance	Yes	1. Requires open space, flood elevation certificates, substantial setback requirements, etc. 2. yes
Subdivision ordinance	Yes	1. Allows for limited number of by-right divisions compared to surrounding jurisdictions. Site plan requirements. 2. yes
Floodplain ordinance	Yes	1. Yes 2. Yes
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Yes	1. Stormwater – limits development 2. Yes - DEQ
Flood insurance rate maps	Yes	
Acquisition of land for open space and public recreation uses	Yes	Conservation Easements & DOF Public Forest

Table 84: KING WILLIAM COUNTY		
Land Use Planning and Ordinances	**Yes/No**	**1. Is the ordinance an effective measure for reducing hazard impacts?** **2. Is the ordinances adequately administered and enforced?**
Zoning ordinance	Yes	Yes
Subdivision ordinance	Yes	
Floodplain ordinance	Yes	
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Yes	Stormwater Ordinance Drought Ordinance
Flood insurance rate maps	Yes	
Acquisition of land for open space and public recreation uses	No	

Table 85: MATHEWS COUNTY		
Land Use Planning and Ordinances	**Yes/No**	**1. Is the ordinance an effective measure for reducing hazard impacts? 2. Is the ordinance adequately administered and enforced?**
Zoning ordinance	Yes	1. Yes 2. Yes
Subdivision ordinance	Yes	1. Yes 2. Yes
Floodplain ordinance	Yes	1. Yes 2. Yes
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	No	
Flood insurance rate maps	Yes	1. Yes, effective date 12/09/14 2. Yes
Acquisition of land for open space and public recreation uses	Yes	Only through FEMA HMGP Grant funding

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

- The Comprehensive Plan will be reviewed this year and into 2016 for potential amendments to identify future land uses for flood prone areas of the county and to adopt ordinances /policies that will reduce risks from recurrent flooding.
- We will consider land use tools such as increased setbacks and increased minimum lot sizes in the zoning ordinance and reducing the number of lots that can be created through subdivision of land to reduce development areas of land in the county subject to flooding.
- We will consider tools such as Purchase of Development Rights and Transfer of Development Rights to be included in our County Code of Ordinances to provide incentives to property owners/developers to develop outside of flood prone areas.
- We will review the Capital Improvements Plan to identify County-owned buildings/facilities that could be flood proofed or developed outside of Special Flood Hazard Areas.
- The Floodplain Management Ordinance could be expanded to identify a freeboard requirement for elevation of structures above the base flood elevation (BFE).

Table 86: MIDDLESEX COUNTY		
Land Use Planning and Ordinances	**Yes/No**	**1. Is the ordinance an effective measure for reducing hazard impacts? 2. Is the ordinance adequately administered and enforced?**
Zoning ordinance	Yes	1. Yes 2. Yes
Subdivision ordinance	Yes	1. Yes 2. Yes
Floodplain ordinance	Yes	1. Yes 2. Yes
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	No	
Flood insurance rate maps	Yes	1. Yes 2. Yes
Acquisition of land for open space and public recreation uses	No	

Table 87: TOWN OF URBANNA		
Land Use Planning and Ordinances	**Yes/No**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinances adequately administered and enforced?**
Zoning ordinance	Yes	1. Yes 2. Yes
Subdivision ordinance	Yes	1. Yes 2. Yes
Floodplain ordinance	Yes	1. Yes 2. Yes
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	No	N/A
Flood insurance rate maps	Yes	1. Yes 2. Yes
Acquisition of land for open space and public recreation uses	No	N/A

Table 88: TOWN OF TAPPAHANNOCK		
Land Use Planning and Ordinances	**Yes/No**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinances adequately administered and enforced?**
Zoning ordinance	Yes/2004	Yes
Subdivision ordinance	Yes/1999	Yes
Floodplain ordinance	Yes/2015	Yes
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	Yes/2011	Yes
Flood insurance rate maps	Yes/2015	Yes
Acquisition of land for open space and public recreation uses	Yes	Yes

Table 89: TOWN OF WEST POINT		
Land Use Planning and Ordinances	**Yes/No**	**Is the ordinance an effective measure for reducing hazard impacts? Is the ordinances adequately administered and enforced?**
Zoning ordinance	Yes	1. Yes 2. Yes
Subdivision ordinance	Yes	1. Yes 2. Yes
Floodplain ordinance	Yes	1. Yes 2. Yes
Natural hazard specific ordinance (stormwater, steep slope, wildfire)	No	1. Yes 2. Yes
Flood insurance rate maps	Yes	1. Yes 2. Yes
Acquisition of land for open space and public recreation uses	Yes	1. Yes 2. Yes

Administrative and technical capabilities include staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions. For smaller jurisdictions without local staff resources, enforcing policies or conducting public outreach may be difficult. Table 90 below indicates whether or not Middle Peninsula localities have specific administrative and technical capabilities.

Table 90: This table indicates whether or not Middle Peninsula localities have specific administrative and technical capabilities.

Administration	Essex	Gloucester	King & Queen	King William	Mathews	Middlesex	Town of Tappahannock	Town of Urbanna	Town of West Point
Planning Commission	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mitigation Planning Committee	No	Yes	No	No	No	No	No	No	No
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Yes	Yes	Yes	No	Yes, Outfall Ditch Program	No	No	No	No
Mutual aid agreements	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Staff									
Chief Building Official	Yes	Yes	Yes	Yes	Yes (Full-time)	Yes	Yes	Yes	Yes (Full-time)
Floodplain Administrator	Yes	Yes	Yes	Yes	Yes (Full-time)	Yes	Yes	Yes	Yes (Full-time)
Emergency Manager	Yes	Yes		Yes	Yes (Full-time)	Yes	Yes	Yes	Yes (Full-time)
Community Planner	Yes	Yes		Yes	Yes (Full-time)	No	Yes	Yes	Yes (Full-time)
Civil Engineer	No	Yes		No	No	No	No	No	Yes (part-time)
GIS Coordinator	No	Yes		Yes	Yes (Full-time)	Yes	No	Yes	Yes (Full-time)
Other				Yes	Yes (Full-time)				
Technical									
Warning systems/services (Reverse 911, outdoor warning signals)		Yes		Yes	Yes	Yes	No	Yes	Yes
Hazard data and information	No	Yes				Yes	No	Yes	Yes
Grant Writing	No	No		Yes	Yes	Yes	No	Yes	Yes
Hazus analysis	No	No	No	No	No	No	No	Yes	Yes

**Note: Each locality had the opportunity to provide responses to available capabilities. Therefore empty squares represent no response from the locality.*

Essex County has tree trimming maintenance program with the local electric company helps to reduce risk of power outages. As for the Town of Tappahannock they have access to and benefit from the Chief Building Official, Floodplain Administrator, and Emergency Manger that is employed with Essex County.

Gloucester County identified that staffing within the County is not adequate to proactively enforce regulations, however all staff are trained on hazards and mitigation and that there is coordination between agencies, staff and committees. Gloucester County has a County hazard Mitigation Committee that meets monthly and aggressively addresses homes in the flood risk zones with FEMA's Hazard Mitigation Grant Program (HMGP) to perform property acquisitions and elevations. The County also works with Dominion for tree trimming maintenance program to reduce risk of power outages.

As the Town of Urbanna is a small coastal community, resources are limited and in many cases shared with the Middlesex County. While the Town of Urbanna has access to a Chief Building Official, Floodplain Administrator, Emergency Manger, and a GIS coordinator, Middlesex County employees these people. In addition the Town of Urbanna benefits from Middlesex County's fire and emergency medical service mutual aid agreements as well as the County's Blackboard connect and Reverse 911 system. Urbanna's Economic Development Plan and Emergency Operations Plans are incorporated into the Middlesex County Plan.

King William County has adequate staffing throughout the county, but identified that the Chief Building Official, Floodplain Administrator, Community Planner, and GIS coordinator are not trained in hazards and mitigation. As for the Town of West Point, it operates separately from the County and only benefits from the King William County warning system in place. Therefore the Town has full-time staffers, with the exception of the civil engineer, that help to adequately to enforce regulations, however the majority of them are not trained on hazards and mitigation (i.e. Chief Building Official, Floodplain administrator, Community planning and the GIS coordinator).

Mathews County identified that while County positions are filled full time positions Chief Building Official and the Floodplain Administrator are not staffed adequately. There is more work then staff hours can handle. However each staffer noted in the above table are trained on hazards and mitigation.

In addition to locality specific capabilities, all Middle Peninsula localities are active members of the Middle Peninsula Planning District Commission (MPPDC). The MPPDC is a regional planning body that can assist localities in grant writing, technical assistance, and executing a project. Depending on the need of the locality or the region, MPPDC staff may assist. For instance, through this AHMP update MPPDC hired a regional preparedness planner to coordinate localities and develop a plan. In part the Hazus analysis was conducted for all localities. So while only few localities had GIS capabilities to conduct such an assessment on their own the MPPDC was able to complete this task on regional basis that ultimately saved local resources and offered a regionally consistent deliverable.

Financial capabilities address a locality's access to or eligibility to use the following funding resources for hazard mitigation. Table 91 below indicates whether or not Middle Peninsula localities have specific financial capabilities.

Table 91: This table indicates whether or not Middle Peninsula localities have specific financial capabilities.									
Plans	**Essex**	**Gloucester**	**King & Queen**	**King William**	**Mathews**	**Middlesex**	**Town of Tappahannock**	**Town of Urbanna**	**Town of West Point**
Capital Improvement Project funding	Yes	Yes		Yes	Yes	No	Yes	Yes/ Eligible	No
Authority to levy taxes for specific purposes	No	Yes		Yes	No	No	No	No	No
Fees for water, sewer, gas, or electric services	No	Yes		No	No	No	No	Yes- Water Only	No
Impact fees for new development	No	No		No	No	No	No	No	No
Storm water utility fee	No	Yes		No	No	No	No	No	No
Incur debt through general obligation bonds and /or special tax bonds	No	Yes		Yes	Yes	No	No	No	No
Incur debt through private activities	Yes	Yes		Yes	No	No	No	No	No
Community Development Block Grant	No	No		Yes	Yes	No	No	No	No
Other federal funding programs	No	Yes		Yes	Yes	Yes	Yes	Yes	Yes
State funding programs	No	Yes		Yes	No	Yes	Yes	Yes	No
**Note: Each locality had the opportunity to provide responses to available capabilities. Therefore empty squares represent no response from the locality.*									

While there some finical options available to localities there are some cases in which these resources may not be used for mitigation. For instance according to Gloucester County it has access to stormwater utility fees, incurred debt through general obligation bonds and /or special tax bonds, as well as debt through private activities and yet Gloucester County cannot utilize these resources for mitigation. For King William County those funding resources identified as "not being used in the past and therefore are not likely to be used in the future" include Authority to levy taxes for specific purposes and incurring debt through private activities. However the King William County also noted funding resources identified as "not being used in the past, but could be in the future" to include capital improvement project funding, community development block grant, other funding programs, and state funded programs as well as incurring debt through general obligation bonds and/or special tax bonds.

The Town of Urbanna noted that while it has access to the community development block grants, other federal funding programs and state funding program these programs have not been used locally in the past and they have limited potential to be used in the future due to income eligibility.

Mathews County has utilized the Community Development Block Grant and received for a business District Revitalization project. While this project was not associated with hazard mitigation, Mathews County could use this funding for future hazard mitigation activities. In additional Mathews County has also received funding from the FEMA's HMGP Program to elevate houses and acquire properties in Special Flood Hazard Areas. The County plans to apply for additional funding from FEMA to elevate houses and acquire properties when the opportunity is available.

Education and Outreach capabilities are education and outreach programs and method already in place that could be used to implement mitigation activities and communicate hazard –related information. Table 92 below indicates whether or not Middle Peninsula localities have specific education and outreach efforts.

Table 92: This table indicates whether or not Middle Peninsula localities have specific education and outreach efforts.

Plans	Essex	Gloucester	King & Queen	King William	Mathews	Middlesex	Town of Tappahannock	Town of Urbanna	Town of West Point
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Yes	Yes		No	No	Yes	No	Yes	No
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes	Yes		No	Yes	Yes	Yes	Yes	No
Natural disaster or safety related school programs	Yes	Yes			Yes	Yes	No	Yes	No
StormReady certification	No	Yes (2014-recertification)		No	No	No	No	No	No
Firewise Communities certification	No	No		No	No	No	No	No	No
Public-private partnership initiatives addressing disaster-related issues	Yes	Yes		No	No	Yes	Yes	NO	No

**Note: Each locality had the opportunity to provide responses to available capabilities. Therefore empty squares represent no response from the locality.*

Essex County has local employees that provide ongoing public education. The County has also worked with local schools to educate students about water issues, fire safety, and household preparedness. In addition the County hosts a Disaster Survivor Day each year to teach citizens how to prepare for

disasters. The Town of Tappahannock is focus on-going public education regarding water quality and water conservation.

Gloucester County offers a variety of public outreach opportunities for their citizens. As participants in the CRS program the County has developed a Program for Public Information (PPI) that includes on-going education about water issues, fire safety, household preparedness, environmental education and hazards. The Emergency Manger provides this outreach and awareness. The County has developed a public-private partnership within the Gloucester Chamber of Commerce in order to host an annual preparedness symposium. The County's Community Emergency Response Team (CERT) performs outreach and education programs for Spring Storms, Hurricane Preparedness, Flood Program Awareness, and Winter Weather Preparedness. Additionally the County has incorporated lightning safety in natural disaster and safety related school programs.

Within Mathews County the capability to provide education and outreach is limited, yet the school curriculum includes natural disaster and safety related programs. The Building Official's web page has online information and community presentations regarding building codes and floodplain management.

In Middlesex County public education is offered through the Office of Emergency Services. As for the Town of Urbanna with limited staff and funds, the Town looks to Middlesex County for the majority of its public engagement efforts. However the Town has a local citizens group, Friends of the parks (501-3-C organization) that is very interested in resource protection and preservation. The organization is in its formative stages of development but has considerable potential to assist in public outreach.

King William County does not currently have an active public education program, but it eh program currently being developed. As of the Town of West Point, they do not have education opportunities for citizens. Staff in Wet Point would need to be trained on hazard mitigation topic before providing outreach programs.

Existing Mitigation Activities - Structural Projects

Gloucester County's Hurricane Recovery/Mitigation Projects

Gloucester County has an active and on-going hurricane residential recovery program in the Jenkins Creek and Guinea communities in the southern portion of the county. This is where the York River and Mobjack Bay meet the Chesapeake Bay. The county has successfully applied for and received grant funding from HUD/VDHCD as well as FEMA/VDEM to implement their multi-phased residential mitigation program.

Since 2004, Gloucester County has participated in eleven (11) Hazard Mitigation (HMGP) grants, one (1) Repetitive Flood Claim (RFC) grant, and one (1) Community Development Block Urgent Needs (CDBG) grant. Five HMGP grants are still active. Gloucester County has been very active in the mitigation scene receiving more than 25% of the Virginia's HMA allocations since 2005. All of the grants were designed to both assist in the recovery from storm events and to help reduce the damages that could come from future events.

The 2006 CDBG Urgent Needs grant built or rehabilitated, on elevated foundations, 7 homes. The homes were all severe loss homes that were substantially damaged by Isabel. The work under this grant was completed in 2009. Under the FEMA Hazard Mitigation Assistance (HMA) program, the County has acquired 30 parcels and has funding to 2 more parcels under 4 FEMA acquisition grants. Each parcel was cleared of its structures and turned into permanent open space. The land was incorporated into an Open Space Plan. Most of the lots are now acting as natural buffers for the Guniea area. One is to be

developed as a walking trail. The County continues to look at additional recreation options for the spaces as well. In all the County owns 82 acres acquired under the FEMA HMA grant.

The FEMA HMA grants have 85 funded elevation since 2004 with 60 on new foundations. Gloucester had 7 FEMA elevation grants and 1 FEMA RFC grant. Gloucester also had 4 owners have withdrawn and we are working on completing 21 elevations. All the current grant work should be complete by next summer (2017). The elevation work places the home on a new foundation that is at least two feet above the FEMA required base flood elevation level (Figures 144-149). Although most of the homes in the grants have been in Guinea area residents in Ware Neck, Harcum (Painkatank River), Glass, and Robins Neck have also participated in the program.

The work by the County has helped reduce its total number of repetitive and severe repetitive loss lists. Of the properties in the FEMA HMA grants, 3 acquired properties were identified as repetitive loss however none of them are severe repetitive loss properties. Sixteen on the elevated homes were repetitive loss properties, 4 of which are severe. All 7 CDBG homes were considered severe repetitive loss homes. In total we have mitigated nineteen repetitive loss properties and 11 severe repetitive loss homes. County's Building Office tracks and has completed all the AW-501 worksheets in order to report to FEMA the completed mitigation activities for these homes.

The total funds allocated by all the grants is just under $12 million dollars. This includes just over $8.5 million plus in federal funds and over $2.5 million in state funds for the FEMA grants and $750,000 in funds for the CDBG program.

Most recently, in July of 2015, Gloucester County received $331,594 of HMGP funding, which is 34% of total state funding. This funding will be used to elevate 2 homes and will allow 2 properties to be acquired. In both cases this will minimize the risk of future flooding to citizens. Gloucester County has joined into a partnership with the United States Geological Service (USCG) by installing a Tide Gage on the Severn River that is used to monitor flood conditions in the southeastern section of the County.



Figure 144: House in Hayes, Gloucester County - BEFORE elevation.



Figure 145: House in Hayes, Gloucester County- AFTER elevation.



Figure146: House in Hayes, Gloucester County - BEFORE elevation.



Figure 147: House in Hayes, Gloucester County - AFTER elevation.



Figure148: House in Hayes, Gloucester County- BEFORE elevation.



Figure149: House in Hayes, Gloucester County- AFTER elevation.

Mathews County Mitigation Projects

The following are a list of FEMA HMGP grants Mathews County has received for elevation of houses and acquisitions of properties over the past five (5) years.

Project Number SLR-2009-115-002

This was a grant to elevate one house under a Severe Repetitive Loss Program funding the County received from FEMA. The total project budget for this elevation was $207,942.00. This house elevation was advertised for bid, a contract was awarded and the house was elevated above the Base Flood Elevation (BFE) for the Special Flood Hazard Area (SFHA) where the property is located. The property owner provided a ten (10) percent match of the contractor's bid amount using his funds. Ninety (90) percent of the cost for elevating the house was paid for out of the grant.

This house is on FEMA's Severe Repetitive Loss list.

Project Number SLR- 1987-008

The county applied for funding after the remnants of Tropical Storm Ida damaged properties in Mathews in November 2009. The county was awarded funding in the amount of $889,825 to acquire one property and elevate eight (8) houses. The County awarded contracts to elevate

four (4) houses and the work has been completed. One property was acquired and there is one house remaining to be elevated. Three houses were not elevated because the eligible property owners chose not to participate in the grant program.

Three of the four houses that were elevated are on FEMA's Repetitive Loss list. The property that was acquired is on the list, and the one house remaining to be elevated is on the list.

Project Number HMGP – 4045 – 002
The County applied for funding subsequent to the Tropical Storm Lee event. The County was awarded funding in the amount of $1,122,865 to elevate nine (9) homes. All nine (9) homes are located throughout the County, but primarily in the eastern and southern portions of the County that are most susceptible to flooding. To date, two homes have been elevated. One home has been awarded a contract to be elevated and one home is ready to be advertised for bid. Five property owners are not participating in the grant program.

One house that was elevated is on the Repetitive Loss List and one that is ready to be advertised for bed is on the list.

Project Number HMGP – 4092-002
The County applied for funding subsequent to the Hurricane Sandy event. The County was awarded funding in the amount of $1,774,360 to elevate eleven (11) homes and acquire one property. All twelve (12) homes were located throughout the County, but primarily in the eastern and southern portions of the County that were most susceptible to flooding. To date, three (3) homes have been elevated (Figures 150 and 151). Two homes have been awarded a contract to be elevated and four homes are ready to be advertised for bid. One house is ready to be acquired. Two property owners are not participating in the grant program.



Figure 150: Photos of an elevated home in Moon, Va during (left) and after (right) (Mathews County, 2015).



Figure 122: Photos of an elevated home in Port Haywood during (left) and after (right) being elevated (Mathews County, 2015).

One house that was elevated is one the Repetitive Loss list and one house that is ready to be advertised for bid is on the list.

Town of West Point Hurricane Recovery/Mitigation Projects

In March of 2010 the Town of West Point applied for funding through the Virginia Department of Emergency Management Hazard Mitigation Grant Program. The Town proposed a project to elevate a home on Kirby Street to base flood elevation plus 1 foot to relocate the home outside the 100 year flood plain. This would reduce flood risk from major storms (i.e. Hurricane Isabel) as well as minor nor'easters.

Upon receiving notice of funding in 2013, the Town requested bids to complete the elevation project. In 2015 the project was finally complete. Below are pictures of the house before and after elevation (Figure 152 and 153).



Figure 152: Photos of a home in the Town of West Point before being elevated.



Figure 153: Photos of a home in the Town of West Point after being elevated.

In conjunction with this elevated home, the Town of West Point received funding through the HMA to relocated the Public Works Building on 7th Street to King William Avenue due to repetitive flooding. This move created a more stable working environmental for employees.

Both the Kirby Street property and the Publics Works Building were on the repetitive loss list prior to mitigation action.
The Town of West Point also received funding through FEMA and VDEM to acquire multiple properties – including two properties on 1st Street, one property on 2nd Street, one property on Glass Island Road as well as one property on 5th street. The 5th Street properly was on the repetitive loss list.

Observations from Existing Structural Mitigation Projects

Due to the engineering and other technical aspects of structural mitigation projects as well as the limited number of county personnel available to undertake these new initiatives, Gloucester County has hired a consulting firm, Community Planning Partners, to assist them with their grant funding applications, project engineering/design as well as construction management of their multi-phased mitigation projects. Mathews County has hired the same consulting firm as Gloucester and have a total of 47 properties either they have mitigation using HMA funds or are in the process of mitigating.

As of yet, none of the other Middle Peninsula localities have undertaken structural mitigation projects. However, 5 private property owners in the town of Urbanna, with their own financial resources, have rebuilt their homes that were damaged by flooding from Hurricane Isabel. These structures were rebuilt in accordance with the locality's floodplain regulations and they were elevated by either being built on stilts or with block crawl spaces having the required vented openings in the foundation.
When Middle Peninsula localities undertake future structural mitigation projects, it can be expected that they will continue to utilize the services of either consulting engineering firms or local agencies that have the technical capacity to undertake housing elevation projects.

The localities have the capacity to offer operational support services such as office space and some administrative support services in their role as the official FEMA grantee. Once again, project management will in all likelihood be a contracted service due to the dependency on grant funding and the technical complexity of elevating houses.

National Flood Insurance Program (NFIP)
The AHMP Steering Committee was given an opportunity to share progress made on implementing the National Flood Insurance Program (NFIP) locally. Information was received through a spread sheet developed by FEMA. The questions inquire about actions taken within the communality with regards to floodplain identification and mapping, floodplain management, and flood insurance.

As all 9 Middle Peninsula jurisdictions participate in the NFIP as administered by FEMA, each jurisdiction has implemented local floodplain ordinances that include requirement that comply with the minimum FEMA – or in some case exceed the minimum requirements prescribed by FEMA. As seen in Section 7 of this plan update, 8 of the 9 Middle Peninsula jurisdictions have implemented Base Floor Elevation (BFE) regulations that require structures to be an additional 1' or over BFE. The 8 Middle Peninsula jurisdictions that require this more restrictive regulation are Essex, Gloucester, King William, King & Queen, and Middlesex Counties and the Towns of Urbanna, West Point, and Tappahannock.

Enforcement of the floodplain regulations are undertaken by the locality's Zoning Administrator and Building Official.

All 9 Middle Peninsula localities remain in full compliance with their floodplain and building code regulations as evidenced by their periodic reviews of their NFIP related activities by FEMA and VDCR evaluators.

For additional details about locality NFIP, please visit Appendix K.

Stormwater Management Ordinances
During the 2012 General Assembly session, the Virginia General Assembly passed legislation (HB 1065) that requires localities throughout the state to develop, adopt, and implement local a Virginia Stormwater Management Program (VSMP) by July 1, 2014. This bill integrated elements of the Erosion and Sediment Control Act, the Stormwater Management Act, and the Chesapeake Bay Preservation Act so that these regulatory programs could be implemented in a consolidated and consistent manner, resulting in greater efficiencies (one-stop shopping) for those being regulated. However in 2014, additional action by the General Assembly, with the passing of House Bill 1173/Senate Bill 423, localities were provided an "Opt-Out" option that would leave the administration of the VSMP to the Virginia Department of Environmental Quality (DEQ) instead of local administration. As a result, only Gloucester County has chosen to develop and administer a local VSMP. All other localities within the Middle Peninsula as decided to "opt-out" and have DEQ administer the program. While this is the

current status of the VSMP, the program is still influx as DEQ wants to relinquish administrative power and give it back to the localities.

Please see Appendix L for Gloucester County's Stormwater Management Ordinance.

Future Mitigation Capabilities and Opportunities

Local governing bodies are charged with protecting the health, safety and welfare of its residents. The 6 Boards of Supervisors and the 3 Town Council are legally empowered to develop ordinances and policies to implement this charge based on sound and comprehensive review and analysis of flood mitigation proposals and strategies.

In general, the localities will continue to facilitate federal and state grant funded flood mitigation projects for private property owners with the understanding that the property owners will pay for all costs – construction and administration – that are not covered by grant funds.

Public infrastructure flood mitigation projects will be undertaken by the local governing bodies when they determine that the benefits outweigh the costs. Typically, these projects will be incorporated into the locality's Capital Improvement Program and considered for funding by the governing body during their annual budget development and approval process.

Section 7 - Review of Strategies from the 2010 Middle Peninsula Natural Hazards Mitigation Plan (MPNHMP)

As Middle Peninsula localities transition from the 2010 natural hazard plan strategies into the 2016 plan strategies, it is critical to look at the progress made over the last 5 years in order to provide a more clear direction moving forward. Therefore to capture the progress made by localities, the Regional Preparedness Planner reviewed the 2010 Mitigation Strategies with the AHMP Steering Committee and requested status updates on each 2010 mitigation strategy. Tables 93 - 101 display the responses and the strategy statuses. Please note that the shaded red boxes identify the completed strategies.

Table 93: Essex County – 2010 Mitigation Strategy Status

2010 Strategy	2010 Priority	Status	Comment
1.1.1	Low	By request	
1.1.2	Low	Yearly	
1.1.5	High	In-progress	Should be completed in 2017
1.1.6	Moderate	In-progress – will be completed 2017	Should be completed in 2017
1.1.8	Moderate	Completed 2015	
1.1.9	Low	In-progress	
1.1.10	Low	Did not adopt	
1.1.11	High	On-going	
1.1.13	Moderate	In-progress	
1.1.15	Low	In-progress	
1.2.1	Low	Completed	Appendix M
2.2.1	High	Partially Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the CountyTown level.
2.2.2	High	Partially Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level
3.1.1	High	Completed	Code Red/ radio station/ PSA
3.1.2	Moderate	On-going	
3.1.3	Moderate	In-progress	
3.1.4	High	Completed	
3.1.5	High		
3.1.6	Moderate	Ongoing & In-progress	
3.1.7	High		
3.1.8	Moderate	Ongoing	
3.2.1	Moderate	In-progress	
3.2.2	Low	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3. 2010 Census was not included in HAZUS.
4.1.1	High	In-progress	Adopted a floodplain overlay district as a component of the County's zoning ordinance.

Table 94: Town of Tappahannock – 2010 Mitigation Strategy status			
2010 Strategy	**2010 Priority**	**Status**	**Comments**
1.1.1	Low	Completed - 2015	
1.1.3	High	Completed - 2014	
1.1.5	High	Delayed	Delayed because of VDOT
1.1.7	High	Delayed	Delayed because of VDOT
1.1.8	Moderate	Completed – 2015	
1.1.9	Low	Delayed	Delayed because of Essex County
1.1.10	Low	w/in 2 years	
1.1.11	High	Not started	
1.1.15	Low	w/in 2 years	
1.2.1	Low	Completed	Appendix M
2.2.1	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level
2.2.2	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level
3.1.1	High	Completed	
3.1.2	Moderate	On-going	
3.1.3	Moderate	w/in 1 years	
3.1.4	High	Completed - 2015	
3.1.5	High	Not started	
3.1.6	Moderate	Not started	
3.2.1	Moderate	w/in 2 years	
3.2.2	Low	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	On-going	Adopted a Floodplain overlay district as a component of the County's zoning ordinance

Table 95: Gloucester County – 2010 Mitigation Strategy Status			
2010 Strategy	**2010 Priority**	**Status**	**Comments**
1.1.1	High	On-going	Ongoing education for business – working with Gloucester Chamber Annual Outcomes
1.1.2	Moderate	On-going	Same as above
1.1.3	Moderate	On-going	Same as above
1.1.4	High	On-going	County Open Space Plan – FEMA Mitigation Grants
1.1.6	Low	On-going	Working with VDOT to ensure road maintenance and reconstruction projects are addressed.
1.1.8	Low	On-going	Next review scheduled for October 2015; County has entered into CRS – progress is documented and monitored by FEMA
1.1.11	High	On-going	County Building Officials follow codes and ensure strict adherence to the County Floodplain Management Plan; The Board of Supervisors voted to include VE Construction
1.1.13	Low	On-going	David Moore, Extensive Service, works with the Department of Agriculture, state level and local county Farmers.
1.1.14	Moderate	Completed	
1.1.15	Low	On-going	Promotes public education and awareness through current floodplain management committee.
1.2.1	Low	Completed	Appendix M
2.2.1	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level. In 2015, Gloucester County also participates in the Hampton Roads Fire and Rescue MOU.
2.2.2	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level. In 2015, Gloucester County also participates in the Hampton Roads Fire and Rescue MOU.
3.1.1	High	Completed	
3.1.2	Moderate	On-going	Added a Program for Public Information (PPI) to CRS that includes public awareness and outreach.
3.1.3	Moderate	On-going	
3.1.4	High	On-going	PPI-CRS and Floodplain Management Committee
3.1.5	High	On-going	Same as above
3.1.6	Moderate	On-going	Same as above; Gloucester Volunteer Fire and Rescue also trained response personnel in ice rescue.
3.1.7	Low	On-going	Same as above
3.1.8	Moderate	On-going	Work with Virginia Department of Forestry on public awareness on fire prevention every October.
3.2.1	Moderate	Completed- January 2015	New FEMA maps. Flood and storm Inundation Maps were updated and on County's emergency management webpage.
3.2.2	Low	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	In-progress	Adopted a floodplain overlay district as a component of the County's zoning ordinance.

Table 96: King and Queen County -2010 Mitigation Strategy Status			
2010 Strategy	**2010 Priority**	**Status**	**Comments**
1.1.6	Moderate	On-going	Route 17 at Parkers Marina completed and now open. Road was raised.
1.1.8	Moderate	Every 2-years	
1.1.9	Low	Not Started	
1.1.10	Low	In-progress	Currently requires flood elevation certificates and looking to propose freeboard with the new maps in May of 2016
1.1.13	Moderate	w/in 2-years	
1.1.15	Low	In-progress	VE zone properties will have high construction requirements once new maps are adopted and effective May of 2016
1.2.1	Low	Completed	Appendix M
2.2.1	High	Partially- Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level
2.2.2	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level
3.1.1	High	Completed	
3.1.2	Moderate	Not Started	Roadways in VDOT system needs ditch cleanouts to prevent roadway flooding
3.1.3	Moderate	In-Progress	REC does a great job of this
3.1.4	High	w/in 1 year	
3.1.6	Moderate	Not started	
3.1.8	Moderate	On-going	
3.2.1	Moderate	In-Progress	New maps to be adopted and effective may of 2016. GIS online to become available to the public Fall of 2015
3.2.2	Low	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	In-Progress	Adopted a floodplain overlay district as a component of the County's zoning ordinance.

Table 97: King William – 2010 Mitigation Strategy Status			
2010 Strategy	**2010 Priority**	**Status**	**Comments**
1.1.5	High		
1.1.6	Moderate	On-going	
1.1.8	Moderate	Completed – Spring 2015	
1.1.9	Low	Completed- Spring 2015	County not interested in joining.
1.1.10	Low	Completed- Spring 2015	Adopted 1.5' freeboard
1.1.12	Moderate		
1.1.13	Moderate		
1.1.14	Moderate	Completed	
1.1.15	Low	On-going	
1.1.16	Moderate	Not Started	Delayed due to lack of funding
1.1.17	Moderate	Completed	
1.1.18	Moderate	On-going	GIS layer developed; Added stormwater BMP layer
1.2.1	Low	Completed	Ordinance adopted 1-23-2012 (Appendix M)
2.2.1	High	Partially- Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level
2.2.2	High	Partially -Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level
3.1.1	High	Completed	
3.1.2	Moderate	Not started	
3.1.3	Moderate	w/in 1 years	
3.1.4	High	Not started	Very little development around flood plains
3.1.6	Moderate	w/in 2 years	
3.1.8	Moderate	Not started	
3.2.1	Moderate	Completed	
3.2.2	Low	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3. 2010 Census was not included in HAZUS.
4.1.1	High	In-progress	Adopted a floodplain overlay district as a component of the County's zoning ordinance.

Table 98: Town of West Point -2010 Mitigation Strategy Status			
2010 Strategy	**2010 Priority**	**Status**	**Comments**
1.1.1	Low	On-going	Waiting to hear from FEMA on application
1.1.2	Moderate	Annually	
1.1.3	High	On-going	Relocated public works building to higher ground
1.1.8	Moderate	Completed	Done by Charles Kline with Virginia Department of Conservation and Recreation
1.1.9	Low	Not started	
1.1.10	Low	Completed - 2015	
1.1.11	High	Ongoing	Review of zone and building applications
1.1.15	Low	Not Started	
1.2.1	Low	Completed	Appendix M
2.2.1	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level.
2.2.2	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level.
3.1.1	High	On-going	King William Dispatch has the capability of doing this for the Town if needed
3.1.2	Moderate	Completed	
3.1.3	Moderate	Not started	
3.1.4	High	Completed - 2015	The town held a public meeting with citizens to explain new FEMA maps. The town denied the residential elevation by FEMA.
3.1.5	High	Completed	The town held a public meeting with citizens to explain new FEMA maps. The town denied the residential elevation by FEMA.
3.1.6	Moderate	Not started	
3.1.7	Moderate	Not started	
3.2.1	Moderate	On-going	Received new GIS information from FEMA, updated as received from FEMA
3.2.2	Low	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	In-progress	Adopted a Floodplain overlay district as a component of the County's zoning ordinance

Table 99: Mathews County- 2010 Mitigation Strategy Status			
2010 Strategy	**2010 Priority**	**Status**	**Comments**
1.1.1	High	In-progress/ ongoing	Four FEMA HMGP grants were awarded to the County for the elevation of houses for thirty-four repetitive loss properties and acquisition of three properties. The elevations and acquisitions in these four grants are in progress and are expected to be completed in 2017. Another FEMA HMGP grant for one severe repetitive loss property was used to elevate the house in 2014.
1.1.2	Moderate	Not started	Delayed because of lack of funding
1.1.3	Moderate	Not started	Delayed because of lack of funding
1.1.4	Moderate	In-progress/ ongoing	FEMA HMGP funds have been used to acquire one repetitive loss property. Two others are in the process of being acquired
1.1.6	Moderate	Not started	Delayed because of lack of VDOT funding
1.1.8	Moderate	Completed – December 2014	
1.1.9	Low	Not started	Delayed because of lack of staff to apply for inclusion and ongoing participation in the CRS Program.
1.1.10	Low	Delayed	Increased elevation requirements proposed for updated floodplain management ordinance, but not adopted. Potential to be addressed in the future.
1.1.11	High	In-progress/ ongoing	County's Building Official is enforcing adopted Floodplain Management Ordinance. Zoning amendments will be considered by the Planning Commission to address recurrent flooding after the five-year review of the Comprehensive Plan.
1.1.13	Moderate	Not started	No request has been made to the NRCS or Tidewater Soil and Water Conservation District for an inventory of farm pond dams.
1.1.15	Low	In-progress/ ongoing	The County's Wetlands Projects Coordinator and the Wetlands Board are promoting "Living Shorelines" as a shoreline erosion control method to property owners by utilizing information provided by VIMS and VMRC.
1.2.1	Low	Completed	Appendix M
2.2.1	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level
2.2.2	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level
3.1.1	High	Completed	
3.1.2	Moderate	In-progress/ ongoing	The County encourages property owners to participate in its Outfall Ditch Maintenance Program. Local VDOT maintenance crews periodically clean ditches in their right-of-way. A Ditching Committee comprised of County residents was also formed to address this problem.
3.1.3	Moderate	Not started	No request has been made to Dominion Power for information and guidance about the importance of keeping trees and brush away from power lines.
3.1.4	High	In-progress/ ongoing	The County's Building Official regularly posts information on the County's website regarding flood hazards.
3.1.5	High	In-progress/ ongoing	The County's Building Official and the Department of Planning & Zoning inform residents about FEMA HMGP grants to elevate their houses or acquire properties. Also,

			the Building Official, along with a local contractor, has conducted a meeting for residents regarding the steps involved in elevating a house.
3.1.6	Moderate	Not started	Delayed because of lack of staff
3.1.7	Moderate	In-progress/ ongoing	Department of Planning & Zoning staff provided this information to residents when the Comprehensive Plan was updated in 2010. On-going information has been provided to the Planning Commission regarding this topic in advance of the five-year review of the Comprehensive Plan.
3.1.8	Moderate	Not started	Delayed because of lack of staff
3.2.1	Moderate	Completed	
3.2.2	Low	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new Dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	Completed	Adopted an amended Floodplain Management Ordinance and updated the County's Floodplain Insurance Rate Maps

Table 100: Middlesex County -2010 Mitigation Strategy Status			
2010 Strategy	**2010 Priority**	**Status**	**Comments**
1.1.1	Low	On-going	Managed by Staff on an on-going basis
1.1.2	Low	Not Started	Delayed because lack of staff; any concerns are forwarded to VDOT
1.1.6	Moderate	On-going	Managed by VDOT
1.1.8	Moderate	On-going	Active program; Ordinance recently readopted
1.1.9	Low	Not Started	Delayed because lack of staff
1.1.10	Low		
1.1.11	High	On-going	Managed by staff on an on-going basis
1.1.13	Moderate	On-going	Coordinate with USDA Staff when required
1.1.15	Low	On-going	Managed by Staff on an on-going basis
1.2.1	Low	Completed	Drought Ordinance adopted in 2011 (Appendix M)
2.2.1	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level.
2.2.2	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level.
3.1.1	High	Completed	Active Program
3.1.2	Moderate	On-going	This occurs as needed
3.1.3	Moderate	On-going	Managed by Staff on an as needed basis
3.1.4	High	On-going	Managed by staff during public education deliveries
3.1.5	High	On-going	This occurs as requested
3.1.6	Moderate	On-going	Managed by staff during public education deliveries
3.1.7	Moderate	Not Started	Reactionary only
3.1.8	Moderate	On-going	Managed by Staff during public education deliveries
3.2.1	Moderate	Completed	
3.2.2	Low	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	In-progress	Adopted a floodplain overlay district as a component of the County's zoning ordinance.

Table 101: Town of Urbanna -2010 Mitigation Strategy Status			
2010 Strategy	**2010 Priority**	**Status**	**Comments**
1.1.1	Low	On-going	Greatly increased freeboard requirements in new floodplain ordinance beyond minimum requirement.
1.1.2	Moderate	On-going	
1.1.8	Moderate	Completed - 12/2014	Greatly increased freeboard requirements in new floodplain ordinance beyond minimum requirement.
1.1.9	Low	Not Started	
1.1.10	Low	Completed – 12/2014	Manpower constraints
1.1.11	High	On-going	Enforcement of all floodplain/zoning/building regulations in flood zones is actively pursued on an on-going basis.
1.1.15	Low	On-going	Conducted jointly with Middlesex County
1.2.1	Low	Completed	Appendix M
2.2.1	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level
2.2.2	High	Partially - Completed	In 2009, the Rappahannock Volunteer Firefighters Association signed a mutual agreement but this only consists of a few volunteer departments within the locality (Appendix N). This is not a mutual aid agreement at the County/Town level
3.1.1	High	Completed	Waiting for final guidance from DEQ for stormwater reg. implementation.
3.1.2	Moderate	On-going	Educational materials periodically placed on web site to encourage maintenance.
3.1.3	Moderate	On-going	Town encourages Dominion line maintenance at every opportunity.
3.1.4	High	Completed –12/2014	Materials were on web site and sent to landowners as part of new Floodplain ordinance adoption.
3.1.5	High	Completed – 12/2014	Materials were on web site and sent to landowners as part of new Floodplain ordinance adoption.
3.1.6	Moderate	Delayed	Manpower constraints
3.1.7	Moderate	In-progress	Materials are being developed for distribution
3.2.1	Moderate	Completed	See Middlesex County
3.2.2	Low	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	In-progress	Adopted a Floodplain overlay district as a component of the County's zoning ordinance

The following is a more descriptive version of the mitigation strategies that have been implemented by Middle Peninsula jurisdictions:

Strategies that have been completed since 2010 by the local governments under **Goal 1: Prevent Future Hazard Related Losses** include the following:

1. The Town of Urbanna amended their floodplain ordinance to increase the freeboard requirements, which is above the minimum requirement. The Base Flood Elevation (BFE) plus a minimum of two feet of freeboard is the new requirement.

2. King William amended their floodplain ordinance to increase the freeboard requirement to 1.5 feet.
3. All Middle Peninsula localities, with the exception of King & Queen County, had Boards of Supervisors/Town Councils adopt the most current DFIRM/FIRM and FIS. King & Queen is still working with FEMA to finalize the maps. Localities adopted these maps on the respective dates: Essex County, April 2015; Town of Tappahannock, May 2015; Gloucester County, November 2015; King William County, September 2014; Town of West Point, August 2015; Mathews County, December 2014; Middlesex County, March 2015; and Town of Urbanna, April 2015.
4. Residential flood mitigation projects in Gloucester and Mathews County as well as the Town of West Counties (2007 to present).
5. Eliminated flooding at the Mathews' County Sewage Treatment Facility by taking the facility off-line and replacing it with a flood-proof pump station/force main for transport and treatment at the HRSD's York River Wastewater Treatment Plant in York County (2010).
6. Town of West Point relocated the public works building out of flood-prone areas (2009).
7. Town of West Point elevated one home to base flood elevation plus 1 foot (2014). The elevation will allow the home to be located outside the 100 year flood plain and will no longer be prone to damage and effects of flooding caused by major storms (i.e. Hurricane Isabel) and minor nor'easters.
8. Middle Peninsula localities have adopted an ordinance to implement a Drought Response and Contingency Plan that is presented in the Middle Peninsula Regional Water Supply Plan as well as the corresponding section in the Hampton Roads Drought Response and Contingency Plan (for the case of Gloucester County). Localities have adopted these ordinances on the respective dates: Essex County, 2011; Town of Tappahannock, 2011; Gloucester County, 2009; King and Queen County, 2011; King William County, 2012; Town of West Point, 2011; Mathews County, 2013; Middlesex County, 2011; and Town of Urbanna, 2011(See Appendix L for copies of the Drought Ordinances).
9. Gloucester County updated and readopted their Coastal Floodplain Management Plan in September 2014.

Strategies that have been completed by the local governments under **Goal 2: Improve Community Emergency Management Capability** include the following:

1. King William implemented Code Red, Radio Station, and Public Service Announcements to notify residents of hazards and emergencies.
2. Formalized mutual aid agreements amongst all Middle Peninsula localities to coordinate the region's fire and emergency medical units to ensure a quick and efficient response to severe weather events (2009).
3. Formalized mutual aid agreements amongst all Middle Peninsula localities to coordinate the region's fire units to ensure a quick and efficient response to wildfires.

A strategy that has been completed under **Goal 3: Increase Public Awareness of Vulnerability to Hazards** includes the following:

1. To improve the hazard assessment within the region, a HAZUS analysis was run with the 2.2 version software. This analysis included HAZUS flood runs for the 1 square mile threshold as well as new dasymetric Census data. A strategy that has been completed under.
2. The Gloucester County website offers a variety of educational resources on their website (http://www.gloucesterva.info/emergencymanagement) for the general public to look at.
3. King William, Essex, Gloucester, King & Queen, and Mathews County as well as the Towns of Urbanna and West Point informed community property owners about changes to the DFIRM/FIRM that would impact their insurance rates.

Regional Summary of Completed 2010 Strategies

To provide a quick snapshot of the completed strategies, below are a list of the strategies and the localities that have completed them.

- **Strategy 1.1.14: Develop Storm Water Management Plans and Policies for Urban Development Areas in both King William and Gloucester Counties.**

  Both of the localities listed above have been designed by the Virginia General Assembly as Urban Development Areas for land use planning purposes. Both localities have experienced rapid growth as they are located near the Hampton Roads and Richmond Metropolitan areas, respectively.

  Planning staff from each of these counties will formulate a plan using guidance regulations and policies promulgated by the General Assembly and as managed by the Virginia Department of Environmental Quality.

  Planning and Administrative Staff will develop a strategy to incorporate the Storm Water Management Plan into the locality's next update their Comprehensive Plan.

  Strategy 1.1.14 was completed by the following Middle Peninsula localities:

  1. ***Gloucester County and***
  2. ***King William County.***

- **Strategy 1.1.16: Add evacuation route insignia to public streets that are part of the hurricane evacuation route.**

  Strategy 1.1.16 was completed by the following Middle Peninsula locality:

  1. ***King William County***

- **Strategy 1.1.17: Install flood gauges and create erosion monitoring locations to inspect at regular intervals.**

  Strategy 1.1.17 was completed by the following Middle Peninsula locality:

1. King William County

- **Strategy 1.2.1 Decrease the adverse affects of drought conditions for residents - many of whom rely on individual wells as their only water source in many parts of the rural Middle Peninsula region by adopting the ordinance to implement the Drought Response and Contingency Plan contained in Section 10 of the Regional Water Supply Plan for the Middle Peninsula of Virginia as well as its corresponding section in the recently completed Hampton Roads Drought Response and Contingency Plan.**

  The County Administrator/Town Manager, with the assistance of the locality's designated Emergency Services Coordinator/Emergency Manager, will implement the actions specified at the Drought Watch, Drought Warning and Drought Emergency stages of this natural hazard.

  Strategy 1.2.1 was completed by the following Middle Peninsula localities:

  1. ***Essex County,***
  2. ***Gloucester County,***
  3. ***King and Queen County,***
  4. ***King William County,***
  5. ***Mathews County,***
  6. ***Middlesex County,***
  7. ***Town of Tappahannock,***
  8. ***Town of Urbanna, and***
  9. ***Town of West Point.***

- **Strategy 3.1.1: Enhance/implement the use of rapid notification systems to warn residents of approaching flood waters and mandatory evacuation notices.**

  Recorded warnings and instructional messages concerning flooding and resulting evacuation notices will be sent to all wired and wireless phone devices using Dispatch Center E-911 Databases at the emergency dispatch centers covering the localities listed above.

  The local Emergency Services Coordinators will be responsible for coordinating this initiative with the Sheriff Department and Dispatch Center Staff.

  Strategy 3.1.1 was completed by the following Middle Peninsula localities:

  1. ***Essex County,***
  2. ***Gloucester County,***
  3. ***King and Queen County,***
  4. ***King William County,***
  5. ***Mathews County,***
  6. ***Middlesex County,***
  7. ***Town of Tappahannock,***
  8. ***Town of West Point, and***
  9. ***Town of Urbanna.***

- **Strategy 3.2.1: Incorporate the newly digitized local floodplain maps into each County's GIS database after adoption by the local governing body, to the extent possible.**

  Each county's GIS technician/consultant will incorporate the digitized floodplain map data into their system when a GIS system becomes available to the locality.

  County planning/zoning officials will ensure that this floodplain data is readily available to property owners so that they are aware of the 100-year flood boundaries on their land.

  Strategy 3.2.1 was completed by the following Middle Peninsula localities:

  1. ***Gloucester County,***
  2. ***King William, and***
  3. ***Middlesex County.***

- **Strategy 3.2.2: When the Natural Hazards Mitigation Plan is updated in the future, complete:**
  1. **HAZUS flood runs for the 1 sq. mi. threshold. In most cases, this will need to be done on priority stream reaches as the program does not run efficiently at this level.**
  2. **Re-run HAZUS for plan update to reflect 2010 census data.**

  Strategy 3.2.2 was completed by the following Middle Peninsula localities:

  1. ***Essex County,***
  2. ***Gloucester County,***
  3. ***King and Queen County,***
  4. ***King William County,***
  5. ***Mathews County,***
  6. ***Middlesex County,***
  7. ***Town of Tappahannock,***
  8. ***Town of Urbanna, and***
  9. ***Town of West Point.***

- **Strategy 4.1.1: All Natural Hazards: Adopt an Implementation Plan that includes one or more of the following:**
  Consider adopting a Floodplain Overlay District as a component of the County's Zoning Ordinance.
  1. **Essex County,**
  2. **Gloucester County,**
  3. **King William County,**
  4. **Mathews County,**
  5. **Middlesex County,**
  6. **Town of Tappahannock,**
  7. **Town of Urbanna, and**
  8. **Town of West Point.**

While Middle Peninsula Localities have worked to complete 2010 mitigation strategies within their jurisdiction to benefit the general public and create a more hazard resilient community, each locality will continue working toward comprehensive hazard mitigation. This review of 2010 mitigation strategies highlights some of the actions taken by localities and it offers insight into what objectives, goals, and strategies that still need to be accomplished or worked on.

Section 8 - New Mitigation Goals, Objectives and Strategies

Taking into account the update of the vulnerability assessment using the Kaiser Permanente methodology as well as the results of the recently completed HAZUS damage assessments, the Steering Committee members propose that new or updated mitigation strategies be developed for the following natural hazards affecting the Middle Peninsula region:

Goal 1: Prevent future losses resulting from natural hazard events.

Objective 1.1: Provide protection for future development to the greatest extent possible.

Strategy 1.1.1: Reduce or eliminate flood damage to residential/business structures that are highly vulnerable for continual flood damage.

Strategy 1.1.1 will be undertaken by the following Middle Peninsula localities:

1. **Essex County,**
2. **Middlesex County,**
3. **Gloucester County,**
4. **Mathews County,**
5. **King William,**
6. **Town of West Point,**
7. **Town of Urbanna, and**
8. **Town of Tappahannock.**

If requested by citizen living in FEMA Repetitive Loss or Severe Repetitive Loss structure, the Middle Peninsula localities listed above will apply on behalf of the citizen for FEMA grant funds that lessen/eliminate flood damages. Project costs, including both construction and administrative costs, will be covered entirely by FEMA grant funds or by the property owners who are benefitting directly from the flood mitigation project.

Some of the localities listed above may want to undertake mitigation projects in one "neighborhood" at a time for consistency/uniformity in the community as well as for some economies-of-scale savings in some of our more rural low-lying areas.

According to FEMA data as of 2015, the following is a summary of the number of Repetitive Loss and Severe Repetitive Loss Properties in each locality (Table 102). If the locality is not listed there are no Repetitive Loss or Severe Repetitive Loss Properties.

Table 102: Repetitive Loss Properties and severe repetitive loss properties in the Middle Peninsula.

Locality	Repetitive Loss Properties	Severe Repetitive Loss Properties
Essex County	32	2
Gloucester County	146	13
Mathews County	169	11
Middlesex County	35	2
Tappahannock	2	0
Urbanna	2	0
West Point	9	0

Properties to be mitigated will receive a higher priority ranking by the locality using the following criteria:

1. Severe Repetitive Loss Properties over Repetitive Loss Properties.
2. Willingness and ability of the property owner to pay for the non-FEMA grant funded portion of their share of the project costs.
3. Higher benefit/cost ratio properties over lower benefit/cost ratio properties.
4. Projects that reduce flood risks to other nearby properties over those that don't.

Cost/Benefit Implications of Implementing Strategy 1.1.1

This strategy will have direct:

1. Benefits for private property owners by reducing/eliminating the severity of structural flood damage to their homes and businesses.
2. Benefits for private property owners with possible reductions in their future flood insurance premiums.
3. Benefits for FEMA by reducing the number of properties on the Repetitive Loss and Severe Repetitive Loss Lists and subsequent flood insurance claims.
4. Costs for private property owners who will directly benefit from the mitigation work on their property as well as by the federal government through expenditure of FEMA Hazard Mitigation Funds.

Mitigation Strategy addresses the following hazards: hurricanes, ice storms, coastal flooding/ nor'easters, snow storms, riverine flooding, sea level rise, tsunamis, ditch flooding, and summer storms.

Strategy 1.1.2: Flood proof, to the greatest extent possible, existing water dependent commercial buildings against flooding, including surge velocities, to insure continuity and viability of the seafood industry and other water dependent businesses.

Strategy 1.1.2 will be undertaken by the following Middle Peninsula localities:

1. **Essex County,**
2. **Middlesex County,**
3. **Gloucester County,**
4. **Mathews County,**
5. **Town of Urbanna and**
6. **Town of West Point.**

Each locality listed above will work with the owners of water dependent commercial properties to communicate the full range of flood proofing techniques available to them to decrease their vulnerability to flood losses. For water dependent commercial properties in the Town of Urbanna, Middlesex County will help accomplish this.

Each locality will advertise and conduct an annual workshop for contractors and property owners to provide instructions on how they can undertake specific flood proofing techniques on their buildings.

Cost/Benefit Implications of Implementing Strategy 1.1.2

This strategy will have direct:

1. Benefits for private business owners by reducing/eliminating the severity of structural flood damage that will allow them to maintain the viability of the coastal seafood industry.

2. Benefits for private property owners with possible reductions in their future flood insurance premiums.
3. Benefits for FEMA by reducing the number of properties on the Repetitive Loss and Severe Repetitive Loss Lists eligible for subsequent flood insurance claims.

Mitigation Strategy addresses the following hazards: hurricanes, ice storms, coastal flooding/ nor'easters, snow storms, riverine flooding, sea level rise, tsunamis, ditch flooding, and summer storms.

Strategy 1.1.3: Protect public buildings and public infrastructure from flood waters resulting from 100-year flood storm events.

Strategy 1.1.3 will be undertaken by the following Middle Peninsula localities:

1. **Gloucester County,**
2. **Mathews County,**
3. **Town of Tappahannock, and**
4. **Town of West Point.**

The Middle Peninsula localities, as well as other political subdivisions of the state providing public infrastructure in our region, including the Hampton Roads Sanitation District (HRSD), shall incorporate flood protection measures into their critical public buildings and public infrastructure if deemed feasible by local officials.

These flood protection measures should be incorporated into their local Capital Improvements Program (CIP) for funding consideration by the governing body during their annual budget development and approval process, if possible.

A list of the critical public buildings and public infrastructure within localities include the following:

- Flood proof and/or elevate the following public sewerage pump stations:

Locality	Pump Station Name
Gloucester County	Pump Station #11 and Pump Station #13
Town of West Point	Second Street Pump Station
Town of West Point	Bagby Street and Mattaponi Ave Pump Station
Town of West Point	Thompson Avenue Pump Station at West Point Creek

- Provide additional shoreline stabilization material at the base of the New Point Comfort Lighthouse in Mathews County.
- Consider mitigation retrofit projects at fire stations in Mathews County at-
    - Bohannon
    - New Point
    - Gwynn's Island
    - Mathews Court House

Cost/Benefit Implications of Implementing Strategy 1.1.3

This strategy will have direct:

1. Benefits for local governments and the HRSD by reducing/eliminating flood damage to public sewage systems.

2. Benefits to the public by maintaining public health standards by reducing/eliminating sewage system overflows into public water bodies during severe weather events.
3. Costs to local governments/HRSD to design and construct waterproofing and stabilization improvements to local buildings/infrastructure.

Mitigation Strategy addresses the following hazards: hurricanes, coastal flooding/ nor'easters, riverine flooding, tsunamis, ditch flooding, and summer storms.

Strategy 1.1.4: When elevating or flood proofing is not feasible for existing buildings threatened by flooding, land purchase and conversion to non-residential recreation/conservation land uses should be pursued by the locality using FEMA Grant Funds.

Strategy 1.1.4 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King William County,**
4. **Mathews County, and**
5. **Middlesex County.**

Cost/Benefit Implications of Implementing Strategy 1.1.4

This strategy will have direct:

1. Benefits for residential neighborhoods by reducing/eliminating storm construction debris that results from structures that are habitually damaged or destroyed by flood waters.
2. Benefits to the locality and general public by increasing vegetative buffering materials in storm surge zones when land is converted from residential use to conservation/preservation use.
3. Benefits for FEMA by reducing the number of properties on the Repetitive Loss and Severe Repetitive Loss Lists and subsequent flood insurance claims.
4. Cost for localities may include the maintenance of the property or properties acquired through this grant program.
5. Costs for FEMA through expenditure of Hazard Mitigation Funds for land use conversion program.

Mitigation Strategy addresses the following hazards: hurricanes, coastal flooding/nor'easters, riverine flooding, ditch flooding, and summer storms.

Strategy 1.1.5: Improve/maintain main evacuation routes (Table 103) used by Middle Peninsula residents as well as Tidewater residents evacuating severe coastal weather events and add evacuation route insignia to public streets that are part of the hurricane evacuation route.

Strategy 1.1.5 will be undertaken in the following Middle Peninsula localities using available grant funds:

1. **Essex County,**
2. **Gloucester County,**
3. **King William County,**

4. **Mathews County,**
5. **Middlesex County,**
6. **Town of Tappahannock, and**
7. **Town of West Point.**

Table 103: Main Evacuation Routes	
Locality	**Road Name/Location**
Essex/Tappahannock	Route 17 at June Parker Marina
King William County	King William Drive (Route 30) at Cypress Swamp at Olson's Pond
Gloucester County	Route 17 N
Mathews County	Route 14 to Rt 198 N to 17 N
Town of West Point	When Bridges are Closed due to Winds above 45 miles per hour: Route 30, however Rt 30 can close due to flooding at Cypress Swamp. When bridges are open: Rt 33 Wet to Route 64

Cost/Benefit Implications of Implementing Strategy 1.1.5

This strategy will have direct:

1. Benefits for both public motorists and the VDOT Primary Road System by decreasing flooding and flood damage to the Middle Peninsula's primary hurricane evacuation routes.
2. Benefits Local resident to better visualize routes as well as seasonal visitors who may not be aware that the route exists.
3. Substantial costs in federal and state transportation construction funds to elevate Route 17 and Route 30.
4. Costs of producing and erecting the signs.

Mitigation Strategy addresses the following hazards: hurricanes, coastal flooding/ nor'easters, and riverine flooding,.

Strategy 1.1.6: Improve/maintain/reconstruct public roads that hinder the evacuation of Middle Peninsula and Tidewater residents fleeing flood waters from coastal storms.

Strategy 1.1.6 will be undertaken in the following Middle Peninsula localities using available grant funds (i.e. VDOT and VDEM):

1. **Essex County,**
2. **Gloucester County,**
3. **King and Queen County,**
4. **King William County,**
5. **Middlesex County, and**
6. **Mathews County.**

Table 104: VDOT Maintained Collector Roads in King and Queen County.		
Route	**Road Name**	**Location of Flooding**
749	Kays Lane	at Root Swamp
721	Newtown Road	Near Bradley Farm Road
721	Newtown Road	Near Level Green Road
721	Newtown Road	Near Cedar Plane Road
721	Newtown Road	Near Glebe Road
623	Indian Neck Road	Near Rappahannock Culture Center
625	Poplar Hill Road	Nar Spring Cottage Road
628	Spring Cottage Road	Near Eastern View Road

628	Todds Bridge Road	Near Gunsmoke Lane
628	Pattie Swamp Road	At swamp
631	Fleets Mill Road	At Fleets Millpond
636	Minter Lane	At Walkerton Creek
631	Norwood Road	At Dickeys Swamp
620	Powcan Road	At Poor House Lane
634	Mt. Elba Road	At Flat Areas
620	Duck Pond Road	At Garnetts Creek
633	Mantua Road	At Garnetts Creek
617	Exol Road	At Exol Swamp
14	The Trail	At Truhart
614	Devils Three Jump Road	At Mt. Olive Road
613	Dabney Road	At Little Tastine Swamp
611	Tastine Road	At little tastine swamp
603	Lombardy Road	At Little Tastine Swamp
608	Clancie Road	At Bugan Villa Drive
601	Stratton Major Road	Near Union Prospect Baptist Church
601	Stratton Major Road	Near Union Road
644	Jonestown Road	At Meadow Swamp
605	Plain View Lane	At Guthrie Creek
601	Cherry Row Lane	At Guthrie Creek and swamp
666	Tuckers Road	entire Road including Tuckers R.P.
667	Wrights Dock Road	Entire road
640	Lyneville Road	At 36" cross-pipes
625	Bryds Mill	At cross-pipes
615	Union Hope Road	At Exol Swamp
604	Bryds Bridge Road	At Bryds Bridge
612	Lilly Pond Road	At Dragons Swamp Bridge
610	Dragonville Road	At Timber Brook Swamp
614	Rock Springs Road	At bridge
14	Buena Vista Road	At King & Queen/Gloucester County Line

Table 105: VDOT Maintained Collector Roads in Essex County

Route	Road Name	Location
617	Island Farm Road	Piscataway Creek
646	Fort Lowery Lane	Rappahannock River
680	River Place	Rappahannock River

Table 106: VDOT Maintained Collector Roads in King William County/West Point

Route	Road Name	Location
636	VFW Road	Cypress Swamp
632	Mt. Olive-Cohoke Road	Intersection of Route 633
609	Smokey Road	Herring Creek
628	Dorrel Road	Herring Creek
1006	Thompson Avenue	West Point Creek
1003	Chelsea Road	West oint Creek to dead end
1130	Glass Island Road	Mattaponi River
1107	Kirby Street	1st to 7th Street
n/a	1st to 7th Street	Between Kirby Street and Pamunkey River
n/a	2nd to 5th Street	Between Lee Street and Mattaponi River

Table 107: VDOT Maintained Collector Roads in Gloucester County

Route	Road Name	Location of Floodwaters

684	Starvation Road	From Big Oak Lane to ESM
662	Allmondsville Road	From Rt. 606 to Rt.618
618	Chappahosic Road	From Rt. 662 to Rt. 639
636	Brays Point Road	From Eagle Lane to ESM
1303	Carmines Island Road	From Gardner Lane to ESM
646	Jenkins Neck Road	Various spots from Owens Road to ESM
648	Maundys Creek Road	From Rt. 649 to ESM
649	Maryus Road	From Haywood Seafood Lane to ESM
652	Rowes Point Road	From 653 to ESM
649	Severn Wharf Road	Various spots from 653 to ESM
602	Burkes Pond Road	From Friendship Road to Burkes Mill Drive
623	Ware Neck Road	From Rt. 14 to Ware Point Road
3	John Clayton Memorial Highway	From Cow Creek to Crab Thicket Road
17	George Washington Memorial Hwy	From Woods Cross Road to Adner Road, and at the Gloucester / Middlesex line at Dragon Run
614	Corduroy Road	Robins Neck to dead end

Table 108: VDOT Maintained Collector Roads in Mathews County

Route	Road Name	Location
610	Marsh Hawk Road	From Rt. 614 to Rt. 611
600	Circle Drive	From Rt. 14 to Rt. 14
600	Light House Road	From Rt. 14 to ESM
611	Tabernacle Road	From Rt. 613 to Rt. 610
611	Tabernacle Road	From Rt. 610 to 609
609	Bethel Beach Road	From Rt. 610 to ESM
609	Bethel Beach Road	From Rt.614 to Rt. 611
643	Haven Beach Road	From Rt. 704 to ESM
633	Old Ferry Road	From Rt. 663 to Gwynn's Island Bridge
608	Potato Neck Road	From Rt. 649 to ESM
644	Bandy Ridge Road	From Rt. 611 to Rt. 614

Table 109: VDOT Maintained Collector Roads in Middlesex County

Route	Road Name	Location
648	Montague Island Road	From Rt. 604 to ESM
651	Smokey Point	From Rt. 640 to Rt. 685
1103	Irma's Lane	From Rt. 33 to Rt. 1102
628	Mill Creek Road	From Rt. 702 to ESM
636	Timber Neck Road	From 643 to Rt. 659
604	Bayport Road	At Masons Mill Swamp
648	Montague Island Road	At Mud Creek
604	Nesting Road	At Mud Creek
610	Burchs Mill Road	At Burch Pond
606	Briery Swamp Road	At Briery Swamp
602	Wares Bridge Road	At Wares Bridge
602	Wares Bridge Road	At Briery Swamp
603	Farley Park Road	At New Dragon Bridge
618	Lovers Retreat Lane	At Dragon Run Swamp
602	Old Virginia Street	At LaGrange Creek/Hilliards Mill Pond
17	Tidewater Trail	Nickleberry Swamp
17	Tidewater Trail	At Dragon Swamp
616	Town Bridge Road	At Glebe Swamp
616	Town Bridge Road	At Town Bridge Swamp
629	Stormont Road	At My Lady Swamp

629	Stormont Road	At Healy's Mill Pond
620	Philpot Road	At Healy's Mill Pond Swamp
625	Bob's Hole Road	At Mill Creek
624	Regent Road	At Mill Creek
622	Dirt Bridge Road	At Locklies Creek
625	Barracks Mill Road	At Barracks Mill Pond
33	General Puller Highway	At Conrad Pond/Wilton Creek
631	North End Road	At Sturgeon Creek
688/ 622/ 654/ 1113/33	All Stingray Point Roads	

Cost/Benefit Implications of Implementing Strategy 1.1.6

This strategy will have direct:

1. Benefits to local residents who will be better able to safely leave their neighborhoods during evacuations when requested by emergency response officials.
2. Benefits to the longevity of the VDOT Secondary Road System as the state struggles to maintain their existing public road network from future flood damages.
3. Substantial costs in federal and state transportation construction funds to make roadway and drainage structure improvements to the many low-lying roads in the Middle Peninsula Region.

Mitigation Strategy addresses the following hazards: hurricanes, coastal flooding/nor'easters, riverine flooding, sea level rise, tsunamis, ditch flooding, and summer storms.

Strategy 1.1.7: Improve public roads that adversely affect critical public infrastructure in the floodplain.

Strategy 1.1.7 will be undertaken in the following Middle Peninsula localities:

1. **Gloucester County,**
2. **Mathews County,**
3. **Town of Tappahannock, and**
4. **Town of West Point.**

Locality	Road Name/ Location
Tappahannock	Newbill Drive
Town of West Point	Second Street
Town of West Point	Bagby Street and Mattaponi Ave
Town of West Point	Thompson Avenue at West Point Creek

Significant storm water runoff from the downtown Tappahannock Business District combined with storm surge activity from the adjacent Rappahannock River causes inundation and the undermining of Newbill Drive. The Town of West Point is focused on improving public roads where sewer pump stations are located in order to reduce flooding inundation that could impact how the pump functions. Within Gloucester County two segments of Route 17 – George Washington Memorial Highway are located in a flood zone and are potentially affected by storm surge. The first is near the Court House area of the County and would be potentially inundated by a storm surge from a Category 1 hurricane. The second area is located at the southern end of the County and has potential to be inundated by a storm surge from a Category 3 or 4 hurricane. Improving these road segments could protect the public infrastructure located in the Court House Area, including government buildings as well as pump stations

(#11 and #13). In addition to these two segments, all roads in Gloucester County used to access critical infrastructure are important and may be improved when needed.

Cost/Benefit Implications of Implementing Strategy 1.1.7
This strategy will have direct:

1. Benefits to the local residents of the Town of West Point that utilize the sewer pump stations. The pump station will remain fully functional during and after severe flooding events.
2. Capital costs to improve storm water drainage in order to avoid future damage to roadway and pump stations.

Mitigation Strategy addresses the following hazards: hurricanes, coastal flooding/nor'easters, riverine flooding, sea level rise, tsunamis, ditch flooding, ice storms, snow storms, dam failure, and summer storms.

Strategy 1.1.8: Review locality's compliance with the National Flood Insurance Program with a bi-annual review of their Floodplain Ordinance and any newly permitted activities in the 100-year floodplain.

Strategy 1.1.8 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King and Queen County,**
4. **King William County,**
5. **Mathews County,**
6. **Middlesex County**
7. **Town of Tappahannock,**
8. **Town of Urbanna and**
9. **Town of West Point.**

Based on the results of their compliance review, County officials responsible for managing the locality's floodplain program will recommend amendments to the local Floodplain Ordinance and/or departmental policies/procedures as requested by compliance officials in a timely manner after the review.
In addition, Gloucester County officials will continue to update any floodplain ordinance, policy or procedural changes in order to keep their Floodplain Management Plan and their Community Rating System Program current.

Cost/Benefit Implications of Implementing Strategy 1.1.8
This strategy will have direct:

1. Benefits to localities by regularly and systematically tracking development activity in the flood zones to enable timely and effective changes to the locality's Floodplain Ordinance and other associated local land development ordinances and regulations.
2. Minimal costs to locality since the review is done by staff at the VDCR and recommended changes are completed by the local government body after consultation with local government zoning and floodplain management employees.

Strategy 1.1.9: Investigate the FEMA Community Rating System (CRS) Program in the Middle Peninsula localities that are not currently participating in it, which can ensure a less flood hazard prone community and thereby lower flood insurance rates for its residents.

Strategy 1.1.9 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **King and Queen County**
3. **King William County,**
4. **Mathews County,**
5. **Middlesex County,**
6. **Town of Tappahannock,**
7. **Town of Urbanna, and**
8. **Town of West Point.**

With the exception of Gloucester County which is already involved in the CRS Program, locality staff from the other localities listed above will determine the steps and resources needed to become a certified CRS Program Community.

Locality staff will take their findings to the County Administrator/Town Manager with a recommendation to either enter into the CRS Program, or not, based on the costs and benefits to its residents.

Cost/Benefit Implications of Implementing Strategy 1.1.9
This strategy will have direct:

1. Benefits to residents living in flood prone areas if the locality adopts a CRS Program with lower property insurance rates.
2. Costs of dedicating additional staff time to develop, implement, and manage the CRS Program.

Mitigation Strategy addresses the following hazards: hurricanes, coastal flooding/nor'easters, riverine flooding, sea level rise, tsunamis, ditch flooding, dam failure, and summer storms.

Strategy 1.1.10: Investigate increasing building elevation requirements for structures proposed in flood zones.

Strategy 1.1.10 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **King and Queen County,**
3. **King William County,**
4. **Mathews County,**
5. **Middlesex County,**
6. **Town of Tappahannock,**
7. **Town of Urbanna, and**
8. **Town of West Point.**

Middle Peninsula localities are adversely affected by flood water surges from coastal storms to some extent - with decreasing severity as you move from the southeastern-most areas to the northwestern-most portions of the region.

The Building/Zoning Officials in each of the localities should undertake a feasibility study to determine if increasing the elevation requirements for proposed structures to be built in flood zones would lessen flood damage as well as lower flood insurance premiums for residents. The lower insurance premiums were analyzed in a 2006 FEMA-commissioned study entitled *Evaluation of the National Flood Insurance Program's Building Standards* (www.fema.gov/library/viewRecord.do?id=2592). The feasibility study should be undertaken using local data sources including the latest FIRM data, FEMA Severe Repetitive Loss and Repetitive Loss Lists and known flood water depths from building permit files in the Building Department's records.

Beginning in September 2010, Gloucester County has updated their ordinances to require new structures to be constructed 2 feet above the Base Flood Elevation. This is a best practice for the County and it is not feasible to go any higher through current ordinances.

Cost/Benefit Implications of Implementing Strategy 1.1.10
This strategy will have direct:

1. Benefits of reduced flood insurance premiums for Middle Peninsula residents if the locality adopts more stringent regulations.
2. Benefit of lowering future flood insurance claims during severe flooding events if the locality implements greater freeboard requirements.
3. Costs of dedicating locality staff time in the Building/Zoning Departments to develop, implement, and manage the building elevation program.

Mitigation Strategy addresses the following hazards: hurricanes, coastal flooding/nor'easters, riverine flooding, sea level rise, tsunamis, ditch flooding, dam failure, and summer storms.

Strategy 1.1.11 Continue to insure that floodplain/zoning/building regulations in flood prone areas are strictly enforced to prevent non-compliant development and the need to invest in additional public infrastructure in these areas in the future.

Strategy 1.1.11 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King William County,**
4. **Mathews County**
5. **Middlesex County,**
6. **Town of Tappahannock,**
7. **Town of Urbanna, and**
8. **Town of West Point.**

Utilize location information gleaned from the FEMA-generated Severe Repetitive Loss List and the Repetitive Loss List as an additional source of data when county officials guide local property owners about proposed construction/development projects in flood-prone areas.

Cost/Benefit Implications of Implementing Strategy 1.1.11
This strategy will have direct:

1. Benefits local officials with being able to provide historical flood occurrence data to prospective home owners/builders in flood prone areas.

2. Costs of dedicating locality staff time in the Planning/GIS Department to map these properties into the locality's data base.

Mitigation Strategy addresses the following hazards: hurricanes, coastal flooding/nor'easters, riverine flooding, sea level rise, tsunamis, ditch flooding, dam failure, and summer storms.

Strategy 1.1.12: Limit future development in inundation areas located below large water impoundments.

Strategy 1.1.12 will be undertaken in the following Middle Peninsula locality:

1. **King William County**

The impoundment with the greatest likelihood for adverse flooding impacts downstream from the dam includes the following:

Locality	Facility
King William County	Lake Anne- Located in Louisa County

King William County officials should request Dominion/Virginia Power to assist them with mapping those land areas in the county that are adversely impacted by flood waters from their periodic release of water from Lake Anna. Those maps could then be used by county officials for incorporation into future Comprehensive Plan updates as well as for creating perhaps a possible zoning ordinance overlay district showing periodic inundation areas where future development should be avoided.

Cost/Benefit Implications of Implementing Strategy 1.1.12

This strategy will have direct:

1. Benefits to local officials with being able to guide future land use planning and development in these periodically affected properties.
2. Costs of dedicating locality staff time in the Planning/GIS Department to map these properties into the locality's data base.

Mitigation Strategy addresses the following hazards: dam failure.

Strategy 1.1.13 Strongly encourage the USDA - Natural Resources Conservation Services staff, Virginia Department of Conservation and Recreation's Regional Dam Safety Engineer, and the Virginia Soil and Water Conservation District Office staff to ensure that farm pond dams remain structurally sound.

Strategy 1.1.13 will be undertaken in the following Middle Peninsula localities by the aforementioned agencies:

1. **Essex County,**
2. **Gloucester County,**
3. **King and Queen County,**
4. **King William County,**
5. **Mathews County, and**
6. **Middlesex County.**

There is no organized database of farm pond dams in the Middle Peninsula. Since catastrophic failure of farm pond dams could have a hazardous flooding outcome for those living below them, it is critical that a database be developed by each locality to ensure emergency response actions and mitigation activities are undertaken.

The agencies listed above have a working knowledge within Middle Peninsula communities of where some of the larger dam structures may be located since they have a history of working with farmers on various farmland enhancement and subsidy projects.

For the USDA and the Virginia Soil and water Conservation Districts King and Queen, King William and Essex Counties are served by an office in Tappahannock while Middlesex, Gloucester and Mathews Counties are served by these agencies located in Gloucester County. As for Virginia Department of Conservation and Recreation's there is one Regional Dam Safety Engineer that serves all Middle Peninsula.

A written request from the County Administrator/Emergency Services Coordinator in each of the six Middle Peninsula counties should be made to these two agencies requesting an inventory of all dams that they are aware of as well as any structural design/physical condition information that they may have about the dam.

This information will be used by County Planning Officials when they evaluate land development requests during the early planning stages of a proposed project.

Cost/Benefit Implications of Implementing Strategy 1.1.13
This strategy will have direct:

1. Benefits local officials with being able to locate and provide a vulnerability assessment of these structures for future emergency planning strategies.
2. Costs to the USDA and VSWCD agencies with the dedication of staff time and resources to gather and synthesize this data for local government use.

Mitigation Strategy addresses the following hazards: dam failure.

Strategy 1.1.15: Promote coastal construction techniques that will minimize soil erosion and shoreline damage caused by coastal storm surges.

Strategy 1.1.15 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King and Queen County,**
4. **King William County,**
5. **Mathews County,**
6. **Middlesex County,**
7. **Town of Tappahannock,**
8. **Town of Urbanna, and**
9. **Town of West Point.**

Locality staff will work with engineers from the Virginia Marine Resources Commission (VMRC) to determine what coastal construction techniques can be used by waterfront property owners to lessen coastal erosion/flooding along the water's edge during severe storm events.

Additionally as FEMA developed new Flood Insurance Rate Maps a new information layer was added called the Limit of Moderate Wave Action (LiMWA) that identifies the 1.5-foot wave height. With this new information communities and property owners can make more informed decision about reducing their coastal flood risk.

Cost/Benefit Implications of Implementing Strategy 1.1.15
This strategy will have direct:

1. Benefits local residents with waterfront property by providing design options that will lessen adverse impacts from flood waters resulting from storm surges.
2. Costs of dedicating locality staff time to work with VMRC staff to develop best management design solutions that will mitigate soil erosion and other environmental damages.

Mitigation Strategy addresses the following hazards: coastal/shoreline erosion.

Strategy 1.1.18: Create a GIS layer of data showing pond locations, their size, inspection data, and dry hydrant information to improve fire response.

Strategy 1.1.18 will be undertaken in the following Middle Peninsula locality:

1. **Gloucester County,**
2. **Middlesex County, and**
3. **King William County.**

Cost/Benefit Implications of Implementing Strategy 1.1.18
This strategy will have direct:

1. Benefits to local fire departments by having a data base of water bodies and dry fire hydrant information when responding to fires.
2. Costs of GIS/Community Development staff time with data gathering, data input and data maintenance of the County's GIS system.

Mitigation Strategy addresses the following hazards: wildfires, droughts, lightning volcanoes, HAZMAT

Strategy 1.1.19: Integrate mitigation strategies into locality plans, policies, codes and programs across disciplines and departments.

Strategy 1.1.19 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King and Queen County,**
4. **King William County,**
5. **Mathews County,**
6. **Middlesex County,**
7. **Town of Tappahannock,**

8. **Town of Urbanna, and**
9. **Town of West Point.**

The localities listed above will work to continue integrating mitigation strategies into regional, county, and/or town plans (ie. Comprehensive Plan, Stormwater Management Plan, Water Supply Plan, etc), policies, codes (ie. ordinances) and programs to help support hazard risk reduction. According to FEMA there are two primary ways to effectively accomplish Plan Integration:

1. Integrate natural hazard information and mitigation policies and principles into local planning mechanism and vise versa.
    - Include information on natural hazards (past events, potential impacts, and vulnerabilities)
    - Identify hazard-prone areas throughout the community.
    - Develop appropriate goals, objectives, policies, and projects.

2. Encourage collaborative planning and implementation and inter-agency coordination:
    - Involve key community officials who have the authority to execute policies and programs to reduce risk.
    - Collaborate across department s and agencies with key staff to help share knowledge and build relationships that are important to the successful implementation of mitigation activities.

Cost/Benefit Implications of Implementing 1.1.19

This Strategy will have direct:

1. Benefits to localities will include enhanced risk reduction through improved coordination.
2. Benefits to localities will include better defined roles of locality staff (ie. planners, emergency mangers, engineers, etc.) in improving disaster resiliency.
3. Cost is the staff time required to develop and integrate mitigation strategies into locality plans and policies.

Mitigation Strategy addresses the following hazards: hurricanes, ice storms, tornadoes, coastal flooding/nor'easters, coastal/shoreline erosion, sea level rise, snow storms, riverine flooding, wildfires, high winds/windstorms, dam failure, droughts, lightning, earthquakes, shrink0swell soils, extreme cold, extreme heat, land subsidence/karsts, landslides, tsunamis, volcanoes, air quality, HAZMAT, ditching flooding, and summer storms.

Objective 1.2: Provide protection for critical public facilities and essential services.

Objective 1.3: Middle Peninsula localities will support implementation of structural and nonstructural mitigation activities to reduce exposure to natural and man-made hazards.

Strategy 1.3.1: Mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include, but are not limited to:

- **Acquisition of hazard prone properties,**
- **Elevation of structures in flood prone areas,**
- **Minor structural flood control projects,**
- **Relocation of structures from hazard prone areas,**
- **Retrofitting of existing buildings and facilities,**
- **Retrofitting of existing buildings and facilities for shelters,**

- **Infrastructure protection measures,**
- **Storm water management improvements,**
- **Advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows),**
- **Targeted hazard education, and**
- **Installation of generator connections for shelters.**

Strategy 1.3.1 will be undertaken in the following Middle Peninsula localities:

1. Gloucester County

As numerous county buildings have experienced repetitive damage due to flooding and storm events these structures will be mitigated to reduce or eliminate the potential for damage associated with natural hazards.

Cost/Benefit Implications of Implementing Strategy 1.3.1
This strategy will have direct:

1. Benefits to the private and public infrastructure by mitigating impacts from natural hazards.
2. Benefits to the general public through hazard education programs to prepare for impacts.
3. Benefits for FEMA by reducing the number of properties on the Repetitive Loss and Severe Repetitive Loss Lists and subsequent flood insurance claims.
4. Cost for localities include retrofitting existing buildings and facilities, implementing advanced warning systems, maintenance of acquired hazard prone properties, installation of stormwater management practices, as well as deploying hazard education.
5. Costs for FEMA through expenditure of Hazard Mitigation Funds for home elevations and land acquisitions in flood prone areas.

Mitigation Strategy addresses the following hazards: hurricanes, ice storms, tornadoes, coastal flooding/nor'easters, coastal/shoreline erosion, sea level rise, snow storms, riverine flooding, wildfires, high winds/windstorms, dam failure, droughts, lightning, earthquakes, shrink0swell soils, extreme cold, extreme heat, land subsidence/karsts, landslides, tsunamis, volcanoes, air quality, HAZMAT, ditching flooding, and summer storms.

Goal 2: Improve community emergency management capabilities.

Objective 2.1: Improve the ability of the jurisdictional emergency managers to communicate with residents and businesses during and following natural hazard emergencies.

Objective 2.2: Improve communications between the emergency managers working in the Middle Peninsula jurisdictions and other nearby localities.

Strategy 2.2.1: Formalize mutual aid agreements to coordinate the region's fire and emergency medical units to ensure a quick and efficient response to these severe weather events.

Strategy 2.2.1 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**

3. **King and Queen County,**
4. **King William County,**
5. **Mathews County,**
6. **Middlesex County,**
7. **Town of Tappahannock, and**
8. **Town of West Point.**

With these little-notice storm events, time is of the essence with the ability to provide life-saving aid to as many residents as possible quickly after the severe storms strike. Currently there is a mutual aid agreement amongst participants of the Rappahannock Volunteer Fire Association, which includes the following Middle Peninsula volunteer fire and rescue departments: Gloucester Volunteer Fire and Rescue, King William Volunteer Fire Department, Lower Middlesex Volunteer Fire, Mathews Volunteer Fire Department, Tappahannock Volunteer Fire Department, Upper Middlesex Volunteer Fire Department, West Point Volunteer Fire and Rescue, Middlesex Volunteer Fire Department, Lower King and Queen Volunteer Fire Department, and Central King and Queen Volunteer Fire Department. While this in inclusive of some fire and rescue department within Middle Peninsula localities, this is not inclusive of all and therefore cannot be labeled as complete. Please note that this strategy focuses on creating mutual aid agreements at the County level.

Cost/Benefit Implications of Implementing Strategy 2.2.1

This strategy will have direct:

1. Benefits for local fire and rescue units since having formalized agreements in place will help to coordinate the dispatching of first response units as needed when there may be limited supply and high demand for assistance.
2. Benefits for local residents with coordinated emergency response services during these damaging and potentially life threatening natural hazards.
3. Costs to implement the mutual aid agreements should be minimal for the jurisdiction with the dedication of a small amount of emergency management and legal staff time.

Mitigation Strategy addresses the following hazards: hurricanes, ice storms, tornadoes, coastal flooding/nor'easters, coastal/shoreline erosion, sea level rise, snow storms, riverine flooding, wildfires, high winds/windstorms, dam failure, droughts, lightning, earthquakes, shrink/swell soils, extreme cold, extreme heat, land subsidence/karsts, landslides, tsunamis, volcanoes, air quality, HAZMAT, ditching flooding, and summer storms.

Strategy 2.2.2: Formalize mutual aid agreements to coordinate the region's fire units to ensure a quick and efficient response to wildfires.

Strategy 2.2.2 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King and Queen County,**
4. **King William County,**
5. **Mathews County,**
6. **Middlesex County,**
7. **Town of Tappahannock, and**
8. **Town of West Point.**

Since numerous wildfire sites can erupt in multiple locations when dry and windy conditions are present throughout the Middle Peninsula, a coordinated regional response by all of the fire departments serving the area is required to combat this natural hazard. Clearly written and uniform mutual aid agreements can insure a greater degree of a well coordinated regional response to this natural hazard.

Currently there is a mutual aid agreement amongst participants of the Rappahannock Volunteer Fire Association, which includes the following Middle Peninsula volunteer fire and rescue departments: Gloucester Volunteer Fire and Rescue, King William Volunteer Fire Department, Lower Middlesex Volunteer Fire, Mathews Volunteer Fire Department, Tappahannock Volunteer Fire Department, Upper Middlesex Volunteer Fire Department, West Point Volunteer Fire and Rescue, Middlesex Volunteer Fire Department, Lower King and Queen Volunteer Fire Department, and Central King and Queen Volunteer Fire Department. While this in inclusive of some fire and rescue department within Middle Peninsula localities, this is not inclusive of all and therefore cannot be labeled as complete. Please note that this strategy focuses on creating mutual aid agreements at the County level.

Cost/Benefit Implications of Implementing Strategy 2.2.2
This strategy will have direct:

1. Benefits for local and nearby fire units since having formalized agreements in place will help to coordinate the dispatching of first response units as needed when there may be a limited supply and a high demand for assistance during times of multiple wildfires.
2. Benefits the local residents with coordinated emergency response services during this damaging and potentially life threatening natural hazard.
3. Costs to implement the mutual aid agreements should be minimal for the jurisdiction's emergency management and legal staff.

Mitigation Strategy addresses the following hazards: wildfires.

Objective 2.3: Improve the ability of localities to communicate with the Virginia Emergency Operations Center during state and federally declared disasters.

Goal 3: Increase the public's awareness and educational level of their vulnerabilities to natural hazards.

Objective 3.1: Provide information to residents and businesses about the types of natural hazards that they may be exposed to, where they are likely to occur and what they can do to better prepare for them to avoid their adverse affects.

Strategy 3.1.2: Encourage private property owners to perform regular and routine maintenance of ditches and culverts in order to keep them free of debris, with a special emphasis on road sections where there are chronic flooding problems, including those listed earlier in the plan.

Strategy 3.1.2 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King and Queen County,**

4. **King William County,**
5. **Mathews County,**
6. **Middlesex County,**
7. **Town of Tappahannock,**
8. **Town of Urbanna, and**
9. **Town of West Point.**

As previous noted, there are many VDOT Secondary Roads that are inundated by flood waters during significant storm events. Oftentimes, the flooding occurs at low-lying section of these roads where the drainage pipes and ditches have been partially or completely blocked by vegetative debris.

Property owners with road frontage should be actively encouraged by local Emergency Management staff, by developing a proactive public information program, to keep ditch lines free of vegetative debris which would lessen the flooding at these stressed road crossings and better allow for vehicles to evacuate during severe storm events.

Cost/Benefit Implications of Implementing Strategy 3.1.2
This strategy will have direct:

1. Benefits for residents living in flood prone areas that will allow them safer evacuation and return routes during severe flooding events.
2. Costs for public information notifications via printed media, reverse 911 systems, County websites or e-mail messages.

Mitigation Strategy addresses the following hazards: ditching flooding, summer storms, coastal flooding/nor'easters, hurricanes, and sea level rise.

Strategy 3.1.3: Encourage the two power companies operating in the Middle Peninsula Region to maintain system components, including power line rights-of–way, to minimize interruptions of the electrical power grid for severe weather.

Strategy 3.1.3 will be undertaken in the following Middle Peninsula localities:

1. **Essex County**
2. **Gloucester County**
3. **King and Queen County,**
4. **King William County,**
5. **Mathews County,**
6. **Middlesex County,**
7. **Town of Tappahannock,**
8. **Town of Urbanna, and**
9. **Town of West Point.**

Local Emergency Service Coordinators will work closely with Community Relations/Education employees at Dominion/Virginia Power and Rappahannock Electric Cooperative to information and guidance to their customers about the importance of keeping trees and brush away from electric power lines on their property in order to decrease the possibility of storm damage to the power grid during severe rain/wind storm events.

Educational mailings, such as landscape design techniques as well as a list of plants to grow under power lines to promote attractive landscaping while protecting the power lines from damaging vegetative growth, could be developed by Dominion/Virginia Power and Rappahannock Electric Cooperative staff and mailed as insert with property owners' monthly electric bills.

Cost/Benefit Implications of Implementing Strategy 3.1.3
This strategy will have direct:

1. Benefits local residents with more reliable electric services during severe weather events.
2. Benefits power companies with lower maintenance and repair costs for their rights-of-way and power system equipment.
3. Costs to the 2 power companies to produce and disseminate educational materials to their customers.

Mitigation Strategy addresses the following hazards: hurricanes, ice storms, tornadoes, coastal flooding/nor'easters, coastal/shoreline erosion, snow storms, high winds/windstorms, earthquakes, and summer storms.

Strategy 3.1.4: Promote public education programs to ensure that property owners are fully informed about the flood hazards on the property that they own.

Strategy 3.1.4 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King and Queen County,**
4. **King William County,**
5. **Mathews County,**
6. **Middlesex County,**
7. **Town of Tappahannock,**
8. **Town of Urbanna, and**
9. **Town of West Point.**

Each local government will develop and post flood mitigation materials on the Emergency Services Section of their web-site. Posted information will include a list of the locality's mitigation strategies as well as technical information that the local property owners can use to help alleviate flood damage to their properties.

Cost/Benefit Implications of Implementing Strategy 3.1.4
This strategy will have direct:

1. Benefits local residents with property in the flood plain about measures they can take to lessen flood damages to their property.
2. Costs of dedicating emergency management and public information officer's staff time to developing and distributing mitigation information.

Mitigation Strategy addresses the following hazards: hurricanes, ice storms, coastal flooding/nor'easters, snow storms, sea level rise, riverine flooding, dam failure, ditch flooding, and summer storms.

Strategy 3.1.5: Develop a public education campaign for residents living in the 100-year floodplain, especially those living on FEMA's list of SRL and RL properties, listing methods for them to decrease flood damage including the availability of any FEMA grant funds for elevation or relocation projects.

Strategy 3.1.5 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King William County,**
4. **Mathews County,**
5. **Middlesex County,**
6. **Town of Tappahannock,**
7. **Town of Urbanna, and**
8. **Town of West Point.**

Technical information should specify design considerations for how to handle all household utility components in flood prone areas as well as breakaway walls and venting options that allow automatic entry and exit of flood waters.

Cost/Benefit Implications of Implementing Strategy 3.1.5
This strategy will have direct:

1. Benefits local residents with property in the flood plain about measures they can take to lessen flood damages to their property.
2. Costs of dedicating emergency management and public information officer's staff time to developing and distributing mitigation information.

Mitigation Strategy addresses the following hazards: hurricanes, ice storms, coastal flooding/nor'easters, sea level rise, riverine flooding, ditch flooding, and summer storms.

Strategy 3.1.6: Increase resident and emergency responder safety during severe winter ice storm events by developing a public education campaign to inform residents about the importance of keeping tree limbs away from their homes and electric lines.

Strategy 3.1.6 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King and Queen County,**
4. **King William County,**
5. **Mathews County,**
6. **Middlesex County,**
7. **Town of Tappahannock,**
8. **Town of Urbanna, and**
9. **Town of West Point.**

By decreasing the potential for structures to incur damage during ice storms, this will allow the structures to remain occupied thereby lessening the number of emergency responder calls to remove

occupants from damaged homes during times when roads are dangerous and/or impassable. Localities will work with utility companies within the region to educate the public.

Cost/Benefit Implications of Implementing Strategy 3.1.6
This strategy will have direct:

1. Benefits for local residents since they will be able to stay in their undamaged homes with electric lines in tact which will allow for quicker restoration of electric service after severe winter storms.
2. Benefits for first responders with fewer risky fire and rescue calls on ice covered roads during and after severe weather events.
3. Costs of dedicating emergency management and public information officer staff time to develop and distribute ice storm related mitigation information on the locality's website and other social media sites.

Mitigation Strategy addresses the following hazards: extreme cold, ice storms, and snow storms.

Strategy 3.1.7: Develop public information and inform property owners about the long range affects that sea level rise will have on low-lying property that they own.

Strategy 3.1.7 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King William County,**
4. **Mathews County,**
5. **Middlesex County,**
6. **Town of Urbanna, and**
7. **Town of West Point.**

The local governments noted above will provide information about the potential physical impacts of sea level rise on the Emergency Management Homepage of their jurisdictional web-site. Posted information will include areas in the locality that are expected to be affected, the time frame within which the impacts will be anticipated, the public infrastructure that may be impacted and what measures can be taken to mitigate future adverse impacts.

Cost/Benefit Implications of Implementing Strategy 3.1.7
This strategy will have direct:

1. Benefits for local residents with property located in low lying areas about measures they can take to lessen future damages from this natural hazard.
2. Benefits to local governments with reduced damages to both public infrastructure and private property.
3. Cost in staff time to assemble, post and update website information on the locality's Emergency Management Homepage about sea level rise.

Mitigation Strategy addresses the following hazards: sea level rise.

Strategy 3.1.8 Promote a public education program to ensure that property owners protect their property by decreasing flammable forest fuels surrounding homes located in wooded settings.

Strategy 3.1.8 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King and Queen County,**
4. **King William County,**
5. **Mathews County, and**
6. **Middlesex County.**

Each of these local governments will develop and post information about wildfire risks on the Emergency Management Homepage of their website. Posted information will include safety tips to minimize threats to homes/property that the Virginia Department of Forestry has developed as well as other existing wildfire reduction strategies that are available on related websites.

Mitigation Strategy addresses the following hazards: wildfires and drought.

Cost/Benefit Implications of Implementing Strategy 3.1.8

This strategy will have direct:

1. Benefits for local residents with property located in wooded areas to lessen the potential for fire damage to their homes and property.
2. Benefits to local and state fire responders with fewer calls to save structures and rescue residents in perilous situations.

Cost in staff time to assemble, post and update website information on the locality's Emergency Management Homepage.

Objective 3.2: Improve jurisdictional mapping capabilities to show the physical areas in their locality that may be affected by natural hazard events including storm surge areas from coastal storms.

Strategy 3.2.1: Incorporate the newly digitized local floodplain maps into each County's GIS database after adoption by the local governing body, to the extent possible.

Strategy 3.2.1 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **King and Queen County,**
3. **Mathews County,**
4. **Town of Tappahannock,**
5. **Town of Urbanna, and**
6. **Town of West Point.**

Each county's GIS technician/consultant will incorporate the digitized floodplain map data into their system when a GIS system becomes available to the locality.

County planning/zoning officials will ensure that this floodplain data is readily available to property owners so that they are aware of the 100-year flood boundaries on their land.

Cost/Benefit Implications of Implementing Strategy 3.2.1
This strategy will have direct:

1. Benefits of more accurate flood plain data that will enable local officials to better guide development in flood prone areas.
2. Benefits for better data to incorporate into locality Comprehensive Plan Updates. Costs of dedicating locality staff time in the GIS Department to incorporate the mapping products into the locality's IT system.

Strategy 3.2.2: When the Natural Hazards Mitigation Plan is updated in the future, complete:

1. **Refine and update data sets for GBS and essential facilities.**

Strategy 3.2.2 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King and Queen County,**
4. **King William County,**
5. **Mathews County,**
6. **Middlesex County,**
7. **Town of Tappahannock,**
8. **Town of Urbanna, and**
9. **Town of West Point.**

Cost/Benefit Implications of Implementing Strategy 3.2.2
This strategy will have direct:

1. Benefits to locality Zoning Administrators/Floodplain Managers/Building Officials with more precise costs when reviewing locality-wide mitigation projects and policies.
2. Costs to local government officials to contract with engineering firms to run HAZUS models since it is a more technically specific application than more localities in the Middle Peninsula can perform with their own staff capabilities.

Mitigation Strategy addresses the following hazards: hurricanes, ice storms, tornadoes, coastal flooding/nor'easters, coastal/shoreline erosion, sea level rise, snow storms, riverine flooding, wildfires, high winds/windstorms, dam failure, droughts, lightning, earthquakes, shrink/swell soils, extreme cold, extreme heat, land subsidence/karsts, landslides, tsunamis, volcanoes, air quality, HAZMAT, ditching flooding, and summer storms.

Goal 4: Ensure that the strategies developed in this plan are incorporated into other local planning documents, ordinances, policies and procedures.

Objective 4.1: Develop an Implementation Plan within the MPNHMP Update that identifies the locality employees/officials who will be responsible for implementing each strategy that they will undertake, the local regulatory tools that the jurisdiction will use to

implement the strategies, the resources that will be needed and the time frame within which the strategy will be completed.

Strategy 4.1.1: All Natural Hazards: Adopt an Implementation Plan that includes one or more of the following:

1. **Assigns locality officials/employees with the ability and authority to implement or cause to be implemented the mitigation strategies that they have agreed to in the update,**
2. **Determines a low, moderate and high priority for each strategy in the locality,**
3. **Establishes realistic timeframes for completing each strategy.**
4. **Appoints a natural hazard mitigation advisory committee to work with the Board of Supervisors, Planning Commission and Planning Staff to monitor progress on adopted strategies and to suggest additional mitigation strategies within the five year review period of the MPNHMP Update by 2016 and the update of the jurisdiction's next Comprehensive Plan.**
5. **Consider including the mitigation strategies in an Implementation Matrix as part of the jurisdiction's next Comprehensive Plan update.**
6. **Amend the locality's Zoning Ordinance and Subdivision Ordinance to include natural hazard mitigation strategies as they relate to land development requirements, policies and procedures.**
7. **Submit capital projects to the Planning Commission/Board of Supervisors for their consideration when they review the locality's Capital Improvement Program (CIP).**
8. **Seeks funding from various state and federal agencies for mitigation strategies that require an infusion of funds beyond what the jurisdiction can provide.**

Strategy 4.1.1 will be undertaken in the following Middle Peninsula localities:

1. **Essex County,**
2. **Gloucester County,**
3. **King William County,**
4. **Mathews County,**
5. **Middlesex County,**
6. **Town of Tappahannock,**
7. **Town of Urbanna, and**
8. **Town of West Point.**

Cost/Benefit Implications of Implementing Strategy 4.1.1

This strategy will have direct:

1. Benefits for the elected officials and locality staff since it gives them specific expectations with implementing the numerous strategies in the plan.
2. Costs to local governments have been kept within reason considering the limited financial resources and the many funding responsibilities that the rural Middle Peninsula jurisdictions face.

Mitigation Strategy addresses the following hazards: hurricanes, ice storms, tornadoes, coastal flooding/nor'easters, coastal/shoreline erosion, sea level rise, snow storms, riverine flooding, wildfires, high winds/windstorms, dam failure, droughts, lightning, earthquakes, shrink/swell soils, extreme cold, extreme heat, land subsidence/karsts, landslides, tsunamis, volcanoes, air quality, HAZMAT, ditching flooding, and summer storms.

Section 9 – Implementation Plan

Overview
The Steering Committee members assigned a **low, moderate or high priority** to each of the strategies that have been proposed to lessen the adverse impacts from natural hazards in their respective communities. These priority ratings were assigned after reviewing the evaluation criteria listed at the beginning of Section 8 as well as their historical insight and knowledge of how their jurisdiction operates.

Strategies that were assigned a **higher priority** are ones that the Steering Committee members determined that their localities could implement:

1. in a timely manner,
2. with limited financial and staff resources, and
3. would reduce or eliminate losses to public infrastructure or private structures that have a history of damage from natural causes.

Strategies that were assigned a **moderate priority** are ones that the Steering Committee members determined that their localities could implement:

1. with a greater commitment of staff time,
2. a higher level of financial support from the locality, and
3. would increase public safety for a significant number of residents.

Strategies that were assigned a **low priority** are ones that Steering Committee members determined would:

1. require assistance from agencies/organizations outside of the direct control of the local government, and
2. have a lower potential to reduce or eliminate direct losses from natural hazards.

Responsible Party
The local Emergency Services Coordinator/Emergency Manager (ESC/EM) will be the primary person responsible for implementing the strategies in this plan as adopted by their jurisdiction. The ESC/EM will need to work closely with the locality's Chief Administrative Officer (CAO) since many of the strategies will require Board of Supervisor or Town Council action.

Local governing body action will include implementation of new policies or ordinances as well as the possibility of amending some existing ones. In addition, the governing body will need to approve grant applications for FEMA Hazard Mitigation Funds and/or other funding sources.

The ESC/EM and CAO will need to work closely with the locality's Building, Planning and Zoning Department staff members as well as with FEMA and VDEM Disaster Mitigation staff in order to implement a successful and comprehensive natural hazards mitigation program.

Changes to the locality's zoning ordinance, comprehensive plan, building regulations and/or capital improvements programs can be anticipated. The CAO and ESC/EM in each locality will spearhead the effort to amend existing ordinances/polices or develop new ones to help implement mitigation strategies adopted for their locality in the MPAHMP update.

Communications
The ESC/EM will develop and implement their county-wide natural hazards mitigation outreach and public awareness campaigns using local media and other proven informational outlets in their locality – including their county websites that includes additional information about their Emergency Services Department.

Each locality's website will list and briefly describe all of the mitigation strategies that they have adopted in this plan and the timeframes by which they plan to implement them. Additionally, the website will include technical information and diagrams that residents can use to implement low-cost/low-tech construction measures to lessen potential future losses from natural hazards.

Table 110: Essex County - Locality Specific Plan of Action

Strategy	Priority	Responsible Party	Funding Source	Status	Comment
1.1.1	Moderate	Zoning	FEMA/land owners	By request	
1.1.2	Low	Building	Local	Yearly	
1.1.4					
1.1.5	High	BOS/VDOT	VDOT	In-progress	Should be completed in 2017
1.1.6	High	BOS/VDOT	VDOT	In-progress	Should be completed in 2017
1.1.9	High	Building/Zoning	Local	In-progress	
1.1.10	Low	Building	Local	Did not adopt	
1.1.11	High	Zoning	Local	On-going	
1.1.13	High	ESC/Planning	Local	In-progress	
1.1.15	High	Building/Wetlands	Local	In-progress	
1.1.19					
3.1.2	Moderate	ESC	n/a	On-going	
2.2.1	High	ESC	Local	In-progress	Currently participate in mutual aid, no formal MOU's
2.2.2	High	ESC	Local	In-progress	Currently participate in mutual aid, no formal MOU's
3.1.3	High	ESC/power co	n/a	In-progress	
3.1.5	Moderate	ESC	n/a		
3.1.6	High	ESC	n/a	Ongoing & In-progress	
3.1.7					
3.1.8	Low	ESC	n/a	Ongoing	
3.2.1	High	Planning	n/a	In-progress	
3.2.2	Low	ESC	n/a	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3. 2010 Census was not included in HAZUS.
4.1.1	High	ESC	Local	In-progress	Adopted a floodplain overlay district as a component of the County's zoning ordinance.

Table 111: Town of Tappahannock Locality Specific Plan of Action

Strategy	Priority	Responsible Party	Funding Source	Status	Comments
1.1.5	High	Town/County	VDOT	ASAP	Delayed because of VDOT
1.1.7	High	Town	VDOT	ASAP	Delayed because of VDOT
1.1.9	Low	Building/Zoning	Local	W/in 2 years	Delayed because of Essex County
1.1.10	Low	Building	Essex County	w/in 2 years	
1.1.11	Low	Zoning	Local	Not started	
1.1.15	Low	Building/Wetlands	Local	w/in 2 years	
1.1.19					
2.2.1	High	ESC	Local	In-progress	Currently participate in mutual aid, no formal MOU's
2.2.2	High	ESC	Local	In-progress	Currently participate in mutual aid, no formal MOU's
3.1.2	Moderate	ESC	n/a	On-going	
3.1.3	Moderate	ESC/power co	n/a	w/in 1 years	
3.1.5	Low	ESC	n/a	Not started	
3.1.6	Low	ESC	n/a	Not started	
3.2.1	High	Planning	n/a	w/in 2 years	
3.2.2	Low	ESC	n/a	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	ESC	Local	On-going	Adopted a Floodplain overlay district as a component of the County's zoning ordinance

Table 112: Gloucester County Locality Specific Plan of Action.

Strategy	Priority	Status	Plan to complete this strategy	Responsible Party	Funding Source	Schedule
1.1.1	Moderate	On-going	Continued progress on the strategy as part of the Hazard Mitigation Management Team combined with our Floodplain Management Committee and Program Public Information.	Hazard Mitigation Management Team and Floodplain Management Committee and Program Public Information	FEMA /landowners	Strategy will be continual on an annual scheduled basis
1.1.2	Moderate	On-going	Same as above	Same as above	FEMA	Strategy will be continual on an annual scheduled basis
1.1.3	M	On-going	Same as above	Engineering and Building & Grounds Departments	Federal grant	Strategy will be continual on an annual scheduled basis
1.1.4	H	On-going	Same as above	Engineering and Building & Grounds Departments	FEMA	Strategy will be continual on an annual scheduled basis as grants are available.
1.1.5 (newly added strategy)	H	In-progress	Same as above	BOS/VDOT	VDOT	Strategy will be continual on an annual scheduled basis
1.1.6	H	On-going	Same as above	BOS/VDOT	VDOT	Strategy will be continual on an annual scheduled basis
1.1.7 (newly added strategy)	M	In-progress	Same as above	BOS/VDOT	VDOT	Strategy will be continual on an annual scheduled basis
1.1.8	M	On-going	Same as above	Building Inspections and Planning & Zoning Departments	Local	Strategy will be continual on a bi-annual scheduled basis
1.1.11	H	On-going	Same as above	Building Inspections and Planning & Zoning Departments	Local	Strategy will be continual on an annual scheduled basis
1.1.13	M	On-going	Same as above	BOS/ Environmental Programs /Extension Service	Local	Strategy will be continual on an annual scheduled basis and updated on a regular basis.
1.1.15	M	On-going	Continued progress on the strategy as part of the Hazard Mitigation Management Team combined with our Floodplain Management Committee and Program Public Information.	Wetlands Board Environmental Programs	Local	Strategy will be continual on an annual scheduled basis
1.1.18 (newly added strategy)	M	In-progress	Same as above	DIT / GIS	Local	Strategy will be continual on an annual scheduled basis
1.1.19 (newly added strategy)	M	In-progress	Same as above	BOS, Building Inspections, Planning & Zoning Departments, VDOT	Local	Strategy will be continual on an annual scheduled basis and revised when plans are reviewed

1.3.1	High	In-progress	Same as above	Emergency Management, Hazard Mitigation Management Team and Floodplain Management Committee, Building Inspections and Planning & Zoning Departments	Local	
2.2.1	High	In-progress	Same as above	Emergency Management	Local	Strategy will be continual on an annual scheduled basis
2.2.2	High	In-progress	Same as above	Emergency Management	Local	Strategy will be continual on an annual scheduled basis
3.1.2	M	On-going	Same as above	VDOT, Floodplain Management Committee and Program Public Information	VDOT & Local grants	Strategy will be continual on an annual scheduled basis and upgraded when VDOT make road improvements as approved by BOS.
3.1.3	Low	On-going	Same as above	Emergency Management, Hazard Mitigation Management Team and Floodplain Management Committee and Program Public Information	Dominion Power	Strategy will be continual on an annual scheduled basis as contract requires by Dominion Power.
3.1.4	Moderate	On-going	Same as above	Same as above	Program Public Information	Strategy will be continual on an annual scheduled basis
3.1.5	High	On-going	Same as above	Emergency Management, Hazard Mitigation Management Team and Floodplain Management Committee and Program Public Information	Program Public Information	Strategy will be continual on an annual scheduled basis and will apply for grants to fund PPI.
3.1.6	Moderate	On-going	Same as above	Emergency Management, Dominion Power	Dominion Power	Strategy will be continual on an annual scheduled basis
3.1.7	Low	On-going	Same as above	Middle Peninsula Planning District Commission	MP PDC	Strategy will be continual on an annual scheduled basis as part of PDC funding
3.1.8	Moderate	On-going	Same as above	Emergency Management, US Forestry Service, and Volunteer Fire Departments	USFS	Strategy will be continual on an annual scheduled basis and will seek grant opportunities.
3.2.2	Low	In-progress	Same as above	Middle Peninsula Planning District Commission	MP PDC	Strategy will be continual as the MPRHMP is scheduled for review 2016
4.1.1	High	In-progress	Same as above	Emergency Management and BOS	local	Strategy will be continual as the MPRHMP is scheduled for review 2016

Table 113: King and Queen County - Locality Specific Plan of Action

Strategy	Priority	Responsible Party	Funding Source	Status	Comments
1.1.6	Moderate	BOS/VDOT	VDOT	On-going	Route 17 at Parkers Marina completed and now open. Road was raised.
1.1.8	Moderate	Zoning	Local	Every 2-years	
1.1.9	Low	Building/Zoning	Local	Not Started	
1.1.10	Low	Building	VDOT	In-progress	Currently requires flood elevation certificates and looking to propose freeboard with the new maps in May of 2016
1.1.13	Moderate	ESC/Planning	VDOT	w/in 2-years	
1.1.15	Low	Building/Wetlands	Local	In-progress	VE zone properties will have high construction requirements once new maps are adopted and effective May of 2016
1.1.19					
1.2.1	Low	ESC/CAO	Local	On-going	
2.2.1	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
2.2.2	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
3.1.2	Moderate	ESC	n/a	Not Started	Roadways in VDOT system needs ditch cleanouts to prevent roadway flooding
3.1.3	Moderate	ESC/power co	n/a	In-Progress	REC does a great job of this
3.1.4	High	ESC	n/a	w/in 1 year	
3.1.6	Moderate	ESC	n/a	Not started	
3.1.8	Moderate	ESC	n/a	On-going	
3.2.1	Moderate	Planning/GIS	n/a	In-Progress	New maps to be adopted and effective may of 2016. GIS online to become available to the public Fall of 2015
3.2.2	Low	ESC	n/a	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	ESC	Local	In-Progress	Adopted a floodplain overlay district as a component of the County's zoning ordinance.

Table 114: King William County - Locality Specific Plan of Action

Strategy	Priority	Responsible Party	Funding Source	Status	Comments
1.1.5	High	BOS/VDOT	VDOT		
1.1.6	Moderate	BOS/VDOT	VDOT	On-going	
1.1.12	Low	Zoning	Local		
1.1.13	Moderate	ESC/Planning	Local		
1.1.15	Low	Building/Wetlands	Local	On-going	
1.1.16	Moderate	Community Development	Local	Not Started	Delayed due to lack of funding
1.1.18	Low	GIS/Community Development	Local	On-going	GIS layer developed; Added stormwater BMP layer
1.1.19					
2.2.1	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
2.2.2	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
3.1.2	Moderate	ESC	n/a	Not started	
3.1.3	Moderate	ESC/power co	n/a	w/in 1 years	
3.1.4	Moderate	ESC	n/a	Not started	Very little development around flood plains
3.1.5				Not started	Very little development around flood plains
3.1.6	Low	ESC	n/a	w/in 2 years	
3.1.7					Threat level of sea rise limited in this community.
3.1.8	Moderate	ESC	n/a	Not started	
3.2.2	Low	ESC	n/a	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3. 2010 Census was not included in HAZUS.
4.1.1	High	ESC	Local	In-progress	Adopted a floodplain overlay district as a component of the County's zoning ordinance.

Table 115: Town of West Point - Locality Specific Plan of Action

Strategy	Priority	Responsible Party	Funding Source	Status	Comments
1.1.1	Moderate	Planning	FEMA/land owners	On-going	Waiting to hear from FEMA on application
1.1.2	High	Building	Local	Annually	
1.1.3	Moderate	HRSD	HRSD/Local	On-going	Relocated public works building to higher ground
1.1.9	Moderate	Building/Zoning	Local	Not started	
1.1.11	Moderate	Zoning	Local	Ongoing	Review of zone and building applications
1.1.15	Low	Building/Wetlands	Local	Not Started	
2.2.1	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
2.2.2	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
3.1.1	Moderate	ESC	King William	On-going	King William Dispatch has the capability of doing this for the Town if needed
3.1.3	Low	ESC/power co	n/a	Not started	
3.1.6	Moderate	ESC	Local	Not started	
3.1.7	Low	ESC	n/a	Not started	
3.2.1	High	Planning	n/a	On-going	Received new GIS information from FEMA, updated as received from FEMA
3.2.2	Low	ESC	Local	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	ESC	Local	In-progress	Adopted a Floodplain overlay district as a component of the County's zoning ordinance

Table 116. Mathews County - Locality Specific Plan of Action					
Strategy	**Priority**	**Responsible Party**	**Funding Source**	**Status**	**Comments**
1.1.1	High	Zoning	FEMA/land owners	In-progress/ ongoing	Four FEMA HMGP grants were awarded to the County for the elevation of houses for thirty-four repetitive loss properties and acquisition of three properties. The elevations and acquisitions in these four grants are in progress and are expected to be completed in 2017. Another FEMA HMGP grant for one severe repetitive loss property was used to elevate the house in 2014.
1.1.2	Low	Public Works	Local	Not started	Delayed because of lack of funding
1.1.3	Moderate	Public Works	Local	Not started	Delayed because of lack of funding
1.1.4	High	Town/County	VDOT	In-progress/ ongoing	FEMA HMGP funds have been used to acquire one repetitive loss property. Two others are in the process of being acquired
1.1.6	Low	Town	VDOT	Not started	Delayed because of lack of VDOT funding
1.1.9	Low	Building/Zoning	Local	Not started	Delayed because of lack of staff to apply for inclusion and ongoing participation in the CRS Program.
1.1.10	High	Building	Essex County	Delayed	Increased elevation requirements proposed for updated floodplain management ordinance, but not adopted. Potential to be addressed in the future.
1.1.11	High	Zoning	Local	In-progress/ ongoing	County's Building Official is enforcing adopted Floodplain Management Ordinance. Zoning amendments will be considered by the Planning Commission to address recurrent flooding after the five-year review of the Comprehensive Plan.
1.1.13	Low	Building/Wetlands	Local	Not started	No request has been made to the NRCS or Tidewater Soil and Water Conservation District for an inventory of farm pond dams.
1.1.15	Moderate	Building/Wetlands	Local	In-progress/ ongoing	The County's Wetlands Projects Coordinator and the Wetlands Board are promoting "Living Shorelines" as a shoreline erosion control method to property owners by utilizing information provided by VIMS and VMRC.

2.2.1	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
2.2.2	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
3.1.2	Moderate	ESC	n/a	In-progress/ ongoing	The County encourages property owners to participate in its Outfall Ditch Maintenance Program. Local VDOT maintenance crews periodically clean ditches in their right-of-way. A Ditching Committee comprised of County residents was also formed to address this problem.
3.1.3	Low	ESC/power co	n/a	Not started	No request has been made to Dominion Power for information and guidance about the importance of keeping trees and brush away from power lines.
3.1.4	High	ESC	n/a	In-progress/ ongoing	The County's Building Official regularly posts information on the County's website regarding flood hazards.
3.1.5	High	ESC	n/a	In-progress/ ongoing	The County's Building Official and the Department of Planning & Zoning inform residents about FEMA HMGP grants to elevate their houses or acquire properties. Also, the Building Official, along with a local contractor, has conducted a meeting for residents regarding the steps involved in elevating a house.
3.1.6	Low	ESC	n/a	Not started	Delayed because of lack of staff
3.1.7	High	ESC	local	In-progress/ ongoing	Department of Planning & Zoning staff provided this information to residents when the Comprehensive Plan was updated in 2010. On-going information has been provided to the Planning Commission regarding this topic in advance of the five-year review of the Comprehensive Plan.
3.1.8	Low	Public Works	Local	Not started	Delayed because of lack of staff
3.2.2	Low	ESC	n/a	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new asymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.

Table 117: Middlesex County - Locality Specific Plan of Action

Strategy	Priority	Responsible Party	Funding Source	Status	Comments
1.1.1	High	Zoning	FEMA/land owners	On-going	Managed by Staff on an on-going basis
1.1.2	Low	Building	Local	Not Started	Delayed because lack of staff; any concerns are forwarded to VDOT
1.1.6	Low	BOS/VDOT	VDOT	On-going	Managed by VDOT
1.1.8	High	Zoning	VDOT	On-going	Active program; Ordinance recently readopted
1.1.9	Low	Building/Zoning	Local	Not Started	Delayed because lack of staff
1.1.11	High	Zoning	Local	On-going	Managed by staff on an on-going basis
1.1.13	Moderate	ESC/Planning		On-going	Coordinate with USDA Staff when required
1.1.15	High	Building/Wetlands	Local	On-going	Managed by Staff on an on-going basis
1.2.1	Low	ESC/CAO	Local	Not Started	
2.2.1	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
2.2.2	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
3.1.2	Low	ESC	n/a	On-going	This occurs as needed
3.1.3	Moderate	ESC/power co	n/a	On-going	Managed by Staff on an as needed basis
3.1.4	High	ESC	n/a	On-going	Managed by staff during public education deliveries
3.1.5	Low	ESC	n/a	On-going	This occurs as requested
3.1.6	High	ESC	n/a	On-going	Managed by staff during public education deliveries
3.1.7	Low	ESC	Local	Not Started	Reactionary only
3.1.8	High	ESC	n/a	On-going	Managed by Staff during public education deliveries
3.2.2	Low	ESC	n/a	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	ESC	Local	In-progress	Adopted a floodplain overlay district as a component of the County's zoning ordinance.

Table 118: Town of Urbanna - Locality Specific Plan of Action

Strategy	Priority	Responsible Party	Funding Source	Status	Comments
1.1.1	High	Zoning	FEMA/land owners	On-going	Greatly increased freeboard requirements in new floodplain ordinance beyond minimum requirement.
1.1.2	High	Building	Local	On-going	
1.1.9	Moderate	Building/Zoning	VDOT	Not Started	
1.1.11	High	Zoning	Local	On-going	Enforcement of all floodplain/zoning/building regulations in flood zones is actively pursued on an on-going basis.
1.1.14	Moderate			Delayed	
1.1.15	High	Building/Wetlands	Local	On-going	Conducted jointly with Middlesex County
2.2.1	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
2.2.2	High	ESC	Local	On-going	Currently participate in mutual aid, no formal MOU's
3.1.2	Low	ESC	n/a	On-going	Educational materials periodically placed on web site to encourage maintenance.
3.1.3	Low	ESC/power co	n/a	On-going	Town encourages Dominion line maintenance at every opportunity.
3.1.6	Low	ESC	n/a	Delayed	Manpower constraints
3.1.7	Moderate	ESC	Local	In-progress	Materials are being developed for distribution
3.2.1	Moderate	Zoning/GIS	n/a	n/a	See Middlesex County
3.2.2	Low	ESC	n/a	In-progress	1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.
4.1.1	High	ESC	Local	In-progress	Adopted a Floodplain overlay district as a component of the County's zoning ordinance

Local Plan Coordination and Integration

During this update the AHMP Steering added strategy 1.1.19 that focuses on integrating mitigation strategies into locality plans, policies, codes and programs across disciplines and departments. While this is a new strategy, Middle Peninsula localities have already been working toward this goal:

Essex County has developed zoning, subdivision, and floodplain ordinances that effectively reduce hazard impacts. Additionally they have adopted flood insurance rate maps and they have acquired land for open space and public recreation uses that assist in reducing hazard impacts.

Gloucester County is currently developing a Continuity of Operations Plan and has developed zoning, subdivision, floodplain, and natural hazard specific ordinances that effectively reduce hazard impacts. Additionally they have adopted flood insurance rate maps and they have acquired land for open space and public recreation. The County has referenced the AHMP in the Comprehensive Plan, Floodplain Management Plan as well as the Open Space Management Plan. In conjunction with County plans, they have also adopted ordinances (zoning, subdivision, floodplain, and natural hazard) as well as flood insurance rate maps and have acquired land for open space and public recreates uses that assist in reducing hazard impacts.

King and Queen County has developed zoning, subdivision, floodplain, and natural hazard specific (ie. stormwater) ordinances that effectively reduce hazard impacts. Additionally they have adopted flood insurance rate maps and they have acquired land for open space and public recreation (ie. conservation easements and Department of Forestry public forests) uses that assist in reducing hazard impacts.

King William County has included references to hazard mitigation in a variety of plans including the County Comprehensive Plan and the Local emergency Operations Plan. Additionally King William County adopted ordinances (zoning, subdivision, floodplain, and natural hazard) as well as flood insurance rate maps that assist in reducing hazard impacts. For more information visit

Mathews County adopted their Comprehensive Plan 2030 in January 2011 that includes a chapter on hazard mitigation. Other plans that address hazards include the Capital Improvements Plan (Adopted in 2014), Local Emergency Operations Plan (Adopted December 20, 2011), and the Transportation Plan. Additionally Mathews County adopted ordinances (zoning, subdivision, floodplain, and natural hazard) as well as flood insurance rate maps and acquired land for open space through FEMA HMGP grant funding that assist in reducing hazard impacts.

Middlesex County has developed zoning, subdivision, and floodplain ordinances that effectively reduce hazard impacts. Additionally they have adopted flood insurance rate maps to assist in reducing hazard impacts.

In conjunction with integrating hazards and mitigation into local policies and plans, Middle Peninsula localities are interested in public involvement and several localities have specifically identified additional public participation steps above the required steps to explore over the next five years:

- King William County- The County has established an All-Hazards Emergency Planning Committee to insure that the public is involved.

- Gloucester County- The public will be involved with natural hazard planning through the Local Emergency Planning Committee (LEPC) and the Floodplain Management Committee (FMC). Both of these groups are open to the public and speak to hazard identification and mitigation strategies. Copies of The Plan will be made available at both County Public Libraries.

- Tappahannock County- Monthly Town Council meetings

- Mathews County- County will, from time to time, include pertinent information and opportunities for input on our website www.mathewscountyva.gov.

- King and Queen County- Copies of The Plan will be made available at the Public Library. Comments from the public will be encouraged with a submission procedure outlined. The plan will be discussed at open public Board of Supervisors meetings when up for review. References to the Plan will be on the County's future Emergency Services Web Page

While the localities make an effort to engage and educate the public on hazards and mitigation, Gloucester and Mathews County school districts have participated in the Climate Education for a Changing Bay (CECB) program hosted by the Chesapeake Bay National Estuarine Research Reserve in Virginia (CBNERR). This is an effort to strengthen the public's and K-12 students' environmental literacy to enable informed decision-making necessary for community resilience to extreme weather events and other environmental hazard. Participating students and teachers are equipped with the knowledge and materials needed to increase their climate literacy. Climate literate people understand the essential principles of Earth's climate system, including sea level rise, know how to assess scientifically credible information, communicate about climate, and make informed and responsible decisions to actions that may affect climate. Community members need to understand the climate system in order to apply that knowledge in their careers and in their engagement as active members of society, creating a resilient community. In the future, CBNERR will introduce this curriculum to King and Queen County, Middlesex County, and West Point as well as have students collect locally relevant data that will be shared with community members through the next Middle Peninsula All Hazards Mitigation Plan.

Section 10 - Plan Adoption

Each of the 9 localities participating in the MPAHMP update held a public informational session during one of their regularly scheduled local governing board/council meetings.

Subsequent to these informational sessions, the 9 governing bodies adopted the MPNHMP update by resolution on the dates noted below:

Locality	Date of Adoption
Essex County	Once FEMA approves the plan, the County will bring the plan to the BOS for adoption. Date will be updated.
Town of Tappahannock	Once FEMA approves the plan, the County will bring the plan to the Town Council for adoption. Date will be updated.
Gloucester County	Once FEMA approves the plan, the County will bring the plan to the BOS for adoption. Date will be updated.
King and Queen County	Once FEMA approves the plan, the County will bring the plan to the BOS for adoption.
King William County	Once FEMA approves the plan, the County will bring the plan to the BOS for adoption. Date will be updated.
Town of West Point	Once FEMA approves the plan, the County will bring the plan to the Town Council for adoption. Date will be updated.
Mathews	Once FEMA approves the plan, the County will bring the plan to the BOS for adoption. Date will be updated.
Middlesex County	Once FEMA approves the plan, the County will bring the plan to the BOS for adoption. Date will be updated.
Town of Urbanna	Once FEMA approves the plan, the County will bring the plan to the Town Council for adoption. Date will be updated.

Copies of meeting minutes from Board of Supervisors/ Town Council meetings relevant to the All Hazards Mitigation Plan will be included in Appendix O. Copies of resolutions adopting the MPAHMP Update from each of the localities will also be included in Appendix O.

Section 11 - Plan Maintenance

The monitoring, evaluating, and updating of this plan shall be done on an annual basis and shall be the responsibility of the locality's Emergency Services Coordinator/Emergency Manager (ESC/EM), with the assistance of the Chief Executive Officer - the County Administrator or Town Manager. In some of the Middle Peninsula localities, these two positions are held by the Chief Executive Officer.

The first annual evaluation of the MPAHMP update by localities will be completed on the 1-year anniversary date after FEMA's approval of the plan. For consistency purposes, the same evaluation spreadsheet tool will be used by all of the Middle Peninsula localities and the focus of the evaluation will be on what strategies/projects have been completed, obstacles that have been encountered and new-mini-strategies that are being proposed to overcome the identified obstacles. See Appendix P for a sample of the spreadsheet.

A Regional Planner at the MPPDC will be available to coordinate the annual evaluation process of the updated MPAHMP at the request of the 9 member jurisdictions. The Planner will work with Steering Committee Members, who actively participated in the development of the AHMP. As these committee members are the most knowledgeable from their locality regarding mitigation projects, they will be able to provide the most up-to-date information from their jurisdiction.

The Regional Planner will assist Middle Peninsula localities with the annual evaluation process in the following ways:

1. Distribute an evaluation spreadsheet tool to each ESC/EM approximately one month before the annual anniversary date of the plan. Each ESC/EM will receive the spreadsheet that lists their locality-specific mitigation strategies.
2. Collate and edit the completed evaluation spreadsheets returned to MPPDC after the Steering Committee Members have solicited input from residents in their community who have benefitted from flood mitigation projects as well as co-workers and outside agencies that have undertaken mitigation projects. More specifically, over the next 5-year cycle the MPAHMP will remain posted on the MPPDC website (www.mppdc.com) and will be available at the MPPDC office in Saluda to provide an opportunity for the public to continually review and provide feedback on the Plan.
3. Convene a meeting of the Steering Committee Members to go over their evaluations before submittal to FEMA/VDEM.
4. Develop goals and mini-strategies to be accomplished in the next year for their mitigation programs.
5. Provide FEMA/VDEM with a written evaluation report of progress/obstacles/opportunities in implementing the mitigation strategies in the plan.
6. Identify possible future revisions to the plan and notify FEMA/VDEM in writing of any proposed revisions.
7. Provide follow-up assistance as requested by Steering Committee Members with strategy implementation.

The 2021 MPAHMP Update

Due to the limited jurisdictional staff and funds it can be anticipated that the 9 Middle Peninsula localities will once again undertake the 2021 update as a regional planning project. It can also be anticipated that MPPDC participating localities will ask MPPDC staff to seek funding from FEMA for this joint project. With or without partial FEMA grant funding, the update will be undertaken and completed within the 5-year mandated federal requirement.

Section 12: Appendices

Appendix A – Signed Memorandum of Understandings……..…340

Appendix B - List of All Hazards Mitigation Plan Committee Members…….....367

Appendix C - Steering Committee Agendas and Meeting Minutes…….……..…371

Appendix D - Public Meeting Sign-in Sheet (January 6, 2016) ……405

Appendix E - Public Comment Announcement on the MPPDC website ……..407

Appendix F - Gazette Journal Press Releases……409

Appendix G - Public Comments Received During the Comment Periods…….....412

Appendix H - Tornado History in the Middle Peninsula Region (1950-2014)……427

Appendix I - Wildfires within the Middle Peninsula 2010 – June 2015 (VDOF, 2015)…..…429

Appendix J - Hazus Methodology……..……433

Appendix K - Nation Flood Insurance Program Survey……..……...453

Appendix L - Gloucester County Stormwater Management Ordinance……481

Appendix M - Drought Response Ordinances from all MPPDC Localities…..……..500

Appendix N - MOU amongst Rappahannock Fire Association Participants……..543

Appendix O - Adopting the 2016 Plan: Resolutions and Other Information…….549

Appendix P - Strategy Evaluation Spreadsheet Sample……550

Appendix A –
Signed Memorandum of Understandings

Memorandum of Understanding (MOU) between
The Middle Peninsula Planning District Commission (MPPDC) and
Essex County for the
Virginia Department of Emergency Management (VDEM)
"Middle Peninsula PDC All Hazards Mitigation Plan Update"
Grant Number HMGP-4042-006

This Memorandum of Understanding (MOU) outlines the terms of agreement between the Middle Peninsula Planning District Commission and Essex County concerning financial obligations of the local adoption of the 2016 Middle Peninsula PDC All Hazards Mitigation Plan Update, Grant Number HMGP-4042-006.

Background

Introduction

The Disaster Mitigation Act of 2000 (DMA 2K) is a key component of the Federal government's commitment to reduce damages to private and public property through mitigation activities. This legislation established the Pre-Disaster Mitigation (PDM) Program and created requirements for the Post-Disaster Hazard Mitigation Grant Program (HMGP). This key piece of federal legislation is known as Public Law 106-390.

DMA 2K requires local governments to develop and submit mitigation plans to qualify for PDM and HMGP funds. The Act requires that the plan demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."

As stated in 44 CFR Ch. 1 Section 201.6, Part a, a local government MUST have a mitigation plan approved in order to receive HMGP project grants and in order to apply for and receive mitigation project grants under all other mitigation grant programs.

The MPPDC is coordinating the effort to update the 2011 Middle Peninsula All Hazards Mitigation Plan.

Scope of Work

The Middle Peninsula Planning District Commission (MPPDC) will update the 2011 Middle Peninsula All-Hazards Mitigation Plan (AHMP) with the help of a Local Planning Team nominated by counties and towns in the Middle Peninsula. The plan will address several natural hazards, including hurricanes, winter storms, tornadoes, coastal flooding, coastal/shoreline erosion, sea level rise, winter storms, wildfire, riverine flooding, wind, dam failures, drought, lightning, earthquakes, shrink-swell soils, extreme cold, extreme heat, landslides, land subsidence/karst, tsunami, and volcanoes.

The project includes the following components:

1. Planning Process
2. Risk Assessment
3. Hazard Mitigation Strategy
4. Hazard Mitigation Plan Maintenance Process
5. Hazard Mitigation Plan Adoption and Approval

Local Adoption

To be eligible for HMGP project grants (grants for a locality after a disaster), a local government must have a mitigation plan approved. Approval includes adoption by the participating jurisdiction. Please see note below.

Timeframe of Grant

September 30, 2013 to September 30, 2016, unless otherwise altered through provisions of the Grant Agreement or extended by written authorization of VDEM.

Budget Detail

Resources

The MPPDC is managing the planning process on a reimbursable basis from VDEM.
The FEMA grant award is $93,750.00 and the total regional local share is $31,250.00.
Currently the LOCAL share is $4,464.29 per county and $1,488.10 per town.
There may be future state funds available to offset some of the local share required. If so, MPPDC will adjust billing or reimburse the locality to reflect local share requirements.

3 Year Federal Grant Award	Total Grant Share/Match Required		County Match/Share over life of grant ($4,464.29 x 6 counties = $26,785.74)	Town Match/Share over life of grant ($1,488.10 x 3 towns = $4,464.30)	Total County and Town Match/Share $26,785.29 + $4,464.30 = $31,250.04
$93,750.00	$31,250.00		$4,464.29 per county	$1,488.10 per town	
			3 Year Grant: Billed to each county annually	3 Year Grant: Billed to each town annually	
			Estimated billing at $1,488.10 per county annually	Estimated billing at $496.03 per town annually	

Note

VDEM states: "if the communities do not adopt (the 2016 AHMP) it could affect parts of their Public Assistance and Hazard Mitigation funds." Further, if a locality does not adopt the plan, there is the potential for VDEM and/or FEMA to deny reimbursement to the MPPDC for a portion of the cost of performing this planning process. If this occurs, the participating locality may be responsible for its share of the unreimbursed costs incurred by the MPPDC up to $13,400.00 per county or $4,450.00 per town as determined by VDEM.

Agreement

Upon completion of the planning process and approval of the 2016 All Hazards Mitigation Plan (AHMP) by VDEM, Essex County should make every attempt to adopt the 2016 AHMP. Since the MPPDC will manage the project in good faith and is required bear the costs of the planning process on a reimbursable basis, if Essex County fails to adopt the plan, any resulting loss of reimbursement to the MPPDC shall be borne by Essex County, not to exceed the Essex County's portion of federal/state/local funding.

Upon execution of this MOU by Essex County, a signed copy shall be returned to the MPPDC.

Accepted by:

Essex County

By: A. Reese Peck 12/5/2013
Date

Print Name/Title A. Reese Peck, County Administrator

Middle Peninsula Planning District Commission

By: _____ 10/24/2013
Lewis Lawrence, Acting Executive Director Date

Memorandum of Understanding (MOU) between
The Middle Peninsula Planning District Commission (MPPDC) and
Gloucester County for the
Virginia Department of Emergency Management (VDEM)
"Middle Peninsula PDC All Hazards Mitigation Plan Update"
Grant Number HMGP-4042-006

This Memorandum of Understanding (MOU) outlines the terms of agreement between the Middle Peninsula Planning District Commission and Gloucester County concerning financial obligations of the local adoption of the 2016 Middle Peninsula PDC All Hazards Mitigation Plan Update, Grant Number HMGP-4042-006.

Background

Introduction

The Disaster Mitigation Act of 2000 (DMA 2K) is a key component of the Federal government's commitment to reduce damages to private and public property through mitigation activities. This legislation established the Pre-Disaster Mitigation (PDM) Program and created requirements for the Post-Disaster Hazard Mitigation Grant Program (HMGP). This key piece of federal legislation is known as Public Law 106-390.

DMA 2K requires local governments to develop and submit mitigation plans to qualify for PDM and HMGP funds. The Act requires that the plan demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."

As stated in 44 CFR Ch. 1 Section 201.6, Part a, a local government MUST have a mitigation plan approved in order to receive HMGP project grants and in order to apply for and receive mitigation project grants under all other mitigation grant programs.

The MPPDC is coordinating the effort to update the 2011 Middle Peninsula All Hazards Mitigation Plan.

Scope of Work

The Middle Peninsula Planning District Commission (MPPDC) will update the 2011 Middle Peninsula All-Hazards Mitigation Plan (AHMP) with the help of a Local Planning Team nominated by counties and towns in the Middle Peninsula. The plan will address several natural hazards, including hurricanes, winter storms, tornadoes, coastal flooding, coastal/shoreline erosion, sea level rise, winter storms, wildfire, riverine flooding, wind, dam failures, drought, lightning, earthquakes, shrink-swell soils, extreme cold, extreme heat, landslides, land subsidence/karst, tsunami, and volcanoes.

The project includes the following components:

1. Planning Process
2. Risk Assessment
3. Hazard Mitigation Strategy
4. Hazard Mitigation Plan Maintenance Process
5. Hazard Mitigation Plan Adoption and Approval

Upon execution of this MOU by Gloucester County, a signed copy shall be returned to the MPPDC.

Accepted by:

Gloucester County _____

By: Brenda G Garton Dec 2, 2013
Date

Print Name/Title BRENDA G. GARTON, COUNTY ADMINISTRATOR

Middle Peninsula Planning District Commission

By: _____ 10/24/2013
Lewis Lawrence, Acting Executive Director Date

Memorandum of Understanding (MOU) between
The Middle Peninsula Planning District Commission (MPPDC) and
King and Queen County for the
Virginia Department of Emergency Management (VDEM)
"Middle Peninsula PDC All Hazards Mitigation Plan Update"
Grant Number HMGP-4042-006

This Memorandum of Understanding (MOU) outlines the terms of agreement between the Middle Peninsula Planning District Commission and King and Queen County concerning financial obligations of the local adoption of the 2016 Middle Peninsula PDC All Hazards Mitigation Plan Update, Grant Number HMGP-4042-006.

Background

Introduction

The Disaster Mitigation Act of 2000 (DMA 2K) is a key component of the Federal government's commitment to reduce damages to private and public property through mitigation activities. This legislation established the Pre-Disaster Mitigation (PDM) Program and created requirements for the Post-Disaster Hazard Mitigation Grant Program (HMGP). This key piece of federal legislation is known as Public Law 106-390.

DMA 2K requires local governments to develop and submit mitigation plans to qualify for PDM and HMGP funds. The Act requires that the plan demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."

As stated in 44 CFR Ch. 1 Section 201.6, Part a, a local government MUST have a mitigation plan approved in order to receive HMGP project grants and in order to apply for and receive mitigation project grants under all other mitigation grant programs.

The MPPDC is coordinating the effort to update the 2011 Middle Peninsula All Hazards Mitigation Plan.

Scope of Work

The Middle Peninsula Planning District Commission (MPPDC) will update the 2011 Middle Peninsula All-Hazards Mitigation Plan (AHMP) with the help of a Local Planning Team nominated by counties and towns in the Middle Peninsula. The plan will address several natural hazards, including hurricanes, winter storms, tornadoes, coastal flooding, coastal/shoreline erosion, sea level rise, winter storms, wildfire, riverine flooding, wind, dam failures, drought, lightning, earthquakes, shrink-swell soils, extreme cold, extreme heat, landslides, land subsidence/karst, tsunami, and volcanoes.

The project includes the following components:

1. Planning Process
2. Risk Assessment
3. Hazard Mitigation Strategy
4. Hazard Mitigation Plan Maintenance Process
5. Hazard Mitigation Plan Adoption and Approval

Local Adoption

To be eligible for HMGP project grants (grants for a locality after a disaster), a local government must have a mitigation plan approved. Approval includes adoption by the participating jurisdiction. Please see note below.

Timeframe of Grant

September 30, 2013 to September 30, 2016, unless otherwise altered through provisions of the Grant Agreement or extended by written authorization of VDEM.

Budget Detail

Resources

The MPPDC is managing the planning process on a reimbursable basis from VDEM.
The FEMA grant award is $93,750.00 and the total regional local share is $31,250.00.
Currently the LOCAL share is $4,464.29 per county and $1,488.10 per town.
There may be future state funds available to offset some of the local share required. If so, MPPDC will adjust billing or reimburse the locality to reflect local share requirements.

3 Year Federal Grant Award	Total Grant Share/Match Required		County Match/Share over life of grant ($4,464.29 x 6 counties = $26,785.74)	Town Match/Share over life of grant ($1,488.10 x 3 towns = $4,464.30)	Total County and Town Match/Share $26,785.29 + $4,464.30 = $31,250.04
$93,750.00	$31,250.00		$4,464.29 per county	$1,488.10 per town	
			3 Year Grant: Billed to each county annually	3 Year Grant: Billed to each town annually	
			Estimated billing at $1,488.10 per county annually	Estimated billing at $496.03 per town annually	

Note

VDEM states: "if the communities do not adopt (the 2016 AHMP) it could affect parts of their Public Assistance and Hazard Mitigation funds." Further, if a locality does not adopt the plan, there is the potential for VDEM and/or FEMA to deny reimbursement to the MPPDC for a portion of the cost of performing this planning process. If this occurs, the participating locality may be responsible for its share of the unreimbursed costs incurred by the MPPDC up to $13,400.00 per county or $4,450.00 per town as determined by VDEM.

Agreement

Upon completion of the planning process and approval of the 2016 All Hazards Mitigation Plan (AHMP) by VDEM, King and Queen County should make every attempt to adopt the 2016 AHMP. Since the MPPDC will manage the project in good faith and is required bear the costs of the planning process on a reimbursable basis, if King and Queen County fails to adopt the plan, any resulting loss of reimbursement to the MPPDC shall be borne by King and Queen County, not to exceed the King and Queen County's portion of federal/state/local funding.

Upon execution of this MOU by King and Queen County, a signed copy shall be returned to the MPPDC.

Accepted by:

King and Queen County _____

By: Doris N. Morris 1-10-14
Date

Print Name/Title Doris N. Morris, Chairman

Middle Peninsula Planning District Commission

By: _____ 10/24/2013
Lewis Lawrence, Acting Executive Director Date

Memorandum of Understanding (MOU) between
The Middle Peninsula Planning District Commission (MPPDC) and
King William County for the
Virginia Department of Emergency Management (VDEM)
"Middle Peninsula PDC All Hazards Mitigation Plan Update"
Grant Number HMGP-4042-006

This Memorandum of Understanding (MOU) outlines the terms of agreement between the Middle Peninsula Planning District Commission and King William County concerning financial obligations of the local adoption of the 2016 Middle Peninsula PDC All Hazards Mitigation Plan Update, Grant Number HMGP-4042-006.

Background

Introduction

The Disaster Mitigation Act of 2000 (DMA 2K) is a key component of the Federal government's commitment to reduce damages to private and public property through mitigation activities. This legislation established the Pre-Disaster Mitigation (PDM) Program and created requirements for the Post-Disaster Hazard Mitigation Grant Program (HMGP). This key piece of federal legislation is known as Public Law 106-390.

DMA 2K requires local governments to develop and submit mitigation plans to qualify for PDM and HMGP funds. The Act requires that the plan demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."

As stated in 44 CFR Ch. 1 Section 201.6, Part a, a local government MUST have a mitigation plan approved in order to receive HMGP project grants and in order to apply for and receive mitigation project grants under all other mitigation grant programs.

The MPPDC is coordinating the effort to update the 2011 Middle Peninsula All Hazards Mitigation Plan.

Scope of Work

The Middle Peninsula Planning District Commission (MPPDC) will update the 2011 Middle Peninsula All-Hazards Mitigation Plan (AHMP) with the help of a Local Planning Team nominated by counties and towns in the Middle Peninsula. The plan will address several natural hazards, including hurricanes, winter storms, tornadoes, coastal flooding, coastal/shoreline erosion, sea level rise, winter storms, wildfire, riverine flooding, wind, dam failures, drought, lightning, earthquakes, shrink-swell soils, extreme cold, extreme heat, landslides, land subsidence/karst, tsunami, and volcanoes.

The project includes the following components:

1. Planning Process
2. Risk Assessment
3. Hazard Mitigation Strategy
4. Hazard Mitigation Plan Maintenance Process
5. Hazard Mitigation Plan Adoption and Approval

Local Adoption

To be eligible for HMGP project grants (grants for a locality after a disaster), a local government must have a mitigation plan approved. Approval includes adoption by the participating jurisdiction. Please see note below.

Timeframe of Grant

September 30, 2013 to September 30, 2016, unless otherwise altered through provisions of the Grant Agreement or extended by written authorization of VDEM.

Budget Detail

Resources

The MPPDC is managing the planning process on a reimbursable basis from VDEM.
The FEMA grant award is $93,750.00 and the total regional local share is $31,250.00.
Currently the LOCAL share is $4,464.29 per county and $1,488.10 per town.
There may be future state funds available to offset some of the local share required. If so, MPPDC will adjust billing or reimburse the locality to reflect local share requirements.

3 Year Federal Grant Award	Total Grant Share/Match Required		County Match/Share over life of grant ($4,464.29 x 6 counties = $26,785.74)	Town Match/Share over life of grant ($1,488.10 x 3 towns = $4,464.30)	Total County and Town Match/Share $26,785.29 + $4,464.30 = $31,250.04
$93,750.00	$31,250.00		$4,464.29 per county	$1,488.10 per town	
			3 Year Grant: Billed to each county annually	3 Year Grant: Billed to each town annually	
			Estimated billing at $1,488.10 per county annually	Estimated billing at $496.03 per town annually	

Note

VDEM states: "if the communities do not adopt (the 2016 AHMP) it could affect parts of their Public Assistance and Hazard Mitigation funds." Further, if a locality does not adopt the plan, there is the potential for VDEM and/or FEMA to deny reimbursement to the MPPDC for a portion of the cost of performing this planning process. If this occurs, the participating locality may be responsible for its share of the unreimbursed costs incurred by the MPPDC up to $13,400.00 per county or $4,450.00 per town as determined by VDEM.

Agreement

Upon completion of the planning process and approval of the 2016 All Hazards Mitigation Plan (AHMP) by VDEM, King William County should make every attempt to adopt the 2016 AHMP. Since the MPPDC will manage the project in good faith and is required bear the costs of the planning process on a reimbursable basis, if King William County fails to adopt the plan, any resulting loss of reimbursement to the MPPDC shall be borne by King William County, not to exceed the King William County's portion of federal/state/local funding.

Upon execution of this MOU by King William County, a signed copy shall be returned to the MPPDC.

Accepted by:

King William County

By: _____ 01/08/14
Date

Print Name/Title TRENTON L. FUNKHOUSER COUNTY ADMINISTRATOR

Middle Peninsula Planning District Commission

By: _____ 10/24/2013
Lewis Lawrence, Acting Executive Director Date

Memorandum of Understanding (MOU) between
The Middle Peninsula Planning District Commission (MPPDC) and
Mathews County for the
Virginia Department of Emergency Management (VDEM)
"Middle Peninsula PDC All Hazards Mitigation Plan Update"
Grant Number HMGP-4042-006

This Memorandum of Understanding (MOU) outlines the terms of agreement between the Middle Peninsula Planning District Commission and Mathews County concerning financial obligations of the local adoption of the 2016 Middle Peninsula PDC All Hazards Mitigation Plan Update, Grant Number HMGP-4042-006.

Background

Introduction

The Disaster Mitigation Act of 2000 (DMA 2K) is a key component of the Federal government's commitment to reduce damages to private and public property through mitigation activities. This legislation established the Pre-Disaster Mitigation (PDM) Program and created requirements for the Post-Disaster Hazard Mitigation Grant Program (HMGP). This key piece of federal legislation is known as Public Law 106-390.

DMA 2K requires local governments to develop and submit mitigation plans to qualify for PDM and HMGP funds. The Act requires that the plan demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."

As stated in 44 CFR Ch. 1 Section 201.6, Part a, a local government MUST have a mitigation plan approved in order to receive HMGP project grants and in order to apply for and receive mitigation project grants under all other mitigation grant programs.

The MPPDC is coordinating the effort to update the 2011 Middle Peninsula All Hazards Mitigation Plan.

Scope of Work

The Middle Peninsula Planning District Commission (MPPDC) will update the 2011 Middle Peninsula All-Hazards Mitigation Plan (AHMP) with the help of a Local Planning Team nominated by counties and towns in the Middle Peninsula. The plan will address several natural hazards, including hurricanes, winter storms, tornadoes, coastal flooding, coastal/shoreline erosion, sea level rise, winter storms, wildfire, riverine flooding, wind, dam failures, drought, lightning, earthquakes, shrink-swell soils, extreme cold, extreme heat, landslides, land subsidence/karst, tsunami, and volcanoes.

The project includes the following components:

1. Planning Process
2. Risk Assessment
3. Hazard Mitigation Strategy
4. Hazard Mitigation Plan Maintenance Process
5. Hazard Mitigation Plan Adoption and Approval

Local Adoption

To be eligible for HMGP project grants (grants for a locality after a disaster), a local government must have a mitigation plan approved. Approval includes adoption by the participating jurisdiction. Please see note below.

Timeframe of Grant

September 30, 2013 to September 30, 2016, unless otherwise altered through provisions of the Grant Agreement or extended by written authorization of VDEM.

Budget Detail

Resources

The MPPDC is managing the planning process on a reimbursable basis from VDEM.
The FEMA grant award is $93,750.00 and the total regional local share is $31,250.00.
Currently the LOCAL share is $4,464.29 per county and $1,488.10 per town.
There may be future state funds available to offset some of the local share required. If so, MPPDC will adjust billing or reimburse the locality to reflect local share requirements.

3 Year Federal Grant Award	Total Grant Share/Match Required		County Match/Share over life of grant ($4,464.29 x 6 counties = $26,785.74)	Town Match/Share over life of grant ($1,488.10 x 3 towns = $4,464.30)	Total County and Town Match/Share $26,785.29 + $4,464.30 = $31,250.04
$93,750.00	$31,250.00		$4,464.29 per county	$1,488.10 per town	
			3 Year Grant: Billed to each county annually	3 Year Grant: Billed to each town annually	
			Estimated billing at $1,488.10 per county annually	Estimated billing at $496.03 per town annually	

Note

VDEM states: "if the communities do not adopt (the 2016 AHMP) it could affect parts of their Public Assistance and Hazard Mitigation funds." Further, if a locality does not adopt the plan, there is the potential for VDEM and/or FEMA to deny reimbursement to the MPPDC for a portion of the cost of performing this planning process. If this occurs, the participating locality may be responsible for its share of the unreimbursed costs incurred by the MPPDC up to $13,400.00 per county or $4,450.00 per town as determined by VDEM.

Agreement

Upon completion of the planning process and approval of the 2016 All Hazards Mitigation Plan (AHMP) by VDEM, Mathews County should make every attempt to adopt the 2016 AHMP. Since the MPPDC will manage the project in good faith and is required bear the costs of the planning process on a reimbursable basis, if Mathews County fails to adopt the plan, any resulting loss of reimbursement to the MPPDC shall be borne by Mathews County, not to exceed the Mathews County's portion of federal/state/local funding.

Upon execution of this MOU by Mathews County, a signed copy shall be returned to the MPPDC.

Accepted by:

Mathews County _____

By: _____ 12/13/13
Date

Print Name/Title Melinda Moran

Middle Peninsula Planning District Commission

By: _____ 10/24/2013
Lewis Lawrence, Acting Executive Director Date

Mark Nugent > LPT members
Wally Horton

Memorandum of Understanding (MOU) between
The Middle Peninsula Planning District Commission (MPPDC) and
Middlesex County for the
Virginia Department of Emergency Management (VDEM)
"Middle Peninsula PDC All Hazards Mitigation Plan Update"
Grant Number HMGP-4042-006

This Memorandum of Understanding (MOU) outlines the terms of agreement between the Middle Peninsula Planning District Commission and Middlesex County concerning financial obligations of the local adoption of the 2016 Middle Peninsula PDC All Hazards Mitigation Plan Update, Grant Number HMGP-4042-006.

Background

Introduction

The Disaster Mitigation Act of 2000 (DMA 2K) is a key component of the Federal government's commitment to reduce damages to private and public property through mitigation activities. This legislation established the Pre-Disaster Mitigation (PDM) Program and created requirements for the Post-Disaster Hazard Mitigation Grant Program (HMGP). This key piece of federal legislation is known as Public Law 106-390.

DMA 2K requires local governments to develop and submit mitigation plans to qualify for PDM and HMGP funds. The Act requires that the plan demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."

As stated in 44 CFR Ch. 1 Section 201.6, Part a, a local government MUST have a mitigation plan approved in order to receive HMGP project grants and in order to apply for and receive mitigation project grants under all other mitigation grant programs.

The MPPDC is coordinating the effort to update the 2011 Middle Peninsula All Hazards Mitigation Plan.

Scope of Work

The Middle Peninsula Planning District Commission (MPPDC) will update the 2011 Middle Peninsula All-Hazards Mitigation Plan (AHMP) with the help of a Local Planning Team nominated by counties and towns in the Middle Peninsula. The plan will address several natural hazards, including hurricanes, winter storms, tornadoes, coastal flooding, coastal/shoreline erosion, sea level rise, winter storms, wildfire, riverine flooding, wind, dam failures, drought, lightning, earthquakes, shrink-swell soils, extreme cold, extreme heat, landslides, land subsidence/karst, tsunami, and volcanoes.

The project includes the following components:

1. Planning Process
2. Risk Assessment
3. Hazard Mitigation Strategy
4. Hazard Mitigation Plan Maintenance Process
5. Hazard Mitigation Plan Adoption and Approval

Local Adoption

To be eligible for HMGP project grants (grants for a locality after a disaster), a local government must have a mitigation plan approved. Approval includes adoption by the participating jurisdiction. Please see note below.

Timeframe of Grant

September 30, 2013 to September 30, 2016, unless otherwise altered through provisions of the Grant Agreement or extended by written authorization of VDEM.

Budget Detail

Resources

The MPPDC is managing the planning process on a reimbursable basis from VDEM.
The FEMA grant award is $93,750.00 and the total regional local share is $31,250.00.
Currently the LOCAL share is $4,464.29 per county and $1,488.10 per town.
There may be future state funds available to offset some of the local share required. If so, MPPDC will adjust billing or reimburse the locality to reflect local share requirements.

3 Year Federal Grant Award	Total Grant Share/Match Required		County Match/Share over life of grant ($4,464.29 x 6 counties = $26,785.74)	Town Match/Share over life of grant ($1,488.10 x 3 towns = $4,464.30)	Total County and Town Match/Share $26,785.29 + $4,464.30 = $31,250.04
$93,750.00	$31,250.00		$4,464.29 per county	$1,488.10 per town	
			3 Year Grant: Billed to each county annually	3 Year Grant: Billed to each town annually	
			Estimated billing at $1,488.10 per county annually	Estimated billing at $496.03 per town annually	

Note

VDEM states: "if the communities do not adopt (the 2016 AHMP) it could affect parts of their Public Assistance and Hazard Mitigation funds." Further, if a locality does not adopt the plan, there is the potential for VDEM and/or FEMA to deny reimbursement to the MPPDC for a portion of the cost of performing this planning process. If this occurs, the participating locality may be responsible for its share of the unreimbursed costs incurred by the MPPDC up to $13,400.00 per county or $4,450.00 per town as determined by VDEM.

Agreement

Upon completion of the planning process and approval of the 2016 All Hazards Mitigation Plan (AHMP) by VDEM, Middlesex County should make every attempt to adopt the 2016 AHMP. Since the MPPDC will manage the project in good faith and is required bear the costs of the planning process on a reimbursable basis, if Middlesex County fails to adopt the plan, any resulting loss of reimbursement to the MPPDC shall be borne by Middlesex County, not to exceed the Middlesex County's portion of federal/state/local funding.

Upon execution of this MOU by Middlesex County, a signed copy shall be returned to the MPPDC.

Accepted by:

Middlesex County _____

By: _____ 12-13-13
Date

Print Name/Title Matt Walker County Administrator

Middle Peninsula Planning District Commission

By: _____ 10/24/2013
Lewis Lawrence, Acting Executive Director Date

TAPPAHANNOCK

Memorandum of Understanding (MOU) between
The Middle Peninsula Planning District Commission (MPPDC) and
The Town of Tappahannock for the
Virginia Department of Emergency Management (VDEM)
"Middle Peninsula PDC All Hazards Mitigation Plan Update"
Grant Number HMGP-4042-006

This Memorandum of Understanding (MOU) outlines the terms of agreement between the Middle Peninsula Planning District Commission and The Town of Tappahannock concerning financial obligations of the local adoption of the 2016 Middle Peninsula PDC All Hazards Mitigation Plan Update, Grant Number HMGP-4042-006.

Background

Introduction

The Disaster Mitigation Act of 2000 (DMA 2K) is a key component of the Federal government's commitment to reduce damages to private and public property through mitigation activities. This legislation established the Pre-Disaster Mitigation (PDM) Program and created requirements for the Post-Disaster Hazard Mitigation Grant Program (HMGP). This key piece of federal legislation is known as Public Law 106-390.

DMA 2K requires local governments to develop and submit mitigation plans to qualify for PDM and HMGP funds. The Act requires that the plan demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."

As stated in 44 CFR Ch. 1 Section 201.6, Part a, a local government MUST have a mitigation plan approved in order to receive HMGP project grants and in order to apply for and receive mitigation project grants under all other mitigation grant programs.

The MPPDC is coordinating the effort to update the 2011 Middle Peninsula All Hazards Mitigation Plan.

Scope of Work

The Middle Peninsula Planning District Commission (MPPDC) will update the 2011 Middle Peninsula All-Hazards Mitigation Plan (AHMP) with the help of a Local Planning Team nominated by counties and towns in the Middle Peninsula. The plan will address several natural hazards, including hurricanes, winter storms, tornadoes, coastal flooding, coastal/shoreline erosion, sea level rise, winter storms, wildfire, riverine flooding, wind, dam failures, drought, lightning, earthquakes, shrink-swell soils, extreme cold, extreme heat, landslides, land subsidence/karst, tsunami, and volcanoes.

The project includes the following components:

1. Planning Process
2. Risk Assessment
3. Hazard Mitigation Strategy
4. Hazard Mitigation Plan Maintenance Process
5. Hazard Mitigation Plan Adoption and Approval

Local Adoption

To be eligible for HMGP project grants (grants for a locality after a disaster), a local government must have a mitigation plan approved. Approval includes adoption by the participating jurisdiction. Please see note below.

Timeframe of Grant

September 30, 2013 to September 30, 2016, unless otherwise altered through provisions of the Grant Agreement or extended by written authorization of VDEM.

Budget Detail

Resources

The MPPDC is managing the planning process on a reimbursable basis from VDEM.
The FEMA grant award is $93,750.00 and the total regional local share is $31,250.00.
Currently the LOCAL share is $4,464.29 per county and $1,488.10 per town.
There may be future state funds available to offset some of the local share required. If so, MPPDC will adjust billing or reimburse the locality to reflect local share requirements.

3 Year Federal Grant Award	Total Grant Share/Match Required		County Match/Share over life of grant ($4,464.29 x 6 counties = $26,785.74)	Town Match/Share over life of grant ($1,488.10 x 3 towns = $4,464.30)	Total County and Town Match/Share $26,785.29 + $4,464.30 = $31,250.04
$93,750.00	$31,250.00		$4,464.29 per county	$1,488.10 per town	
			3 Year Grant: Billed to each county annually	3 Year Grant: Billed to each town annually	
			Estimated billing at $1,488.10 per county annually	Estimated billing at $496.03 per town annually	

Note

VDEM states: "if the communities do not adopt (the 2016 AHMP) it could affect parts of their Public Assistance and Hazard Mitigation funds." Further, if a locality does not adopt the plan, there is the potential for VDEM and/or FEMA to deny reimbursement to the MPPDC for a portion of the cost of performing this planning process. If this occurs, the participating locality may be responsible for its share of the unreimbursed costs incurred by the MPPDC up to $13,400.00 per county or $4,450.00 per town as determined by VDEM.

Agreement

Upon completion of the planning process and approval of the 2016 All Hazards Mitigation Plan (AHMP) by VDEM, The Town of Tappahannock should make every attempt to adopt the 2016 AHMP. Since the MPPDC will manage the project in good faith and is required bear the costs of the planning process on a reimbursable basis, if The Town of Tappahannock fails to adopt the plan, any resulting loss of reimbursement to the MPPDC shall be borne by The Town of Tappahannock, not to exceed The Town of Tappahannock's portion of federal/state/local funding.

Upon execution of this MOU by The Town of Tappahannock, a signed copy shall be returned to the MPPDC.

Accepted by:

Town of Tappahannock _____

By: _____ 11-25-13
Date

Print Name/Title G.G. REUFELT JR. - TOWN MANAGER

Middle Peninsula Planning District Commission

By: _____ 10/24/2013
Lewis Lawrence, Acting Executive Director Date

Memorandum of Understanding (MOU) between
The Middle Peninsula Planning District Commission (MPPDC) and
The Town of Urbanna for the
Virginia Department of Emergency Management (VDEM)
"Middle Peninsula PDC All Hazards Mitigation Plan Update"
Grant Number HMGP-4042-006

This Memorandum of Understanding (MOU) outlines the terms of agreement between the Middle Peninsula Planning District Commission and The Town of Urbanna concerning financial obligations of the local adoption of the 2016 Middle Peninsula PDC All Hazards Mitigation Plan Update, Grant Number HMGP-4042-006.

Background

Introduction

The Disaster Mitigation Act of 2000 (DMA 2K) is a key component of the Federal government's commitment to reduce damages to private and public property through mitigation activities. This legislation established the Pre-Disaster Mitigation (PDM) Program and created requirements for the Post-Disaster Hazard Mitigation Grant Program (HMGP). This key piece of federal legislation is known as Public Law 106-390.

DMA 2K requires local governments to develop and submit mitigation plans to qualify for PDM and HMGP funds. The Act requires that the plan demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."

As stated in 44 CFR Ch. 1 Section 201.6, Part a, a local government MUST have a mitigation plan approved in order to receive HMGP project grants and in order to apply for and receive mitigation project grants under all other mitigation grant programs.

The MPPDC is coordinating the effort to update the 2011 Middle Peninsula All Hazards Mitigation Plan.

Scope of Work

The Middle Peninsula Planning District Commission (MPPDC) will update the 2011 Middle Peninsula All-Hazards Mitigation Plan (AHMP) with the help of a Local Planning Team nominated by counties and towns in the Middle Peninsula. The plan will address several natural hazards, including hurricanes, winter storms, tornadoes, coastal flooding, coastal/shoreline erosion, sea level rise, winter storms, wildfire, riverine flooding, wind, dam failures, drought, lightning, earthquakes, shrink-swell soils, extreme cold, extreme heat, landslides, land subsidence/karst, tsunami, and volcanoes.

The project includes the following components:

1. Planning Process
2. Risk Assessment
3. Hazard Mitigation Strategy
4. Hazard Mitigation Plan Maintenance Process
5. Hazard Mitigation Plan Adoption and Approval

Local Adoption

To be eligible for HMGP project grants (grants for a locality after a disaster), a local government must have a mitigation plan approved. Approval includes adoption by the participating jurisdiction. Please see note below.

Timeframe of Grant

September 30, 2013 to September 30, 2016, unless otherwise altered through provisions of the Grant Agreement or extended by written authorization of VDEM.

Budget Detail

Resources

The MPPDC is managing the planning process on a reimbursable basis from VDEM.
The FEMA grant award is $93,750.00 and the total regional local share is $31,250.00.
Currently the LOCAL share is $4,464.29 per county and $1,488.10 per town.
There may be future state funds available to offset some of the local share required. If so, MPPDC will adjust billing or reimburse the locality to reflect local share requirements.

3 Year Federal Grant Award	Total Grant Share/Match Required		County Match/Share over life of grant ($4,464.29 x 6 counties = $26,785.74)	Town Match/Share over life of grant ($1,488.10 x 3 towns = $4,464.30)	Total County and Town Match/Share $26,785.29 + $4,464.30 = $31,250.04
$93,750.00	$31,250.00		$4,464.29 per county	$1,488.10 per town	
			3 Year Grant: Billed to each county annually	3 Year Grant: Billed to each town annually	
			Estimated billing at $1,488.10 per county annually	Estimated billing at $496.03 per town annually	

Note

VDEM states: "if the communities do not adopt (the 2016 AHMP) it could affect parts of their Public Assistance and Hazard Mitigation funds." Further, if a locality does not adopt the plan, there is the potential for VDEM and/or FEMA to deny reimbursement to the MPPDC for a portion of the cost of performing this planning process. If this occurs, the participating locality may be responsible for its share of the unreimbursed costs incurred by the MPPDC up to $13,400.00 per county or $4,450.00 per town as determined by VDEM.

Agreement

Upon completion of the planning process and approval of the 2016 All Hazards Mitigation Plan (AHMP) by VDEM, The Town of Urbanna should make every attempt to adopt the 2016 AHMP. Since the MPPDC will manage the project in good faith and is required bear the costs of the planning process on a reimbursable basis, if The Town of Urbanna fails to adopt the plan, any resulting loss of reimbursement to the MPPDC shall be borne by The Town of Urbanna, not to exceed The Town of Urbanna's portion of federal/state/local funding.

Upon execution of this MOU by The Town of Urbanna, a signed copy shall be returned to the MPPDC.

Accepted by:

Town of Urbanna _____

By: Holly Y Gailey _____ 1/14/2014
Date

Print Name/Title Holly Y. Gailey

Middle Peninsula Planning District Commission

By: _____ 10/24/2013
Lewis Lawrence, Acting Executive Director Date

Memorandum of Understanding (MOU) between
The Middle Peninsula Planning District Commission (MPPDC) and
The Town of West Point for the
Virginia Department of Emergency Management (VDEM)
"Middle Peninsula PDC All Hazards Mitigation Plan Update"
Grant Number HMGP-4042-006

This Memorandum of Understanding (MOU) outlines the terms of agreement between the Middle Peninsula Planning District Commission and The Town of West Point concerning financial obligations of the local adoption of the 2016 Middle Peninsula PDC All Hazards Mitigation Plan Update, Grant Number HMGP-4042-006.

Background

Introduction

The Disaster Mitigation Act of 2000 (DMA 2K) is a key component of the Federal government's commitment to reduce damages to private and public property through mitigation activities. This legislation established the Pre-Disaster Mitigation (PDM) Program and created requirements for the Post-Disaster Hazard Mitigation Grant Program (HMGP). This key piece of federal legislation is known as Public Law 106-390.

DMA 2K requires local governments to develop and submit mitigation plans to qualify for PDM and HMGP funds. The Act requires that the plan demonstrate "a jurisdiction's commitment to reduce risk from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards."

As stated in 44 CFR Ch. 1 Section 201.6, Part a, a local government MUST have a mitigation plan approved in order to receive HMGP project grants and in order to apply for and receive mitigation project grants under all other mitigation grant programs.

The MPPDC is coordinating the effort to update the 2011 Middle Peninsula All Hazards Mitigation Plan.

Scope of Work

The Middle Peninsula Planning District Commission (MPPDC) will update the 2011 Middle Peninsula All-Hazards Mitigation Plan (AHMP) with the help of a Local Planning Team nominated by counties and towns in the Middle Peninsula. The plan will address several natural hazards, including hurricanes, winter storms, tornadoes, coastal flooding, coastal/shoreline erosion, sea level rise, winter storms, wildfire, riverine flooding, wind, dam failures, drought, lightning, earthquakes, shrink-swell soils, extreme cold, extreme heat, landslides, land subsidence/karst, tsunami, and volcanoes.

The project includes the following components:

1. Planning Process
2. Risk Assessment
3. Hazard Mitigation Strategy
4. Hazard Mitigation Plan Maintenance Process
5. Hazard Mitigation Plan Adoption and Approval

Local Adoption

To be eligible for HMGP project grants (grants for a locality after a disaster), a local government must have a mitigation plan approved. Approval includes adoption by the participating jurisdiction. Please see note below.

Timeframe of Grant

September 30, 2013 to September 30, 2016, unless otherwise altered through provisions of the Grant Agreement or extended by written authorization of VDEM.

Budget Detail

Resources

The MPPDC is managing the planning process on a reimbursable basis from VDEM.
The FEMA grant award is $93,750.00 and the total regional local share is $31,250.00.
Currently the LOCAL share is $4,464.29 per county and $1,488.10 per town.
There may be future state funds available to offset some of the local share required. If so, MPPDC will adjust billing or reimburse the locality to reflect local share requirements.

3 Year Federal Grant Award	Total Grant Share/Match Required	County Match/Share over life of grant ($4,464.29 x 6 counties = $26,785.74)	Town Match/Share over life of grant ($1,488.10 x 3 towns = $4,464.30)	Total County and Town Match/Share $26,785.29 + $4,464.30 = $31,250.04
$93,750.00	$31,250.00	$4,464.29 per county	$1,488.10 per town	
		3 Year Grant: Billed to each county annually	3 Year Grant: Billed to each town annually	
		Estimated billing at $1,488.10 per county annually	Estimated billing at $496.03 per town annually	

Note

VDEM states: "if the communities do not adopt (the 2016 AHMP) it could affect parts of their Public Assistance and Hazard Mitigation funds." Further, if a locality does not adopt the plan, there is the potential for VDEM and/or FEMA to deny reimbursement to the MPPDC for a portion of the cost of performing this planning process. If this occurs, the participating locality may be responsible for its share of the unreimbursed costs incurred by the MPPDC up to $13,400.00 per county or $4,450.00 per town as determined by VDEM.

Agreement

Upon completion of the planning process and approval of the 2016 All Hazards Mitigation Plan (AHMP) by VDEM, The Town of West Point should make every attempt to adopt the 2016 AHMP. Since the MPPDC will manage the project in good faith and is required bear the costs of the planning process on a reimbursable basis, if The Town of West Point fails to adopt the plan, any resulting loss of reimbursement to the MPPDC shall be borne by The Town of West Point, not to exceed The Town of West Point's portion of federal/state/local funding.

Upon execution of this MOU by The Town of West Point, a signed copy shall be returned to the MPPDC.

Accepted by:

Town of West Point

By: _____ 11/20/13
John B. Edwards, Jr., Town Manager Date

Middle Peninsula Planning District Commission

By: _____ 10/24/2013
Lewis Lawrence, Acting Executive Director Date

Appendix **B** –
List of All Hazards Mitigation Plan Committee Members

County Administrators/Town Managers

Mindy Moran, County Administrator
Mathews County
P. O. Box 839
Mathews, VA 23109
804-725-7172
mmoran@co.mathews.va.us

Ms. Edwina Casey, Board of Supervisor
Mathews County
P O Box 472
North, VA 23128
ecasey@co.mathews.va.us

Matt Walker, County Administrator
Middlesex County
P. O. Box 428
Saluda, VA 23149
804-758-4330
m.walker@co.middlesex.va.us

Brenda Garton, County Administrator
Gloucester County
P. O. Box 329
Gloucester, VA 23061
804-693-4042
bgarton@gloucesterva.info

Mr. Garrey Curry, Jr., Assistant County Administrator for Community Development
Gloucester County
P O Box 329
Gloucester, VA 23061
804-693-4042
GCurry@gloucesterva.info

Mr. Tom Swartzwelder, County Administrator
King and Queen County
P. O. Box 177
King and Queen C.H., VA 23085
804-785-5975
tswartzwelder@kingandqueenco.net

Mr. Reece Peck, County Administrator
Essex County
P. O. Box 1079
Tappahannock, VA 22560
804-443-4331
rpeck@essex-virginia.org

Mr. Jimmy Sydnor, Assistant Town Manager
Town of Tappahannock
P O Box 266
Tappahannock, VA 22560
804-443-3336
jsydnor@essex-virginia.org

Mr. K. Charles Griffin, County Administrator
King William County
P. O. Box 215
King William, VA 23086
804-769-4927

Mr. Jimmy Sydnor, Assistant Town Manager
Town of Tappahannock
P. O. Box 266
Tappahannock, VA 22560
804-443-3336
tappzone@tappahannock-va.gov

Ms. Holly Gailey, Town Administrator
Town of Urbanna
45 Cross Street
Urbanna, VA 23175
804-758-2613
h.gailey@urbannava.gov

Mr. John Edwards, Town Manager
Town of West Point
P. O. Box 152
West Point, VA 23181
804-843-3330
jedwards@west-point.va.us

Emergency Services Coordinators
(if different than County Administrator/Town Manager)

Mr. Larry Smith, Chief of Emergency Services (Retired)
Essex County
P.O. Box 1079
Tappahannock, VA 22569
lsmith@essex-virginia.org

Mr. Jimmy Brann, Emergency Medical Services Chief
Town of Tappahannock
P O Box 1079
Tappahannock, VA 22560
804-443-3336
jbrann@essex-virginia.org

Mr. Creig Moore, Emergency Management Coordinator
Gloucester County
6504 Main Street
Gloucester, VA 23061
804-693-1390
cmoore@gloucesterva.info

Mr. Greg Hunter, Emergency Services Coordinator
King & Queen County
P O Box 177
King and Queen, VA 23085
ghunter@kingandqueenco.net

Mr. Chris Bruce, Emergency Management Coordinator
King William County
P O Box 215
King William, VA 23086
emc@kingwilliamcounty.us

Mr. Dave Burns, Emergency Services Coordinator
Mathews County
P O Box 839
Mathews, VA 23109
bouttime.dave@gmail.com

Mr. Mark Nugent, Emergency Services Coordinator
Middlesex County
P O Box 428
Saluda, VA 23149
m.nugent@co.middlesex.va.us

Mr. Robert Mawyer, Chief of Police
Town of West Point
P O Box 152
West Point, VA 23181
wppd-chief@west-point.va.us

County Planning/Zoning Staff

Mr. Wally Horton, Director of Planning and Community Development
Middlesex County
P O Box 428
Saluda, VA 23149
w.horton@co.middlesex.va.us

Ms. Holly McGowan, Director of Community Development
Town of West Point
P O Box 152
West Point, VA 23181
hmcgowan@west-point.va.us

Mr. John Gill, Zoning Administrator
Town of Urbanna
45 Cross Street
Urbanna, VA 23175
804-758-2613
j.gill@urbannava.gov

Mr. John Shaw, Planning Director
Mathews County
P.O. Box 839
Mathews, VA 23109
804-725-4034
jshaw@co.mathews.va.us

State Agency Participants

Ms. Debbie Messmer, Mitigation Project Coordinator
Virginia Department of Emergency Management
10501 Trade Court
Richmond, VA 23236
(804) 897-9975 (o)
(804) 516-5773 (c)
Debbie.Messmer@vdem.virginia.gov

Mr. Charles Kline, Floodplain Program Planner
Dame Safety & Floodplain Management
Virginia Department of Conservation and Recreation
200 East Main Street, 4th Floor
Richmond, VA 23219
804-625-3978

Ms. Marcie Parker, Residency Administrator
Virginia Department of Transportation
P. O. Box 184
Saluda, VA 23149
804-758-2321

Mr. Steve Rykal, Emergency Planner
Virginia Department of Health, Three Rivers Health District
P. O. Box 415
Saluda, VA 23149
804-758-2381 x 28

Mr. Doug Martin, Manager
U.S. Corp of Engineers
803 Front Street
Norfolk, VA 23510-1096
757-441-3538

U.S. Coast Guard
U. S. Coast Guard - Milford Station
Mathews, VA 23109
804-725-2125

Mr. Bill Sammler, Warning Coordination Meteorologist
NOAA's National Weather Service
10009 General Mahone Hwy.
Wakefield, VA 23888-2742
(757) 899-5732

Appendix C -
Steering Committee Agendas and Meeting Minutes

AGENDA

2011 All Hazards Mitigation Plan UPDATE

MPPDC Boardroom
Saluda, Va
March 13, 2014
9:00 A.M.

1. **Welcome and Introductions**
2. **Overview of Project**
3. **Work Timeline and Meeting Schedule**
4. **Suggestions for Additional Local Planning Team Members**
5. **Review of Hazards Rankings from 2010 Plan**
6. **HAZUS Discussion – contract award process/(Dewberry Consultants 2010)**
7. **Inventory of Available Resources/Collect Data (worksheets)**
8. **Discussion of Public Process**
9. **Next Meeting**

2011 Middle Peninsula
All Hazards Mitigation Plan (MPAHMP) Update

Meeting 1 – MINUTES

MPPDC Boardroom
Saluda, Va.
March 13, 2014

This was the first meeting of the All Hazards Mitigation Plan Local Planning Team (LPT) to focus on the update of the 2010 Middle Peninsula All Hazards Mitigation Plan (MPAHMP) that was previously adopted by all nine Middle Peninsula localities. The Committee members consist of officials from the nine Middle Peninsula localities as well as state and Federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome

Mr. Harrison Bresee, project manager, welcomed everyone to the meeting and then asked everyone to introduce themselves to the group. Meeting participates included:

- C. Creig Moore, Gloucester County
- Mark Nugent, Middlesex County
- Larry E. Smith, Essex County
- Holly McGowan, Town of West Point
- Travis Lindsey, King William County
- Bret Schardein, King William County
- Dave Burns, Mathews County
- Holly Gailey, Town of Urbanna
- John Gill, Town of Urbanna
- Harrison P. Bresee III, Middle Peninsula Planning District Commission (MPPDC)

Overview of Project

Mr. Bresee gave the group a brief overview of the project. He stated that Middle Peninsula localities adopted the MPAHMP in 2010 and that the plan (http://www.mppdc.com/articles/service_centers/mandates/Final_11_24with%20Appenx1-10.pdf) needs to be updated every 5 years in order to be compliant with FEMA regulations.
Since its adoption in 2010, there have been no major revisions to it. This update of the MPAHMP will include reviewing and updating mitigation strategies for those natural hazards that were identified in the 2010 plan and include new hazards such as "ditch flooding" and any others identified by the LPT.

Review of Project Timeline

Mr. Bresee referred the LPT to the Timeline that was included in the meeting packet mailed to them prior to the meeting. He noted that the contract between the Federal Emergency Management Agency (FEMA) and Virginia Department of Emergency Management (VDEM) with the MPPDC runs for 3 years, ending on September 30, 2016.

Mr. Bresee asked the LPT when they would like to meet. The team agreed that they should meet the second Thursday of each month at 9:00 a.m. in the MPPDC Boardroom in Saluda, VA.

Suggestions for Additional Local Planning Team Members

Mr. Bresee asked the LPT who else should be invited to participate in the MPAHMP. Suggestions from the LPT included: Todd Canon, VDEM (to cover Hazardous Materials); the National Weather Service; Steve Bucket, Virginia Department of Health; the Red Cross; the U.S. Forest Service; the National Guard; and a representative/geologist from the National Geological Survey. The team decided that these members should not be asked to come to every meeting, but to those meetings that focus on their area(s) of expertise.

Review of Hazards Rankings from the 2010 plan

Mr. Bresee referred the LPT to the Prioritization Worksheet for Hazards from the 2010 MPAHMP that was included in meeting handouts. It was noted that this summary of hazards and their risk ratings was completed using a Kaiser Permanente hazard vulnerability tool. Mr. Bresee asked the group if they still agreed with the rankings and ratings of the impacts of these natural hazards. Mr. Lindsey suggested that we consider adding Hazardous Materials as a threat as there is a push from the state to develop a plan. Mr. Lindsey offered to explore this in more detail and provide any guidance he could find from the Commonwealth. The LPT agreed that this hazard should be explored. Mr. Bresee mentioned the hazard of "ditch flooding". The LPT discussed this and agreed that it was different from coastal and riverine flooding and posed a hazard in the form of unpredictable road closings during heavy rain events. The hazard should be added to the list. Finally, the issue of whether "Air Quality" should be included as a hazard was discussed. The context was related to the hazard planning which results in other localities issuing "asthmatic alerts" to the public. Mr. Bresee will explore this to see it relates to our localities.

HAZUS Discussion

Mr. Bresee told the LPT that the HAZUS Level 1 Analysis for the update to the 2006 AHMP was prepared by Dewberry & Davis, LLC and asked if they would like to use the same firm for the update to the 2010 AHMP. The LPT agreed that the same firm was a good choice assuming they were still legally able to provide this service. Mr. Bresee said he would look into any procurement issues, but that a conversation with VDEM had indicated that it was up to the MPPDC and the LPT to pick the firm. Mr. Bresee will proceed with contacting Dewberry & Davis LLC to get a proposal.

Inventory of Available Resources

Mr. Bresee directed the LPT's attention to the worksheet handouts designed to allow the localities the ability to inventory their available resources, historic hazard events, hazard risks, capability, and vulnerability. The LPT discussed the worksheets and asked if there was a timeline. Mr. Bresee indicated that the worksheets should be complete by the June 12, 2014 meeting.

Discussion of Public Process

Mr. Bresee asked the LPT how they would like to approach the public outreach process. He stated that the plan was designed to include public input at all levels. The LPT was interested in holding meetings in

their localities to include as many of the area's constituencies as possible. The Public Process plan, including content and timing, will be put on the next agenda as an agenda item.

Next Meeting

The next meeting will be the 2nd Thursday of the month, April 10, 2014, in the MPPDC Boardroom at 9:00 a.m.

AGENDA

2011 All Hazards Mitigation Plan UPDATE

MPPDC Boardroom
Saluda, Va
April 10, 2014
9:00 A.M.

1. **Welcome and Introductions**

2. **Discussion of Including HAZMAT threats in the 2016 Plan**

3. **Discussion of Hazard Rankings from 2011 Plan**
   a. **Do we divide Hurricanes into categories**
   b. **Add Ditch Flooding, Air Quality, HAZMAT**

4. **Discussion of HAZUS proposal from Dewberry**

5. **Worksheet update**
   a. **Progress to date**
   b. **Date for completion is June 12, 2014**

6. **Discussion of Public Process – begin to set timeline, locations, and agenda**

7. **Other Business**

8. **Next Meeting – May 8, 2014**

2011 Middle Peninsula
All Hazards Mitigation Plan (MPAHMP) Update

Meeting 2 – MINUTES

MPPDC Boardroom
Saluda, Va.
April 10, 2014

This was the second meeting of the All Hazards Mitigation Plan Local Planning Team (LPT) to focus on the update of the 2010 Middle Peninsula All Hazards Mitigation Plan (MPAHMP) that was previously adopted by all nine Middle Peninsula localities. The Committee members consist of officials from the nine Middle Peninsula localities as well as state and Federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome

Mr. Harrison Bresee, project manager, welcomed everyone to the meeting and then asked everyone to introduce themselves to the group. Meeting participants included:

- C. Creig Moore, Gloucester County
- Mark Nugent, Middlesex County
- Larry E. Smith, Essex County
- Holly McGowan, Town of West Point
- John Gill, Town of Urbanna
- Bobby Mawyer, Town of West Point Police Department
- Debbie Messmer, Virginia Department of Emergency Management (VDEM)
- Harrison P. Bresee III, Middle Peninsula Planning District Commission (MPPDC)

Overview of Project

Mr. Bresee gave the group a brief overview of the project. He stated that Middle Peninsula localities adopted the MPAHMP in 2010 and that the plan (http://www.mppdc.com/articles/service_centers/mandates/Final_11_24with%20Appenx1-10.pdf) needs to be updated every 5 years in order to be compliant with FEMA regulations.
Since its adoption in 2010, there have been no major revisions to it. This update of the MPAHMP will include reviewing and updating mitigation strategies for those natural hazards that were identified in the 2010 plan and include new hazards such as "ditch flooding" and any others identified by the LPT.

Discussion of Including HAZMAT threats in the 2016 Plan

The LPT discussed the dangers of HAZMAT related incidents in the region. HAZMAT threats are real and have the potential to cause serious disruption to the safety and welfare of the citizens of the region.

The LPT would like to see HAZMAT included on the Hazard Ranking worksheet so the region can assess the threat level.

Discussion of Hazard Ranking from the 2010 Plan

The LPT discussed dividing Hurricanes into two separate items on the Hazard Worksheet based on the National Weather Service (NWS) rating of Hurricanes from Category 1 – 5 (Category 5 being the hurricane with the highest winds). The rational is that the Middle Peninsula region has a much higher likelihood of seeing a tropical storm or hurricane rated less than a Category 2 than a Category 3 to 5 Hurricane. Through discussion the LPT ultimately decided that separating hurricane categories could cause confusion and agreed to leave the Hurricane category as one item.

The LPT discussed adding Ditch Flooding, Air Quality, HAZMAT, and Summer Storms as new threats to the region. After much discussion, it was agreed that these items were specific and different enough to merit a separate listing on the Hazard Worksheet.

The LPT agreed not to remove any Hazard items from the list created for the 2010 AHMP.

Discussion of HAZUS proposal from Dewberry

Mr. Bresee spoke with Ms. Jane Frantz at Dewberry about performing a HAZUS. Ms. Frantz stated that the FEMA had not updated their Census data since the 2010 AHMP was done for the Middle Peninsula. If she were to run a HAZUS now, she would have to manually input the data which would be more expensive than is budgeted. Mr. Bresee gave the LPT two options: 1) Wait for the Census update to run the data or 2) Run the HAZUS at a higher cost. The LPT decided on option 1 as the AHMP update is not due to be complete until 2016. However, they asked to be updated at each meeting to make sure the window to complete a HAZUS is not missed.

Worksheet update

Mr. Bresee asked if there were any questions on the Worksheets. Everyone agreed that they were clear and would be completed by the June 12, 2014 deadline.

Discussion of Public Process

The LPT discussed how they would like to involve the public in commenting on the AHMP process. It was decided that a mix of public meetings, and displaying the plan (and any drafts) on the MPPDC website with links to the locality websites, putting the plan at libraries in each locality would be ideal. Mr. Bresee stated that he would develop a plan for this process.

Other Business

It was noted that Mr. Lindsey of West Point had taken a position in New Kent County. Mr. Bresee will contact West Point to discuss their participation on the LPT and their timeframe for completing the Worksheets and Hazard Rankings.

Next Meeting

May 8, 2014 at the MPPDC Boardroom at 9am.

AGENDA

2011 All Hazards Mitigation Plan UPDATE

MPPDC Boardroom
Saluda, Va
May 8, 2014
9:00 A.M.

1. **Welcome and Introductions**

2. **Discussion of THIRA process (for appendix in AHMP)**

3. **Discussion of Hazard Rankings from 2011 Plan**
    a. **Final Prioritization Worksheet**
    b. **Add Ditch Flooding, Air Quality, HAZMAT, Summer Storms**

4. **Worksheet update**
    a. **Progress to date**
    b. **Date for completion is June 12, 2014**

5. **Discussion of Public Process**
    a. **Public Meetings**
    b. **Plan on MPPPDC Website for Comments**
    c. **Plan at Libraries for Comments**
6. **Other Business**

7. **Next Meeting – Jun 12, 2014**

2011 Middle Peninsula
All Hazards Mitigation Plan (MPAHMP) Update

Meeting 3 - MINUTES

MPPDC Boardroom
Saluda, Va.
May 8, 2014

This was the third meeting of the All Hazards Mitigation Plan Local Planning Team (LPT) to focus on the update of the 2010 Middle Peninsula All Hazards Mitigation Plan (MPAHMP) that was previously adopted by all nine Middle Peninsula localities. The Committee members consist of officials from the nine Middle Peninsula localities as well as state and Federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome

Mr. Harrison Bresee, project manager, welcomed everyone to the meeting and then asked everyone to introduce themselves to the group. Meeting participants included:

- C. Creig Moore, Gloucester County
- Larry E. Smith, Essex County
- Holly McGowan, Town of West Point
- John Gill, Town of Urbanna
- Bobby Mawyer, Town of West Point Police Department
- Trent Funkhouser, King William County
- Wally Horton, Middlesex County
- Dave Burns, Mathews County
- Harrison P. Bresee III, Middle Peninsula Planning District Commission (MPPDC)

Discussion of Threat and Hazards Identification and Risk Assessment (THRIA) process (as an appendix in the AHMP)

The LPT discussed the inclusion of the THIRA as an appendix in the AHMP. Most thought it was a good idea, but, since it was not a requirement, it was not necessary.

Discussion of Hazard Ranking from the 2010 plan

The final prioritization worksheet was presented to the LPT. The worksheet includes all the Hazards from the 2010 AHMP plus Summer Storms, Ditch Flooding, Air Quality, and HAZMAT. The LPT all agreed that the worksheet was correct. The worksheet was handed out to each county (and would be emailed after the meeting). The worksheet is due by the June 2014 meeting.

Worksheet update

Mr. Bresee asked if there were any questions on the Worksheets. Everyone agreed that they were clear and would be completed by the June 12, 2014 deadline.

Discussion of Public Process

Mr. Bresee presented the Public Process discussed at the last meeting. The process is a mix of obtaining comments at public meetings, displaying the plan (and any drafts) on the MPPDC website with links to the locality websites, putting the plan at libraries in each locality would be ideal. All agreed that the process was solid and should be implemented according the schedule as defined in the Grant Contract with Virginia Department of Emergency Management (VDEM).

Other Business

None.

Next Meeting

June 12, 2014 at the MPPDC Boardroom at 9am.

AGENDA

2011 All Hazards Mitigation Plan UPDATE

MPPDC Boardroom
Saluda, Va
August 14, 2014
9:00 A.M.

1. Welcome and Introductions

2. Complete Hazard Rankings from 2011 Plan
- **c. Prioritization Worksheet (Natural Hazards Summary Tool)**
- **d. New to Rank - Ditch Flooding, Air Quality, HAZMAT, Summer Storms**

3. Worksheet update
- **a. Progress to date**

4. HAZUS Update
- **a. 2010 Census Data HAZUS update from FEMA - pending**

5. Discussion of Public Process
- **a. Public Meetings**
- **b. Plan on MPPPDC Website for Comments**
- **c. Plan at Libraries for Comments**

6. Other Business
- **a. Discussion of the extended timeline for the 2014 HMGP**

7. Next Meeting: September 11, 2014

2011 Middle Peninsula
All Hazards Mitigation Plan (MPAHMP) Update

Meeting 4 - MINUTES

MPPDC Boardroom
Saluda, Va.
August 14, 2014

This was the fourth meeting of the All Hazards Mitigation Plan Local Planning Team (LPT) to focus on the update of the 2010 Middle Peninsula All Hazards Mitigation Plan (MPAHMP) that was previously adopted by all nine Middle Peninsula localities. The Committee members consist of officials from the nine Middle Peninsula localities as well as state and Federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome

Mr. Harrison Bresee, project manager, welcomed everyone to the meeting and then asked everyone to introduce themselves to the group. Meeting participants included:

- C. Creig Moore, Gloucester County
- Larry E. Smith, Essex County
- Holly McGowan, Town of West Point
- John Gill, Town of Urbanna
- Bobby Mawyer, Town of West Point Police Department
- Trent Funkhouser, King William County
- Debbie Messmer, Virginia Department of Emergency Management (VDEM)
- Harrison P. Bresee III, Middle Peninsula Planning District Commission (MPPDC)

Complete Hazard Ranking from the 2010 AHMP

Mr. Bresee asked for an update on the Prioritization Worksheet (Hazard Ranking spreadsheet or Natural Hazards summary tool). All present agreed to have the tool completed by the September 2014 meeting.

Worksheet update

Mr. Bresee asked if there were any questions on the Worksheets. To date the Town of West Point, the Town of Urbanna, and Gloucester County have completed the worksheets. All other members of the LPT agreed to complete the worksheets ASAP.

Discussion of Public Process

Mr. Bresee presented the Public Process discussed at the last meeting. The process is a mix of obtaining comments at public meetings, displaying the plan (and any drafts) on the MPPDC website with links to

the locality websites, putting the plan at libraries in each locality would be ideal. There were no changes made to the process.

Other Business
None.

Next Meeting
September 11, 2014 at the MPPDC Boardroom at 9am.

AGENDA

2011 All Hazards Mitigation Plan UPDATE

MPPDC Boardroom
Saluda, Va
September 18, 2014
9:00 A.M.

1. **Welcome and Introductions**

2. **Complete Hazard Rankings from 2011 Plan**

3. **Worksheet update**
    a. **Progress to date**
    b. **Data for new hazards (need time to compile when sheets are complete)**

4. **HAZMAT events**
    a. **Natural Hazard Driven - define**
    b. **Strategies to Mitigate - define**

5. **Timeline**
    a. **Begin updating goals, strategies, and actions - 2015**
    b. **Solicit public comments on plan - 2015**

6. **HAZUS Update**
    a. **2010 Census Data HAZUS update from FEMA - pending**

7. **Discussion of Public Process**
    a. **Public Meetings**
    b. **Plan on MPPPDC Website for Comments**
    c. **Plan at Libraries for Comments**

8. **Other Business**
    a. **2014 HMGP**

9. **Next Meeting: October 9, 2014**

2011 Middle Peninsula
All Hazards Mitigation Plan (MPAHMP) Update

Meeting 5 - MINUTES

MPPDC Boardroom
Saluda, Va.
September 11, 2014

This was the fifth meeting of the All Hazards Mitigation Plan Local Planning Team (LPT) to focus on the update of the 2010 Middle Peninsula All Hazards Mitigation Plan (MPAHMP) that was previously adopted by all nine Middle Peninsula localities. The Committee members consist of officials from the nine Middle Peninsula localities as well as state and Federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome

Mr. Harrison Bresee, project manager, welcomed everyone to the meeting and then asked everyone to introduce themselves to the group. Meeting participants included:

- C. Creig Moore, Gloucester County
- Bryan Wade, Gloucester County
- Larry E. Smith, Essex County
- Mark Nugent, Middlesex County
- Dave Burns, Mathews County
- Bobby Mawyer, Town of West Point Police Department
- Harrison P. Bresee III, Middle Peninsula Planning District Commission (MPPDC)

Complete Hazard Ranking from the 2010 AHMP

Mr. Bresee asked for an update on the Prioritization Worksheet (Hazard Ranking spreadsheet or Natural Hazards summary tool). Localities that completed their worksheets include Gloucester County, Essex County, Town of West Point, and Town of Urbanna. Mr. Bresee advised the LPT that he could not begin drafting the Hazard Identification chapter until all worksheets were submitted. All present agreed to have the tool completed ASAP.

Worksheet update

Mr. Bresee asked if there were any questions on the Worksheets. To date the Town of West Point, the Town of Urbanna, Essex County (including the Town of Tappahannock), Gloucester County, King and Queen County, and Middlesex County have completed their worksheets. Mathews County agreed to complete the worksheets ASAP. King William County was not present (see other business). Mr. Bresee thanked those who had submitted their worksheets and advised the LPT that the worksheets were necessary for drafting several chapters of the 2016 AHMP update.

HAZMAT Events

Mr. Bresee advised the LPT that he had discussed HAZMAT events with Ms. Messmer of Virginia Department of Emergency Management (VDEM) as they related to the AHMP update. Ms. Messmer advised Mr. Bresee that the HAZMAT events pertinent to this plan should be in two categories: Natural Hazard Driven and Strategies to Mitigate. Examples of Natural Hazard driven would be propane tanks destroyed in a flood or wind damaging hazardous materials storage areas. Examples of Strategies to Mitigate would be weather related such as flood mitigation and drinking water warnings after a contamination event. The LPT agreed that this logic made sense.

Timeline

Mr. Bresee updated the LPT on the Grant Timeline. Goals, strategies, and actions would be updated in 2015 and a draft AHMP would be written. In 2015 public comment on the draft AHMP would be solicited. The LPT agreed that the timeline was in keeping with the update requirements and agreed to continue supporting the process.

HAZUS Update

Mr. Bresee advised the LPT that FEMA had not yet updated the Census data and a contract with Dewberry was still pending this action. Further, the timeline to complete the HAZUS was still intact. A HAZUS would need to be completed by the Summer of 2015 and Dewberry would need approximately 2 months to complete the project.

Discussion of Public Process

Mr. Bresee presented the Public Process discussed at the last meeting. No changes were made to the structure.

Other Business

It was noted that Mr. Funkhouser had resigned as County Administrator for King William County, leaving the county with no Emergency Coordinator or County Administrator. Mr. Bresee continues to encourage King William to complete their worksheets.

Mr. Nugent advised the LPT that his department at Middlesex County had purchased WebEx and would be willing to host meetings with this software.

Next Meeting

November 13, 2014 at the MPPDC Boardroom at 9am.

AGENDA

2011 All Hazards Mitigation Plan UPDATE

MPPDC Boardroom
Saluda, Va
November 13, 2014
9:00 A.M.

1. **Welcome and Introductions**

2. **HAZMAT events**

3. **Timeline**
    a. **Begin updating goals, strategies, and actions - 2015**
    b. **Solicit public comments on plan - 2015**

4. **HAZUS Update**
    a. **2010 Census Data HAZUS update from FEMA - pending**

5. **Discussion of Public Process**
    a. **Public Meetings**
    b. **Plan on MPPPDC Website for Comments**
    c. **Plan at Libraries for Comments**

6. **Other Business**
    a. **2014 HMGP – awarded**

7. **Next Meeting?**

2011 Middle Peninsula
All Hazards Mitigation Plan (MPAHMP) Update

Meeting 6 - MINUTES

MPPDC Boardroom
Saluda, Va.
November 13, 2014

This was the sixth meeting of the All Hazards Mitigation Plan Local Planning Team (LPT) to focus on the update of the 2010 Middle Peninsula All Hazards Mitigation Plan (MPAHMP) that was previously adopted by all nine Middle Peninsula localities. The Committee members consist of officials from the nine Middle Peninsula localities as well as state and Federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome

Mr. Harrison Bresee, project manager, welcomed everyone to the meeting and then asked everyone to introduce themselves to the group. Meeting participants included:

- Chris Bruce, King William County
- Bryan Wade, Gloucester County
- John Gill, Town of Urbanna
- Holly Gailey, Town of West Point
- Greg Hunter, King and Queen County
- Mark Nugent, Middlesex County
- Dave Burns, Mathews County
- Bret Schardein, King William County
- Harrison P. Bresee III, Middle Peninsula Planning District Commission (MPPDC)

Complete Hazard Ranking from the 2010 AHMP

Mr. Bresee asked for an update on the Prioritization Worksheet (Hazard Ranking spreadsheet or Natural Hazards summary tool). Localities that have completed the worksheets include Gloucester County, Essex County (including the Town of Tappahannock), Middlesex County, King and Queen County, Mathews County, and the Town of West Point, and Town of Urbanna. The Worksheet from King William County is still needed. Mr. Bresee advised the LPT that he could not begin drafting the Hazard Identification chapter until all worksheets were submitted. Mr. Bruce, the new Emergency Coordinator for King William County, agreed to provide the worksheet ASAP.

Worksheet update

Mr. Bresee asked if there were any questions on the Worksheets. To date the Town of West Point, the Town of Urbanna, Essex County (including the Town of Tappahannock), Gloucester County, King and Queen County, Mathews County, and Middlesex County have completed their worksheets. Mr. Bruce, the new Emergency Coordinator for King William County, agreed to work on the worksheets as

soon as he could. Mr. Bresee thanked those who had submitted their worksheets and advised the LPT that the worksheets were necessary for drafting several chapters of the 2016 AHMP update.

HAZMAT Events

Mr. Bresee advised the LPT that HAZMAT will be included in the chapters as discussed at the previous meetings.

Timeline

Mr. Bresee again updated the LPT on the Grant Timeline. Goals, strategies, and actions would be updated in 2015 and a draft AHMP would be written. In 2015, public comment on the draft AHMP would be solicited. The LPT agreed that the timeline was in keeping with the update requirements and agreed to continue supporting the process.

HAZUS Update

Mr. Bresee again advised the LPT that FEMA had not yet updated the Census data and a contract with Dewberry was still pending this action. Further, the timeline to complete the HAZUS was still intact. A HAZUS would need to be completed by the Summer of 2015 and Dewberry would need approximately 2 months to complete the project.

Discussion of Public Process

Mr. Bresee advised the LPT that the public process would begin once the worksheets were submitted and used to update chapters in the AHMP. No changes were made to the structure of the public meetings.

Other Business

Mr. Chris Bruce has been hired by King William County as their new Emergency Coordinator. He will need to come up to speed on his new position, but stated that he will be involved in and support the 2016 AHMP update process. He was welcomed by the LPT.

This meeting will be the last meeting until 2015. The project manager will reach out to the LPT in the new year.

Next Meeting

To be determined.

AGENDA

2011 All Hazards Mitigation Plan UPDATE

MPPDC Boardroom
Saluda, Va
April 16, 2015
10:00 A.M.

1. **Welcome and Introductions**

2. **Review completed Hazards Rankings (2010 and 2016)**

3. **HAZUS update**

4. **Timeline**
    a. **Begin updating goals, strategies, and actions - Summer 2015**
    b. **Solicit public comments on plan - Fall 2015**

5. **Discussion of Public Process**
    a. **Public Meetings – Start in June 2015 with HAZUS?**
    b. **Plan on MPPDC Website for Comments**
    c. **Plan at Libraries for Comments**

6. **Other**

7. **Next Meeting: May 2015 – Webex?**
    June 2015

2011 Middle Peninsula
All Hazards Mitigation Plan (MPAHMP) Update

Meeting 7 - MINUTES

MPPDC Boardroom
Saluda, Va.
April 16, 2015

This was the seventh meeting of the All Hazards Mitigation Plan Local Planning Team (LPT) to focus on the update of the 2011 Middle Peninsula All Hazards Mitigation Plan (MPAHMP) that was previously adopted by all nine Middle Peninsula localities. The Committee members consist of officials from the nine Middle Peninsula localities as well as state and Federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome

Ms. Jackie Rickards, project manager, welcomed everyone to the meeting and then asked everyone to introduce themselves to the group. Meeting participants included:

- Chris Bruce, King William County
- Dave Burns, Mathews County
- Craig Moore, Gloucester County
- Jackie Rickards, Middle Peninsula Planning District Commission (MPPDC)
- Harrison P. Bresee III, MPPDC

Complete Hazard Ranking from the 2011 AHMP

Ms. Rickards informed the group that there are multiple chapters of the plan are being updated. Therefore as the Section 4 (Hazard Identification) is currently being updated, Ms. Rickards asked the group to review the Kaiser Permanente results in comparison to the 2011 results. The objective of this review was to confirm with the group that these are the results that they want me to write about. Mr. Dave Burns questioned the ranking of Coastal Flooding at #1 since this is a common occurrence in the region and that many of the localities have adapted to this hazard. Ms. Rickards explained that this was a regional ranking, so it's dependant on all nine of the localities, however to verify the regional input there will be a review of the individual Kaiser Permanente worksheets from localities. (Please see appendix A for the 2011 and 2016 Ranking comparison).

HAZUS Update

Ms. Rickards explained that there has been progress regarding HAZUS. In February MPPDC staff signed a contract with Dewberry to update the HAZUS-MH Flood and Hurricane Module Risk Assessment analyses and subsequent HIRA element updates for the six counties of the Middle Peninsula. Additionally based on conversations with FEMA Region III there is an expectation to include a sea level in the assessment. Therefore MPPDC staff also contracted with Dewberry to add Sea Level Rise to the HAZUS assessment. The sea level rise scenarios will includes a baseline of Mean Highest High Water scenarios as well as a 6ft sea level rise scenario. According to Dewberry there have been multiple updates to the HAZUS assessment, including:

1. Use of new coastal elevations from FEMA
2. Use of coastal studies from the US Army Corps of Engineers
3. Use of new day symmetric data (ie general building stock)
4. New HAZUS version 2.2 software
5. Use of 1 square mile drainage run instead of a 10 square mile drainage run used in the 2010 plan.

To-date Dewberry has completed a HAZUS Modeling Report that reviews the various modeling efforts performed and where appropriate, denotes modeling efforts that transcend previous efforts given available scope, schedule and budget of the project. Ms. Rickards explained that Dewberry will have a draft of the final project completed by April 24, 2015.

Timeline

a. **Begin Updating Goals, Strategies and Actions (Summer 2015):** Ms. Rickards explained that the next section of the plan to update included the goals, strategies and actions. To begin to address this, Ms. Rickards presented a handout of mitigation strategies from the 2010 plan and asked "if funding or technical expertise were to become available what mitigation strategies would your locality identify and work towards." Committee members looked at their individual mitigation strategies and will consider updating the strategies as goals are updated.

b. Solicit Public Comment on Plan (Winter/Spring 2015): According to the public process laid out early on n this project MPPDC staff is to solicit public comments on the plan update. Therefore as the HAZUS is to be completed on April 24, 2015 the first public meeting will be able to include the HAZUS as well as the HIRA for the region.

Discussion of Public Process

a. Public Meetings – start June 2015 with HAZUS?
b. Plan on MPPC website for Comments
c. Plan at Libraries for Comments

Ms. Rickards shared with the group that as the HAZUS will be completed April 24, 2015 that public meetings can begin in late June. The committee agreed. Also Ms. Rickards asked if any locality wanted an individual public meeting. The committee agreed that having two public meeting within the region will suffice. Based on this response Ms. Rickards will begin looking for public meeting venues and begin planning the announcement for the public meetings.

Other Business

Mr. Craig Moore explained that a better way to more people around that table could be to attend the quarterly regional meetings of the Middle Peninsula and Northern Neck. He also reminded to the group to sign up for a Public Safety Response to Terrorism Awareness training in Gloucester on May 2, 2015 from 8am-5pm.

Next Meeting

To be determined.

AGENDA

2011 All Hazards Mitigation Plan UPDATE

MPPDC Boardroom
Saluda, Va
June 25, 2015
10:00 A.M.

1. **Welcome and Introductions**

2. **Hazards Identification Section Review**

3. **HAZUS Review**

4. **Mitigation Strategy Review**

5. **Timeline**
    a. **Begin updating goals, strategies, and actions - Summer 2015**
    b. **Solicit public comments on plan – Summer & Fall 2015**
    c. **Capacity Assessment & Local Strategy Accomplishments – July 2015**

6. **Discussion of Public Process**
    a. **Public Meetings – July 29th & 30th, 2015**
    b. **Plan on MPPDC Website for Comments**
    c. **Plan at Libraries for Comments**

7. **Other Discussion**

8. **Next Meeting: July 2015**

2011 Middle Peninsula
All Hazards Mitigation Plan (MPAHMP) Update

Meeting 8 - MINUTES

MPPDC Boardroom
Saluda, Va.
June 25, 2015

This was the seventh meeting of the All Hazards Mitigation Plan Local Planning Team (LPT) to focus on the update of the 2011 Middle Peninsula All Hazards Mitigation Plan (MPAHMP) that was previously adopted by all nine Middle Peninsula localities. The Committee members consist of officials from the nine Middle Peninsula localities as well as state and Federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome and Introductions

Ms. Jackie Rickards, project manager, welcomed everyone to the meeting and then asked everyone to introduce themselves to the group. Meeting participants included:

- Chris Bruce, King William County
- Dave Burns, Mathews County
- Craig Moore, Gloucester County
- Mark Nugent, Middlesex County
- Holly McGowan, Town of West Point
- Bobby Mawyer, Town of West Point
- Charles Kline, Virginia Department of Conservation and Recreation
- Debbie Messmer, Virginia Department of Emergency Management
- Jackie Rickards, Middle Peninsula Planning District Commission (MPPDC)
- Harrison P. Bresee III, MPPDC

Hazards Identification Section Review

Ms. Rickards explained to the Local Planning Team that the draft of the Hazards identification Section of the Mitigation Plan was complete and ready for review by the public. The Section starts with the Kaiser Permanente Tool that assesses and prioritizing hazard vulnerability threats to the Middle Peninsula region. Upon prioritization, the hazards were put into one of three hazard categories: Critical, Moderately Critical or Non-Critical. Also in this section data and maps were updated with the most recent information.

Ms. Rickards then asked the LPT to explain why the new hazards, including HAZMAT, ditch flooding, summer storms, and air quality, were added to the list of potential threats. Mr. Moore mentioned that in an effort to improve the plan and be more comprehensive these hazards were important to add to the list.

HAZUS Review

Ms. Rickards explained that there has been progress regarding HAZUS. In February MPPDC staff signed a contract with Dewberry to update the HAZUS-MH Flood and Hurricane Module Risk Assessment analyses and subsequent HIRA element updates for the six counties of the Middle Peninsula. Additionally based on conversations with FEMA Region III there is an expectation to include a sea level in the assessment. Therefore MPPDC staff also contracted with Dewberry to add Sea Level Rise to the HAZUS assessment. The sea level rise scenarios will includes a baseline of Mean Highest High Water scenarios as well as a 6ft sea level rise scenario. According to Dewberry there have been multiple updates to the HAZUS assessment, including:

6. Use of new coastal elevations from FEMA
7. Use of coastal studies from the US Army Corps of Engineers
8. Use of new day symmetric data (ie general building stock)
9. New HAZUS version 2.2 software
10. Use of 1 square mile drainage run instead of a 10 square mile drainage run used in the 2010 plan.

To-date Dewberry has completed a HAZUS Modeling Report that reviews the various modeling efforts performed and where appropriate, denotes modeling efforts that transcend previous efforts given available scope, schedule and budget of the project. Ms. Rickards explained that Dewberry will have a draft of the final project completed by April 24, 2015.

Mitigation Strategy Review

Ms. Rickards read through each of the 2010 mitigation strategies and asked the group if there are any updates to make. In some cases there were mitigation strategies that were complete by localities includes:

Strategy 1.1.14 - Develop Storm Water Management Plans and Policies for urban Development areas in both King William and Gloucester Counties.

Strategy 1.2.1 – Decrease the adverse affects of drought conditions for residents – many of whom rely on individual wells as their only water source in many parts of the rural Middle Peninsula region by adopting the ordinance to implement the Drought Response and Contingency Plan contained in Section 10 of the recently completed Middle Peninsula Drought Response and Contingency Plan as well as its corresponding section in the recently completed Hampton Roads Drought Response and Contingency Plan.

Strategy 2.2.1 – Formalize mutual aid agreements to coordinate the region's fire and emergency medical units to ensure a quick and efficient response to these severe weather events. (Completed by all MPPDC localities)

Strategy 2.2.2 – Formalize mutual aid agreements to coordinate the region's fire units to ensure a quick and efficient response to wildfires. (Completed by all MPPDC localities)

Strategy 3.1.1 – Enhance/implement the use of rapid notification systems to warn residents of approaching flood waters and mandatory evacuation notices. (Completed by all MPPDC localities)

Strategy 3.2.1- Incorporate the newly digitized local floodplain maps into each County's GIS database after adoption y the local governing body. (Completed by Middlesex and Gloucester Counties and Town of Urbanna).

With input from the Local Planning Team (LPT), these mitigation strategies will be updated and then will be emailed to the LPT for final review.

Timeline

c. **Begin Updating Goals, Strategies and Actions (Summer 2015):** Ms. Rickards explained that the next section of the plan to update included the goals, strategies and actions. To begin to address this, Ms. Rickards presented a handout of mitigation strategies from the 2010 plan and asked "if funding or technical expertise were to become available what mitigation strategies would your locality identify and work towards." Committee members looked at their individual mitigation strategies and will consider updating the strategies as goals are updated.

d. Solicit Public Comment on Plan (Summer/ Fall 2015): According to the public process laid out early on n this project MPPDC staff is to solicit public comments on the plan update. Therefore as the HAZUS is to be completed on April 24, 2015 the first public meeting will be able to include the HAZUS as well as the HIRA for the region.

e. Capacity Assessment & Local Strategy Accomplishments (July 2015)

Discussion of Public Process

d. Public Meetings – July 29th and 30th 2015
Ms. Rickards explained that news articles have been written about AHMP and announced that there would be two public meetings on July 29th and 30th. One of the meetings would take place at the King & Queen Public Library and the other would be at the MPPDC Boadroom in Saluda.

e. Plan on MPPC website for Comments
MPPDC staff posted information regarding a 30 day comment period for the AHMP as well as public meetings on the MPPDC website.

f. Plan at Libraries for Comments
Ms. Rickards explained that the draft of the AHMP would be available at libraries throughout the Middle Peninsula region.

Other Business
None

Next Meeting
The next meeting will take place after the public's review of sections 1, 3, 4, and 5 in early August.

AGENDA

2011 All Hazards Mitigation Plan UPDATE

MPPDC Boardroom
Saluda, Va
August 13, 2015
10:00 A.M.

1. **Welcome and Introductions**

2. **Review Public Comments – things to consider.**

3. **Reviewing 2010 Mitigation Strategies**

4. **FEMA meeting**
    a. **National Flood Insurance Program Survey**
    b. **Plan Integration**

5. **Capability Assessment Worksheet**

6. **Timeline**
    a. **Begin updating goals, strategies, and actions - Completed**
    b. **Solicit public comments on plan – Fall 2015**
    c. **Capacity Assessment & Local Strategy Accomplishments – August 2015**

7. **Other Discussion**

8. **Next Meeting: ?**

2011 Middle Peninsula
All Hazards Mitigation Plan (MPAHMP) Update

Meeting 9 - MINUTES

MPPDC Boardroom
Saluda, Va.
August 13, 2015

This was the tenth meeting of the All Hazards Mitigation Plan Local Planning Team (LPT) to focus on the update of the 2011 Middle Peninsula All Hazards Mitigation Plan (MPAHMP) that was previously adopted by all nine Middle Peninsula localities. The Committee members consist of officials from the nine Middle Peninsula localities as well as state and Federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome and Introductions

Ms. Jackie Rickards, project manager, welcomed everyone to the meeting and then asked everyone to introduce themselves to the group. Meeting participants included:

- Chris Bruce, King William County
- Craig Moore, Gloucester County
- John Gill, Town of Urbanna
- Jimmy Brann, Essex County
- Jackie Rickards, Middle Peninsula Planning District Commission (MPPDC)

Review Public Comments –things to consider

Ms. Rickards explained that there were a total of 5 comments made on the plan and that zero people attended the public meeting on July 29th and 30th. All comments were similar in nature and expressed concern about the inclusion of sea level rise and land subsidence within the Plan. The Local Planning Team (LPT) discussed this and concluded that it would be remiss if these topics were not included within the plan, particular since the Federal government recognizes these topics as hazards. Also it was thought that if we remove these topics from the plan Middle Peninsula localities could be excluding themselves from potential funding.

Reviewing 2010 Mitigation Strategies

As part of the AHMP update, Ms. Rickards explained that FEMA as well as VDEM is interested in seeing a better record of mitigation strategy statuses. Therefore in an effort to capture the locality's progress with mitigation strategies, Ms. Rickards created and presented a table with mitigation strategies and questions to address the progress of mitigation strategies. This will help gather information from all localities, but also helps localities gain an idea of the progress made and progress needed on mitigation strategies. While most strategies are on-going, this table provides a chance to share the accomplishments since the last plan.

FEMA Meeting

a. National Flood Insurance Program Survey

FEMA is looking for clarity regarding how are localities are managing the National Flood Insurance Program. Therefore they provided me with a worksheet to hand out to you and have completed. FEMA noted that there will be no punitive consequences if you write down that your locality has not completed a requirement. However this is more of an exercise that will help your locality get an idea what you have accomplished as well as what your locality still need to accomplish in relation to the NFIP.

b. Plan Integration

At the FEMA meeting, they expressed their interest in having localities integrate mitigation strategies into existing planning mechanisms (ie. Comprehensive plans, stormwater management plans, etc.). Therefore Ms. Rickards presented another handout that provides a list of local plans in hopes that localities will provide information about whether or not they have included the mitigation strategies in other planning documents.

Capability Assessment Worksheet

To gain an understanding of a localities ability to accomplish the mitigation strategies, Ms. Rickards presented a handout that focused on the planning and regulatory, administrative and technical, financial, and education and outreach as it relates to local mitigation capabilities.

Timeline

f. **Begin Updating Goals, Strategies and Actions:** Completed

g. Solicit Public Comment on Plan (Fall 2015): Ms. Rickards explained that the 2nd Round of the public comment will take place in late Fall on the entire plan.

h. **Capability Assessment & Local Strategy Accomplishments (August 2015):** MPPDC staff will work on completing the Capability Assessment by the end of August.

Other Business

None

Next Meeting

TBD

AGENDA

2011 All Hazards Mitigation Plan UPDATE

Webex Conference Call
January 26, 2016
10:00 A.M.

1. **Welcome and Introductions**

2. **VDEM feedback**

3. **Review Public Comments**

4. **Timeline – Next Steps**

5. **Other Topics**
   a. Gather dates for BOS and Town Council Presentations and/or public outreach

6. **Next Meeting**

2011 Middle Peninsula
All Hazards Mitigation Plan (MPAHMP) Update

Meeting 11 - MINUTES

Webex Conference Call
January 26, 2016

This was the eleventh meeting of the All Hazards Mitigation Plan Local Planning Team (LPT) to focus on the update of the 2011 Middle Peninsula All Hazards Mitigation Plan (MPAHMP) that was previously adopted by all nine Middle Peninsula localities. The Committee members consist of officials from the nine Middle Peninsula localities as well as state and Federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome and Introductions

Ms. Jackie Rickards, project manager, welcomed everyone to the meeting and then asked everyone to introduce themselves to the group. Meeting participants included:

- Chris Bruce, King William County
- Craig Moore, Gloucester County
- John Gill, Town of Urbanna
- Jimmy Brann, Essex County
- Mark Nugent, Middlesex County
- Holly McGowan, Town of West Point
- Robert Mawyer, Town of West Point
- Jackie Rickards, Middle Peninsula Planning District Commission (MPPDC)

Virginia Department of Emergency Management (VDEM) feedback

Upon review of the final plan by the Local Planning Team, Ms. Rickards explained that the plan was sent to VDEM for a 30 day review. VDEM provided the following feedback on the Plan:

- When we submit this to FEMA there should be no blank spaces or yellow highlighted areas. If the adoption has not occurred then I would state something along the lines of when the adoption occurs. Also, remove the word Draft in Red and Draft across most pages
- Page 7 – you stated people received comments for their jurisdictions, FEMA would like to have those comments included in the plan.
- Page 23 – at the top you list Ditch flooding as #6, but you call it ditching, I would remove the "ing"
- Around page 40 you mention each localities Comprehensive Plan, all of the dates are form the 90s and early 2000's is that the latest version?
- Page 46 – You do not mention the huge tornado that damaged Gloucester County, I think that should be mentioned here as impact.
- Page 50 – It seems you have stopped including impact, extent, and vulnerability under each section.
- Page 52 – Figure 17 I cannot read the caption
- Page 72 – Storm Surge Map, you could not get anything a little newer than 2008?
- Page 81 – Why is 2015 not included
- Page 87 – I am not sure what this table is referring to? I think this should be where the severe repetitive loss properties are documented. If this is something else, then we need to add a table with the SRL properties included

- Page 220 – the first paragraph is incorrect. Mathews is using the same group Gloucester is using and they have a total of 47 properties either they have mitigated using HMA funds or are in the process of mitigating
- Page 220 – the Town of West Point has elevated one property and acquired a public building and relocated their Public Works using HMA funding
- Section B.4 of the Planning Checklist – I do not think you have accurately addressed this requirement. I think you should detail the projects that have been completed in MPPDC (elevation and acquisition) and also find out from the communities how many were on the RL and SRL lists.
- Section D.1 of the Planning Checklist – This requirement can be met in 2 different ways and we touched on it at the meeting with Matt from FEMA. They want to see what was done for each section as an update…a short paragraph synopsis of what you guys looked at reviewing and changing. You can also put this in Section 1 or 2 of the plan. They want you to touch on each chapter, and I would just add something significant.

Ms. Rickards reviewed this feedback with the Local Planning Team. Ms. Rickards explained that changes to the plan have been made to address VDEM's feedback.

Review Public Comments

Ms. Rickards shared that during the public comment period which opened December 16, 2015 and closed January 14, 2016 that there were a total of 10 public. In addition two public meetings were hosted on January 5, 2016 in Saluda and on January 6, 2016 at the King & Queen Regional Library Branch. A total of one person attended the meetings.

Ms. Rickards shared all the public comments with the local planning team and asked if and how they would like to address the comments. The Committee agreed that they would be remiss if they did not include sea level rise and climate change in the plan as there is local data that supports their occurrences.

Timeline – Next Steps

Ms. Rickards reviewed the tasks that have been recently been completed to finalize the plan and the actions that need to occur in order to have this plan adopted by each locality.

- ☑ 12/4/2015 – Finish Draft of Report
- ☑ 12/15/2015 – Committee finishes plan review; MPPDC makes changes
- ☑ 12/16/2015 - Send final draft to VDEM for a 30 day review
- ☑ 12/16/2015 – 1/14/2016 – Public Comment Period; MPPDC staff posts draft on MPPDC website and sends copies of draft to local libraries
- ☑ 1/5/2016 – Public Meeting in MPPDC Boardroom, Saluda, VA
- ☑ 1/6/2016 – Public Meeting in King & Queen Library Branch, St. Stephen's Church, VA
- ☑ 1/15/2016 - MPPDC staff will collect public comments and send to Steering Committee.
- ☐ 1/26/2016 - MPPDC staff will also host a phone conference to review:
    - Public comments and gather feedback.

- Gather dates from localities regarding when presentations to BOS and/or public outreach will be given.

☐ 1/19/2016-1/27/2016 - MPPDC staff will make recommended changes

☐ 1/28/2016 – 3/29/2016 - MPPDC staff will send final plan to FEMA for a 60 day review. During this time localities should consider hosting public outreach meetings and/or presenting the plan to the BOS. VDEM recommends that each locality adopt the plan after FEMA reviews and approves the plan. Therefore adoption of this plan will most likely take place in April or May 2016. Please note that the 2010 Middle Peninsula Natural Hazards Plan expires May 2016 therefore the 2016 plan should be adopted no later than May 2016 in order to stay compliant with the National Flood Insurance Program.

Other Topics

Ms. Rickards asked the group if they had plans to date to present the plan to their Board of Supervisors and Town Councils. Below are the responses:

1. **Town of West Point:** This plan will need to go through the Public Safety Committee and then the Town Council. Currently the plan is to present the plan to the Public Safety Committee in March and then present the plan to the Council on April 26, 2016. Holly McGowan requested that Ms. Rickards be present at that meeting.
2. **Middlesex County:** The plan was presented at the January 5, 2016 Board of Supervisors meeting and Mr. Nugent plans to recommendation plan adoption at the April 5th or May 3rd meeting of the BOS.
3. **Town of Urbanna:** John Gill said that he will double check with the Town Manager, but he's assumes that the plan will be presented at the April 18, 2016 meeting at 7pm.
4. **Essex County:** Jimmy Brann said that the plan will be presented at the April 12, 2016. He also requested that Ms. Rickards attend the meeting.
5. **King William County:** Chris Bruce will need to discuss this with the County Administration, however the meeting in April is scheduled on the 4th.
6. **Gloucester County:** Creig Moore will double check with the County Administration on how they want to present the plan to Board of Supervisors.

Please note that these dates may change. It will depend on how quick FEMA responds.

Next Meeting

Feedback provided by FEMA will determine whether or not another meeting will be scheduled.

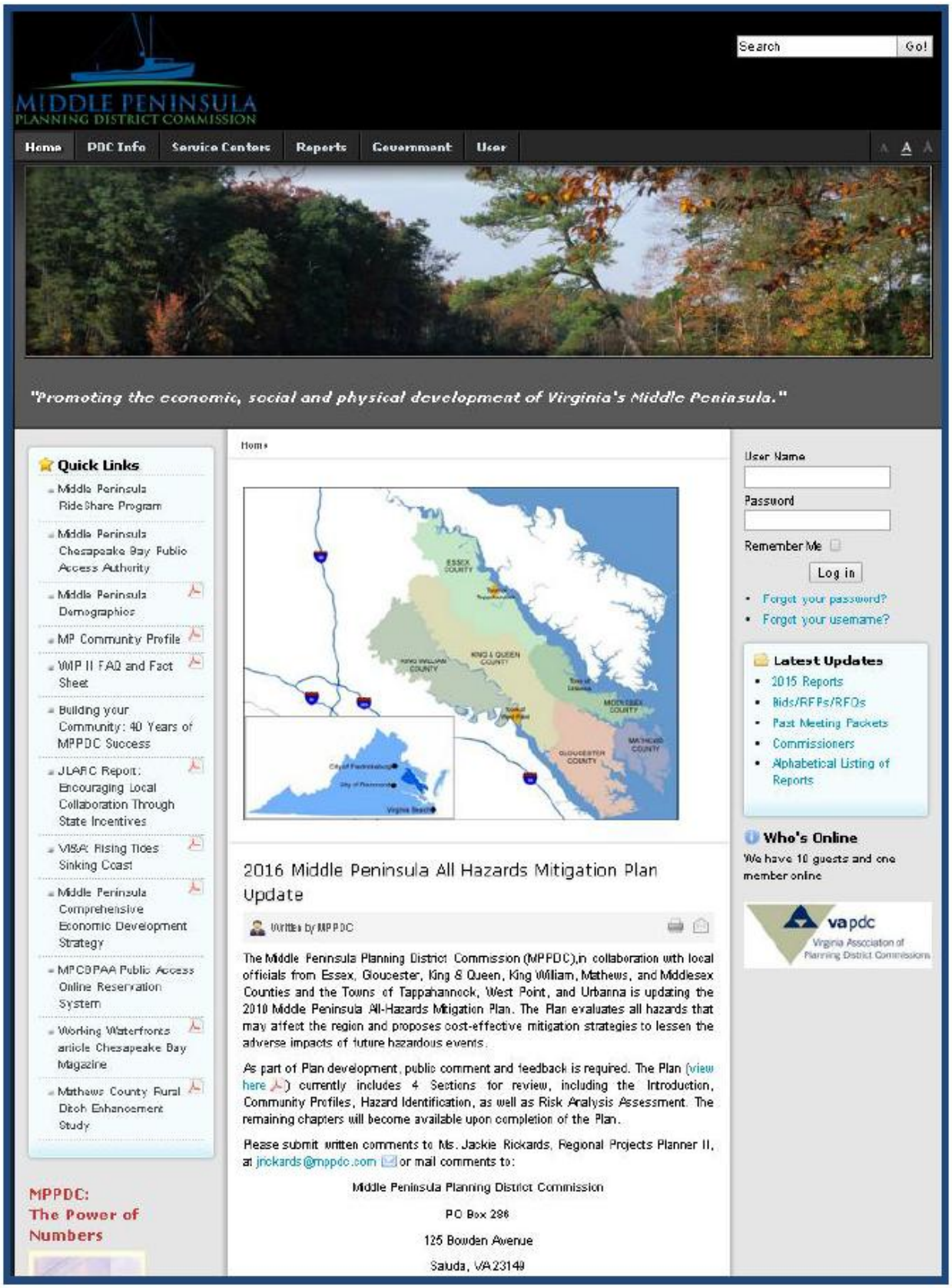
Appendix D –
Public Meeting Sign-in Sheet (January 6, 2016)

Sign-In Sheet

All Hazards Mitigation Plan Public Meeting
January 6, 2016
King & Queen County Library
5 – 7pm

Name	Town and County of Residence	Email
Clariest Brown	King William, Va	thomasclariest@yahoo.com

Appendix E -
Public Comment Announcement on the MPPDC website


Search
Go!
MIDDLE PENINSULA
PLANNING DISTRICT COMMISSION
Home
PDC Info
Service Centers
Reports
Government
User
"Promoting the economic, social and physical development of Virginia's Middle Peninsula."
Quick Links
Middle Peninsula Ride Share Program
Middle Peninsula Chesapeake Bay Public Access Authority
Middle Peninsula Demographics
MP Community Profile
WIP II FAQ and Fact Sheet
Building your Community: 40 Years of MPPDC Success
JLARC Report: Encouraging Local Collaboration Through State Incentives
VIMS: Rising Tides Sinking Coast
Middle Peninsula Comprehensive Economic Development Strategy
MPCBPAA Public Access Online Reservation System
Working Waterfronts article Chesapeake Bay Magazine
Mathews County Rural Ditch Enhancement Study
MPPDC: The Power of Numbers
Home »
2016 Middle Peninsula All Hazards Mitigation Plan Update
Written by MPPDC
The Middle Peninsula Planning District Commission (MPPDC),in collaboration with local officials from Essex, Gloucester, King & Queen, King William, Mathews, and Middlesex Counties and the Towns of Tappahannock, West Point, and Urbanna is updating the 2010 Middle Peninsula All-Hazards Mitigation Plan. The Plan evaluates all hazards that may affect the region and proposes cost-effective mitigation strategies to lessen the adverse impacts of future hazardous events.
As part of Plan development, public comment and feedback is required. The Plan (view here) currently includes 4 Sections for review, including the Introduction, Community Profiles, Hazard Identification, as well as Risk Analysis Assessment. The remaining chapters will become available upon completion of the Plan.
Please submit written comments to Ms. Jackie Rickards, Regional Projects Planner II, at jrickards@mppdc.com or mail comments to:
Middle Peninsula Planning District Commission
PO Box 286
125 Bowden Avenue
Saluda, VA 23149
User Name
Password
Remember Me
Log in
Forgot your password?
Forgot your username?
Latest Updates
2015 Reports
Bids/RFPs/RFQs
Past Meeting Packets
Commissioners
Alphabetical Listing of Reports
Who's Online
We have 10 guests and one member online
vapdc
Virginia Association of Planning District Commissions

Appendix F –
Gazette Journal Press Releases

GLOUCESTER-MATHEWS
GAZETTE-JOURNAL

Public comment sought on regional hazard plan

by Bill Nachman - Posted on Jun 24, 2015 - 12:40 PM

The Middle Peninsula Planning District Commission is seeking public comment as its staff works to update the 2011 Middle Peninsula All-Hazards Mitigation Plan, which addresses about two dozen types of hazards from hurricanes to coastal flooding to hazardous material spills.

Jackie Rickards, regional project planner for MPPDC, said that the public comment period will begin Monday, June 29, and end Tuesday, July 28.

"As part of this project," Rickards said, "there is a public participation component which needs to include notifying the public that there is a 30-day review and comment period as well as two scheduled public meetings." She said that update will include "more transportation side of things," such as the Hazmat situations.

One meeting will be held from 5-7 p.m. Wednesday, July 29, at King and Queen Library Conference Room on Newtown Road in St. Stephens Church. The second meeting will be held from 5-7 p.m. Thursday, July 30, at the MPPDC office on Bowden Avenue in Saluda.

Copies of the plan are available for review from June 29-July 28 at the Gloucester and Mathews public libraries, as well as several other libraries in the region. Comments may be sent via e-mail to jrickards@mppdc.com or mail to MPPDC, P.O. Box 286, Saluda, Va. 23149.

Only the updated introduction, community profiles, hazard intensity and risk analysis assessment components of the plan will be available for review at this time, Rickards said, and additional public comments on other components of the plan will be sought later.

The MPPDC board is expected to adopt the revised plan by May 2016, Rickards said. For more information, call MPPDC at 758-2311.

© Copyright 2010-2015, Tidewater Newspapers, Inc. All Rights Reserved.
P.O. Box 2060, Gloucester, VA 23061 - phone: 804-693-3101

GLOUCESTER-MATHEWS
GAZETTE-JOURNAL
News and Information for Gloucester and Mathews, Virginia | Thursday, December 31, 2015 Vol. LXXVIII, no. 53 NEW SERIES

MPPDC meetings next month on hazard plan

| POSTED ON DEC 16, 2015 - 01:23 PM

PRINTER FRIENDLY VIEW

The Middle Peninsula Planning District Commission will hold two public meetings in early January to help update the 2011 Middle Peninsula All-Hazards Mitigation Plan.

Jackie Rickards, regional project planner for MPPDC, said hearings are scheduled from 5-7 p.m. Tuesday, Jan. 5, in the commission boardroom on Bowden Street in Saluda and from 5-7 p.m. Wednesday, Jan. 6 in the King & Queen Branch Library Conference Room on Newtown Road in St. Stephens Church.

The current plan addresses about two dozen types of hazards from hurricanes to coastal flooding to hazardous material spills. Copies of the plan are available of review at a number of libraries in the region. For more information, contact Rickards at jrickards@mppdc.com or call 758-2311.

To view this article in its entirety, subscribe here. Already an online subscriber? Login Here

GLOUCESTER-MATHEWS
GAZETTE-JOURNAL
News and Information for Gloucester and Mathews, Virginia | Thursday, December 31, 2015 Vol. LXXVIII, no. 53 NEW SERIES

HOME ABOUT NEWS OPINION SCHOOLS SPORTS FOOD OBITUARIES CLASSIFI

Home » News

Meetings next week on hazard mitigation plan

| POSTED ON DEC 30, 2015 - 11:26 AM

PRINTER FRIENDLY VIEW

The Middle Peninsula Planning District Commission will hold two public meetings next week to help update the 2011 Middle Peninsula All-Hazards Mitigation Plan.

Meetings will be held from 5-7 p.m. Tuesday in the commission boardroom on Bowden Street in Saluda and from 5-7 p.m. next Wednesday, Jan. 6, in the King and Queen Branch Library Conference Room on Newtown Road in St. Stephens Church.

The current plan addresses about two dozen types of hazards from hurricanes to coastal flooding to hazardous material spills. Copies of the plan are available of review at a number of libraries in the region. For more information, contact jrickards@mppdc.com or call 758-2311.

To view this article in its entirety, subscribe here. Already an online subscriber? Login Here

Appendix G –
Public Comments Received During the Comment Periods

PUBLIC COMMENT PERIOD 1(JUNE 29, 2015 – JULY 28, 2015)

July, 30, 2015

To Whom It May Concern:

Ref: Public Comments on the ***2016 Middle Peninsula All-hazards Mitigation Draft Plan***

I find it very disturbing to see a continuing trend/push by the federal/state/local governments to write ***climate change/sea level rise*** language into our local emergency planning documents, as is in the case of the ***2016 Middle Peninsula All-hazards Mitigation Draft Plan.***
http://www.mppdc.com/articles/service_centers/mandates/Draft_AHMP_Public_Comment_1507.pdf
For several examples see: **Chart** Pg. 14; **Air Quality** Pg. 26-31; **Sea Level Rise** pg. 46; **Hurricanes** Pgs. 60-61.

The ***2016 Middle Peninsula All-hazards Mitigation Draft Plan*** is blatantly setting the stage to move forward with the crushing economic and political agendas of the Obama administration [in concert with the United Nations], with policies which will ***adversely affect the 5th Amendment guaranteed use of our private property rights by way of locally adopted ordinances***!

I have seen firsthand at Middle Peninsula Planning District Commission meetings [which mimic other Planning District Commissions] that ***local planning*** is driven by federal GRANTS [and flow-through state GRANTS], resulting in the adoption of all manner of unacceptable policies, which are forced on citizens in our communities. I have also seen when the GRANT money runs out, we taxpayers, end up with the tab for the duration!!

People are always astounded to hear that the MPPDC staffs actually get ***paid based on the number of GRANTS*** they secure for the Middle Peninsula local governments! Quantity not quality for the local citizens...

The issue of climate change/sea level rise is NOT settled science, quite the opposite. As the rest of the world has stopped the scam in its tracks, the administration continues on this destructive path. These issues have NO place in local emergency planning documents!

Attached, as inclusions to my comments, are a number of documents which disclosing current thinking about the issue.

Mr. Lawrence has emphatically stated in MPPDC meetings on several occasions that the Middle Peninsula is sinking due to land subsidence. This draft plan contradicts his claim. It appears that has become more politically correct to claim the *sea is rising* than the *land is sinking*!
See:
Pg. 34 4.2.5. Land Subsidence/Karst
"Land subsidence is the lowering of surface elevations due to changes made underground. The USGS notes that land subsidence is usually caused by human activity such as pumping of water, oil, or gas from underground reservoirs. Land subsidence often occurs in regions with mildly acidic groundwater and the geology is dominated by limestone, dolostone, marble or gypsum. Karst is the term used to refer to geology dominated by limestone and similar soluble rocks. The acidic groundwater dissolves the surrounding geology creating sinkholes. Sinkholes are classified as natural depressions of the land surface. Areas with large amounts of karst are characterized by the presence of sinkholes, sinking

streams, springs, caves and solution valleys. ***These conditions do not occur in the Middle Peninsula (Figure 12)."***

In addition to my comments on the ***2016 Middle Peninsula All-hazards Mitigation Draft Plan,*** I am including my formal complaint regarding the MPPDC citizen participation plan, in which the MPPDC scheduled its **public comment period to end before the public meetings.** Chairman Smith assured me he would seek the other MPPDC Commissioners input on extending the comment period at the last MPPDC meeting, but he failed to do so.

I request this reversed-sequenced citizen participation plan schedule not be repeated in the future, as a simple curtesy to Middle Peninsula constituents.

B.L.
Dunnsville, VA

July 31, 2015

MPPDC,

I believe a mitigation plan is a tool which should be used to "react" to a hazardous event. Any inclusion of a mandate or requirement placed upon property owners due to climate change, sea level rise or land subsidence, must be done so "only" with demonstrated, proven scientific results. This cannot be done with "modeling and assumptions" and that is all that you have at the moment. Please do not mandate to citizens what they are limited to do because you "assume" there is a need. It must be demonstrated with real proof, not theory.

I am strongly against any inclusion otherwise.

Respectfully,

B.B.
Dunnsville, VA 22454
Essex County

August 3, 2015

I have read the 2016 Middle Peninsula All-hazards Mitigation Plan with alarm. Not that the stats disturb me. I have lived long enough to know that hurricanes, tornadoes, snow, rain and sunshine happens. What concerns me is the extent to which government is getting involved. As if we humans have had a part in the cause and that government is the solution.

More and more there is solid evidence that climate change is in no way caused by human activities. For example:
The World Health Organization has been exposed by a leading U.S./UN climate scientist for using fraudulent statistics and methodologies to push for more UN control over energy and human activity.
http://www.thenewamerican.com/tech/environment/item/19635-un-ipcc-scientist-scorches-who-for-exaggerating-deaths-caused-by-global-warming?utm_source=Newsletter&utm_campaign=6bc703daea-

The_Editors_Top_Picks_3_12_143_12_2014&utm_medium=email&utm_term=0_8ca494f2d2-6bc703daea-289802065

and

The Obama Defense Department is at it again, ratcheting up the global warming fear index http://www.thenewamerican.com/tech/environment/item/21348-obama-pentagon-flogs-discredited-climate-fears-again

How much of our money was wasted in producing this plan? Was it so that government could dictate how and where we live in order to meet the designs of government? I can't think of any other plausible reason.

Thank you for your consideration.

S.L.
Mathews County

August 3, 2015

Ms Richards,

It concerns me that the Middle Peninsula Planning District Commission continues to support the idea of climate change with it's bogus effects on the environment. The climate has not warmed in almost two decades but the assertion that it has continues. Please consider the following.

Here is the smoking gun. Speaking at a news conference in Brussels earlier this year was Christiana Figueres, executive secretary of the U.N.'s Framework Convention on Climate Change who admitted that the goal of environmental activists is not to save the world from ecological calamity but to **destroy capitalism.** She said "This is the first time in history that we are setting ourselves the task of intentionally, within a defined period of time, to change the economic development model that has been reigning for at least 150 years, since the industrial Revolution." Referring to a new international treaty, environmentalist hope will be adopted at the Paris climate change conference later this year she added "This is probably the most difficult task we have ever given ourselves, which is to intentionally transform the economic model for the first time in history".

D.E.

August 4, 2015

J Rickards, MPPDC,

I believe a mitigation plan is a tool which should be used to "react" to a hazardous event. Any inclusion of a mandate or requirement placed upon property owners due to climate change, sea level rise or land subsidence, must be done so "only" with demonstrated, proven scientific results. This cannot be done with "modeling and assumptions" and that is all that you have at the moment. Do not mandate to

citizens what they are limited to do because you "assume" there is a need. It must be demonstrated with real proof, not some assumed theory.
I am strongly against any inclusion otherwise.

Respectfully,

S.R. B.
Laneview, Va.
Essex County

PUBLIC COMMENT PERIOD 2 (DECEMBER 16, 2015 – JANUARY 14, 2016)

January 13, 2016

Please do not include any reference to Climate change or sea level rise into the all hazard mitigation plan as These issues are not yet PROVEN science as relates to the plan Thank you D. D. -- Hartfield, Va.

January 14, 2016

Ms. Rickards;

As a citizen in King William County, I am concerned about the far reaching effects of government and overstepping its bounds. The issue of climate change and sea level is not a proven science any more then evolution.....That is only one theory.....

Thus I ask that this document strip reference to climate change and sea level rise and focus tangible and measurable items, such as natural disasters and hazards associated with transportation.

B.E.
King William

January 14, 2016

A mitigation plan is a tool which should be used to "react" to naturally occurring hazardous events. Any inclusion of climate change, sea level rise or land subsidence, has nothing to do with natural causes and is solely done with political intent. Climate change terminology must be excluded since it is deemed a so called, human caused event on "modeling only' and not scientific fact. The purpose of the mitigation plan is to protect the citizens of this region with inclusions of all the naturally occurring hazardous events so as to be able to be assisted by FEMA. Let's remove the politics from the plan and do what is intended by the document. Lightning, earthquakes, droughts, and "floods," etc. occur naturally and nothing more needs to be said. Once terminology is documented and included as something that is not.... it can become that thing. Otherwise, the continued inclusion of that terminology sets the precedent to include, arson, terrorism, home invasions and who knows what else. I would suggest that termites destroying an individuals home would need to be listed as a naturally caused event and therefore could also be included if you continue down this road. I hope you capture

what is indeed needed, and nothing more. Only the terminologies to best protect the citizens and nothing more. That is what this mandate is all about.... stop the political inclusions.

I believe the public comment period expires tomorrow, Thursday the 14th, and most folks, including myself, were never provided ample notification for response. I hope that others are able to provide their comments in time.

Respectfully,

B.B.
Dunnsville, VA
Essex County

January 14, 2016

Members of the MPPDC,

A mitigation plan is a tool which should be used to "react" to naturally occurring hazardous events. Any inclusion of climate change, sea level rise or land subsidence, has nothing to do with natural causes and is solely done with political intent. Climate change terminology must be excluded since it is deemed a so called, human caused event on "modeling only' and not scientific fact. The purpose of the mitigation plan is to protect the citizens of this region with inclusions of all the naturally occurring hazardous events so as to be able to be assisted by FEMA.

Let's remove the politics from the plan and do what is intended by the document. Lightning, earthquakes, droughts, and "floods," etc. occur naturally and nothing more needs to be said. Once terminology is documented and included as something that is not.... it can become that thing. Otherwise, the continued inclusion of that terminology sets the precedent to include, arson, terrorism, home invasions and who knows what else. I would suggest that termites destroying an individuals home would need to be listed as a naturally caused event and therefore could also be included if you continue down this road.

I hope you capture what is indeed needed, and nothing more. Only the terminologies to best protect the citizens and nothing more. That is what this mandate is all about.... stop the political inclusions.

I believe the public comment period expires tomorrow, Thursday the 14th, and most folks, including myself, were never provided ample notification for response. I hope that others are able to provide their comments in time.

Respectfully,

S. B.
Laneview, Va.
Essex County

January 14, 2016

Dear Louis,

I hope that you will take in account the following as my attempt to insert my feelings as a "Public Comment".

A mitigation plan is a tool which should be used to "react" to naturally occurring hazardous events. Any inclusion of climate change, sea level rise or land subsidence, has nothing to do with natural causes and is solely done with political intent. **Climate change terminology must be removed since it is deemed a so called, human caused event on "modeling only' and backed by scientific studies calling climate change an effect of human behavior.** . The purpose of the mitigation plan is to protect the citizens of this region with inclusions of all the **naturally occurring hazardous events** so as to be able to be assisted by FEMA. Let's just do what is intended by the document. Lightning, earthquakes, droughts, floods, tornadoes, hurricanes, sink holes and insect infestation,etc. occur naturally and nothing more needs to be said. Once terminology is documented and included as something that it is not.... it is opened up to all kinds of other disasters that are human caused and not natural events. Otherwise, the continued inclusion of terminology that is not **natural caused** sets the precedent to include, arson, terrorism, home invasions and who knows what else. I hope you capture what is indeed needed, and nothing more. Only the terminologies to best protect the citizens and nothing more. That is what this mandate is all about.

B. C.
Dunnsville, VA
Essex County

January 14, 2016

Members of the MPPDC,

A mitigation plan is a tool which should be used to "react" to naturally occurring hazardous events. Any inclusion of climate change, sea level rise or land subsidence, has nothing to do with natural causes and is solely done with political intent. Climate change terminology must be excluded since it is deemed a so called, human caused event on "modeling only' and not scientific fact. This terminology is the basis for the biggest hoaks ever perpetrate on the citizens of America and does not exist. The purpose of the mitigation plan is to protect the citizens of this region with inclusions of all the naturally occurring hazardous events so as to be able to be assisted by FEMA.

Let's remove the politics from the plan and do what is intended by the document. Lightning, earthquakes, droughts, and "floods," etc. occur naturally and nothing more needs to be said. Once terminology is documented and included as something that is not.... it can become that thing. Otherwise, the continued inclusion of that terminology sets the precedent to include, arson, terrorism, home invasions and who knows what else. I would suggest that termites destroying an individuals home would need to be listed as a naturally caused event and therefore could also be included if you continue down this road.

I hope you capture what is indeed needed, and nothing more. Only the terminologies to best protect the citizens and nothing more. That is what this mandate is all about.... stop the political inclusions.

I believe the public comment period expires tomorrow, Thursday the 14th, and most folks, including myself, were never provided ample notification for response. I hope that others are able to provide

their comments in time.

Respectfully

D.R.

January 19, 2016

To whom it may concern:

Local emergency plans are very important documents.

I request the plan that will be submitted to the various counties and towns needs to be simplified to a minimum document.

Climate change and sea level rise is still debatable.

Is the issue sea level rise or land subsidence? It could be one, both or neither.

In the 2016 All-Hazards Mitigation Plan Update neither sea level rise or land subsidence occur in the Middle Peninsula. (page 34, 4.2.5. Land Subsidence/KARSD)

The reference to sea level rise or land subsidence should be removed from the update.

As Global Warming is unfinished science, that entire section should be removed from the document.

If necessary, when the science is settled, can be added or not in subsequent updates.

Thank you,
W. L.
Dunnsville, VA
Essex County

January 14, 2016

Return Receipt Requested

To Whom It May Concern:

Ref: Public Comments on the ***2016 Middle Peninsula All-Hazards Mitigation Plan Update***

It is crystal clear that the MPPDC, as part of the VAPDC system, is pushing a federal/state ***political agenda*** onto cities/counties/towns' local emergency planning documents by way of the unsettled "science" of *manmade* global warming and sea level rise!

As the current Federal Administration has been unable to pressure the U.S. Congress to adopt this ***political* agenda** into federal law, the Executive Branch is now in its "recurring mode" of going around Congress. The "go around" includes withdrawing emergency funding for FEMA insurance claims, if the locales resist the adoption of the ***2016 All-Hazards Mitigation Plan Update*** with its unacceptable language [*manmade* global warming and sea level rise]! Climate change and sea level rise are ***world policies*** enacted through the *United Nations*. Of note: the U.S. Constitution disallows the implementation of ***foreign policy***, without the approval of the United States Senate!

The MPPDC, in concert with the *American Planning Association's* master planning book and with facilitators, uses the Hegelian dialectic tools, to steer/control groups to get a "consensus" in order to achieve the desired "predetermined conclusion". Using Regionalism, local elected officials are pressured into "compliance" on plans [with threats of penalties] in order to qualify for government grants, thereby illegally depriving and adversely affecting their constituents U.S. Constitution 5th Amendment guaranteed use of their private property rights, by way of ***locally adopted ordinances!***
The following statements best explain the value of ***consensus*** in creating sound conclusions to deal with an unknown series of events [with unprovable unscientific theories] predicted 30-50 years or more into the future:

"Appealing to a (false) consensus is a political argument and a propaganda technique to deflect from your lack of facts or empirical evidence. Consensus has no legitimacy in science."
[odin2 Biologyteacher100 http://www.thenewamerican.com/tech/environment/item/22294-disarming-the-alarmists-climate-change-myth-takes-three-more-hits]
You don't have to be Einstein to understand the following, but it helps:

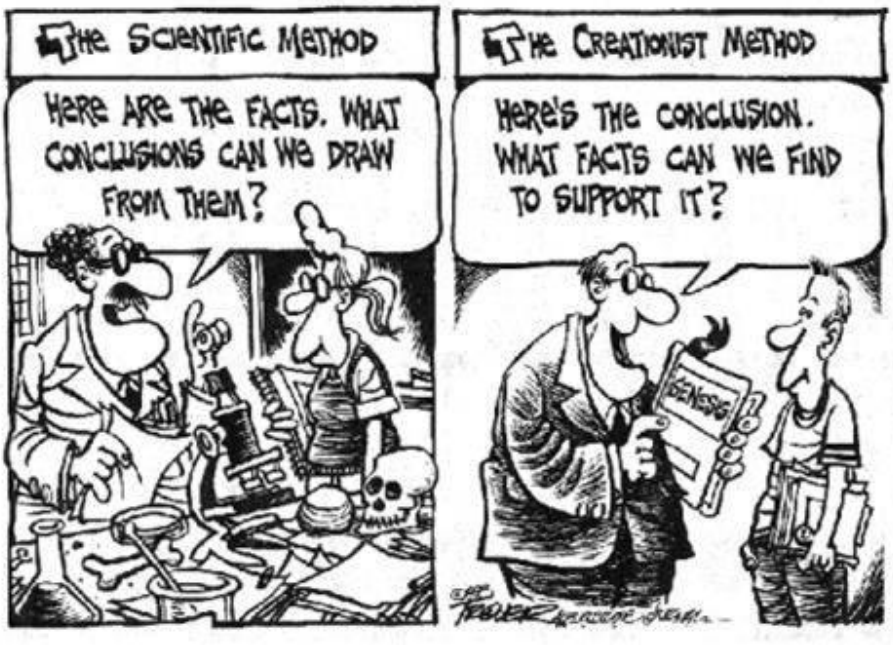
Albert Einstein said: ***"The important thing is not to stop questioning." So why do so many people insist the science is beyond dispute and that there's nothing further to discuss?"***
Concerning the Hegelian dialectic and its sister, the Delphi method:

"Overall the track record of the Delphi method is mixed...It must also be realized that ***in areas such as science and technology forecasting, the degree of uncertainty is so great that exact and always correct predictions are impossible, so a high degree of error is to be expected."***
https://en.wikipedia.org/wiki/Delphi_method

On an examination of why the MPPDC dedicates so much time "designing plans", the bones of which were already provided by the *American Planning Association* [with their funding coming from the federal government], see the explanation below:
Global Warming /Climate Change is based on solid facts. Paul Watson, the co-founder of Greenpeace has said, "The data does not matter, it does not matter what is true, it only matters what people believe is true."

The truth of the matter is best stated by Donna Holt, Executive Director, *Campaign for Liberty:*
"In the absence of any clear scientific evidence, central planning is an inappropriate extreme that should be avoided. It suggests that it's more about greater government control over the population than protecting the environment."
www.campaignforliberty.com/VA 12/25/2011

A Visual:



RE: Link: draft plan *2016 Middle Peninsula All-Hazards Mitigation Plan Update* **Section: 4.3.6. Sea Level Rise** Pages 56-59

RE: http://www.mppdc.org/index.php/service-centers/mandates/hazards :
"The plan will address several natural hazards, including hurricanes, winter storms, tornadoes, coastal flooding, coastal/shoreline erosion, ***sea level rise****, winter storms, wildfire, riverine flooding, wind, dam failures, drought, lightning, earthquakes, shrink-swell soils, extreme cold, extreme heat, landslides, land subsidence/karst, tsunami, and volcanoes."*

***8/4/15 Statement from Lewie Lawrence, Director of MPPDC:

"The 2016 Middle Peninsula All-Hazard Mitigation Plan is driven by Federal requirements established under the Disaster Mitigation Act of 2000[**]. The Findings and Purpose of this Act is clear and enumerated below. If you disagree with the purpose of the Act, please contact Congressman Rob Wittman (VA-1) office as only Congress can change the requirements cited under the Act.

MPPDC is under contract acting on behalf of and for Middle Peninsula local governments. If you have concerns about your local government remaining consistent with the Disaster Mitigation Act of 2000, this is a local issue and I direct your inquiry to the Essex County Board of Supervisors as the adoption of the Middle Peninsula All Hazard Mitigation Plan can only be done by action of the local Board of Supervisor once approved by FEMA.

As with the two previous Middle Peninsula mitigation plans, FEMA will make the final determination of plan elements and appropriateness of plan contents. If you have suggestions concerning methodology and a litmus test for deciding what data is appropriate for inclusion, please contact FEMA directly to discuss your concerns. Our liaison at the Virginia Department of Emergency Management is CC'd above and can provide FEMA contact information if requested."

I ask, where is ***climate change/sea level rise identified in the *Disaster Act of 2000* [See below**]? Is the federal government using bogus "science" to explain normal planet earth events, so as to regulate all aspects of our lives? I think yes…

The Supreme Court has ruled that the cost of ***regulations enacted* must be justified by *results obtained*.** The need/costs to regulate the planet cannot be justified with climate change/sea level rise claims of ultimate remediation obtained. ***Verifiable data is unattainable through unreliable "modeling".***

***Below is the Act referred to by Mr. Lawrence:

DISASTER MITIGATION ACT OF 2000**

SEC. 101. FINDINGS AND PURPOSE.

(a) FINDINGS.—Congress finds that—

42 USC 5133
note.

42 USC 5121
note.

Disaster Mitigation Act of 2000.

Oct. 30, 2000

[H.R. 707]

PUBLIC LAW 106–390—OCT. 30, 2000 114 STAT. 1553

(1) natural disasters, including earthquakes, tsunamis, tornadoes, hurricanes, flooding, and wildfires, pose great danger to human life and to property throughout the United States;

(2) greater emphasis needs to be placed on—

(A) identifying and assessing the risks to States and local governments (including Indian tribes) from natural disasters;

(B) implementing adequate measures to reduce losses from natural disasters; and

(C) ensuring that the critical services and facilities of communities will continue to function after a natural disaster;

(3) expenditures for postdisaster assistance are increasing without commensurate reductions in the likelihood of future losses from natural disasters;

(4) in the expenditure of Federal funds under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121 et seq.), high priority should be given to mitigation of hazards at the local level; and

(5) with a unified effort of economic incentives, awareness and education, technical assistance, and demonstrated Federal support, States and local governments (including Indian tribes) will be able to—

(A) form effective community-based partnerships for hazard mitigation purposes;

(B) implement effective hazard mitigation measures that reduce the potential damage from natural disasters;

(C) ensure continued functionality of critical services;

(D) leverage additional non-Federal resources in meeting natural disaster resistance goals; and

(E) make commitments to long-term hazard mitigation efforts to be applied to new and existing structures.

(b) PURPOSE.—The purpose of this title is to establish a national disaster hazard mitigation program—

(1) to reduce the loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters; and

(2) to provide a source of predisaster hazard mitigation funding that will assist States and local governments (including Indian tribes) in implementing effective hazard mitigation measures that are designed to ensure the continued functionality of critical services and facilities after a natural disaster.

***Statement of MPPDC Planner J. Rickards [8/4/15] in answer to questions about WHY counties/towns need to adopt the 2016 Middle Peninsula All-Hazards Mitigation Plan Update:

"The development of an All-Hazards Mitigation Plan is a federal requirement in order to receive disaster mitigation funding. If a locality does not participate in the development of an All Hazards Mitigation Plan then private property owners, public entities, and businesses cannot receive disaster mitigation funding. For instance, let's say a hurricane comes through the Middle Peninsula and several properties are flooded. Most property owners recover just fine from the incident but there is one private property owner that is tired of cleaning up after floods and he/she wants to elevate his/her home. If his locality worked on and adopted an All Hazards Mitigation Plan then this private property owner could work with his locality to receive the necessary disaster mitigation funding. However if his locality did not work on or adopt an All Hazards Mitigation Plan then the private property owner is not eligible to apply."

***My emailed public comments to MPPDC Planner J. Rickards [7/30/15] were as follows:
"I find it very disturbing to see a continuing trend/push by the federal/state/local governments to write ***climate change/sea level rise*** language into our local emergency planning documents, as is in the case of the ***2016 Middle Peninsula All-hazards Mitigation Draft Plan.***

http://www.mppdc.com/articles/service_centers/mandates/Draft_AHMP_Public_Comment_1507.pdf
For several examples see: **Chart** Pg. 14; **Air Quality** Pg. 26-31; **Sea Level Rise** pg. 46; **Hurricanes** Pgs. 60-61.

The ***2016 Middle Peninsula All-hazards Mitigation Draft Plan*** is blatantly setting the stage to move forward with the crushing economic and political agendas of the Obama administration [in concert with the United Nations], with policies which will ***adversely affect the 5th Amendment guaranteed use of our private property rights by way of locally adopted ordinances***!

I have seen firsthand at Middle Peninsula Planning District Commission meetings [which mimic other Planning District Commissions] that ***local planning*** is driven by federal GRANTS [and flow-through state GRANTS], resulting in the adoption of all manner of unacceptable policies, which are forced on citizens in our communities. I have also seen when the GRANT money runs out, we taxpayers, end up with the tab for the duration!!

People are always astounded to hear that the MPPDC staffs actually get ***paid based on the number of GRANTS*** they secure for the Middle Peninsula local governments! Quantity not quality for the local citizens...

The issue of climate change/sea level rise is NOT settled science, quite the opposite. As the rest of the world has stopped the scam in its tracks, the administration continues on this destructive path. These issues have NO place in local emergency planning documents!

Attached, as inclusions to my comments, are a number of documents which disclosing current thinking about the issue.

Mr. Lawrence has emphatically stated in MPPDC meetings on several occasions that the Middle Peninsula is sinking due to land subsidence. This draft plan contradicts his claim. It appears that it has become more politically correct to claim the *sea is rising* than the *land is sinking*!

See: *Pg. 34 4.2.5.* ***Land Subsidence/Karst***
"Land subsidence is the lowering of surface elevations due to changes made underground. The USGS notes that land subsidence is usually caused by human activity such as pumping of water, oil, or gas from underground reservoirs. Land subsidence often occurs in regions with mildly acidic groundwater and the geology is dominated by limestone, dolostone, marble or gypsum. Karst is the term used to refer to geology dominated by limestone and similar soluble rocks. The acidic groundwater dissolves the surrounding geology creating sinkholes. Sinkholes are classified as natural depressions of the land surface. Areas with large amounts of karst are characterized by the presence of sinkholes, sinking streams, springs, caves and solution valleys. ***These conditions do not occur in the Middle Peninsula*** *(Figure 12)."*

*** Public comments [July/August 2015] made to MPPDC Planner Ms. J. Rickards, with which I concur:
"I believe a mitigation plan is a tool which should be used to "react" to a hazardous event. Any inclusion of a mandate or requirement placed upon property owners due to climate change, sea level rise or land subsidence, must be done so "only" with demonstrated, proven scientific results. This cannot be done with "modeling and assumptions" and that is all that you have at the moment. Please do not mandate to citizens what they are limited to do because you "assume" there is a need. It must be demonstrated with real proof, not theory
I am strongly against any inclusion otherwise."

I have read the 2016 Middle Peninsula All-hazards Mitigation Plan with alarm. Not that the stats disturb me. I have lived long enough to know that hurricanes, tornadoes, snow, rain and sunshine happens. What concerns me is the extent to which government is getting involved. As if we humans have had a part in the cause, and that government is the solution.

More and more there is solid evidence that climate change is in no way caused by human activities.

For example:
The World Health Organization has been exposed by a leading U.S./UN climate scientist for using fraudulent statistics and methodologies to push for more UN control over energy and human activity.
http://www.thenewamerican.com/tech/environment/item/19635-un-ipcc-scientist-scorches-who-for-exaggerating-deaths-caused-by-global-warming?utm_source=Newsletter&utm_campaign=6bc703daea-The_Editors_Top_Picks_3_12_143_12_2014&utm_medium=email&utm_term=0_8ca494f2d2-6bc703daea-289802065

and

The Obama Defense Department is at it again, ratcheting up the global warming fear index
http://www.thenewamerican.com/tech/environment/item/21348-obama-pentagon-flogs-discredited-climate-fears-again

How much of our money was wasted in producing this plan? Was it so that government could dictate how and where we live in order to meet the designs of government? I can't think of any other plausible reason.

Thank you for your consideration."

***Post note from a Matthews County Citizen who has been sounding a warning about these over-reaching federal/state/local plans:

"I have been warning you for a long time about federal control of localities through grant monies. The Middle Planning District Commission is a major conduit for that. I can only hope that people will come to understand that central planning is destroying their property rights. If you don't believe that, try doing something on your land without planning approval. It has little to do with good stewardship environmentalism, and everything to do with total control.
When you hear or see anything related to climate change, sea level rise, and sustainable development remember this:

This is the smoking gun. Speaking at a news conference in Brussels this year was Christiana Figueres, Executive Secretary of the U.N.'s Framework Convention on Climate Change, who admitted that the goal of environmental activists is not to save the world from ecological calamity, but to destroy capitalism. She said "This is the first time in history that we are setting ourselves the task of intentionally, within a defined period of time, to change the economic development model that has been reigning for at least 150 years, since the industrial revolution." Referring to a new international treaty, environmentalist hope will be adopted at the Paris climate Change Conference later this
year she added "This is probably the most difficult task we have ever given ourselves, which is to intentionally transform the economic model for the first time in history"

B. L.
Dunnsville, VA
Essex County

January 14, 2016

Jackie,
Just like all comments they are blown off by the members of the MPPDC. This commission has lost its way and has been become the extension of the UN agenda 21. I am an American first and I hope that the decision are based on what makes America great not some socialistic agenda that I have seen from the past from this commission. I have been to several meetings and you guys treat the public like second class citizens and the arrogance and some of the non scientific or any basis of truth is astounding. I consider this organization a detriment to our country and mostly the citizens of Essex County. You guys can not even police you members as to there qualifications. I look back no further than David Whitlow from Essex. When will Essex get a TRUE citizen representative? Not a hack who used to be on the BOS. Shame on this organization!

D.R.

January 20, 2016

Ms. Rickards:

Thank you for your response. See attached article about the beneficial effects of CO2 on plants [falsely referred to as "carbon"]. We learned in elementary school that CO2 is "plant food"!
As you know, every year NOAA predicts how many and how intense hurricanes will be in the United States. They can't get it right nor do reasonable people expect them to…

Climate change predictions have been consistently wrong [i.e. Al Gore]. Why do you think the term "global warming" had to be changed to "climate change"? Proponents have had to repeatedly explain why predicted events did not occur! They constantly try to convince us that *"modeling errors"* have been fixed to produce the now corrected "*settled science"*.

The "science" of global warning/sea level rise has been tainted by political hacks who wish to *economically control* our ability to use our private property. Thinking people know that science is never "settled" when it comes to natural events like the weather!

This plan's *political* injection of climate change/sea level rise language must be removed. Like most plans that come out of the White House and the United Nations, this plan is an unconstitutional assault on the private property protections we are afforded by the 5th Amendment.

B.L.
Dunnsville, VA
Essex County

Appendix H –
Tornado History in the Middle Peninsula Region (1950-2014)

Tornado History in the Middle Peninsula Region (1950-2014)												
Date	Time	Affected Counties	Fujita	Fatalities	Injuries	Width (yards)	Length (miles)	Damage	Touch Latitude	Touch Longitude	Lift Latitude	Lift Longitude
5/11/1951	3:00 PM	King and Queen	1	0	0	10	0.1	$5K-$50K	37.55	-76.73	-	-
6/26/1954	7:00 PM	Essex	?	0	0	10	0.1	$500-$5000	37.93	-76.87	-	-
4/25/1975	4:00 PM	Gloucester, Mathews	1	0	4	10	4	$50K-$500K	37.47	-76.48	37.5	-76.42
7/13/1975	7:20 PM	King William	0	0	0	10	0.1	$50-$500	37.77	-77.17	-	-
8/14/1975	7:10 PM	Gloucester	0	0	0	27	0.2	$500-$5000	37.42	-76.53	-	-
8/24/1975	10:30 PM	Gloucester	1	0	0	27	0.1	$500-$5000	37.3	-76.53	-	-
7/15/1976	5:00 PM	Middlesex	1	0	0	10	0.1	-	37.67	-76.58	-	-
9/5/1979	3:30 PM	Gloucester	1	0	0	20	0.5	$5K-$50K	37.23	-76.48	-	-
5/24/1980	4:50 PM	Gloucester	1	0	0	27	0.6	$500-$5000	37.55	-76.53	-	-
5/11/1981	5:30 PM	Middlesex	2	0	0	20	0.2	$5K-$50K	37.68	-76.68	-	-
3/30/1989	3:15 PM	Mathews	1	0	0	150	3	$50K-$500K	37.33	-76.32	37.35	-76.27
10/18/1990	3:00 PM	King William	3	1	0	430	5	$500K-$5M	37.62	-77.1	37.67	-77.05
8/6/1993	12:00 PM	Middlesex	3	0	0	100	2.9	$5K-$50K	37.58	-76.58	-	-
10/5/1995	11:20 AM	King and Queen	1	0	0	150	3	$50K-$500K	37.52	-76.77	37.55	-76.75
7/12/1996	9:05 PM	Gloucester	0	0	0	50	0.5	$10,000	37.28	-76.4	37.28	-76.4
7/12/1996	9:15 PM	Gloucester	0	0	0	50	0.5	$10,000	37.48	-76.62	37.48	-76.62
7/15/1996	5:30 PM	Gloucester	1	0	0	100	7	$100,000	37.27	-76.48	37.28	-76.37
3/9/1998	4:30 AM	Gloucester	0	0	0	50	1.5	$20,000	37.77	-76.42	37.28	-76.4
7/14/2000	6:09 PM	Mathews	0	0	0	20	0.5	$2,000	37.5	-76.3	37.5	-76.3
7/14/2000	5:08 PM	Middlesex	0	0	0	20	0.5	-	37.55	-76.33	37.55	-76.33
5/8/2003	1:15 PM	Essex	0	0	0	50	0.2	-	37.93	-76.85	37.93	-76.85
5/2/2004	8:30 PM	King and Queen	1	0	0	100	1	$30,000	37.67	-76.85	37.67	-76.85
9/8/2004	12:05 PM	King William	0	0	0	100	1	$10,000	37.78	-77.1	37.78	-77.1
7/8/2005	1:15 AM	Middlesex	1	0	0	50	3	$10,000	37.6	-76.6	37.6	-76.6
1/14/2006	1:15 AM	King and Queen	0	0	0	50	0.3	$10,000	37.77	-76.88	37.77	-76.88
9/28/2006	6:35 PM	King and Queen	1	0	0	100	2	$30,000	37.67	-76.8	37.67	-76.8
4/27/2007	10:30 AM	Gloucester	0	0	0	100	5.13	$50,000	37.44	-76.67	37.46	-76.58
4/20/2008	1:58 PM	King William	0	0	0	40	0.3	$10,000	37.72	-77.22	-	-
4/20/2008	4:25 PM	King William	0	0	0	40	0.3	$10,000	37.71	-77.12	-	-
4/20/2008	4:28 PM	King William	0	0	0	25	0.2	$2,000	37.74	-77.15	-	-
4/28/2008	2:55 PM	Gloucester, Mathews	0	0	0	50	11	$20,000	37.39	-76.59	37.47	-76.41
4/28/2008	2:45 PM	Mathews	1	0	0	50	0.3	$50,000	37.39	-76.37	37.39	-76.36
5/31/2008	2:52 PM	King William	0	0	0	50	1	$50,000	37.77	-77.27	37.78	-77.25
4/16/2011	4:45 PM	Gloucester, Mathews	3	2	24	800	46.89	$8,020,000	37.1532	-76.704	37.4636	-76.4241
4/16/2011	4:30 PM	Middlesex	1	0	0	400	1.06	$100,000	37.6743	-76.6037	37.681	-76.5862
4/16/2011	5:25 PM	Middlesex	2	0	0	400	2.8	$6,000,000	37.5331	-76.3528	37.5693	-76.3299
2/24/2012	5:25 PM	Mathews	0	0	0	50	0.75	$20,000	37.3337	-76.3012	37.3356	-76.2878
5/22/2014	4:05 PM	King and Queen	0	0	0	50	0.85	$0.01	37.78	-76.94	37.7709	-76.9297

Appendix I –
Wildfires within the Middle Peninsula 2010 – June 2015 (VDOF, 2015)

Wildfires within the Middle Peninsula 2010 – June 2015 (VDOF, 2015)						
Fire Number	**County Name**	**Fire Origin Type**	**General Cause**	**Specific Cause**	**Fire Start**	**Total Acres**
ESS10001	Essex	Virginia - Non Federal	Debris Burning	Other Debris Burn	3/10/2010	0.2
ESS10002	Essex	Virginia - Non Federal	Smoking	Smoking	3/18/2010	0.3
ESS10003	Essex	Virginia - Non Federal	Equipment Use	Exhaust	5/6/2010	0.2
ESS10004	Essex	Virginia - Non Federal	Debris Burning	Prescribed Burn	5/4/2010	32
ESS10005	Essex	Virginia - Non Federal	Equipment Use	Exhaust	6/12/2010	3
ESS10006	Essex	Virginia - Non Federal	Miscellaneous	Powerlines	6/28/2010	48
ESS10007	Essex	Virginia - Non Federal	Miscellaneous	Other Miscellaneous	6/21/2010	5
ESS11001	Essex	Virginia - Non Federal	Miscellaneous	Powerlines	2/19/2011	21
ESS11002	Essex	Virginia - Non Federal	Miscellaneous	Other Miscellaneous	2/20/2011	0.1
ESS11003	Essex	Virginia - Non Federal	Miscellaneous	Other Miscellaneous	2/20/2011	0.1
ESS11004	Essex	Virginia - Non Federal	Equipment Use	Exhaust	3/5/2011	0.5
ESS11005	Essex	Virginia - Non Federal	Debris Burning	Trash Burn	4/6/2011	5
ESS11006	Essex	Virginia - Non Federal	Miscellaneous	Powerlines	4/20/2011	2
ESS11007	Essex	Virginia - Non Federal	Debris Burning	Other Debris Burn	6/3/2011	0.2
ESS12001	Essex	Virginia - Non Federal	Incendiary	Incendiary	3/30/2012	0.1
ESS12002	Essex	Virginia - Non Federal	Lightning	Lightning	6/22/2012	1
ESS12003	Essex	Virginia - Non Federal	Lightning	Lightning	6/29/2012	0.1
ESS12004	Essex	Virginia - Non Federal	Equipment Use	Friction/Dragging	7/7/2012	3
ESS12005	Essex	Virginia - Non Federal	Miscellaneous	Powerlines	7/9/2012	0.5
ESS13001	Essex	Virginia - Non Federal	Children	Under Age 12	4/3/2013	0.1
ESS13002	Essex	Virginia - Non Federal	Debris Burning	Prescribed Burn	9/27/2013	0.8
ESS14001	Essex	Virginia - Non Federal	Debris Burning	Trash Burn	3/21/2014	0.4
ESS14002	Essex	Virginia - Non Federal	Equipment Use	Equipment Malfunction	4/24/2014	0.1
ESS14004	Essex	Virginia - Non Federal	Miscellaneous	Other Miscellaneous	7/19/2014	7
ESS15001	Essex	Virginia - Non Federal	Smoking	Smoking	3/16/2015	0.1
ESS15002	Essex	Virginia - Non Federal	Miscellaneous	Powerlines	4/22/2015	3
GLO10001	Gloucester	Virginia - Non Federal	Debris Burning	Other Debris Burn	3/20/2010	1
GLO10002	Gloucester	Virginia - Non Federal	Lightning	Lightning	7/18/2010	2
GLO10003	Gloucester	Virginia - Non Federal	Debris Burning	Other Debris Burn	8/27/2010	2
GLO10004	Gloucester	Virginia - Non Federal	Debris Burning	Other Debris Burn	8/28/2010	0.3
GLO10005	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	9/23/2010	0.3
GLO10006	Gloucester	Virginia - Non Federal	Children	Under Age 12	9/25/2010	0.2
GLO11001	Gloucester	Virginia - Non Federal	Debris Burning	Other Debris Burn	12/24/2010	1.5
GLO11002	Gloucester	Virginia - Non Federal	Equipment Use	Friction/Dragging	2/13/2011	3
GLO11003	Gloucester	Virginia - Non Federal	Miscellaneous	Powerlines	2/14/2011	4
GLO11004	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	2/13/2011	9
GLO11005	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	2/17/2011	40
GLO11006	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	2/20/2011	83
GLO11007	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	2/19/2011	140
GLO11008	Gloucester	Virginia - Non Federal	Miscellaneous	Powerlines	2/19/2011	372
GLO11009	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	8/22/2011	5
GLO11010	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	11/14/2011	8
GLO12001	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	4/7/2012	83
GLO12002	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	4/8/2012	40
GLO12003	Gloucester	Virginia - Non Federal	Debris Burning	Trash Burn	4/15/2012	0.5

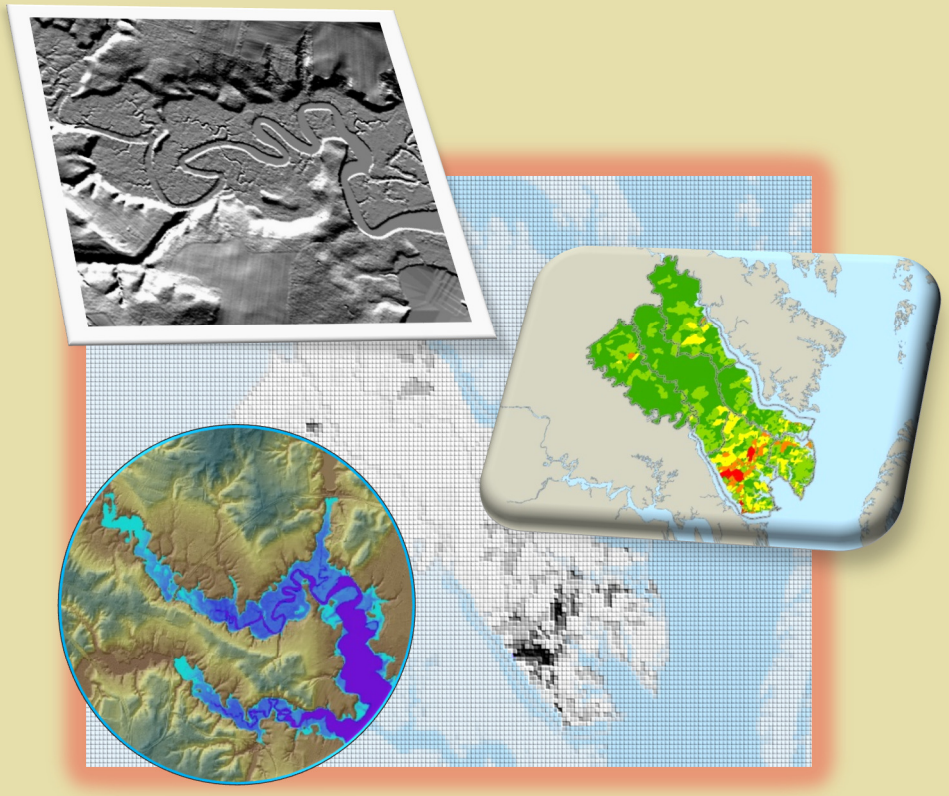
Fire Number	County Name	Fire Origin Type	General Cause	Specific Cause	Fire Start	Total Acres
GLO12004	Gloucester	Virginia - Non Federal	Equipment Use	Friction/Dragging	4/17/2012	1
GLO12005	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	7/7/2012	7.1
GLO12006	Gloucester	Virginia - Non Federal	Debris Burning	Other Debris Burn	8/4/2012	0.3
GLO12007	Gloucester	Virginia - Non Federal	Miscellaneous	Woodstove Ashes	11/25/2012	0.5
GLO13001	Gloucester	Virginia - Non Federal	Debris Burning	Trash Burn	3/28/2013	0.4
GLO13002	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	5/30/2013	3.4
GLO13004	Gloucester	Virginia - Non Federal	Miscellaneous	Powerlines	11/24/2013	0.5
GLO14001	Gloucester	Virginia - Non Federal	Miscellaneous	Firearms/Ammunition	2/27/2014	0.3
GLO14002	Gloucester	Virginia - Non Federal	Debris Burning	Other Debris Burn	3/2/2014	11
GLO14003	Gloucester	Virginia - Non Federal	Miscellaneous	Structure Fires	4/24/2014	2.5
GLO14004	Gloucester	Virginia - Non Federal	Miscellaneous	Powerlines	7/7/2014	0.8
GLO15001	Gloucester	Virginia - Non Federal	Children	Ages 12 - 17	3/12/2015	0.8
GLO15002	Gloucester	Virginia - Non Federal	Debris Burning	Other Debris Burn	3/24/2015	0.7
GLO15003	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	4/2/2015	127
GLO15004	Gloucester	Virginia - Non Federal	Equipment Use	Exhaust	4/2/2015	5
GLO15005	Gloucester	Virginia - Non Federal	Debris Burning	Other Debris Burn	4/6/2015	0.5
GLO15006	Gloucester	Virginia - Non Federal	Incendiary	Incendiary	5/27/2015	11
KAQ10001	King and Queen	Virginia - Non Federal	Miscellaneous	Other Miscellaneous	4/3/2010	0.1
KAQ10002	King and Queen	Virginia - Non Federal	Miscellaneous	Other Miscellaneous	7/24/2010	3
KAQ11001	King and Queen	Virginia - Non Federal	Debris Burning	Other Debris Burn	2/19/2011	5
KAQ12001	King and Queen	Virginia - Non Federal	Debris Burning	Other Debris Burn	2/27/2012	0.1
KAQ12002	King and Queen	Virginia - Non Federal	Lightning	Lightning	6/30/2012	17
KAQ12003	King and Queen	Virginia - Non Federal	Lightning	Lightning	6/29/2012	3
KAQ13001	King and Queen	Virginia - Non Federal	Lightning	Lightning	6/28/2013	2
KAQ13002	King and Queen	Virginia - Non Federal	Equipment Use	Other Equipment Use	6/24/2013	5
KAQ14001	King and Queen	Virginia - Non Federal	Debris Burning	Other Debris Burn	3/15/2014	50
KAQ14002	King and Queen	Virginia - Non Federal	Debris Burning	Prescribed Burn	4/12/2014	0.5
KAQ15001	King and Queen	Virginia - Non Federal	Debris Burning	Other Debris Burn	2/8/2015	16
KWM10001	King William	Virginia - Non Federal	Smoking	Smoking	4/5/2010	2
KWM10002	King William	Virginia - Non Federal	Children	Under Age 12	4/6/2010	0.1
KWM10003	King William	Virginia - Non Federal	Debris Burning	Trash Burn	7/6/2010	2
KWM10005	King William	Virginia - Non Federal	Lightning	Lightning	7/22/2010	2
KWM10006	King William	Virginia - Non Federal	Debris Burning	Prescribed Burn	9/4/2010	1
KWM10007	King William	Virginia - Non Federal	Equipment Use	Friction/Dragging	9/4/2010	6
KWM10008	King William	Virginia - Non Federal	Debris Burning	Prescribed Burn	9/10/2010	1
KWM11001	King William	Virginia - Non Federal	Debris Burning	Trash Burn	2/13/2011	5
KWM11002	King William	Virginia - Non Federal	Miscellaneous	Powerlines	2/14/2011	1
KWM11003	King William	Virginia - Non Federal	Miscellaneous	Other Miscellaneous	2/19/2011	46
KWM12001	King William	Virginia - Non Federal	Miscellaneous	Vehicle Fires	1/16/2012	9.9
KWM12002	King William	Virginia - Non Federal	Smoking	Smoking	4/16/2012	0.1
KWM12003	King William	Virginia - Non Federal	Lightning	Lightning	6/22/2012	12
KWM14001	King William	Virginia - Non Federal	Debris Burning	Trash Burn	2/28/2014	0.5
KWM14002	King William	Virginia - Non Federal	Debris Burning	Other Debris Burn	3/20/2014	0.1
KWM14003	King William	Virginia - Non Federal	Children	Under Age 12	5/2/2014	0.8
KWM14004	King William	Virginia - Non Federal	Children	Under Age 12	5/4/2014	0.2
KWM15001	King William	Virginia - Non Federal	Miscellaneous	Woodstove Ashes	2/6/2015	1
KWM15002	King William	Virginia - Non Federal	Debris Burning	Other Debris Burn	4/5/2015	0.3

Fire Number	County Name	Fire Origin Type	General Cause	Specific Cause	Fire Start	Total Acres
KWM15003	King William	Virginia - Non Federal	Miscellaneous	Powerlines	4/19/2015	0.1
MAT10001	Mathews	Virginia - Non Federal	Debris Burning	Other Debris Burn	5/8/2010	0.5
MAT10002	Mathews	Virginia - Non Federal	Equipment Use	Other Equipment Use	9/18/2010	15
MAT10003	Mathews	Virginia - Non Federal	Smoking	Smoking	11/23/2010	15
MAT11001	Mathews	Virginia - Non Federal	Children	Under Age 12	8/5/2011	0.2
MAT12001	Mathews	Virginia - Non Federal	Lightning	Lightning	6/22/2012	1
MAT12002	Mathews	Virginia - Non Federal	Lightning	Lightning	6/25/2012	0.2
MAT12003	Mathews	Virginia - Non Federal	Lightning	Lightning	6/29/2012	2.3
MAT13001	Mathews	Virginia - Non Federal	Equipment Use	Friction/Dragging	6/1/2013	0.5
MAT14001	Mathews	Virginia - Non Federal	Incendiary	Incendiary	3/11/2014	4.1
MID10001	Middlesex	Virginia - Non Federal	Debris Burning	Trash Burn	4/16/2010	6
MID10002	Middlesex	Virginia - Non Federal	Debris Burning	Trash Burn	4/23/2010	0.1
MID10003	Middlesex	Virginia - Non Federal	Smoking	Smoking	5/1/2010	0.5
MID10004	Middlesex	Virginia - Non Federal	Smoking	Smoking	7/18/2010	0.5
MID10005	Middlesex	Virginia - Non Federal	Miscellaneous	Powerlines	7/28/2010	0.4
MID11001	Middlesex	Virginia - Non Federal	Equipment Use	Exhaust	2/14/2011	0.1
MID11002	Middlesex	Virginia - Non Federal	Debris Burning	Trash Burn	2/15/2011	0.3
MID11003	Middlesex	Virginia - Non Federal	Debris Burning	Other Debris Burn	2/19/2011	478
MID11004	Middlesex	Virginia - Non Federal	Smoking	Smoking	2/19/2011	0.1
MID11005	Middlesex	Virginia - Non Federal	Smoking	Smoking	2/19/2011	0.3
MID11006	Middlesex	Virginia - Non Federal	Lightning	Lightning	6/10/2011	0.1
MID11007	Middlesex	Virginia - Non Federal	Miscellaneous	Structure Fires	11/14/2011	1
MID12001	Middlesex	Virginia - Non Federal	Equipment Use	Exhaust	4/9/2012	0.5
MID12002	Middlesex	Virginia - Non Federal	Debris Burning	Trash Burn	4/14/2012	0.1
MID12003	Middlesex	Virginia - Non Federal	Campfires	Campfires	8/4/2012	0.5
MID12004	Middlesex	Virginia - Non Federal	Debris Burning	Trash Burn	12/4/2012	0.3
MID14001	Mathews	Virginia - Non Federal	Debris Burning	Trash Burn	3/2/2014	0.3
MID14002	Middlesex	Virginia - Non Federal	Miscellaneous	Powerlines	8/26/2014	0.1
MID14003	Middlesex	Virginia - Non Federal	Children	Ages 12 - 17	11/4/2014	0.3
MID14004	Middlesex	Virginia - Non Federal	Miscellaneous	Other Miscellaneous	11/4/2014	0.3
MID15001	Middlesex	Virginia - Non Federal	Miscellaneous	Firearms/Ammunition	4/5/2015	1

Appendix J –
Hazus Methodology

Middle Peninsula Planning District Commission
2015 Hazard Mitigation Plan Update

HAZUS Modeling Report



Dewberry

April 2015

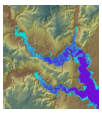
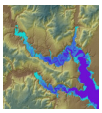


Table of Contents

INTRODUCTION ***1***
Flood Modeling – Riverine Streams ***1***
Issues & Challenges Encountered (with Solutions) 3
Flood Modeling – Coastal ***7***
Issues & Challenges Encountered (with Solutions) 7
Hurricane (Wind) Modeling – Probabilistic Scenario ***13***
Issues & Challenges Encountered 14
Sea Level Rise Modeling – Hazus Flood Model ***15***
Issues & Challenges Encountered 15
Hazus Modeling Results ***16***
Results Exports to GIS 16
Hazus Project Files (HPR) 16

Table of Figures

Figure 1: Riverine 0.2% Annual Chance (500 Year) Depth Grids Comparison 2
Figure 2: Riverine 1% Annual Chance Depth Grid vs. FEMA Digital FIRM Comparison 3
Figure 3: Riverine Failed/Problem Reaches and Riverine Depth Grid vs. Coastal Depth Grid 5
Figure 4: Hazus Shoreline Revisions 8
Figure 5: Hazus Shorelines for King and Queen County vs. FIS Transect Map 10
Figure 6: Hazus Shorelines for King and Queen County vs. FIS Transect Map (Zoom) 10
Figure 7: Hazus Shoreline Data for King and Queen County vs. FIS Table 2 11
Figure 8: Hurricane (Wind) Model Results at the Tract versus Block Geography 14
Figure 9: Depth Grid Areas Added (Red) where NOAA data terminated 15
Figure 10: HPR File Information 16



INTRODUCTION

As part of the Middle Peninsula Planning District Project, Dewberry was asked to perform HAZUS flood and hurricane wind modeling for the next Hazard Mitigation Plan (HMP) revision. The goal and intent of the effort is that Dewberry would provide the MPPDC updated Hazard Identification and Risk Assessment (HIRA) elements that can be incorporated into the final MPPDC HMP. The effort is also a repeat effort in that Dewberry had provided the same services for the currently approved HMP.

Therefore, the work performed seeks to update the previous HIRA section maps, text and tables. Given the nature of hazard mitigation planning and the goals that the Federal Emergency Management Agency (FEMA) has set for jurisdictions to continually improve HMP's from one revision to the next, Dewberry has significantly improved the nature of the Hazus Flood modeling on behalf of the MPPDC. This report documents the various modeling efforts performed and, where appropriate, denotes modeling efforts that transcend previous efforts given available scope, schedule and budget of the project.

This report documents the methodology used to construct the HAZUS modeling efforts and also discusses core model results where applicable. Users of this document are directed to the final HMP that will be completed in the future (2015/2016) by the MPPDC but will include this work effort by Dewberry in the HIRA sections for Hurricane Wind and Flooding to include certain Sea Level Rise scenarios.

Flood Modeling – Riverine Streams

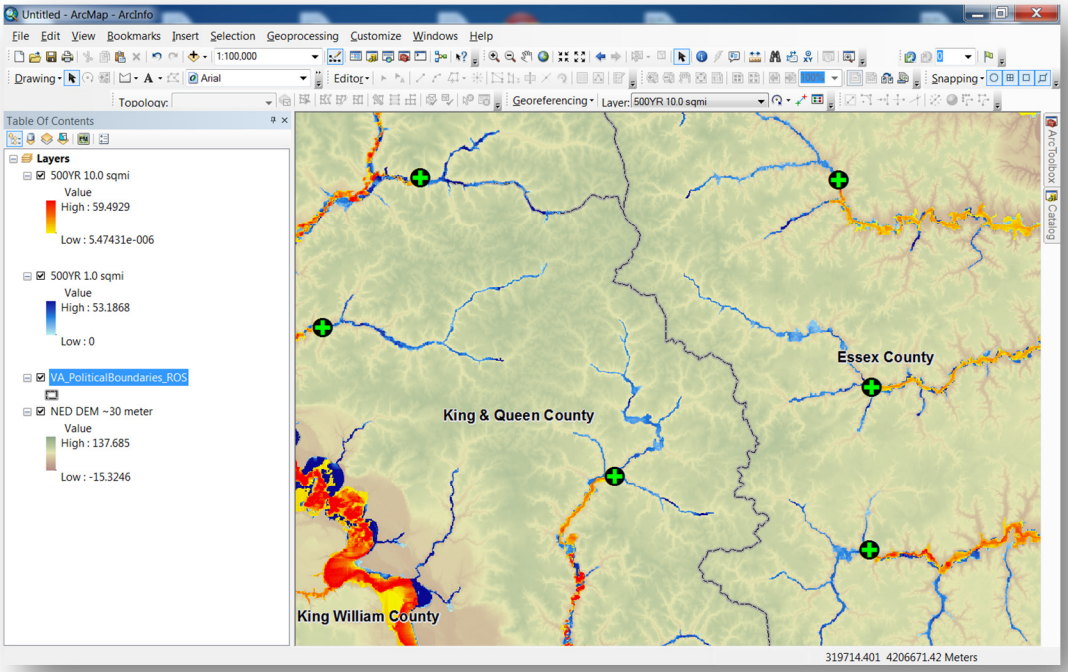
The previous Plan flood modeling utilized Hazus Version 1 – Maintenance Release 4; a.k.a. MR4. Significant changes have occurred with the Hazus software and models over the past five (5) years and the software has moved through the following versions:

- Version 1 – Maintenance Release 4 (MR4)
- Version 1 – Maintenance Release 5 (MR5)
- Version 2.0
- Version 2.1
- Version 2.2 (current)

In addition to the version releases noted above there have also been various patches deployed in-between the version releases. One notable improvement to the Flood - Riverine Module is the automated methodology of cross section placement which, along with typical advancements in computing hardware and software, helps in the ability to process smaller drainage thresholds. Dewberry in-fact processed the project area at the one-square mile (1 mi^2) as had been suggested in the previous Plan as a mitigation action that could improve the Hazus Flood modeling efforts. This new Riverine analysis included use of the most recent National Elevation Dataset (NED) digital elevation

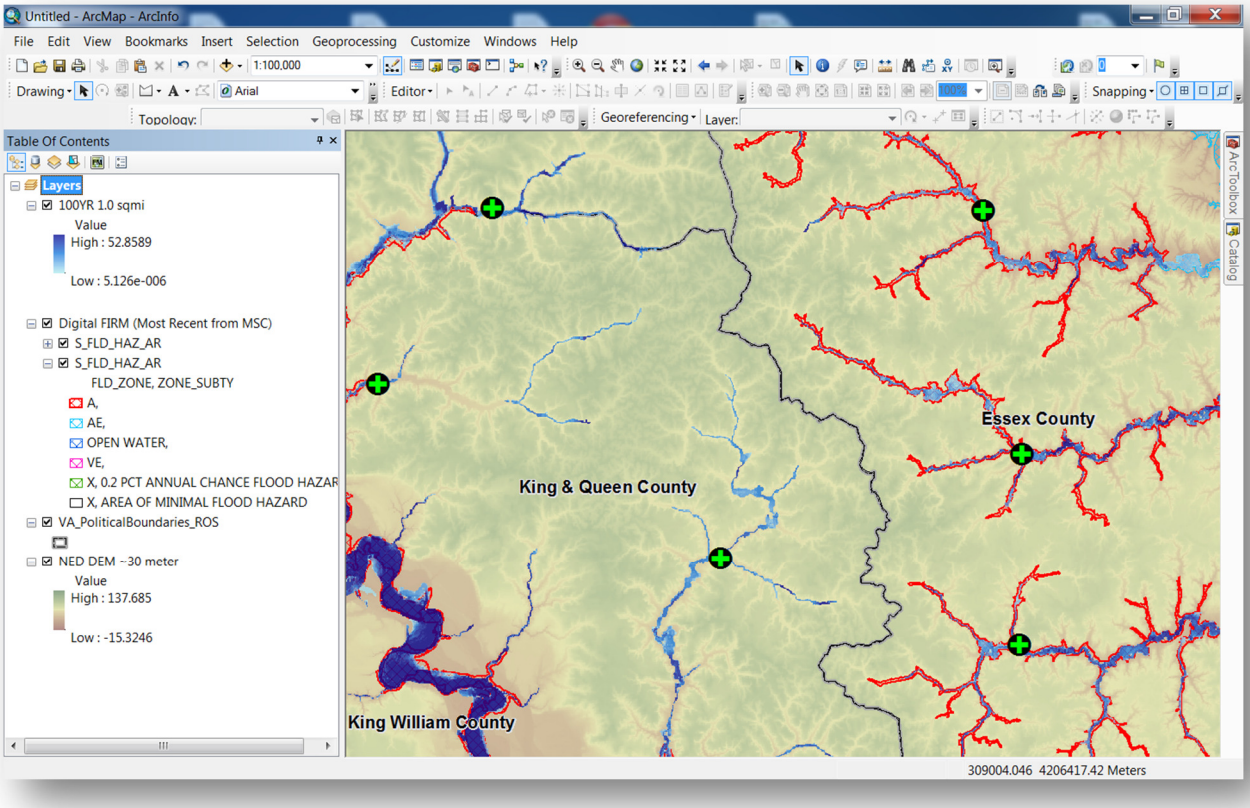
model (DEM) at the one-arc second resolution (i.e., ~ 30 meter resolution). The previous Plan Riverine modeling effort only included one-square mile (1 mi^2) delineation for Mathews County and the remainder of the Planning District utilized ten-square mile (10 mi^2). The beneficial effect of using the smaller drainage area threshold means that the analysis of flooded streams will extend further upstream - offering a more complete representation of potential flooding as is shown in **Figure 1** below. It can be seen that the blue-scale depth grid delineations of the 0.2% Annual Chance or 500-year event at one-square mile (1 mi^2) extends much further upstream as compared to the red-yellow scale grid of the same event delineated at ten-square miles (10 mi^2). The point-marker has been added to show the relative most upstream extent of the ten-square mile (10 mi^2) delineation.

Figure 1: Riverine 0.2% Annual Chance (500 Year) Depth Grids Comparison



Furthermore, the (1 mi^2) delineations, for most riverine streams are consistent with the current effective or new revised preliminary FEMA floodplain mapping. **Figure 2** shows the same example area with the FEMA digital Flood Insurance Rate Map (FIRM) data overlaid with the blue-scale depth grid delineations of the 1% Annual Chance (i.e., 100-Year Event) of the one-square mile (1 mi^2) depth grid. The example area shown includes primarily 1% Annual Chance Approximate Zone (i.e., Zone A) delineations and are shown as red outlined areas. The marker symbols have been left for reference.

Figure 2: Riverine 1% Annual Chance Depth Grid vs. FEMA Digital FIRM Comparison

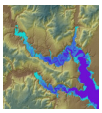


It is also important to note that most FEMA-initiated flood insurance studies use a one-square mile (1 mi^2) drainage threshold for delineation of floodplains. However, users should be warned and realize that FEMA flood studies also require the use of ground data that is much more precise than one-arc second resolution (i.e., ~ 30 meter resolution); i.e., typical FEMA studies require DEM resolution of two-meter (2 m. or ~6.6 ft.) resolution or better.

Issues & Challenges Encountered:

As noted earlier, the previous Plan riverine modeling only utilized one-square mile (1 mi^2) drainage threshold for Mathews. While the most recent effort now has accomplished one-square mile (1 mi^2) drainage threshold for the remainder of the MPPDC planning area, there were still a few issues and challenges that existed; some were overcome and others may warrant additional consideration in the future.

- **Issue 1**:
  - Issue: Hydrology or Hydraulics would not complete for a given County.

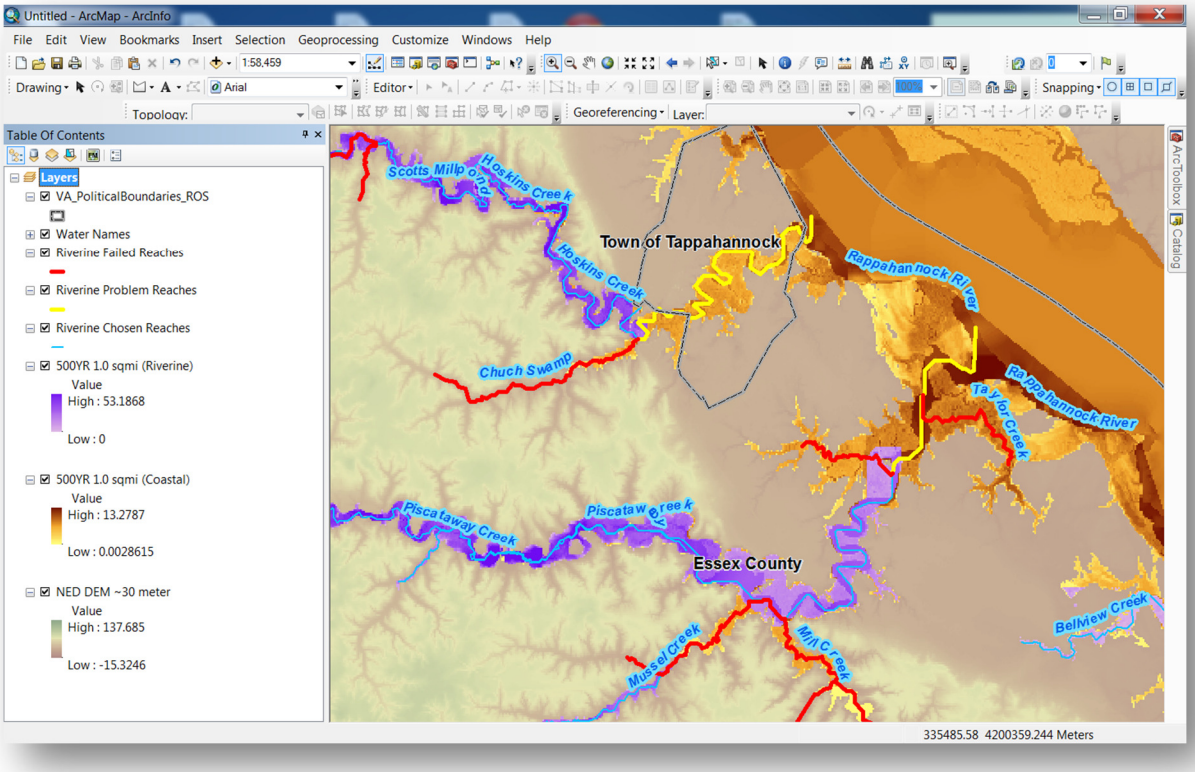


- Solution: Divide the County into smaller sub-geographies to reduce the number of stream segments that Hazus must process. There were three (3) counties that had to be divided into two (2) portions each - Essex, King and Queen and lastly, King William each had to be divided into portions. Dividing these counties into smaller portions enabled Hazus to process a smaller quantity of streams and produce usable results.

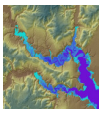
- **Issue 2**:
  - Issue: Hazus produced "Failed Reaches" or "Problem Reaches".
  - Solution: Utilize successful reaches (i.e., non-failed) from adjacent geography where it exists. For example, Dragon Swamp which borders both Essex and King and Queen Counties failed in the riverine model portion of Essex County yet, the same reach did not fail in the companion model of King and Queen. In order to overcome such issues all grids were merged across the MPPDC area to compensate for the deficiency of failed reaches. Inevitably, the Hazus software will utilize the damages estimated from the flooding source that generates the greatest amount of estimated damage. Therefore, another consideration regarding failed reaches is the interaction within Hazus between riverine and coastal hazards as defined by the depth grids from each flooding source. There are failed reaches for which the riverine module did not create a depth grid, however in-reality the same reach may actually be influenced by coastal forces and therefore the coastal methodology is able to supplement or compensate for the lack of a riverine depth grid. An example (see **Figure 3** – next page) where the coastal module generated depth for a riverine failed reach includes Hoskins Creek which runs through the Town of Tappahannock or nearby Piscataway Creek and its tributaries - Mussel Creek or Mill Creek. Also, Cohoke Mill Pond in King William County presents another example of same.

Intentionally Blank

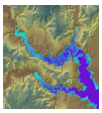
Figure 3: Riverine Failed/Problem Reaches and Riverine Depth Grid vs. Coastal Depth Grid



- Other Discussion: Regarding failed reaches, the Hazus documentation has little information that explains the reasons why reaches fail. However, Dewberry experience has shown that reaches fail for a few common reasons that are not always in the user's control; for example given a particular geography a reach may fail due to lack of hydrologic stream gauges within the vicinity. Another possibility is that the hydrologic methodology employed by Hazus does not produce any flow (i.e., discharge or "Q" modeling parameter); this is most common where rural regression equations are employed. Notably, it is also possible that Hazus has not been updated with the most recent regression equation parameters available from the United States Geologic Survey (USGS). While Dewberry did not verify the equation parameters in Hazus Version 2.2, based on other work that Dewberry has performed in Virginia, it was known that Hazus Version 2.1 did not include the most recent rural regression equations available from the USGS.



- **Issue 3**:
  - Issue: FEMA Region III concern over the use of Hazus Level 1 functionality.
  - Solution: The solution employed included the suggestion that the MPPDC and Dewberry discuss with FEMA Region III expectations of the Hazus modeling. The call that was held on March 13, 2015 included such discussions. Ultimately, the MPPDC and the Virginia Department of Emergency Management (VADEM) agreed that the Dewberry plan of action was reasonable and appropriate. However, for reference, Dewberry has compiled an explanation of the specific concerns expressed by the Region during the March 13, 2015 call. Dewberry agrees with the Region in that the best data is in-fact the best, however needs to be tempered with the realities of effort, time and cost. The Region expressed concern over the use of the Level 1 methodology which means the Region would prefer the use of the following:
    - Hydrology & Hydraulics (H&H) – preference would be to use data typical of FEMA Risk MAP Flood Insurance Studies (FIS) and Non-Regulatory Depth Grid creation versus the Hazus methodology. Typical H&H is accessed via models such as US Army Corps of Engineers HEC-RAS models. Where such models are not available or inaccessible, digital FIRM data may be used but legacy riverine data typically only includes water surface elevations for the 1% annual chance event which is not conducive to generating annualized loss values expected of hazard mitigation planning. Last, where models and digital FIRM data are not complete or not available, the remaining H&H data would typically be gleaned from Flood Insurance Study (FIS) reports; more specifically, users wishing to develop the flood hazard into depth grids for direct-use in Hazus, would have to convert water surface profiles within the FIS-text into digital data. Lastly, regardless of which H&H inputs mentioned are available, the user would be required to process all data to digital water surfaces for further processing into depth grids.
    - Topographic Data – preference is to use LiDAR-based topography at a resolution consistent with FEMA Risk MAP Flood Insurance Studies (FIS) and Non-Regulatory Depth Grid creation versus the one-arc second or ~ 30-meter DEM employed.
    - Depth Grid Creation – preference is again suggested to develop depth grids consistent with FEMA Risk MAP Non-Regulatory Depth Grid creation which means the use of hydraulic stream models (if they exist and are accessible), and/or the use of digital FIRM data, and/or the use of flood profiles published in FIS reports. Notably, while there is definitely benefits associated with the most accurate inputs, Dewberry noted on the call that the level of effort to produce such depth grids is quite extensive and typically is not feasible under budgets available for HMP's.



Flood Modeling – Coastal

As with the Flood Riverine, the previous Plan flood modeling utilized Hazus Version 1 – Maintenance Release 4; a.k.a. MR4. The coastal flood module has also experienced certain changes; the primary difference in the coastal model is that users no longer define certain shoreline characteristics such as wave exposure (i.e., Open Coast, Moderate/Minimal Exposure or Sheltered) and shoreline type (e.g., Rocky bluffs, sandy beaches w/ small dunes, open wetlands, etc.). Otherwise, much of the coastal module is the same in that users are still asked to choose shoreline segments and then users have the option of sub-dividing the shorelines and entering water surface and wave characteristics.

Dewberry followed user guidance for the entry of water surfaces by obtaining the most recent versions of either effective (or) newly released preliminary FIS-text from the FEMA Map Service Center (MSC). Dewberry obtained the following FEMA FIS documents:

- ESSEX COUNTY,VIRGINIA AND INCORPORATED AREAS – Revised May 4, 2015
    - FLOOD INSURANCE STUDY NUMBER - 51057CV000B
- GLOUCESTER COUNTY,VIRGINIA (ALL JURISDICTIONS) – Revised November 19, 2014
    - FLOOD INSURANCE STUDY NUMBER - 51073CV000B
- KING AND QUEEN COUNTY,VIRGINIA AND INCORPORATED AREAS – Preliminary October 3, 2013
    - FLOOD INSURANCE STUDY NUMBER - 51097CV000B
- KING WILLIAM COUNTY,VIRGINIA AND INCORPORATED AREAS – Preliminary October 3, 2013
    - FLOOD INSURANCE STUDY NUMBER - 51101CV000B
- MIDDLESEX COUNTY,VIRGINIA AND INCORPORATED AREAS – Revised May 18, 2015
    - FLOOD INSURANCE STUDY NUMBER - 51119CV000B
- MATHEWS COUNTY,VIRGINIA (ALL JURISDICTIONS) – Revised December 9, 2014
    - FLOOD INSURANCE STUDY NUMBER - 51115CV000B

Per Hazus User guidance the shoreline was divided as closely as possible to the Transect Location Map found within each respective FIS and the Starting Stillwater Elevations (typ. TABLE 2 – Transect Data) were utilized to populate the Hazus menu of Stillwater elevations. Therefore, the Hazus Level 1 methodology was utilized to perform hydrology, hydraulics and coastal hazard delineation. The resulting depth grids were created from the same NED one-arc second DEM utilized for the Riverine analysis.

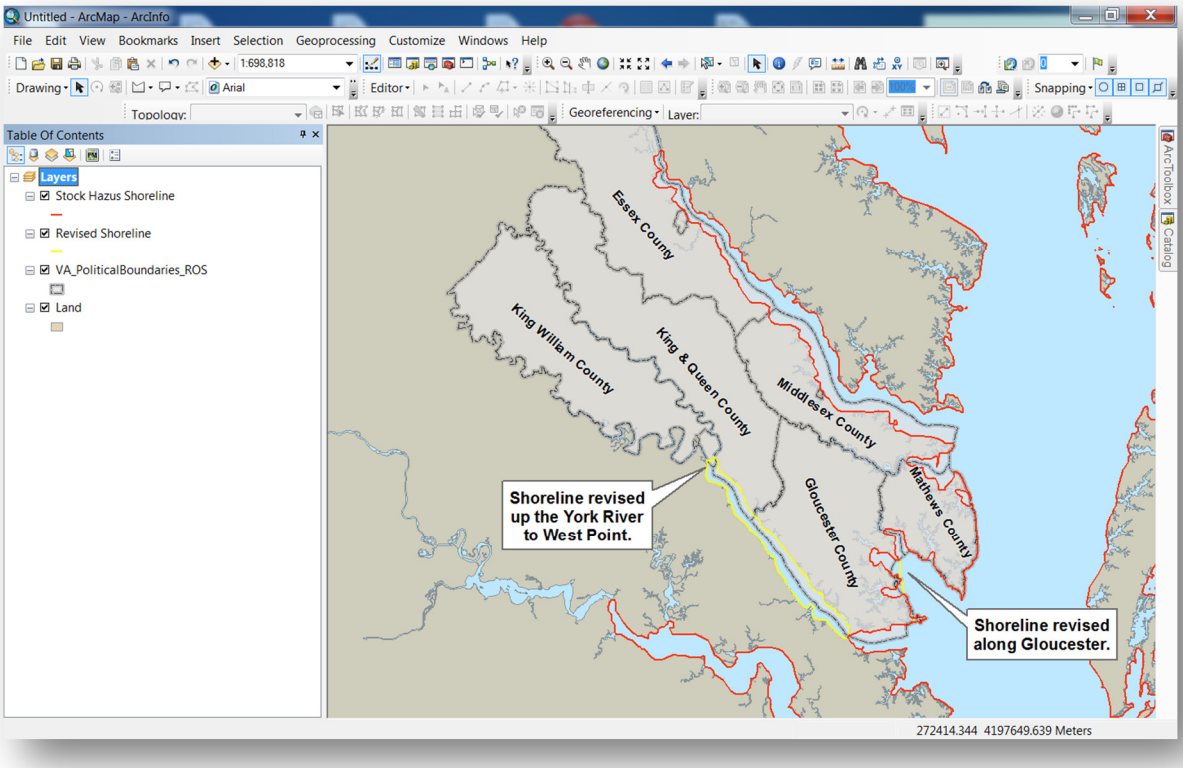
Issues & Challenges Encountered:

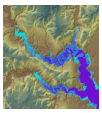
The coastal modeling performed for the previous Plan utilized the Hazus Level 1 methodology. The original intent for the current Plan update was to utilize the same depth grids as the previous Plan, however because new FEMA FIS have been released for all of the counties in the MPPDC region, it was determined that the previous analysis depth grids would not be valid to re-run through the new version

of Hazus (Version 2.2) because of the new FEMA coastal studies. There were a few issues and challenges that existed; some were overcome and others may warrant additional consideration in the future.

- **Issue 1**:
  - Issue: Hazus stock Shoreline file does not adequately intersect King and Queen nor King William Counties.
  - Solution: Dewberry made specific adjustments to the stock Hazus shoreline file in order to match, to the greatest extent possible, the most recent Flood Insurance Studies (FIS) performed along coastal Virginia and within the MPPDC region. Most importantly, all six (6) of the MPPDC counties now have coastal hazards as of the most recent FEMA Flood Studies. However, this differs from that which is in Hazus; the stock Hazus shoreline data does not intersect two (2) of six (6) counties (King William and King and Queen) and only covers a portion of Gloucester County. Inherently, if a user creates a Hazus Flood Project for any county that does not intersect with the shoreline, the user cannot define the Hazus project as having a coastal hazard. **Figure 4** shows the original stock Hazus shoreline and the edited shoreline used to extend the coastal potential up the York River along Gloucester, King and Queen, and King William Counties.

Figure 4: Hazus Shoreline Revisions





- **Issue 2**:
  - Issue: Unable to produce Coastal results for Gloucester County.
  - Solution: Simplifying the coastal shoreline was required to produce results.
  - Other Discussion: Dewberry made no less than five (5) separate attempts to produce coastal analyses for Gloucester County. In short, the coastal module would fail at the process of performing Hydrology. Based on similar experiences with other counties, it was determined that the Hazus shoreline could not be sub-divided to match the same transect divisions as documented in the FEMA FIS; the detail is too great for the simplified functionality of Hazus. The solution employed to produce results included simplifying the shoreline as also noted in **Figure 4**. The simplified shoreline enabled Hazus to no longer "stall" or "fail" at the Hydrology process. Other counties had to be re-run by simplifying the shoreline sub-divisions (see **Issue 3** below) however, the shoreline line work was not revised for other counties (except up the York River).
- **Issue 3**:
  - Issue: Unable to produce Coastal results for other counties.
  - Solution: Simplifying the manner in which the coastal shoreline is sub-divided enabled Hazus to no longer "stall" or "fail" at the processes for Hydrology.
  - Other Discussion: Dewberry made multiple attempts (as necessary) to produce coastal analyses results for each of the MPPDC counties. However, the coastal module would fail at the process of performing Hydrology ***if and when*** the shoreline sub-divisions were too detailed for Hazus to process. As noted earlier, in some cases the Hazus shoreline could not be sub-divided to match the same transect divisions as documented in the FEMA FIS because the detail is too great for the simplified functionality of Hazus. **Figure 5** (below) includes King and Queen County and shows an example where the Hazus shoreline was able to be sub-divided *almost exactly* to match the FIS; the colored shoreline segments are those defined for the coastal run in Hazus and are overlaid on a geo-referenced image of the FIS Transect Map. **Figure 6** is a zoom-in view showing the slight differences between the detailed shoreline of King and Queen; the importance is to note how the FIS Transect #9 is positioned upstream in the Mattaponi River, however the shoreline that Dewberry created to extend Hazus functionality along the York River is simplified near the Town of West Point. However **Figure 7** shows that Dewberry still utilized the appropriate "Starting Stillwater Elevations" as published in FIS Table 2 – Transect Descriptions. Consequently, the combination of **Figures 5 through 7** are shown to exemplify how Dewberry performed the Level 1 coastal shoreline work; i.e., matching the FIS as closely as possible. Other counties were not as simple and in some cases engineering judgments were applied to 1.) Simplify the shoreline sub-divisions coupled with 2.) Applying average water surface elevations and wave heights or in some cases applying a weighted average of water surface elevations and wave heights.

Figure 5: Hazus Shorelines for King and Queen County vs. FIS Transect Map

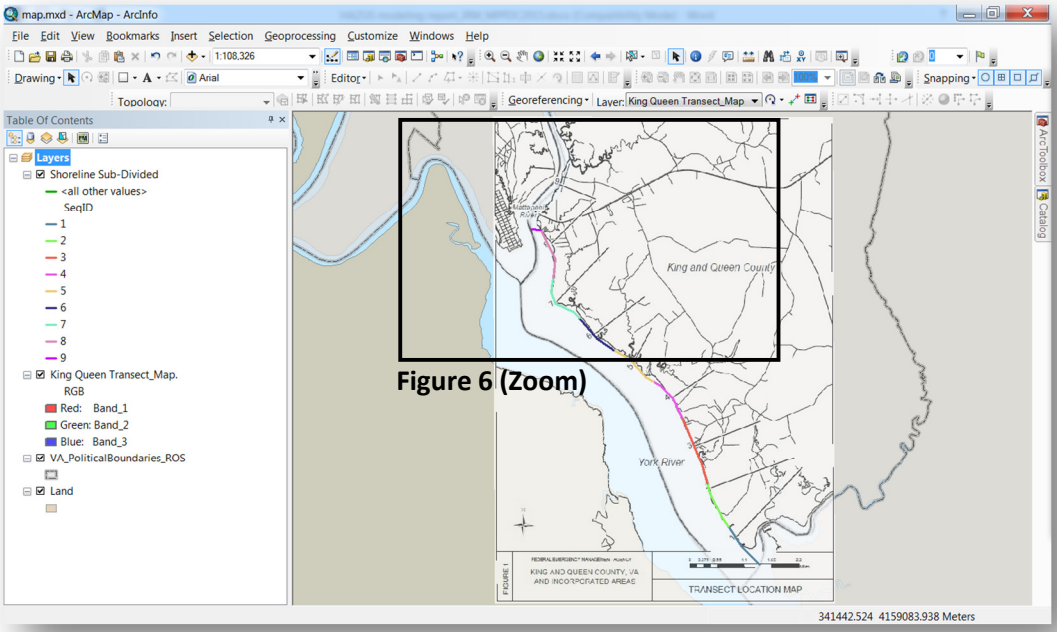


Figure 6 (Zoom)

Figure 6: Hazus Shorelines for King and Queen County vs. FIS Transect Map (Zoom)

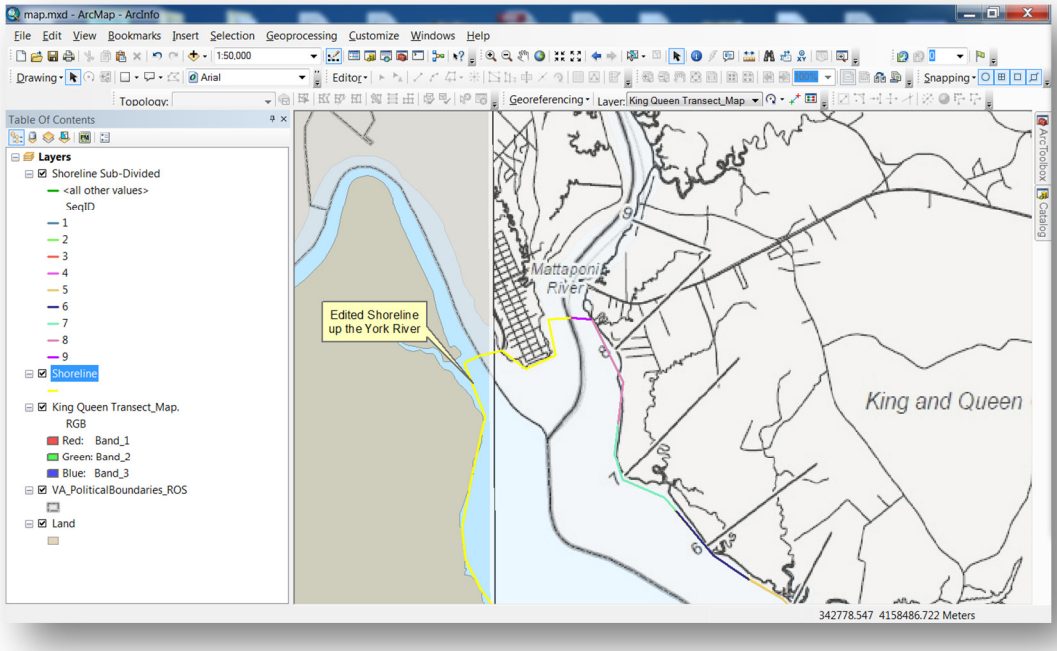
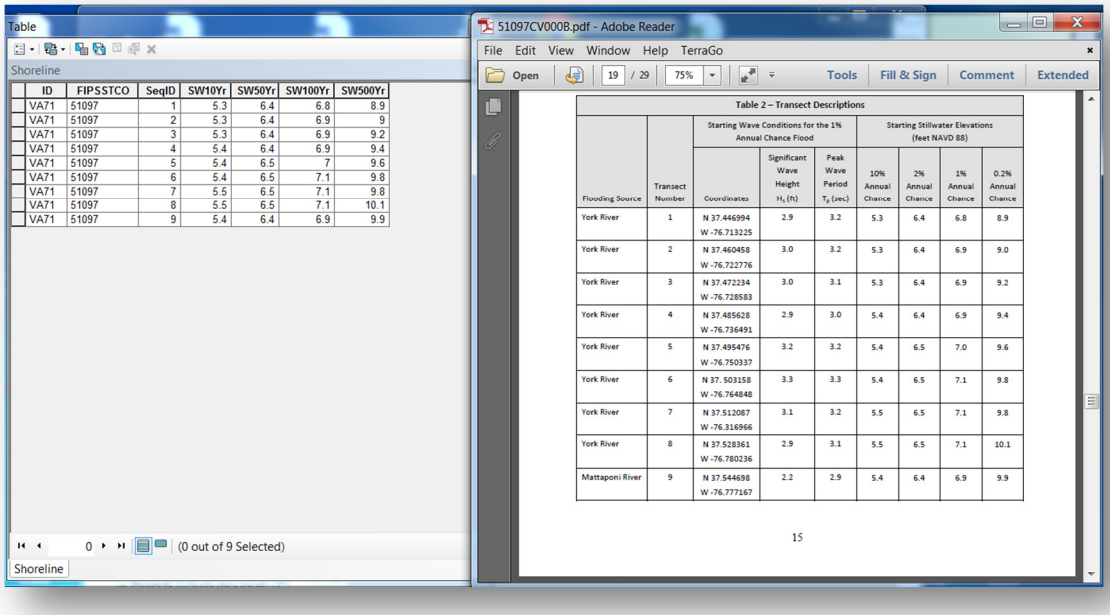


Figure 7: Hazus Shoreline Data for King and Queen County vs. FIS Table 2



Table

Shoreline

ID	FIPSSTCO	SeqID	SW10Yr	SW50Yr	SW100Yr	SW500Yr
VA71	51097	1	5.3	6.4	6.8	8.9
VA71	51097	2	5.3	6.4	6.9	9
VA71	51097	3	5.3	6.4	6.9	9.2
VA71	51097	4	5.4	6.4	6.9	9.4
VA71	51097	5	5.4	6.5	7	9.6
VA71	51097	6	5.4	6.5	7.1	9.8
VA71	51097	7	5.5	6.5	7.1	9.8
VA71	51097	8	5.5	6.5	7.1	10.1
VA71	51097	9	5.4	6.4	6.9	9.9

0 (0 out of 9 Selected)

Shoreline

51097CV000B.pdf - Adobe Reader

File Edit View Window Help TerraGo

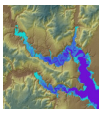
Open 19 / 29 75% Tools Fill & Sign Comment Extended

Table 2 – Transect Descriptions

Flooding Source	Transect Number	Coordinates	Starting Wave Conditions for the 1% Annual Chance Flood: Significant Wave Height H_s (ft)	Starting Wave Conditions for the 1% Annual Chance Flood: Peak Wave Period T_p (sec)	Starting Stillwater Elevations (feet NAVD 88): 10% Annual Chance	2% Annual Chance	1% Annual Chance	0.2% Annual Chance
York River	1	N 37.446994 W -76.713225	2.9	3.2	5.3	6.4	6.8	8.9
York River	2	N 37.460458 W -76.722776	3.0	3.2	5.3	6.4	6.9	9.0
York River	3	N 37.472234 W -76.728583	3.0	3.1	5.3	6.4	6.9	9.2
York River	4	N 37.485628 W -76.736491	2.9	3.0	5.4	6.4	6.9	9.4
York River	5	N 37.495476 W -76.750337	3.2	3.2	5.4	6.5	7.0	9.6
York River	6	N 37. 503158 W -76.764848	3.3	3.3	5.4	6.5	7.1	9.8
York River	7	N 37.512087 W -76.316966	3.1	3.2	5.5	6.5	7.1	9.8
York River	8	N 37.528361 W -76.780236	2.9	3.1	5.5	6.5	7.1	10.1
Mattaponi River	9	N 37.544698 W -76.777167	2.2	2.9	5.4	6.4	6.9	9.9

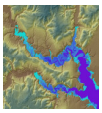
15

- **Issue 4**:
  - Issue: The 0.2% Annual Chance flood hazard (500 Year) of Gloucester County appears to be significantly under-estimated.
  - Solution: Discuss the matter with MPPDC and substitute the 500 Year depth grid from the previous Plan effort.
  - Other Discussion: As discussed earlier, Dewberry made multiple attempts (as necessary) to produce coastal analyses results for each of the MPPDC counties. Gloucester presented the greatest challenge and the 500 Year flood hazard of the Level 1 methodology did not produce a result that – as compared to the new digital FIRM data – seemed reasonable to use. Therefore, Dewberry contacted the MPPDC and offered the option of substituting the 500 Year depth grid from the previous Plan effort as an alternative solution. The MPPDC agreed that while the previous Plan 500 Year depth grid likely over-estimates the potential hazard, it is better to side with caution and Plan around a conservative approach. It is also important to note that Dewberry compared the Level 1 hazard delineations in all counties with the new digital FIRM data. While the digital FIRM data only includes delineations of 1% and 0.2% (100 Year & 500 Year) flood hazard, a visual comparison offers a minimal means by which to gauge how well the Hazus hazard delineations are being created. All issues and challenges being equal, Dewberry is satisfied that the Level 1 delineations are perfectly acceptable for the nature of the work – Hazard Mitigation Planning.



- **Issue 5**:
  - Issue: Level 2 Coastal Risk MAP 1% Annual Chance (100 Year) losses greater than Level 1 0.2% Annual Chance (500 Year) losses.
  - Solution: Do not substitute the Level 2 Coastal Risk MAP 1% Annual Chance (100 Year) for the Level 1 Coastal 1% Annual Chance (100 Year) in the calculation of annualized results. Rather, produce a separate result for comparison of the 100 Year coastal only.
  - Discussion: Original intent was to substitute the new Risk MAP 1% Annual Chance (100 Year) depth grid and subsequent losses for the Hazus-generated Level 1 Coastal 1% Annual Chance (100 Year) depth grid and subsequent losses. However, noting that the new Risk MAP 100 Year depth grid would have been created with much greater detail in all aspects as discussed in detail under **Issue 6** (below) the most appropriate solution is to separate the runs and respective results for comparative purposes. Furthermore, noting the goal and expectation of the Risk MAP Program as well as the nature of Hazard Mitigation Planning; as new, updated or more detailed analyses are available, professionals would endeavor to integrate and utilize new information in the planning, preparation and resilience of communities.

- **Issue 6**:
  - Issue: FEMA Region III concern over the use of Hazus Level 1 functionality.
  - Solution: The solution employed included the suggestion that the MPPDC and Dewberry discuss with FEMA Region III expectations of the Hazus modeling. The call that was held on March 13, 2015 included such discussions. Ultimately, the MPPDC and the Virginia Department of Emergency Management (VADEM) agreed that the Dewberry plan of action was reasonable and appropriate. However, for reference, Dewberry has compiled an explanation of the specific concerns expressed by the Region during the March 13, 2015 call. Dewberry agrees with the Region in that the best data is in-fact the best, however needs to be tempered with the realities of effort, time and cost. The Region expressed concern over the use of the Level 1 methodology which means the Region would prefer the use of the following:
    - Hydrology & Hydraulics (H&H) – preference would be to use data typical of FEMA Risk MAP Flood Insurance Studies (FIS) and Non-Regulatory Depth Grid creation versus the Hazus methodology. Typical H&H for ***coastal studies*** are limited to the development of Stillwater elevations for four (4) frequencies (10, 50, 100 & 500 Yr.) and Static Base Flood Elevations are only mapped for one (1) frequency; namely the 1% annual chance or 100 Year Event. Consequently, even the core H&H of the coastal modeling would require further analyses by qualified coastal engineers and mapping specialists to effectively produce the data required for coastal depth grid creation.



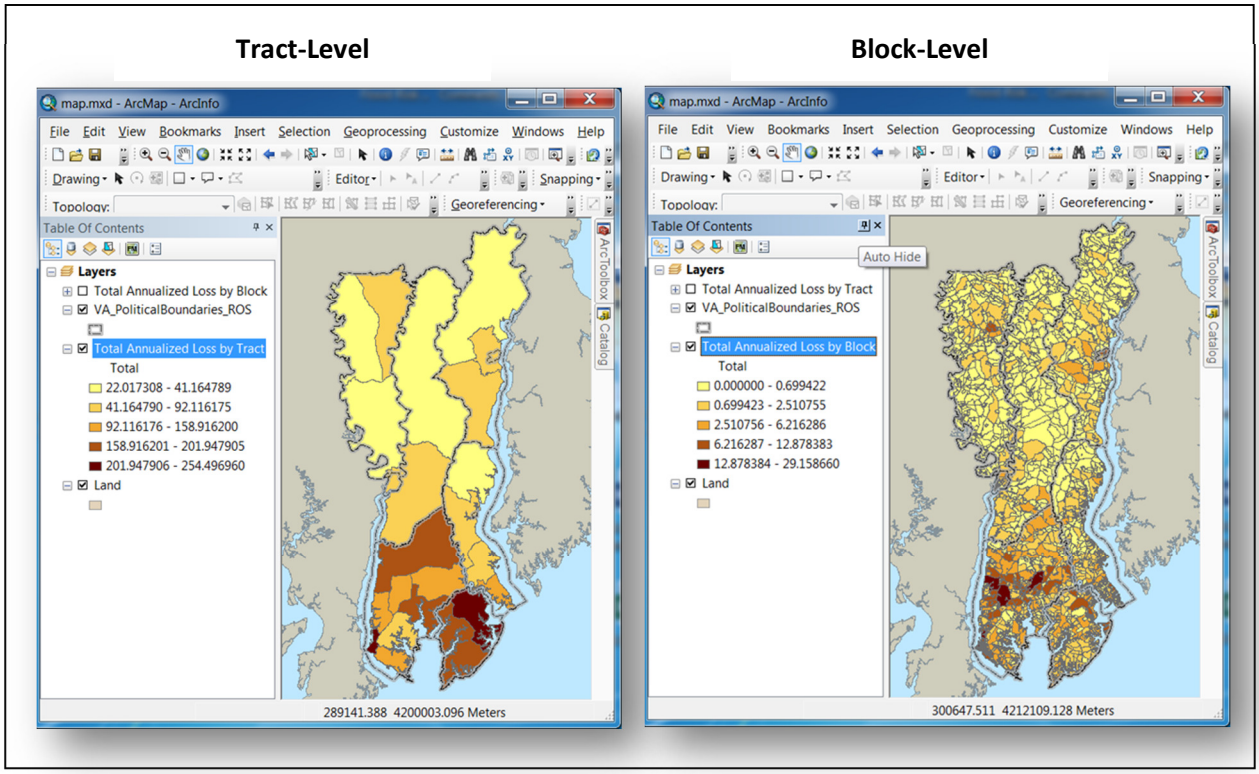
- Topographic Data – preference is to use LiDAR-based topography at a resolution consistent with FEMA Risk MAP Flood Insurance Studies (FIS) and Non-Regulatory Depth Grid creation versus the one-arc second or ~ 30-meter DEM employed.
- Depth Grid Creation – preference is again suggested to develop depth grids consistent with FEMA Risk MAP Non-Regulatory Depth Grid creation which means the use of hydraulic coastal models that have been fully-developed to produce wave-propagated water surface elevations. Again, FEMA flood studies only do this for the 100 Year. Therefore specialized additional work would be required to produce similar data for other frequencies in order to create multi-frequency hazard data that would support the expected annualized analysis typical of Hazard Mitigation Plans. Dewberry again agrees with the Region that there is definitely benefits associated with the most accurate inputs, Dewberry noted on the call that the level of effort to produce such depth grids is quite extensive and typically is not feasible under budgets available for HMP's.

- Other Discussion: As discussed (above) regarding Issue 5, Dewberry has provided the Solution of separating out certain results of the 100 Year Coastal Only Hazus runs so that these can be directly compared. Again, as already noted, over time as more detailed hazard analyses is expected, desired or deemed necessary - future modeling efforts can be sought to produce Risk MAP-based or otherwise detailed depth grids and associated loss analyses.

Hurricane (Wind) Modeling – Probabilistic Scenario

As with the previous Plan, Dewberry again performed a Probabilistic scenario in the Hazus Level 1 Hurricane (Wind) module. Notably, Dewberry ran the scenario in a Region that was created for both Flood and Hurricane as this allows results to be accessed at the census block-level. In contrast, if a Hazus project is created for only Hurricane Hazus will default to using only census tract-level geography. Ultimately, the level of detail that is able to be accessed, displayed and planned for offers a better representation of Hurricane Wind loss when mapped by census block versus census tract. **Figure 8** shows this very comparison.

Figure 8: Hurricane (Wind) Model Results at the Tract versus Block Geography



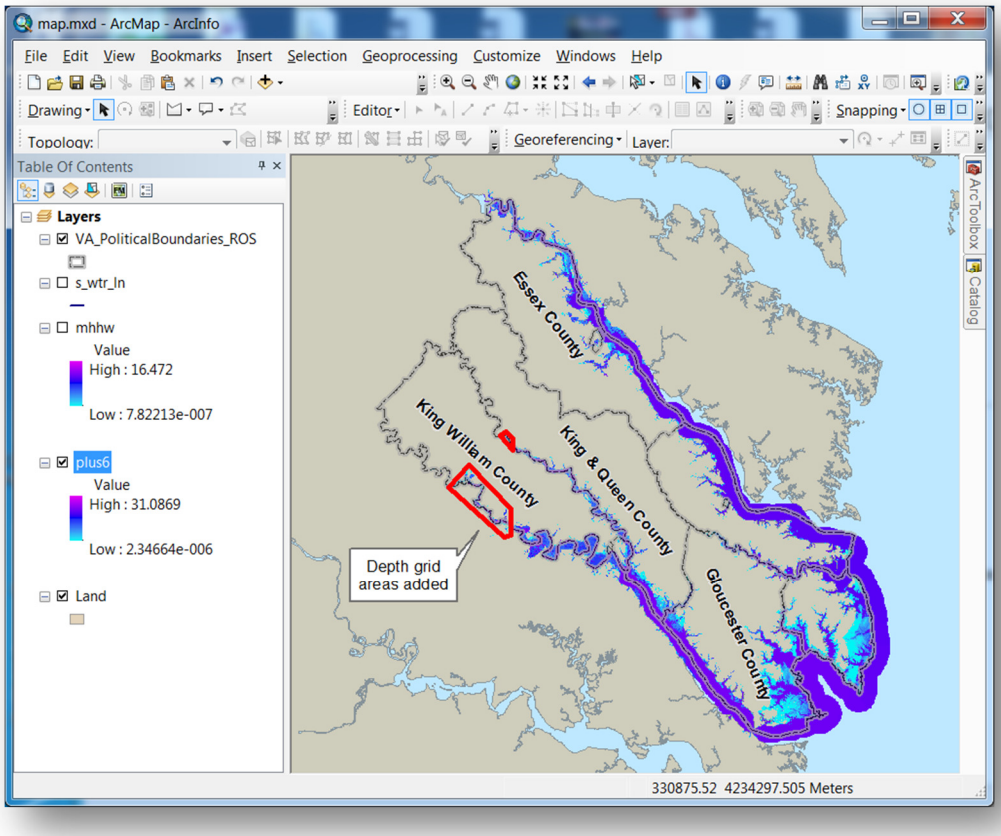
<u>Issues & Challenges Encountered</u>:

None.

Sea Level Rise Modeling – Hazus Flood Model

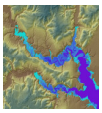
As proposed, Dewberry utilized depth grids available from NOAA Coastal Services Center Sea Level Rise Data. Dewberry obtained and utilized the depth grid of the Mean Higher High Water or Base Scenario and also the Plus 6 feet Sea Level Rise. As a benefit to the MPPDC, Dewberry estimated the addition of depth values in the upstream areas of both the Pamunkey and Mattoponi Rivers; the NOAA depth grids do not extend upstream from these areas as it is the limit of the NOAA data. The method utilized to estimate these small additional areas of depth grid included estimating the water surface elevation where the NOAA depth grids terminated. Next, Spatial Analyst was used to query all elevations in the vicinity that were equal to (or) less than the estimated elevation. The areas were extracted, assigned the estimated water elevation and then converted to a water surface grid. Last the water surface grid was subtracted from the NED one-arc second grid to produce depth values. The additional depth grids were mosaicked with the NOAA grids and ultimately run through the Hazus Flood Module.

Figure 9: Depth Grid Areas Added (Red) where NOAA data terminated



<u>Issues & Challenges Encountered</u>:

None.



Hazus Modeling Results

Dewberry has exported various Hazus modeling results to ESRI File Geodatabase format as standalone GIS layers and tables as necessary. These various result export files will be used to update the HIRA sections to include text, maps and tables. As a benefit to the MPPDC, Dewberry is providing the various result exports to be used as deemed necessary. As scoped, Dewberry is providing final Hazus Project Files – otherwise known as HPR files. A Hazus HPR file is essentially a zipped version of all files that are created by Hazus in the course of a given Hazus project. The HPR archive can be imported on any computer that has an active installation of Hazus Version 2.2. The delivery of HPR's includes an Excel spreadsheet that has basic information about each Hazus Project and HPR file (see **Figure 10**). Importantly, the spreadsheet includes file size information as users need to know how much drive space may be required for a given Hazus Project if they import the HPR file.

- **Results Exports to GIS**:
  - About: Result export files will be used to update the HIRA sections to include text, maps and tables.

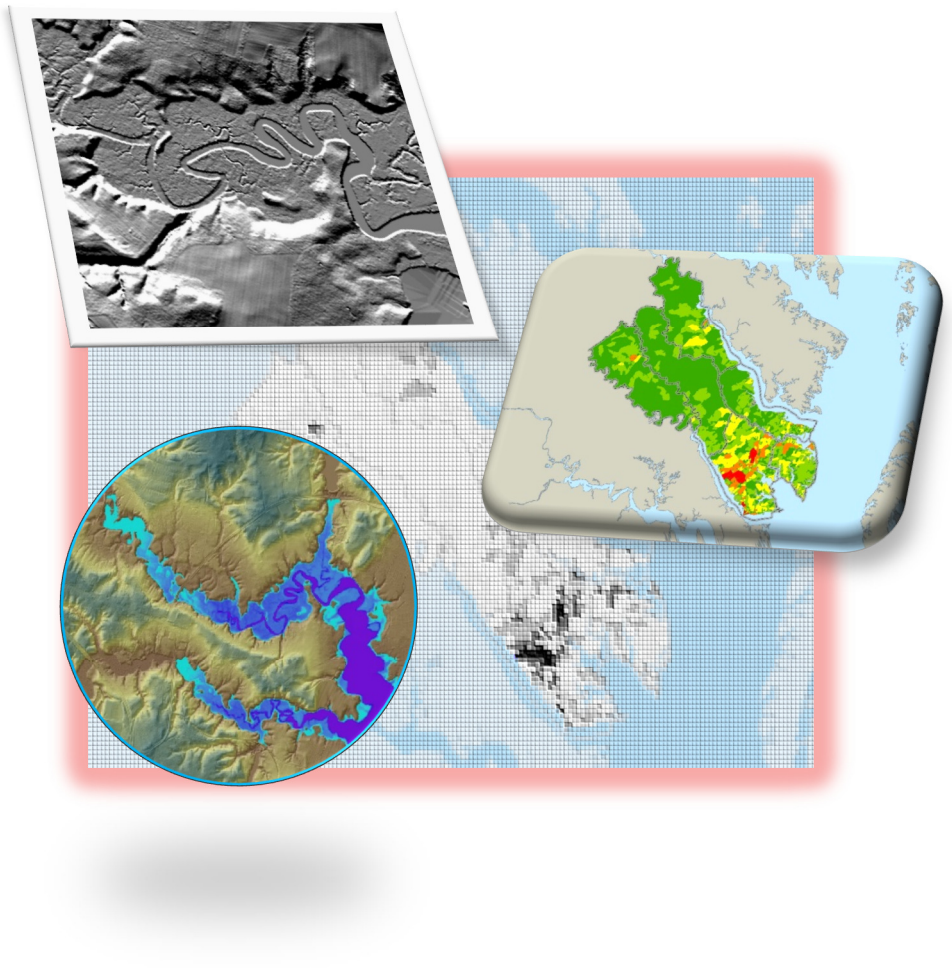
- **Hazus Project Files (HPR)**:
  - About: Zipped version of all files that are created in the course of a given Hazus project.

Figure 10: HPR File Information

Hazard	Application	HPR Name	HPR File Size	Expanded File Size	Info/Source
FLD*	Level 1 Annualized	MPPDC2015_DasymV22.hpr**	407 MB	10.6 GB	Riverine and Coastal Level 1 Annualized Scenarios were run seperately. One-square mile (1 mi^2) drainage threshold used for all Riverine Level 1 modeling. One-Arc Second (~ 30 meter) National Elevation Dataset (NED) Digital Elevation Model (DEM) utilized. All depth grids were extracted and mosaiced into Region-wide depth grids. The Region-wide depth grids were then imported into a new Hazus Project of the entire MPPDC Region and then the loss analysis was run. The Hazus version used in Version 2.2; which includes the new 2010 census-based data. Additionally, the new Hazus Dasymetric General Building Stock (GBS) was used. Note however that final report mapping does not display the losses by dasymetric spatial geometry; rather the results dasymetric data is joined to the stock full block geometry and displayed as such.
	Level 2 RiskMap Coastal 1% (100 YR) Only	MPPDC2015_DasymV22_RskMp100yrDG.hpr**	774 MB	25.3 GB	The depth grids provided by the US Army Corps of Engineers (USACE) were utilized as Level 2 scenario. Dewberry mosaiced all of the 1% (100 YR) depth grids provided and ran them through a Hazus Project created of the entire MPPDC Region. This HPR also includes a second scenario that is the Level 1 depth grid of the coastal-only 1% (100YR) which was run through Hazus for comparison to the Level 2 RiskMap coastal-only 1% (100YR).
	Sea Level Rise Scenarios (Base and Plus 6FT)	MPPDC2015_SLR.hpr**	232 MB	6.92 GB	NOAA depth grids of Sea Level Rise (SLR) utilized per scope of work; Base Scenario or MHHW along with the Plus 6 Feet Scenario.
HUR*	Probabilistic	MPPDC2015_HUR_ByBlockwFLD_Probabilistic.hpr	163 MB	3 GB	Hurricane model probilistic was run with new 2010 inventory provided by MOTF.

***NOTES:** **All Hazus Model Runs using Version 2.2**
All Hazus Flood Model Runs using Version 2.2 Dasymetric Data for Virginia.

HAZUS Modeling Report



End

Appendix K –
Nation Flood Insurance Program Survey

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: ESSEX COUNTY

1. FLOODPLAIN IDENTIFICATION AND MAPPING			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	All information is on file and available in the Essex County Building and Zoning Department
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Yes	Adopted April 14, 2015 by the Essex County Board of Supervisors
c. Does the municipality support request for map updates?	If yes, state how.	Yes	We assist citizens in all their requests
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	No	We reviewed the maps and gave our opinion of history of areas
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Yes	We require property owners to get elevation certifications when in question
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Yes	Essex County Building & Zoning Department (202 South Church Lane Tappahannock, VA 22560

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	No	?
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Yes	Building and Zoning Dept.
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Yes	
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Yes	
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Yes	

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	Yes	Education certificates

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	Yes	Community meetings/ FEMA
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	Yes	Public notice, local newspaper
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	Y	We review maps, explain scenarios. Refer property owners to insurance companies

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: TOWN OF TAPPAHANNOCK

1. FLOODPLAIN IDENTIFICATION AND MAPPING

Requirement	Recommended Action	Yes/No	Comments
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	yes	
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	5-4-2015	
c. Does the municipality support request for map updates?	If yes, state how.	no	We forward anyone who has a request to FEMA
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	yes	By forwarding information to FEMA
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	yes	With the assistance of Essex County Building Inspector office
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	no	

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.		
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.		
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.		
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.		
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.		
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.		

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.		

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.		
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.		
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.		

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: GLOUCESTER COUNTY

1. FLOODPLAIN IDENTIFICATION AND MAPPING

Requirement	Recommended Action	Yes/No	Comments
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Y	On the emergency management website.
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Y	FIRM adopted by BOS
c. Does the municipality support request for map updates?	If yes, state how.	N	
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	?	We provide VDEM with information and not directly to FEMA
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Y	Planning Development, Building officials and EM assist
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Y	County Administration

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	Y	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.		Permits Building officials
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Y	Planning, Building Officials, Information Technology
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Y	Building Official, Planning
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Y	Code Compliance, Building Officials
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Y	BOS, County Adminsitration

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	Y	Established VE construction zone

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	Y	CRS-PPI
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	Y	CRS-PPI
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	Y	CRS-PPI

MUNICIPALITY: KING & QUEEN COUNTY

1. FLOODPLAIN IDENTIFICATION AND MAPPING			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	Located at the Front Counter of Building/Zoning & Planning Office
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Yes	New maps to be adopted around May of 2016 once letter of determination is received from FEMA in November of 2015
c. Does the municipality support request for map updates?	If yes, state how.	?	
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	No	N/A
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Yes	Only as found on the adopted FEMA Flood Maps, field determination/Flood Elevation Certificate is to be done by surveyor (required for all flood zones other than X)
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	yes	Planning & Zoning Department

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	Yes	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Yes	Planning & Zoning Department
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Yes	Planning & Zoning Department
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	Planning & Zoning Department
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Yes	Planning & Zoning Department
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Yes	Require Flood Elevation Certificates for all construction located in a floodplain other than Zone X

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	Yes	Our new proposed ordinance and map adoption will require free board and recognize LimWa

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	Yes	FEMA Handouts
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	Yes	During latest map change, all property owners were notified by U.S. mail and news article for an Open House held in November of 2014.
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	No	

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: KING WILLIAM COUNTY

1. FLOODPLAIN IDENTIFICATION AND MAPPING			
Requirement	*Recommended Action*	*Yes/No*	*Comments*
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	Available from County Building and Planning Department
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Yes	9/2/15
c. Does the municipality support request for map updates?	If yes, state how.	Yes	
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	No	
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Yes	Provided information to FEMA
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Yes	Building and Planning Department

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	Yes	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Yes	Building and Planning Department
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Yes	Building and Planning Department
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	Building and Planning Department
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	No	
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	No	

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	Yes	Considered CRS but decided not to pursue at the time Adopted BFE over minimum

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	No	
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	Yes	Mailings & Community Meeting
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	Yes	Provided FEMA contact and website information

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: _____URBANNA_____

1. FLOODPLAIN IDENTIFICATION AND MAPPING			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	4-22-15	
c. Does the municipality support request for map updates?	If yes, state how.	Yes	Town staff will assist update requests
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	Yes	All data obtained by the town will be forwarded to State Floodplain Coordinating Office (DCR) for their assistance in forwarding to the appropriate FEMA offices
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	No	
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Yes	Town Zoning Office

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	Yes*	*Middlesex County provides cooperative administration of the Floodplain Ordinance. County Building Official is co-administrator for the Town. See Middlesex Co. for additional information
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.		
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.		
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.		
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.		
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Yes	All construction requiring a building permit and/or land disturbance permit receives site visits and stop work orders can be issued if violations are found.

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	Yes	Investigating the feasibility of participating in the CRS program

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	Yes	Brochure/periodic web site info
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	Yes	Direct notification of effected land owners
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	Yes	Information and Referral

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: MATHEWS COUNTY

1. FLOODPLAIN IDENTIFICATION AND MAPPING			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	Available in the Building Department and online VIA FEMA MSC link on County website
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	yes	Effective date is 12-09-2014
c. Does the municipality support request for map updates?	If yes, state how.	yes	Providing assistance and guidance through the process
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	yes	Enforcing requirements as adopted in floodplain management ordinance
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	yes	On a daily basis by reviewing FIRM's and making interpretations and determinations
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	yes	Building Department

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	yes	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	yes	Flood zone permit, building permits, etc (Building Department)
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	yes	Per our floodplain management ordinance (Building Department)
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	USBC and floodplain management ordinance enforcement; plan review process (Building Department)
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	yes	FEMA elevation certificate required for new construction and substantial improvement (Building Department)
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	yes	Permitting process; inspections; and requiring elevation certificates be submitted for verification

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	yes	Higher standards were considered, but were not adopted at this time; minimum required standards were adopted.

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	yes	Online info; handouts; various presentations and community events
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	yes	Every single property owner was notified VIA mail regarding map changes and the new ordinance. In addition the public was notified VIA newspaper ads, online ads, PSA's (radio)
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.		Not specifically regarding insurance, but assistance is provided to ensure both FEMA-NFIP requirements are met and the requirements of the floodplain management ordinance are met. Assistance is also provided for flood zone determinations and providing FIRMettes. ICC letters are also provided if documentation is submitted (as required).

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: MIDDLESEX COUNTY, VA

1. FLOODPLAIN IDENTIFICATION AND MAPPING			
Requirement	*Recommended Action*	*Yes/No*	*Comments*
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Yes	
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Yes	3-3-15
c. Does the municipality support request for map updates?	If yes, state how.	N	Not Asked
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	N	
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Yes	Review FIRM Map, Required Elevation Certification
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Yes	Flood Plain Manager/Planning Department

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	Yes	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Yes	Building Department
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Yes	Planning Department
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Yes	Building Department
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Yes	Building Department
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Yes	Inspections and Notices of Violation

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	NO	

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	No	
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	No	
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	No	

NATIONAL FLOOD INSURANCE PROGRAM (NFIP) SURVEY

MUNICIPALITY: TOWN OF WEST POINT

1. FLOODPLAIN IDENTIFICATION AND MAPPING			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	Place these documents in the local libraries or make available publicly.	Y	
b. Has the municipality adopted the most current DFIRM/FIRM and FIS?	State the date of adoption, if approved.	Y	Adopted by Town Council on 8/10/2015. Sent to FEMA, waiting for approval
c. Does the municipality support request for map updates?	If yes, state how.	N	
d. Does the municipality share with Federal Emergency Management Agency (FEMA) any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	If yes, specify how.	Y	We would if we had data that resulted in map revisions
e. Does the municipality provide assistance with local floodplain determinations?	If yes, specify how.	Y	We have new maps that we supply citizens and agents with
f. Does the municipality maintain a record of approved Letters of Map Change?	If yes, specify the responsible office.	Y	Community Development

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	If yes, answer questions (1) through (4) below.	Y	
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	If yes, specify the office responsible.	Y	Community development and building official
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 lots or 5 acres?	If yes, specify the office responsible.	Y	Community development
(3) Does the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities and service facilities to prevent water damage?	If yes, specify the office responsible.	Y	Community development and building official
(4) Does the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	If yes, specify the office responsible.	Y	Community Development and building official
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	If yes, specify how.	Y	Notice of violations would be mailed. Notification to owner and applicant

2. FLOODPLAIN MANAGEMENT			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
c. Has the municipality considered adopting activities that extend beyond the minimum requirements? Examples include: • Participation in the Community Rating System • Prohibition of production or storage of chemicals in SFHA • Prohibition of certain types of structures, such as hospitals, nursing homes, and jails in SFHA • Prohibition of certain types of residential housing (manufactured homes) in SFHA • Floodplain ordinances that prohibit any new residential or nonresidential structures in SFHA	If yes, specify activities.	Y	Considered CRS

3. FLOOD INSURANCE			
Requirement	***Recommended Action***	***Yes/No***	***Comments***
a. Does the municipality educate community members about the availability and value of flood insurance?	If yes, specify how.	Y	When requested and community meetings
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	If yes, specify how.	Y	When requested and community meetings
c. Does the municipality provide general assistance to community members regarding insurance issues?	If yes, specify how.	Y	When requested, suggest they speak to insurance agents

Appendix L –
Gloucester County Stormwater Management Ordinance

Chapter 6 - STORMWATER MANAGEMENT[1]

Pursuant to Virginia Code § 62.1-44.15:27, this ordinance is adopted as part of an initiative to integrate the Gloucester County stormwater management requirements with the Erosion and Sediment Control Ordinance of Gloucester County, Virginia (Chapter 7.5) and the Chesapeake Bay Preservation Ordinance (Chapter 5.5) requirements into a unified stormwater program. The unified stormwater program is intended to facilitate the submission and approval of plans, issuance of permits, payment of fees, and coordination of inspection and enforcement activities into a more convenient and efficient manner for both Gloucester County and those responsible for compliance with these programs.

Footnotes:

--- (**1**) ---

Editor's note—An ordinance adopted Aug. 6, 2013, repealed ch. 6, §§ 6-1—6-13, which pertained to demonstrations and parades. Subsequently, an ordinance adopted June 3, 2014, §§ 1-1—1-16, enacted new provisions to the Code, but did not specify manner of inclusion; hence, codification as ch. 6, §§ 6-1—6-16 was at the discretion of the editor.

Sec. 6-1. - Purpose and authority.

(a) The purpose of this chapter is to ensure the general health, safety, and welfare of the citizens of the county and protect the quality and quantity of state waters from the potential harm of unmanaged stormwater, including protection from a land-disturbing activity causing unreasonable degradation of properties, water quality, stream channels, and other natural resources, and to establish procedures whereby stormwater requirements related to water quality and quantity shall be administered and enforced.

(b) This chapter is adopted pursuant to Article 2.3 (§ 62.1-44.15:24 et seq.) of Chapter 3.1 of Title 62.1 of the Code of Virginia.

(Ord. of 6-3-2014(1), § 1-1)

Sec. 6-2. - Definitions.

In addition to the definitions set forth in 9VAC25-870-10 of the Virginia Stormwater Management Regulations, as amended, which are expressly adopted and incorporated herein by reference, the following words and terms used in this chapter have the following meanings unless otherwise specified herein. Where definitions differ, those incorporated herein shall have precedence.

"Administrator" means the VSMP authority including the County Administrator, or her designee.

"Agreement in lieu of a stormwater management plan" means a contract between the VSMP authority and the owner or permittee that specifies methods that shall be implemented to comply with the requirements of a VSMP for the construction of a single family residence; such contract may be executed by the VSMP authority in lieu of a stormwater management plan.

"Administrative Guidance Manual" means the latest version of policies and procedures for documentation and calculations verifying compliance with the water quality and quantity requirements, review and approval of Stormwater Pollution Prevention Plans and Stormwater Management Plans, site inspections, obtaining and releasing sureties, reporting and recordkeeping, and compliance strategies for reviews, enforcement, and long-term maintenance and inspection programs.

"Applicant" means any person submitting an application for a permit or requesting issuance of a permit under this chapter.

"Best management practice" or "BMP" means schedules of activities, prohibitions of practices, including both structural and nonstructural practices, maintenance procedures, and other management practices to prevent or reduce the pollution of surface waters and groundwater systems from the impacts of land-disturbing activities.

"Chesapeake Bay Preservation Act land-disturbing activity" means a land-disturbing activity including clearing, grading, or excavation that results in a land disturbance equal to or greater than 2,500 square feet and less than one acre in all areas of jurisdictions designated as subject to the regulations adopted pursuant to the Chesapeake Bay Preservation Act, Virginia Code § 62.1-44.15:67 et seq.

"Common plan of development or sale" means a contiguous area where separate and distinct construction activities may be taking place at different times on different schedules.

"Control measure" means any best management practice or stormwater facility, or other method used to minimize the discharge of pollutants to state waters.

"Clean Water Act" or "CWA" means the federal Clean Water Act (33 U.S.C § 1251 et seq.), formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972, Public Law 92-500, as amended by Public Law 95-217, Public Law 95-576, Public Law 96-483, and Public Law 97-117, or any subsequent revisions thereto.

"Department" means the Department of Environmental Quality.

"Development" means land disturbance and the resulting landform associated with the construction of residential, commercial, industrial, institutional, recreation, transportation or utility facilities, structures, uses or the clearing of land for non-agricultural or non-silvicultural purposes.

"General permit" means the state permit titled GENERAL PERMIT FOR DISCHARGES OF STORMWATER FROM CONSTRUCTION ACTIVITIES found in Part XIV (9VAC25-880-1 et seq.) of the Regulations authorizing a category of discharges under the CWA and the Act within a geographical area of the Commonwealth of Virginia.

"Land disturbance" or "land-disturbing activity" means a man-made change to the land surface that potentially changes its runoff characteristics including clearing, grading, or excavation except that the term shall not include those exemptions specified in section 6-3(c) of this chapter.

"Layout" means a conceptual drawing sufficient to provide for the specified stormwater management facilities required at the time of approval.

"Locality" or "County" means Gloucester County, Virginia.

"Minor modification" means an amendment to an existing general permit before its expiration not requiring extensive review and evaluation including, but not limited to, changes in EPA promulgated test protocols, increasing monitoring frequency requirements, changes in sampling locations, and changes to compliance dates within the overall compliance schedules. A minor general permit modification or amendment does not substantially alter general permit conditions, substantially increase or decrease the amount of surface water impacts, increase the size of the operation, or reduce the capacity of the facility to protect human health or the environment.

"Municipal separate storm sewer system" or "MS4" means all separate storm sewers that are defined as "large", "medium," or "small" municipal separate storm sewer systems or designated under 9VAC25-870-380(A)(1).

"Operator" means the owner or operator of any facility or activity subject to regulation under this chapter.

"Permit" or "VSMP Authority Permit" means an approval to conduct a land-disturbing activity issued by the Administrator for the initiation of a land-disturbing activity, in accordance with this chapter, and which may only be issued after evidence of general permit coverage has been provided by the Department.

"Permittee" means the person to whom the VSMP Authority Permit is issued.

"Person" means any individual, corporation, partnership, association, state, municipality, commission, or political subdivision of a state, governmental body, including federal, state, or local entity as applicable, any interstate body or any other legal entity.

"Regulations" means the Virginia Stormwater Management Program (VSMP) Permit Regulations, 9VAC25-870 et seq., as amended.

"Site" means the land or water area where any facility or land-disturbing activity is physically located or conducted, including adjacent land used or preserved in connection with the facility or land-disturbing activity. Areas channelward of mean low water in tidal Virginia shall not be considered part of a site.

"State" means the Commonwealth of Virginia.

"State Board" means the Virginia Water Control Board.

"State permit" means an approval to conduct a land-disturbing activity issued by the State Board in the form of a state stormwater individual permit or coverage issued under a state general permit or an approval issued by the State Board for stormwater discharges from an MS4. Under these state permits, the Commonwealth imposes and enforces requirements pursuant to the federal Clean Water Act and regulations, the Virginia Stormwater Management Act and the Regulations.

"State Water Control Law" means Chapter 3.1 (§ 62.1-44.2 et seq.) of Title 62.1 of the Code of Virginia.

"State waters" means all water, on the surface and under the ground, wholly or partially within or bordering the Commonwealth or within its jurisdiction, including wetlands.

"Stormwater" means precipitation that is discharged across the land surface or through conveyances to one or more waterways and that may include stormwater runoff, snow melt runoff, and surface runoff and drainage.

"Stormwater Board" means the body of Board of Supervisor-appointed individuals who convene to arbitrate written decisions of the Stormwater Authority administration.

"Stormwater management plan" means a document(s) containing material describing methods for complying with the requirements of section 6-6 of this chapter. An agreement in lieu of a stormwater management plan as defined in this chapter shall be considered to meet the requirements of a stormwater management plan.

"Stormwater Pollution Prevention Plan" or "SWPPP" means a document that is prepared in accordance with good engineering practices and that identifies potential sources of pollutants that may reasonably be expected to affect the quality of stormwater discharges from a construction site, and otherwise meets the requirements of this chapter. In addition, the document shall identify and require the implementation of control measures, and shall include, but not be limited to the inclusion of, or the incorporation by reference of, an approved erosion and sediment control plan, an approved stormwater management plan, and a pollution prevention plan.

"Subdivision" means the division of any lot, tract, or parcel of land into two (2) or more lots or parcels, for the purpose, whether immediate or future, of transfer of ownership, or building development.

"Total maximum daily load" or "TMDL" means the sum of the individual wasteload allocations for point sources, load allocations for nonpoint sources, natural background loading and a margin of safety. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure. The TMDL process provides for point versus nonpoint source trade-offs.

"Virginia Stormwater BMP Clearinghouse website" means a state-designated website that contains detailed design standards and specifications for control measures that may be used in Virginia to comply with the requirements of the Virginia Stormwater Management Act and associated regulations.

"Virginia Stormwater Management Act" or "Act" means Article 2.3 (§ 62.1-44.15 et seq.) of Chapter 3.1 of Title 62.1 of the Code of Virginia.

"Virginia Stormwater Management Program" or "VSMP" means a program approved by the State Board after September 13, 2011, that has been established by a locality to manage the quality and quantity of runoff resulting from land-disturbing activities and shall include such items as local ordinances, rules, permit requirements, annual standards and specifications, policies and guidelines, technical materials, and requirements for plan review, inspection, enforcement, where authorized in this article, and evaluation consistent with the requirements of Article 2.3 of Chapter 3.1 of Title 62.1 of the Code of Virginia, and associated regulations.

"Virginia Stormwater Management Program authority" or "VSMP authority" means an authority approved by the State Board after September 13, 2011, to operate a Virginia Stormwater Management Program.

(Ord. of 6-3-2014(1), § 1-2)

Sec. 6-3. - Stormwater permit requirement; exemptions.

(a) Except as provided herein, no person may engage in any land-disturbing activity until a VSMP authority permit has been issued by the Administrator in accordance with the provisions of this chapter.

(b) Chesapeake Bay Preservation Act land-disturbing activities do not require completion of a registration statement or require coverage under the general permit but shall be subject to an erosion and sediment control plan consistent with the requirements of the Erosion and Sediment Control Ordinance, a stormwater management plan as outlined under section 6-6 of this chapter, the technical criteria and administrative requirements for land-disturbing activities outlined in section 6-9 of this chapter, and the requirements for control measures long-term maintenance outlined under section 6-10 of this chapter.

(c) Notwithstanding any other provisions of this chapter, the following activities are exempt from the requirements and regulations contained in this chapter, unless otherwise required by federal law:

    (1) Permitted surface or deep mining operations and projects, or oil and gas operations and projects conducted under the provisions of Title 45.1 of the Code of Virginia;

    (2) Clearing of lands specifically for agricultural purposes and the management, tilling, planting, or harvesting of agricultural, horticultural, or forest crops, livestock feedlot operations, or as additionally set forth by the State Board in regulations, including engineering operations as follows: construction of terraces, terrace outlets, check dams, desilting basins, dikes, ponds, ditches, strip cropping, lister furrowing, contour cultivating, contour furrowing, land drainage, and land irrigation; however, this exception shall not apply to harvesting of forest crops unless the area on which harvesting occurs is reforested artificially or naturally in accordance with the provisions of Chapter 11 (§ 10.1-1100 et seq.) of Title 10.1 of the Code of Virginia or is

converted to bona fide agricultural or improved pasture use as described in Virginia Code § 10.1-1163(B);

(3) Single-family residences separately built and disturbing less than one acre and not part of a larger common plan of development or sale, including additions or modifications to existing single-family detached residential structures;

(4) Land-disturbing activities that disturb less than one acre of land area, except for land-disturbing activity exceeding an area of 2,500 square feet in all areas of the county designated as subject to the Chesapeake Bay Preservation Area Designation and Management Regulations (9VAC25-830) adopted pursuant to the provisions of the Chesapeake Bay Preservation Act (Virginia Code § 62.1-44.15:67 et seq.) or activities that are part of a larger common plan of development or sale that is one acre or greater of disturbance;

(5) Permitted or authorized discharges to a sanitary sewer or a combined sewer system;

(6) Activities under a State or federal reclamation program to return an abandoned property to an agricultural or open land use;

(7) Routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original construction of a project. The paving of an existing road with a compacted or impervious surface and reestablishment of existing associated ditches and shoulders shall be deemed routine maintenance if performed in accordance with this subsection; and

(8) Conducting land-disturbing activities in response to a public emergency where the related work requires immediate authorization to avoid imminent endangerment to human health or the environment. In such situations, the Administrator shall be advised of the disturbance within seven days of commencing the land-disturbing activity and compliance with the administrative requirements of Virginia Code § 62.1-44.15:34(A) is required within 30 days of commencing the land-disturbing activity.

(Ord. of 6-3-2014(1), § 1-3)

Sec. 6-4. - Stormwater management program established; submission and approval of plans; prohibitions.

(a) Pursuant to § 62.1-44.15:27 of the Code of Virginia, Gloucester County hereby establishes a Virginia stormwater management program for land-disturbing activities and adopts the applicable Regulations that specify standards and specifications for VSMPs promulgated by the State Board for the purposes set out in section 6-1 of this chapter. The Gloucester County Board of Supervisors hereby designates the County Administrator as the Administrator of the Virginia stormwater management program.

(b) No VSMP authority permit shall be issued by the Administrator until the following items have been submitted to, and approved by, the Administrator as prescribed herein:

(1) A permit application that includes a general permit registration statement;

(2) An erosion and sediment control plan approved in accordance with the Erosion and Sediment Control Ordinance of Gloucester County, Virginia (Chapter 7.5); and

(3) A stormwater management plan that meets the requirements of Section 6-6 of this chapter or an agreement in lieu of a stormwater management plan as determined appropriate by the Administrator.

(c) No VSMP authority permit shall be issued until evidence of general permit coverage is obtained by the Administrator from the Department.

(d) No VSMP authority permit shall be issued until the fees required to be paid pursuant to section 6-15 of this chapter are received, and a reasonable performance surety required pursuant to section 6-16 of this chapter has been submitted.

(e) No VSMP authority permit shall be issued unless and until the permit application and attendant materials and supporting documentation demonstrate that all land clearing, construction, disturbance, land development and drainage will be done according to the approved permit.

(f) No grading, building or other local permit shall be issued for a property unless a VSMP authority permit has been issued by the Administrator.

(Ord. of 6-3-2014(1), § 1-4)

Sec. 6-5. - Stormwater pollution prevention plan; contents of plans.

(a) The Stormwater Pollution Prevention Plan (SWPPP) shall include the content specified by Section 9VAC25-870-54 and must also comply with the requirements and general information set forth in Section 9VAC25-880-70, Section II [stormwater pollution prevention plan] of the general permit.

(b) The SWPPP shall be amended by the operator whenever there is a change in design, construction, operation, or maintenance that has a significant effect on the discharge of pollutants to state waters which is not addressed by the existing SWPPP.

(c) The SWPPP must be maintained by the operator at a central location onsite. If an onsite location is unavailable, notice of the SWPPP's location must be posted near the main entrance at the construction site. Operators shall make the SWPPP available for public review in accordance with Section II of the general permit, either electronically or in hard copy.

(Ord. of 6-3-2014(1), § 1-5)

Sec. 6-6. - Stormwater management plan; contents of plan.

(a) The Stormwater Management Plan, required in section 6-4 of this chapter, must apply the stormwater management technical criteria set forth in section 6-9 of this chapter to the entire land-disturbing activity. Individual lots in new residential, commercial, or industrial developments, including those developed under subsequent owners, shall not be considered separate land-disturbing activities. The Stormwater Management Plan shall consider all known sources of surface runoff and all known sources of subsurface and groundwater flows converted to surface runoff, and include the following information:

(1) Information on the type and location of stormwater discharges; information on the features to which stormwater is being discharged including surface waters or karst features, if present, and the predevelopment and post-development drainage areas;

(2) Contact information including the name, address, email address, and telephone number of the owner and the tax reference number, parcel number, and RPC of the property or properties affected;

(3) A narrative that includes a description of current site conditions and final site conditions;

(4) A general description of the proposed stormwater management facilities and the mechanism through which the facilities will be operated and maintained after construction is complete and a note that states the stormwater management meets the requirements set forth in the VSMP Permit Regulations (9VAC25-870-55) and the Administrative Guidance Manual;

(5) Information on the proposed stormwater management facilities, including:

(i) The type of facilities;

(ii) Location, including geographic coordinates;

(iii) Acres treated; and

(iv) The surface waters or karst features, if present, into which the facility will discharge.

(6) Hydrologic and hydraulic computations, including runoff characteristics;

(7) Documentation and calculations verifying compliance with the water quality and quantity requirements of section 6-9 of this chapter and the Administrative Guidance Manual; and

(8) A map or maps of the site that depicts the topography of the site and includes:

(i) All contributing drainage areas;

(ii) Existing streams, ponds, culverts, ditches, wetlands, other water bodies, and floodplains;

(iii) Soil types, geologic formations if karst features are present in the area, forest cover, and other vegetative areas;

(iv) Current land use including existing structures, roads, and locations of known utilities and easements;

(v) Sufficient information on adjoining parcels to assess the impacts of stormwater from the site on these parcels;

(vi) The limits of clearing and grading, and the proposed drainage patterns on the site;

(vii) Proposed buildings, roads, parking areas, utilities, and stormwater management facilities; and

(viii) Proposed land use with tabulation of the percentage of surface area to be adapted to various uses, including but not limited to planned locations of utilities, roads, and easements.

(b) If an operator intends to meet the water quality and/or quantity requirements set forth in section 6-9 of this chapter through the use of off-site compliance options, where applicable, then a letter of availability from the off-site provider must be included. Approved off-site options must achieve the necessary nutrient reductions prior to the commencement of the applicant's land-disturbing activity except as otherwise allowed by § 62.1-44.15:35 of the Code of Virginia.

(c) Elements of the stormwater management plans that include activities regulated under Chapter 4 (§ 54.1-400 et seq.) of Title 54.1 of the Code of Virginia shall be appropriately sealed and signed by a professional registered in the Commonwealth of Virginia pursuant to Article 1 (§ 54.1-400 et seq.) of Chapter 4 of Title 54.1 of the Code of Virginia.

(d) A construction record drawing for permanent stormwater management facilities shall be submitted to the Administrator. The construction record drawing shall be appropriately sealed and signed by a professional engineer, architect, landscape architect, or land surveyor registered in the Commonwealth of Virginia, certifying that the stormwater management facilities have been constructed in accordance with the approved plan.

(Ord. of 6-3-2014(1), § 1-6)

Sec. 6-7. - Pollution prevention plan; contents of plans.

(a) A Pollution Prevention Plan, required by 9VAC25-870-56, shall be developed, implemented, and updated as necessary and must detail the design, installation, implementation, and maintenance of effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, such measures must be designed, installed, implemented, and maintained to:

(1) Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent treatment to a sediment basin or better treatment prior to discharge;

(2) Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater; and

(3) Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

(b) The pollution prevention plan shall include effective best management practices to prohibit the following discharges:

(1) Wastewater from washout of concrete, unless managed by an appropriate control;

(2) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials;

(3) Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and

(4) Soaps or solvents used in vehicle and equipment washing.

(c) Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls.

(Ord. of 6-3-2014(1), § 1-7)

Sec. 6-8. - Review of stormwater management plan.

(a) The Administrator shall review stormwater management plans and shall approve or disapprove a stormwater management plan according to the following:

(1) The Administrator shall determine the completeness of a plan in accordance with section 6-6 of this chapter, and shall notify the applicant, in writing, of such determination, within 15 working days of receipt of VSMP permit application notification. If the plan is deemed to be incomplete, the above written notification shall contain the reasons the plan is deemed incomplete.

(2) The Administrator shall have an additional 60 calendar days from the date of the communication of completeness to review the plan, except that if a determination of completeness is not made within the time prescribed in subdivision (1), then the plan shall be deemed complete and the Administrator shall have 60 calendar days from the date of submission to review the plan.

(3) For plans not approved by the Administrator, including an incomplete submittal, all comments shall be addressed and resubmitted by the applicant within 180 calendar days of the latest plan-review comment letter addressed to the applicant. Plans that are not resubmitted within this time period may be subject to a new application fee, as outlined in the Administrative Guidance Manual or referenced as a re-submittal fee in the Fee Schedule.

(4) The Administrator shall review any plan that has been previously disapproved, within 45 calendar days of the date of resubmission.

(5) During the review period, the plan shall be approved or disapproved and the decision communicated in writing to the Applicant. If the plan is not approved, the reasons for not approving the plan shall be provided in writing to the Applicant. Approval or denial shall be based on the plan's compliance with the requirements of this chapter and the Administrative Guidance Manual.

(6) If a plan meeting all requirements of this chapter is submitted and no action is taken within the time provided above in subdivision (2) for review, the plan shall be deemed approved.

(b) Approved stormwater plans may be modified as follows:

(1) Modifications to an approved stormwater management plan shall be allowed only after review and written approval by the Administrator. The Administrator shall have 60 calendar days to respond in writing either approving or disapproving such request.

(2) The Administrator may require that an approved stormwater management plan be amended, within a time prescribed by the Administrator, to address any deficiencies noted during stormwater inspection.

(c) The operator shall submit to the Administrator construction record drawings for permanent stormwater management facilities.

(Ord. of 6-3-2014(1), § 1-8)

Sec. 6-9. - Technical criteria for regulated land-disturbing activities.

(a) To protect the quality and quantity of state water from the potential harm of unmanaged stormwater runoff resulting from land-disturbing activities, the county hereby adopts the technical criteria for regulated land-disturbing activities set forth in 9VAC25-870-62 [Part II B of the Regulations], as amended, expressly to include 9VAC25-870-63 [water quality design criteria requirements]; 9VAC25-870-65 [water quality compliance]; 9VAC25-870-66 [water quantity]; 9VAC25-870-69 [offsite compliance options]; 9VAC25-870-72 [design storms and hydrologic methods]; 9VAC25-870-74 [stormwater harvesting]; 9VAC25-870-76 [linear development projects]; 9VAC25-870-85 [stormwater management impoundment structures or facilities]; and 9VAC25-870-92 [comprehensive stormwater management plans], which shall apply to all land-disturbing activities regulated pursuant to this chapter, except as expressly set forth in subsection (b) and (c) of this section.

(b) Any land-disturbing activity shall be considered grandfathered and shall be subject to 9VAC25-870-93 thru 99 [Part II C Technical Criteria of the Regulations], provided:

(1) A proffered or conditional zoning plan, zoning with a plan of development, preliminary or final subdivision plat, preliminary or final site plan, or any document determined by the locality to be equivalent thereto (i) was approved by the locality prior to July 1, 2012, (ii) provided a layout as defined in 9VAC25-870-10, (iii) will comply with the Part II C technical criteria of the VSMP Regulations, and (iv) has not been subsequently modified or amended in a manner resulting in an increase in the amount of phosphorus leaving each point of discharge, and such that there is no increase in the volume or rate of runoff;

(2) A state permit has not been issued prior to July 1, 2014; and

(3) Land disturbance did not commence prior to July 1, 2014.

(c) County, state, and federal projects shall be considered grandfathered by the VSMP authority and shall be subject to the Part II C technical criteria of the VSMP Regulations, provided:

(1) There has been an obligation of county, state, or federal funding, in whole or in part, prior to July 1, 2012, or the department has approved a stormwater management plan prior to July 01, 2012;

(2) A state permit has not been issued prior to July 1, 2014; and

(3) Land disturbance did not commence prior to July 1, 2014.

(d) Land-disturbing activities grandfathered under subsections b and c of this section shall remain subject to the Part II C Technical Criteria of the Regulations for one additional state permit cycle. After such time, portions of the project not under construction shall become subject to any new technical criteria adopted by the State Board.

(e) In cases where governmental bonding or public debt financing has been issued for a project prior to July 01, 2012, such project shall be subject to the technical criteria of Part II C of the VSMP Regulations.

(f) The Administrator may grant exceptions to the technical requirements of Part II B or Part II C of the Regulations, provided that (i) the exception is the minimum necessary to afford relief, (ii) reasonable and appropriate conditions are imposed so that the intent of the Act, the Regulations, and this chapter are preserved, (iii) granting the exception will not confer any special privileges that are denied in other similar circumstances, and (iv) exception requests are not based upon conditions or circumstances that are self-imposed or self-created. Economic hardship alone is not a sufficient reason to grant an exception from the requirements of this chapter. Exceptions granted shall be reported to the Department.

(1) Exceptions to the requirement that the land-disturbing activity obtain required VSMP authority permit shall not be given by the Administrator, nor shall the Administrator approve the use of a BMP not found on the Virginia Stormwater BMP Clearinghouse Website, or any other control measure duly approved by the Department.

(2) Exceptions to requirements for phosphorus reductions shall not be allowed unless offsite options otherwise permitted pursuant to 9VAC25-870-69 have been considered and found not available.

(g) Nothing in this section shall preclude an operator from constructing to a more stringent standard at his discretion.

(Ord. of 6-3-2014(1), § 1-9)

Sec. 6-10. - Long-term maintenance of permanent stormwater facilities.

The Administrator shall require the provision of long-term responsibility for and maintenance of stormwater management facilities and other techniques specified to manage the quality and quantity of runoff. Such requirements shall be set forth in an instrument recorded in the county land records prior to general permit termination or earlier as required by the Administrator, and shall at a minimum:

(a) Be submitted to the Administrator for review and approval prior to the approval of the stormwater management plan;

(b) Be stated to run with the land;

(c) Provide for all necessary access to the property for purposes of maintenance and regulatory inspections;

(d) Provide for inspections and maintenance and the submission of inspection and maintenance reports to the Administrator; and

(e) Be enforceable by all appropriate governmental parties.

(Ord. of 6-3-2014(1), § 1-10)

Sec. 6-11. - Monitoring and inspections.

(a) Pursuant to § 62.1-44.15:37 of the Code of Virginia, the Administrator or any duly authorized agent of the Administrator shall provide for periodic inspections of a land-disturbing activity during construction for:

(1) Compliance with the approved erosion and sediment control plan;

(2) Compliance with the approved stormwater management plan;

(3) Development, updating, and implementation of a pollution prevention plan; and

(4) Development and implementation of any additional control measures necessary to address a TMDL.

(b) The Administrator or any duly authorized agent of the Administrator may, at reasonable times and under reasonable circumstances, enter any establishment or upon any property, public or private, for the purpose of obtaining information or conducting surveys or investigations necessary in the enforcement of the provisions of this chapter when reasonable notice has been provided to the owner/agent.

(c) In accordance with a performance bond with surety, cash escrow, letter of credit, any combination thereof, or such other legal arrangement or instrument, the Administrator may also enter any establishment or upon any property, public or private, for the purpose of initiating or maintaining appropriate actions which are required by the permit conditions associated with a permitted activity when a permittee, after proper notice, has failed to take acceptable action within the time specified.

(d) Pursuant to § 62.1-44.15:40 of the Code of Virginia, the Administrator may require every VSMP authority permit applicant or permittee, or any such person subject to VSMP authority requirements under this chapter, to furnish when requested such application materials, plans, specifications, and other pertinent information as may be necessary to determine the effect of his discharge on the quality of state waters, or such other information as may be necessary to accomplish the purposes of this chapter.

(e) Post-construction inspections of stormwater management facilities required by the provisions of this chapter and the recorded maintenance agreement shall be conducted by the owner and at the owner's cost pursuant to the county's adopted and Board approved inspection program, and shall occur within the minimum frequencies shown in BMP Inspection Frequency Table within the Administrative Guidance Manual following approval of the final construction record report for each stormwater facility.

(f) The owner shall furnish to the Administrator an inspection report prepared by a qualified inspector within the time frames provided in the BMP Inspection Frequency Table within the Administrative Guidance Manual. This report shall include, but not be limited to, current photographs of the BMP, a summary of the current BMP condition, and any recommendations for improvements, if necessary.

(g) Qualified inspection personnel include a professional engineer, architect, landscape architect, or land surveyor registered in the Commonwealth of Virginia and project inspector or combined administrator for stormwater authority who have met the certification requirements of Virginia Code § 62.1-44.15:30.

(h) Post-construction inspections of stormwater management facilities required by the provisions of this chapter shall be conducted by the Administrator pursuant to the County's adopted and State Board approved inspection program, and shall occur, at a minimum, at least once every five (5) years.

(Ord. of 6-3-2014(1), § 1-11)

Sec. 6-12. - Hearings.

(a) Any permit applicant or permittee, or person subject to the requirements of this chapter, aggrieved by any action of the county taken without a formal hearing, or by inaction of the county, may demand in writing a formal hearing by the Stormwater Board considering such grievance, provided a petition requesting such hearing is filed with the Administrator within 30 days after notice of such action is given by the Administrator.

(b) The hearings held under this section shall be conducted by the Stormwater Board at a time and place identified by the Stormwater Board.

(c) A verbatim record of the proceedings of such hearings shall be taken and filed with the Stormwater Board.

(Ord. of 6-3-2014(1), § 1-12)

Sec. 6-13. - Appeals.

The final decision of the county under this chapter shall be subject to review by the Circuit Court of Gloucester County, provided an appeal is filed within thirty (30) days from the date of any written decision adversely affecting the rights, duties, or privileges of the person engaging in or proposing to engage in land-disturbing activities. An appeal shall not stay the decision of the County.

(Ord. of 6-3-2014(1), § 1-13)

Sec. 6-14. - Enforcement.

(a) If the Administrator determines that there is a failure to comply with the VSMP authority permit conditions or determines there is an unauthorized discharge, notice shall be served upon the permittee or person responsible for carrying out the permit conditions by, but shall not be limited to, any of the following: verbal warnings and inspection reports, notices of violation, notices of corrective action, consent special orders, and notices to comply. Written notices shall be served by registered or certified mail to the address specified in the permit application or by delivery at the site of the development activities to the agent or employee supervising such activities.

    (1) The notice shall specify the measures needed to comply with the permit conditions and shall specify the time within which such measures shall be completed. Upon failure to comply within the time specified, a stop work order may be issued in accordance with subsection (2) or the permit may be revoked by the Administrator.

(2) If a permittee fails to comply with a notice issued in accordance with this section within the time specified, the Administrator may issue an order requiring the owner, permittee, person responsible for carrying out an approved plan, or the person conducting the land-disturbing activities without an approved plan or required permit to cease all land-disturbing activities until the violation of the permit has ceased, or an approved plan and required permits are obtained, and specified corrective measures have been completed.

Such orders shall be issued in accordance with the Administrative Guidance Manual. Such orders shall become effective upon service on the person by certified mail, return receipt requested, sent to his address specified in the land records of the county, or by personal delivery by an agent of the Administrator. However, if the Administrator finds that any such violation is grossly affecting or presents an imminent and substantial danger of causing harmful erosion of lands or sediment deposition in waters within the watersheds of the Commonwealth or otherwise substantially impacting water quality, she may issue, without advance notice or hearing, an emergency order directing such person to cease immediately all land-disturbing activities on the site and shall provide an opportunity for a hearing, after reasonable notice as to the time and place thereof, to such person, to affirm, modify, amend, or cancel such emergency order. If a person who has been issued an order is not complying with the terms thereof, the Administrator may revoke the permit and institute a proceeding for an injunction, mandamus, or other appropriate remedy in accordance with subsection 6-14(c).

(b) In addition to any other remedy provided by this chapter, if the Administrator determines that there is a failure to comply with the provisions of this chapter, she may initiate such informal and/or formal administrative enforcement procedures in a manner that is consistent with the Administrative Guidance Manual.

(c) Any person violating or failing, neglecting, or refusing to obey any rule, regulation, ordinance, order, approved standard or specification, or any permit condition issued by the Administrator may be compelled in a proceeding instituted in Circuit Court of Gloucester County to obey the same and to comply therewith by injunction, mandamus or other appropriate remedy.

(d) Any person who violates any provision of this chapter or who fails, neglects, or refuses to comply with any order of the Administrator, shall be subject to a civil penalty not to exceed $32,500 for each violation. Each day of violation of each requirement shall constitute a separate offense.

(1) Violations for which a penalty may be imposed under this subsection shall include but not be limited to the following:

(i) No state permit registration;

(ii) No SWPPP;

(iii) Incomplete SWPPP;

(iv) SWPPP not available for review;

(v) No approved erosion and sediment control plan;

(vi) Failure to install stormwater BMPs or erosion and sediment controls;

(vii) Stormwater BMPs or erosion and sediment controls improperly installed or maintained;

(viii) Operational deficiencies;

(ix) Failure to conduct required inspections;

(x) Incomplete, improper, or missed inspections; and

(xi) Discharges not in compliance with the requirements of Section 9VAC25-880-70 of the general permit.

(2) The Administrator may issue a summons for collection of the civil penalty and the action may be prosecuted in the appropriate court.

(3) In imposing a civil penalty pursuant to this subsection, the court may consider the degree of harm caused by the violation and also the economic benefit to the violator from noncompliance.

(4) Any civil penalties assessed by a court as a result of a summons issued by the county shall be paid into the treasury of the county to be used for the purpose of minimizing, preventing, managing, or mitigating pollution of the waters of the county and abating environmental pollution therein in such manner as the court may, by order, direct.

(e) Notwithstanding any other civil or equitable remedy provided by this section or by law, any person who willfully or negligently violates any provision of this chapter, any order of the Administrator, any condition of a permit, or any order of a court shall be guilty of a Class 1 misdemeanor punishable by confinement in jail for not more than 12 months, or a fine of not more than $2,500, or both.

(f) Violation of any provision of this chapter may also result in the following sanctions:

(1) The VSMP authority, where authorized to enforce Virginia Code § 62.1-44.15:24 et seq., may apply to the Circuit Court of Gloucester County to enjoin a violation or a threatened violation of the provisions of Virginia Code § 62.1-44.15:24 et seq. or of this chapter without the necessity of showing that an adequate remedy at law does not exist.

(2) With the consent of any person who has violated or failed, neglected, or refused to obey any ordinance, any condition of a permit, any order of the VSMP authority, or any provision of Virginia Code § 62.1-44.15:24 et seq., the VSMP authority may provide, in an order issued against such person, for the payment of civil charges for violations in specific sums, not to exceed the limit specified in this section. Such civil charges shall be instead of any appropriate civil penalty that could be imposed under this section. Any civil charges collected shall be paid to the treasury of the county pursuant to subsection (d)(4). Charges collected shall be applied to environmental restoration.

(Ord. of 6-3-2014(1), § 1-14)

Sec. 6-15. - Fees.

(a) Fees to cover costs associated with implementation of a VSMP related to land-disturbing activities and issuance of general permit coverage and VSMP authority permits shall be imposed in accordance with Table 1.

(b) The applicable fees designated to the Administrator shall be paid by the Applicant directly to the Administrator at the initial plan submittal; fees designated to the Department shall be paid by the Applicant directly to the Department through the online reporting system. A minimum 50-percent of the fee is required upon submittal; the difference shall be due prior to issuance of permit.

Table 1: Stormwater Ordinance Permitting Fees

Type of Permit	Fee Amount	
	County	State
Chesapeake Bay Preservation Act Land-Disturbing Activity (not subject to General Permit coverage; sites within designated areas of Chesapeake Bay Act localities with land-disturbance acreage equal to or greater than 2,500 square feet and less than 1 acre)	$290	$0
VSMP General/Stormwater Management - Small Construction Activity/Land Clearing (Areas within common plans of development or sale with land-disturbance acreage less than one acre, except for single-family detached residential structures)	$209	$81
VSMP General/Stormwater Management - Small Construction Activity/Land Clearing (single family detached residential structure with a site or area, within or outside a common plan of development or sale, that is equal to or greater than one acre but less than five acres)	$209	$0
VSMP General/Stormwater Management - Small Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land disturbance acreage equal to or greater than 1 acre and less than 5 Acres)	$1,944	$756
VSMP General/Stormwater Management - Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land disturbance acreage equal to or greater than 5 acres and less than 10 acres)	$2,448	$952
VSMP General/Stormwater Management - Large Construction Activity/Land Clearing [Sites or areas within common plans of development or sale with land disturbance acreage equal to or greater than 10 acres and less than 50 acres]	$3,240	$1,260
VSMP General/Stormwater Management - Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land disturbance acreage equal to or greater than 50 acres and less than 100 acres)	$4,392	$1,708
VSMP General/Stormwater Management - Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land disturbance acreage equal to or greater than 100 acres)	$6,912	$2,688
VSMP Individual Permit for Discharges of Stormwater From Construction Activities	$0	$15,000

(c) Fees for the modification or transfer of registration statements from the general permit issued by the Board shall be imposed in accordance with VSMP Permit Regulations and adopted by this chapter in accordance with Table 2 and shall be paid directly to the Administrator.

Table 2: Fees for the modification or transfer of registration statements for the General Permit for Discharges of Stormwater from Construction Activities

Type of Permit	Fee Amount
Chesapeake Bay Preservation Act Land-Disturbing Activity (not subject to General Permit coverage; sites within designated areas of Chesapeake Bay Act localities with land-disturbance acreage equal to or greater than 2,500 square feet and less than 1 acre)	$20
General/Stormwater Management - Small Construction Activity/Land Clearing (Areas within common plans of development or sale with land-disturbance acreage less than one acre, except for single-family detached residential structures)	$20
General/Stormwater Management - Small Construction Activity/Land Clearing (Single-family detached residential structures within or outside a common plan of development or sale with land-disturbance acreage less than 5 acres)	$20
General/Stormwater Management - Small Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than one and less than five acres)	$200
General/Stormwater Management - Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than five acres and less than 10 acres)	$250
General/Stormwater Management - Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 10 acres and less than 50 acres)	$300
General/Stormwater Management - Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 50 acres and less than 100 acres)	$450
General/Stormwater Management - Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 100 acres)	$700
Individual Permit for Discharges of Stormwater from Construction Activities	$5,000

(d) If the general permit modifications result in changes to stormwater management plans that require additional review by the county, such reviews shall be subject to the fees set out in the VSMP Permit Regulations and this chapter.

(e) The fee assessed shall be based on the total disturbed acreage of the site. In addition to the general permit modification fee, applicants seeking modifications resulting in an increase in total disturbed acreage shall pay the difference in the initial permit fee paid and the permit fee that would have applied for the total disturbed acreage in this chapter. These fees shall be paid directly to the Administrator.

(f) Annual permit maintenance shall be imposed in accordance with Table 3 of this chapter, including fees imposed on expired permits that have been administratively continued. With respect to the general permit, these fees shall apply until the permit coverage is terminated.

Table 3: Permit Maintenance Fees

Type of Permit	Fee Amount
Chesapeake Bay Preservation Act Land-Disturbing Activity (not subject to General Permit coverage; sites within designated areas of Chesapeake Bay Act localities with land-disturbance acreage equal to or greater than 2,500 square feet and less than 1 acre)	$50
General/Stormwater Management - Small Construction Activity/Land Clearing (Areas within common plans of development or sale with land-disturbance acreage less than one acre)	$50
General/Stormwater Management - Small Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance equal to or greater than one acre and less than five acres)	$400
General/Stormwater Management - Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than five acres and less than 10 acres)	$500
General/Stormwater Management - Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 10 acres and less than 50 acres)	$650
General/Stormwater Management - Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater than 50 acres and less than 100 acres)	$900
General/Stormwater Management - Large Construction Activity/Land Clearing (Sites or areas within common plans of development or sale with land-disturbance acreage equal to or greater [than] 100 acres)	$1,400
Individual Permit for Discharges from Construction Activities	$3,000

(g) General permit coverage maintenance fees shall be paid annually to the county, by the anniversary date of general permit coverage. No permit will be reissued or automatically continued without

payment of the required fee. General permit coverage maintenance fees shall be applied until a Notice of Termination is effective.

(h) The fees set forth in subsections (a) through (g) above, shall apply to:

(1) All persons seeking coverage under the general permit.

(2) All permittees who request modifications to or transfers of their existing registration statement for coverage under a general permit.

(i) No general permit application fees will be assessed to:

(1) Permittees who request minor modifications to general permits as defined in section 6-2 of this chapter. Permit modifications at the request of the permittee resulting in changes to stormwater management plans that require additional review by the Administrator shall not be exempt pursuant to this section.

(2) Permittees whose general permits are modified or amended at the initiative of the Department, excluding errors in the registration statement identified by the Administrator or errors related to the acreage of the site.

(j) All incomplete payments will be deemed as nonpayment, and the applicant shall be notified of any incomplete payments. Interest may be charged for late payments at the underpayment rate set forth in § 58.1-15 of the Code of Virginia and is calculated on a monthly basis at the applicable periodic rate. A 10% late payment fee shall be charged to any delinquent (over 90 days past due) account. The county shall be entitled to all remedies available under the Code of Virginia in collecting any past due amount.

(k) The fee for applications brought for hearing through the Stormwater Board, section 6-12 of this chapter, shall be $275.

(Ord. of 6-3-2014(1), § 1-15)

Sec. 6-16. - Performance bond.

Prior to permit issuance, the Applicant shall submit a reasonable performance bond with surety, cash escrow, letter of credit, any combination thereof, or such other legal arrangement acceptable to the county attorney and Administrator to ensure that measures could be taken by the county at the Applicant's expense should he fail, after proper notice, within the time specified to initiate or maintain appropriate actions which may be required of him by the permit conditions as a result of his land disturbing activity. If the county takes such action upon such failure by the Applicant, the county may collect from the Applicant the difference should the amount of the reasonable cost of such action exceed the amount of the security held, if any. Within 60 days of the completion of the requirements of the permit conditions, such bond, cash escrow, letter of credit or other legal arrangement, or the unexpended or unobligated portion thereof, shall be refunded to the Applicant or terminated.

(Ord. of 6-3-2014(1), § 1-16)

Appendix M –
Drought Response Ordinances from all MPPDC Localities

ESSX4

Chapter 21

Essex County Water Conservation Ordinance

Section 21-1. Water emergencies and conservation.
(a) Applicability, Purpose and authority to declare water emergencies. For purposes of this Ordinance, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any water utility system that is owned and/or operated "by a locality, authority, or company distributing water for a fee or charge". It shall not apply to individual wells serving residences or businesses or to community systems providing water to residences or businesses.
In the event of an actual or anticipated shortage of potable water due to climatic, hydrological, mechanical and/or other extraordinary conditions, the County of Essex may determine that certain uses of water should be reduced, restricted, curtailed and/or prohibited. These reductions, restrictions, curtailments and/or prohibitions are intended to protect the health, safety and welfare of the residents of the County of Essex.
The County Administrator, with the approval of the Board of Supervisors, or its subsequent ratification by the Board within 48 hours, is authorized to declare water emergencies in the (County/Town), as a whole or portions thereof, affecting the use of water. A Drought Emergency declaration will be issued after consideration of the conditions of individual affected water systems. The County Administrator may order mandatory restrictions on water use in response to specific conditions, such as when any system exceeds 90 percent of the permitted capacity for 3 consecutive months. The County Administrator may intervene to declare a drought emergency for privately-owned systems if the private system operation is unable to restrict water usage when needed.
(b) Drought monitoring to anticipate water emergency conditions. The County of Essex, in cooperation with other jurisdictions of the Middle-Peninsula Water Supply Planning Region, will monitor the U.S. Drought Monitor operated by the U.S. Geological Service and made available through DEQ's website at:
http://www.deq.virginia.gov/waterresources/drought.php.
When the USGS Drought Monitor registers a condition "D1-Moderate Drought" for the County of Essex, the County Administrator shall declare a Drought Watch alert for all water systems addressed by this ordinance.

(c) *Water conservation measures.* After the declaration of a water emergency under the authority provided by Virginia Code Sections 15.2-923 and 15.2-924, and upon a determination by the County Administrator of the existence of the following one or more conditions, the County Administrator shall take the following actions which shall apply to any person whose water supply is furnished from an affected water utility system: (1) *Condition 1 (Drought Warning).* When moderate but limited supplies of water are available or when a "D2-Severe Drought" condition is registered on the USGS Drought Monitor, the County Administrator may, through appropriate means, call upon the affected population and entities to employ prudent restraint in water usage and to conserve water voluntarily by whatever methods available.

(2) *Condition 2 (Drought Emergency).* The County Administrator is hereby further authorized during the duration of a water emergency for which voluntary measures would be insufficient to order the restriction or prohibition of any or all of the following water uses by users of an identified, affected water system after consultation with the affected water system owner/operator:

a. Watering of outside shrubbery, trees, lawns, grass, plants, home vegetable gardens, or any other vegetation except from a watering can or other container not exceeding five gallons in capacity. This limitation shall not apply to commercial greenhouses, nursery stocks and sod growing, which may be watered in the minimum amount required to preserve plant life between 6:00 p.m. and 8:00 a.m.

b. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.

c. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state or local law.

d. The operation of any ornamental fountain or other structure making a similar use of water.

e. The filling of swimming or wading pools requiring more than five gallons of water, or the refilling of swimming or wading pools that were drained after the effective date of the declaration of emergency, except that pools may be filled to a level of two feet below normal, or water may be added to bring the level to two feet below normal, or as necessary to protect the structure from hydrostatic damage.

f. The use of water during outdoor recreational activities. This limitation shall not apply to water utilized for drinking and sanitary purposes during such activities.
g. The use of water from fire hydrants for any purposes other than fire suppression and related training exercises, unless otherwise approved by the county administrator.
h. The serving of drinking water in restaurants, except upon request.
i. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.
(3) *Condition 3.* In addition to the restrictions and prohibitions authorized under subsection (2) above, the County Administrator is hereby further authorized during the duration of a water emergency to implement any or all of the following for any of the affected water systems:
a. For any publicly owned and operated public water utility:
i. Industrial, institutional, commercial, governmental, wholesale and all other nonresidential customers shall be allotted a percentage reduction based on that customer's average monthly water consumption for the same billing period of the previous calendar year's consumption. ii. Individual residential customers shall be limited to a specific volume or percentage reduction of water per month.
iii. If the allotted monthly water usage, as determined in subsection (3)a.i. and (3)a.ii. above, is exceeded, the customer shall be charged two times the existing service rate for consumption over the minimum monthly charge for every 1,000 gallons of water consumed above the allotted volume. Where prior consumption data is not available, the county administrator shall estimate allocations based upon the data available from similar activities of equal intensity.
iv. Declaration of a moratorium on new and expanded connections to the public water utility system, unless such connections are primarily intended and designed to provide fire protection and/or potable drinking water to lawfully permitted residential or nonresidential buildings that are existing or substantially constructed at the time that a water emergency is declared.
b. For any privately owned and operated public water supply: The system operator shall be required to demonstrate on a monthly schedule, compliance with the capacity requirements set forth by the Virginia Department of Health Waterworks Regulations (12 VAC5-590-520 and 12 VAC5-590-690).

(4) *Condition 4.* When crucially limited supplies of water are available, the County Administrator shall restrict the use of water from any affected water system to purposes which are absolutely essential to life, health and safety. Such permitted uses of water may include, but may not be limited to, the provision of limited quantities of water for drinking and sanitation purposes to residents, health care facility patients and/or emergency shelter evacuees, who are unable to utilize their potable water supplies due to the loss of electrical power, storm events or other natural or manmade causes.

(5) *Failure to address leaks.* It shall be unlawful for the owner of any residential unit or units, or the owner of any commercial or industrial establishment which is found to be an excessive user of water due to leakage from waterlines or plumbing fixtures on the premises, to fail to take immediate action to repair and to stop such leakage after being so ordered by the (County Administrator/Town Manager) or his agent.

(6) *Effective date.* The imposition of the restrictions above shall become effective upon their being printed in any newspaper of general circulation in the County of Essex, or broadcasted upon any radio or television station serving the County of Essex.

(7) *Appeals for exemptions.* Upon implementation of subsections (2), (3) or (4) above, the County Administrator shall establish an appeals procedure to review customer applications for exemptions from the provisions of subsections (2), (3) or (4) on a case-by-case basis and, if warranted, to make equitable adjustments to such provisions. The County Administrator shall also be empowered to establish regulations governing the granting of temporary exemptions applicable to all or some of the uses of the water supply set forth in subsections (2), (3) or (4). The County Administrator shall, in rendering a decision on such applications, balance economic and other hardships to the applicant resulting from the imposition of water use restrictions or allocations against the individual and cumulative impacts to the water supply resulting from the granting of such exemptions and may impose reasonable conditions to ensure compliance with the terms of the exemption. Any person subject to a decision rendered by the County Administrator under this section may appeal such decision to the Board of Supervisors. The appeal shall be in writing and shall be submitted to the County Administrator, as agent for and clerk to the Board of Supervisors.

The County Administrator may issue temporary waivers or exemptions within the provisions of this subsection for such periods of time as may be necessary for the (Board of Supervisor to formally consider action on the appeal. The Board of Supervisors shall render a decision on the appeal and may: affirm, with or without modification, the County Administrator's decision; or approve the requested exemption, with or without modification. The Board of Supervisors may impose reasonable conditions to ensure compliance with the terms of any exemption granted hereunder. Any decision rendered by the Board of Supervisors shall be subject to remedies provided by statute.

(d) *Penalty for violations.* Any person, firm or entity who shall violate any of the provisions of this section, or of any of the conservation regulations promulgated by the County of Essex pursuant thereto, shall, upon conviction thereof, be subject to the penalties provided in Section (F). Each act or each day's continuation of a violation shall be deemed a separate offense. In addition to the foregoing, the County Administrator may suspend public water utility service to any person continuing to violate the provisions of this ordinance of the regulations promulgated hereunder. If such public water utility service is terminated, the person, firm or entity shall pay a reconnection fee of $50.00 before service is restored.

(e) *Declaration of end of water emergencies.* The County Administrator shall notify the Board of Supervisors when, in his opinion, the water emergency situation no longer exists. Upon concurrence of the Board of Supervisors, the water emergency shall be declared to have ended.

(f) *Violations.* Any person, firm, entity or operator of any water system, who violates any provision of this Ordinance shall be guilty of a Class 4 misdemeanor. Any person who violates any provision of this Ordinance a second or subsequent time within 30 days shall be guilty of a Class 2 misdemeanor.

This Ordinance shall be in effect upon adoption.

Adopted December 6, 2011.

Middlesex County Water Conservation Ordinance

Water emergencies and conservation.

Section (A) Applicability, Purpose and authority to declare water emergencies. For purposes of this Ordinance, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any water utility system that is owned and/or operated "by a locality, authority, or company distributing water for a fee or charge". It shall not apply to individual wells serving residences or businesses or to community systems providing water to residences or businesses.

In the event of an actual or anticipated shortage of potable water due to climatic, hydrological, mechanical and/or other extraordinary conditions, Middlesex County may determine that certain uses of water should be reduced, restricted, curtailed and/or prohibited. These reductions, restrictions, curtailments and/or prohibitions are intended to protect the health, safety and welfare of the residents of Middlesex County.

The County Administrator, with the approval of the Board of Supervisors, or its subsequent ratification by the Board within 48 hours, is authorized to declare water emergencies in the County, as a whole or portions thereof, affecting the use of water. A Drought Emergency declaration will be issued after consideration of the conditions of individual affected water systems. The County Administrator may order mandatory restrictions on water use in response to specific conditions, such as when any system exceeds 90 percent of the permitted capacity for 3 consecutive months.

Section (B) Drought monitoring to anticipate water emergency conditions. Middlesex County, in cooperation with other jurisdictions of the Middle-Peninsula Water Supply Planning Region, will monitor the U.S. Drought Monitor operated by the U.S. Geological Service and made available through DEQ's website at: http://www.deq.virginia.gov/waterresources/drought.php. When the USGS Drought Monitor registers a condition "D1-Moderate Drought" for Middlesex County, the County Administrator shall declare a Drought Watch alert for all water systems addressed by this ordinance.

Section (C) Water conservation measures. After the declaration of a water emergency under the authority provided by Virginia Code Sections 15.2-923 and 15.2-924, and upon a determination by the County Administrator of the existence of the following one or more conditions, the County Administrator shall take the following actions which shall apply to any person whose water supply is furnished from an affected water utility system:

(1) *Condition 1 (Drought Warning).* When moderate but limited supplies of water are available or when a "D2-Severe Drought" condition is registered on the USGS Drought Monitor, the County Administrator may, through appropriate means, call upon the affected population and entities to employ prudent restraint in water usage and to conserve water voluntarily by whatever methods available.

(2) *Condition 2 (Drought Emergency).* The County Administrator is hereby further authorized during the duration of a water emergency for which voluntary measures would

be insufficient to order the restriction or prohibition of any or all of the following water uses by users of an identified, affected water system after consultation with the affected water system owner/operator:

a. Watering of outside shrubbery, trees, lawns, grass, plants, home vegetable gardens, or any other vegetation except from a watering can or other container not exceeding five gallons in capacity. This limitation shall not apply to commercial greenhouses, nursery stocks and sod growing, which may be watered in the minimum amount required to preserve plant life between 6:00 p.m. and 8:00 a.m.
b. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.
c. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state or local law.
d. The operation of any ornamental fountain or other structure making a similar use of water.
e. The filling of swimming or wading pools requiring more than five gallons of water, or the refilling of swimming or wading pools that were drained after the effective date of the declaration of emergency, except that pools may be filled to a level of two feet below normal, or water may be added to bring the level to two feet below normal, or as necessary to protect the structure from hydrostatic damage.
f. The use of water during outdoor recreational activities. This limitation shall not apply to water utilized for drinking and sanitary purposes during such activities.
g. The use of water from fire hydrants for any purposes other than fire suppression and related training exercises, unless otherwise approved by the county administrator.
h. The serving of drinking water in restaurants, except upon request.
i. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.

(3) *Condition 3.* In addition to the restrictions and prohibitions authorized under subsection (2) above, the County Administrator is hereby further authorized during the duration of a water emergency to implement any or all of the following for any of the affected water systems:

a. For any publicly owned and operated public water utility:
   i. Industrial, institutional, commercial, governmental, wholesale and all other nonresidential customers shall be allotted a percentage reduction based on that customer's average monthly water consumption for the same billing period of the previous calendar year's consumption.
   ii. Individual residential customers shall be limited to a specific volume or percentage reduction of water per month.
   iii. If the allotted monthly water usage, as determined in subsection (3)a.i. and (3)a.ii. above, is exceeded, the customer shall be charged two times the existing service rate for consumption over the minimum monthly charge for every 1,000 gallons of water consumed above the allotted volume. Where prior consumption data is not available, the county administrator shall estimate allocations based upon the data available from similar activities of equal intensity.

iv. Declaration of a moratorium on new and expanded connections to the public water utility system, unless such connections are primarily intended and designed to provide fire protection and/or potable drinking water to lawfully permitted residential or nonresidential buildings that are existing or substantially constructed at the time that a water emergency is declared.

b. For any privately owned and operated public water supply: The system operator shall be required to demonstrate on a monthly schedule, compliance with the capacity requirements set forth by the Virginia Department of Health Waterworks Regulations (12 VAC5-590-520 and 12 VAC5-590-690).

(4) *Condition 4.* When crucially limited supplies of water are available, the County Administrator shall restrict the use of water from any affected water system to purposes which are absolutely essential to life, health and safety. Such permitted uses of water may include, but may not be limited to, the provision of limited quantities of water for drinking and sanitation purposes to residents, health care facility patients and/or emergency shelter evacuees, who are unable to utilize their potable water supplies due to the loss of electrical power, storm events or other natural or manmade causes.

(5) *Failure to address leaks.* It shall be unlawful for the owner of any residential unit or units, or the owner of any commercial or industrial establishment which is found to be an excessive user of water due to leakage from waterlines or plumbing fixtures on the premises, to fail to take immediate action to repair and to stop such leakage after being so ordered by the County Administrator or his agent.

(6) *Effective date.* The imposition of the restrictions above shall become effective upon their being printed in any newspaper of general circulation in Middlesex County, or broadcasted upon any radio or television station serving Middlesex County.

(7) *Appeals for exemptions.* Upon implementation of subsections (2), (3) or (4) above, the County Administrator shall establish an appeals procedure to review customer applications for exemptions from the provisions of subsections (2), (3) or (4) on a case-by-case basis and, if warranted, to make equitable adjustments to such provisions. The County Administrator shall also be empowered to establish regulations governing the granting of temporary exemptions applicable to all or some of the uses of the water supply set forth in subsections (2), (3) or (4). The County Administrator shall, in rendering a decision on such applications, balance economic and other hardships to the applicant resulting from the imposition of water use restrictions or allocations against the individual and cumulative impacts to the water supply resulting from the granting of such exemptions and may impose reasonable conditions to ensure compliance with the terms of the exemption.

Any person subject to a decision rendered by the County Administrator under this section may appeal such decision to the Board of Supervisors. The appeal shall be in writing and shall be submitted to the County Administrator, as agent for and clerk to the Board of Supervisors.

The County Administrator may issue temporary waivers or exemptions within the provisions of this subsection for such periods of time as may be necessary for the Board of Supervisors to formally consider action on the appeal.

The Board of Supervisors shall render a decision on the appeal and may: affirm, with or without modification, the County Administrator's decision; or approve the requested exemption, with or without modification. The Board of Supervisors may impose reasonable conditions to ensure compliance with the terms of any exemption granted hereunder.

Any decision rendered by the Board of supervisors shall be subject to remedies provided by statute.

Section (D) *Penalty for violations.* Any person, firm or entity who shall violate any of the provisions of this section, or of any of the conservation regulations promulgated by Middlesex County pursuant thereto, shall, upon conviction thereof, be subject to the penalties provided in Section (F). Each act or each day's continuation of a violation shall be deemed a separate offense.

In addition to the foregoing, the County Administrator may suspend public water utility service to any person continuing to violate the provisions of this ordinance or the regulations promulgated hereunder.

If such public water utility service is terminated, the person, firm or entity shall pay a reconnection fee of $50.00 before service is restored.

Section (E) *Declaration of end of water emergencies.* The County Administrator shall notify the Board of Supervisors when, in his opinion, the water emergency situation no longer exists. Upon concurrence of the Board of Supervisors, the water emergency shall be declared to have ended.

Section (F) *Violations.* Any person, firm, entity or operator of any water system, who violates any provision of this Ordinance shall be guilty of a Class 4 misdemeanor. Any person who violates any provision of this Ordinance a second or subsequent time within 30 days shall be guilty of a Class 2 misdemeanor.

This Ordinance shall be in effect upon adoption.

Present and voting:

John D. Miller, Jr.	aye
Wayne H. Jessie, Sr.	aye
Fred S. Crittenden	aye
Carlton S. Revere	aye
Peter W. Mansfield	nay

A Copy Teste

Charles M. Culley, Jr.
Clerk of the Board

(b) The biosolids monitor shall have the authority to order the abatement of any violation of state law or regulation. The abatement order shall identify the activity constituting the violation; specify the code provision or regulation violated by the activity and order cessation and correction of the violation.

(c) The county may bring suit to enjoin, restrain, correct or prevent any violation of this article.

(Ord. of 8-12-2005)

(Sec. 264 – 275 Reserved)

ARTICLE VII. WATER CONSERVATION ORDINANCE

Sec. 22-276. Purpose and Authority to Declare Water Emergencies

For purposes of this section, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any water utility system that is owned and/or operated "by a locality, authority, or company distributing water for a fee or charge".

In the event of an actual or anticipated shortage of potable water due to climatic, hydrological, mechanical and/or other extraordinary conditions, King and Queen County may determine that certain uses of water should be reduced, restricted, curtailed and/or prohibited. These reductions, restrictions, curtailments and/or prohibitions are intended to protect the health, safety and welfare of the residents of King and Queen County.

The County Administrator with the approval of the Board of Supervisors, or its subsequent ratification by the Board within 48 hours, is authorized to declare water emergencies in the County of King and Queen, as a whole or portions thereof, affecting the use of water.

A Drought Emergency declaration will be issued after consideration of the conditions of individual affected systems. The County Administrator may order mandatory restrictions on water use in response to specific conditions, such as when any system exceeds 90 percent of the permitted capacity for 3 consecutive months. The County Administrator may intervene to declare a drought emergency for privately-owned systems if the private system operation is unable to restrict water usage when needed.

Sec. 22-277. Drought Monitoring to Anticipate Water Emergency Conditions

King and Queen County in cooperation with other jurisdictions of the Middle-Peninsula Water Supply Planning Region, will monitor the U.S. Drought Monitor operated by the U.S. Geological Service and made available through DEQ's website at: http://www.deq.virginia.gov/waterresources/drought.php. When the USGS Drought Monitor registers a condition "D1-Moderate Drought" for King and Queen County, the

County Administrator shall declare a Drought Watch alert for all water systems addressed by this ordinance.

Sec. 22-278. Water Conservation Measures

After the declaration of a water emergency under the authority provided by Virginia Code Sections 15.2-923 and 15.2-924, and upon a determination by the County Administrator of the existence of the following one or more conditions, the County Administrator shall take the following actions which shall apply to any person whose water supply is furnished from an affected water utility system:

(1) *Condition 1 (Drought Warning)*. When moderate but limited supplies of water are available or when a "D2-Severe Drought" condition is registered on the USGS Drought Monitor, the County Administrator may, through appropriate means, call upon the affected population and entities to employ prudent restraint in water usage and to conserve water voluntarily by whatever methods available.

(2) *Condition 2 (Drought Emergency)*. The County Administrator is hereby further authorized during the duration of a water emergency for which voluntary measures would be insufficient to order the restriction or prohibition of any or all of the following water uses by users of an identified, affected water system after consultation with the affected water system owner/operator:

a. Watering of outside shrubbery, trees, lawns, grass, plants, home vegetable gardens, or any other vegetation except from a watering can or other container not exceeding five gallons in capacity. This limitation shall not apply to commercial greenhouses, nursery stocks and sod growing, which may be watered in the minimum amount required to preserve plant life between 6:00 p.m. and 8:00 a.m.

b. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.

c. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state or local law.

d. The operation of any ornamental fountain or other structure making a similar use of water.

e. The filling of swimming or wading pools requiring more than five gallons of water, or the refilling of swimming or wading pools that were drained after the effective date of the declaration of emergency, except that pools may be filled to a level of two feet below normal, or water may be added to bring the level to two feet below normal, or as necessary to protect the structure from hydrostatic damage.

f. The use of water during outdoor recreational activities. This limitation shall not apply to water utilized for drinking and sanitary purposes during such activities.

g. The use of water from fire hydrants for any purposes other than fire suppression and related training exercises, unless otherwise approved by the county administrator.

h. The serving of drinking water in restaurants, except upon request.

i. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.

(3) *Condition 3.* In addition to the restrictions and prohibitions authorized under subsection (2) above, the County Administrator is hereby further authorized during the duration of a water emergency to implement any or all of the following for any of the affected water systems:

a. For any publicly owned and operated public water utility:

i. Industrial, institutional, commercial, governmental, wholesale and all other nonresidential customers shall be allotted a percentage reduction based on that customer's average monthly water consumption for the same billing period of the previous calendar year's consumption.

ii. Individual residential customers shall be limited to a specific volume or percentage reduction of water per month.

iii. If the allotted monthly water usage, as determined in subsection (3)a.i. and (3)a.ii. above, is exceeded, the customer shall be charged two times the existing service rate for consumption over the minimum monthly charge for every 1,000 gallons of water consumed above the allotted volume. Where prior consumption data is not available, the county administrator shall estimate allocations based upon the data available from similar activities of equal intensity.

iv. Declaration of a moratorium on new and expanded connections to the public water utility system, unless such connections are primarily intended and designed to provide fire protection and/or potable drinking water to lawfully permitted residential or nonresidential buildings that are existing or substantially constructed at the time that a water emergency is declared.

b. For any privately owned and operated public water supply:
The system operator shall be required to demonstrate on a monthly schedule, compliance with the capacity requirements set forth by the Virginia Department of Health Waterworks Regulations (12 VAC5-590-520 and 12 VAC5-590-690).

(4) *Condition 4.* When crucially limited supplies of water are available, the County Administrator shall restrict the use of water from any affected water system to purposes which are absolutely essential to life, health and safety. Such permitted uses of water may include, but may not be limited to, the provision of limited quantities of water for drinking and sanitation purposes to residents, health care facility patients and/or emergency shelter evacuees, who are unable to utilize their potable water supplies due to the loss of electrical power, storm events or other natural or manmade causes.

Sec. 22-279. Failure to Address Leaks

It shall be unlawful for the owner of any residential unit or units, or the owner of any commercial or industrial establishment which is found to be an excessive user of water due to leakage from waterlines or plumbing fixtures on the premises, to fail to take immediate action to repair and to stop such leakage after being so ordered by the County Administrator or his agent.

Sec. 22-280. Effective Date

The imposition of the restrictions above shall become effective upon their being printed in any newspaper of general circulation in King and Queen County, or broadcasted upon any radio or television station serving King and Queen County.

Sec. 22-281. Appeals for Exemptions

Upon implementation of subsections (2), (3) or (4) above, the County Administrator shall establish an appeals procedure to review customer applications for exemptions from the provisions of subsections (2), (3) or (4) on a case-by-case basis and, if warranted, to make equitable adjustments to such provisions. The County Administrator shall also be empowered to establish regulations governing the granting of temporary exemptions applicable to all or some of the uses of the water supply set forth in subsections (2), (3) or (4). The County Administrator shall, in rendering a decision on such applications, balance economic and other hardships to the applicant resulting from the imposition of water use restrictions or allocations against the individual and cumulative impacts to the water supply resulting from the granting of such exemptions and may impose reasonable conditions to ensure compliance with the terms of the exemption.

Any person subject to a decision rendered by the County Administrator under this section may appeal such decision to the Board of Supervisors. The appeal shall be in writing and shall be submitted to the County Administrator, as agent for and clerk to the Board of Supervisors.

The County Administrator may issue temporary waivers or exemptions within the provisions of this subsection for such periods of time as may be necessary for the Board of Supervisors to formally consider action on the appeal.

The Board of Supervisors shall render a decision on the appeal and may: affirm, with or without modification, the County Administrators decision; or approve the requested exemption, with or without modification. The Board of Supervisors may impose reasonable conditions to ensure compliance with the terms of any exemption granted hereunder.

Any decision rendered by the Board of Supervisors shall be subject to remedies provided by statute.

Sec. 22-282. Penalty for Violations

Any person who shall violate any of the provisions of this section, or of any of the conservation regulations promulgated by King and Queen County pursuant thereto, shall, upon conviction thereof, be subject to penalties as provided by law. Each act or each day's continuation of a violation shall be deemed a separate offense.
In addition to the foregoing, the County Administrator may suspend public water utility service to any person continuing to violate the provisions of this ordinance or the regulations promulgated hereunder.

If such public water utility service is terminated, the person shall pay a reconnection fee of $50.00 before service is restored.

Sec. 22-282. Declaration of end of Water Emergencies

The County Administrator shall notify the Board of Supervisors when, in his opinion, the water emergency situation no longer exists. Upon concurrence of the Board of Supervisors the water emergency shall be declared to have ended.

ORDINANCE #11-03
AMEND SECTION 78-192
WATER EMERGENCIES AND CONSERVATION

WHEREAS, the Board of Supervisors of King William County, Virginia has received a request to amend and update Chapter 78 (Utilities) of the King William County Code to be consistent with Virginia State Water Control Board Regulation 9 VAC 25-780, Local and Regional Water Supply Planning; and

WHEREAS, guidance received from the VA Department of Environmental Quality regarding the adoption of a regional water supply plan and the subsequent issuing or renewal of groundwater withdrawal permits by the VA Department of Environmental Quality indicates the need to amend and update Section 78-192, Water Emergencies and Conservation; and

WHEREAS, the request is specifically to amend Section 78-192, Water Emergencies and Conservation; and

NOW, THEREOFRE, BE IT ORDAINED AND ENACTED, that the Board of Supervisors of King William County, Virginia, does hereby amend and readopt Section 86-499 of the King William County Code to read as follows:

Section 78-192. Water Emergencies and Conservation

(a) *Application and authority to declare water emergency; notice of impending shortage.* For purposes of this section, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any water utility system that is owned and/or operated by the County of King William or by a purveyor distributing water within the County for a fee or charge.

In the event of an actual or anticipated shortage of potable water due to climatic, hydrological, mechanical and/or other extraordinary conditions, the County of King William may determine that certain uses of water should be reduced, restricted, curtailed and/or prohibited. These reductions, restrictions, curtailments and/or prohibitions are intended to protect the health, safety and welfare of the residents of the County of King William.

The county administrator, with the approval of the board of supervisors, or with subsequent ratification by the board at its next scheduled regular or special meeting, is authorized to declare a water emergency in the county or in portions thereof, and restrict the use of water as set forth in this section.

The County of King William, in cooperation with other jurisdictions of the Middle-Peninsula Water Supply Planning Region, will monitor the U.S. Drought Monitor operated by the U.S. Geological Service. When the USGS Drought Monitor registers a condition "D1-Moderate Drought" for the County of King William, the county administrator shall declare a Drought Watch alert for all water systems addressed by this ordinance and take appropriate steps to increase public

awareness of the potential for a significant drought event and the potential water conservation measures that may have to be implemented after further public notice.

(b) *Water conservation measures.* Should conditions continue to deteriorate and after the declaration of a water emergency the county administrator shall take the following actions as necessary according to the circumstances:

(1) When the onset of a significant drought is imminent and when moderate but limited supplies of water are available, or when a "D2-Severe Drought" condition is registered on the USGS Drought Monitor, the county administrator through appropriate means shall call upon the affected population and entities to employ prudent restraint in water usage and to conserve water voluntarily by whatever methods available and shall identify voluntary conservation measures that can be expected to reduce usage by five to ten percent.

(2) The county administrator is further authorized during a water emergency for which voluntary measures would be insufficient, to order the restriction or prohibition of any or all of the following water uses:

a. Watering of outside shrubbery, trees, lawns, grass, plants, home vegetable gardens, or any other vegetation except from a watering can or other container not exceeding five gallons in capacity. This limitation shall not apply to commercial greenhouses, nursery stocks and sod growing, which may be watered in the minimum amount required to preserve plant life between 6:00 p.m. and 8:00 a.m.

b. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.

c. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state or local law.

d. The operation of any ornamental fountain or other structure making a similar use of water.

e. The filling of swimming or wading pools requiring more than five gallons of water, or the refilling of swimming or wading pools that were drained after the effective date of the declaration of emergency, except that pools may be filled to a level of two feet below normal, or water may be added to bring the level to two feet below normal, or as necessary to protect the structure from hydrostatic damage.

f. The use of water during outdoor recreational activities. This limitation shall not apply to water utilized for drinking and sanitary purposes during such activities.

g. The use of water from fire hydrants for any purposes other than fire suppression and related training exercises, unless otherwise approved by the county administrator.

h. The serving of drinking water in restaurants, except upon request.

i. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.

(3) In addition to the restrictions and prohibitions authorized under subsection (2) above, the county administrator is authorized during a water emergency to implement any or all of the following as necessary:

a. For any publicly owned and operated public water utility:

i. Industrial, institutional, commercial, governmental, wholesale and all other nonresidential customers may be allotted a percentage reduction based on that customer's average monthly water consumption for the same billing period of the previous calendar year's consumption.

ii. Individual residential customers may be limited to a specific volume or percentage reduction of water per month.

If the allotted monthly water usage, as determined in subsection (3)a.i. and (3)a.ii. above, is exceeded, the customer shall be charged two times the existing service rate for consumption over the minimum monthly charge for every 1,000 gallons of water or fraction thereof consumed above the allotted volume. Where prior consumption data is not available, the county administrator shall estimate allocations based upon the data available from similar activities of equal intensity.

iii. Declaration of a moratorium on new and expanded connections to the public water utility system, unless such connections are primarily intended and designed to provide fire protection and/or potable drinking water to lawfully permitted residential or nonresidential buildings that are existing or substantially constructed at the time that a water emergency is declared.

b. For any privately owned and operated public water supply:

The system operator shall be required to demonstrate on a monthly schedule, compliance with the capacity requirements set forth by the Virginia Department of Health.

(4) When water supplies are critically limited, the county administrator is authorized to restrict the use of water to purposes which are absolutely essential to life, health and safety. Such permitted uses of water may

include, but may not be limited to, the provision of limited quantities of water for drinking and sanitation purposes to residents, health care facility patients and/or emergency shelter evacuees, who are unable to utilize their potable water supplies due to the loss of electrical power, storm events or other natural or manmade causes.

(c) *Failure to address leaks.* It shall be unlawful for the owner of any residential unit or units, or the owner of any commercial or industrial establishment which is found to be an excessive user of water due to leakage from waterlines or plumbing fixtures on the premises, to fail to take immediate action to repair and to stop such leakage after being so ordered by the county administrator or his agent.

(d) *Effective date.* The imposition of any of the restrictions set forth in this section shall become effective upon their being printed in any newspaper of general circulation in the County of King William, or broadcasted upon any radio or television station serving the County of King William.

(e) *Exemptions.* Upon implementation of subsections (b)(2), (b)(3) or (b)(4) above, the county administrator shall establish an appeals procedure to review customer applications for exemptions from the restrictions imposed on a case-by-case basis and, if warranted, to make equitable adjustments to such provisions. The county administrator is empowered to establish regulations governing the granting of temporary exemptions applicable to specific restrictions. The county administrator shall, in rendering a decision on exemption requests, balance economic and other hardships to the applicant resulting from the imposition of water use restrictions or allocations against the individual and cumulative impacts to the water supply resulting from the granting of such exemptions and may impose reasonable conditions to ensure compliance with the terms of any exemption.

Any person seeking an exemption may appeal the county administrator's decision to the board of supervisors. The appeal shall be in writing and shall be submitted to the county administrator, as agent for and clerk to the board of supervisors.

The county administrator may issue temporary waivers or exemptions within the provisions of this subsection for such periods of time as may be necessary for the board of supervisors to formally consider action on the appeal.

The board of supervisors shall render a decision on the appeal and may: affirm, with or without modification, the county administrator's decision; or approve the requested exemption, with or without modification. The board of supervisors may impose reasonable conditions to ensure compliance with the terms of any exemption granted hereunder.

(f) *Penalty for violations.* Any person who shall violate any of the provisions of this section, or of any of the conservation regulations promulgated pursuant thereto, shall, upon conviction thereof, be subject to the penalties provided in

section 78-190. Each act or each day's continuation of a violation shall be deemed a separate offense.

In addition to the foregoing, the county administrator may suspend public water utility service to any person continuing to violate the provisions of this ordinance or the regulations promulgated hereunder.

If such public water utility service is terminated, the person shall pay a reconnection fee of $50.00 before service is restored.

(g) *Declaration of end of water emergency.* The county administrator shall notify the board of supervisors when, in his opinion, the water emergency no longer exists. Upon concurrence of the board of supervisors, the water emergency shall be declared to have ended.

(Ord. of 7-23-2007(1))

_____
C. Thomas Redd III
Chairman, Board of Supervisors

Those members voting:

S. K. Greenwood _____
T. J. Moskalski _____
T. S. Stone _____
O. O. Williams _____
C. T. Redd III _____

Adopted this _____ of _____, 2012

Copy Teste:

_____
Trenton L. Funkhouser
County Administrator

Sec. 78-192. - Water emergencies and conservation.

(a) *Purpose and authority to declare water emergencies.* For purposes of this section, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any water utility system that is owned and/or operated by the County of King William.

In the event of an actual or anticipated shortage of potable water due to climatic, hydrological, mechanical and/or other extraordinary conditions, the County of King William may determine that certain uses of water should be reduced, restricted, curtailed and/or prohibited. These reductions, restrictions, curtailments and/or prohibitions are intended to protect the health, safety and welfare of the residents of the County of King William.

The county administrator, with the approval of the board of supervisors, or its subsequent ratification by the board within 48 hours is authorized to declare water emergencies in the county, as a whole or portions thereof, affecting the use of water.

A Drought Emergency declaration will be issued after consideration of the conditions of individual affected systems. The County Administrator may order mandatory restrictions on water use in response to specific conditions, such as when any system exceeds 90 percent of the permitted capacity for 3 consecutive months. The County Administrator may intervene to declare a drought emergency for privately-owned systems if the private system operation is unable to restrict water usage when needed.

(b) Drought monitoring to anticipate water emergency conditions. The County of King William, in cooperation with other jurisdictions of the Middle-Peninsula Water Supply Planning Region, will monitor the U.S. Drought Monitor operated by the U.S. Geological Service and made available through DEQ's website at: http://www.deq.virginia.org/waterresources/drought.php. When the USGS Drought Monitor registers a condition "D1-Moderate Drought" for the County of King William, the County Administrator shall declare a Drought Watch alert for all water systems addressed by this ordinance.

(c) *Water conservation measures.* After the declaration of a water emergency under the authority provided by Virginia Code Sections 15.2-923 and 15.2-924, and upon a determination by the county administrator of the existence of the following one or more conditions, the county administrator shall take the following actions which shall apply to any person whose water supply is furnished from an affected water utility system:

Deleted: b

Deleted: the County of King William's public

(1) *Condition 1 (Drought Warning).* When moderate but limited supplies of water are available, or when a "D2-Severe Drought" condition is registered on the USGS Drought Monitor, the county administrator may, through appropriate means, call upon the affected population and entities to employ prudent restraint in water usage and to conserve water voluntarily by whatever methods available.

Deleted: shall

(2) *Condition 2 (Drought Emergency).* The county administrator is hereby further authorized during the duration of a water emergency for which voluntary measures would be insufficient to order the restriction or prohibition of any or all of the following water uses by users of an identified, affected water system after consultation with the affected water system owner/operator:

Deleted: of the water supply

a. Watering of outside shrubbery, trees, lawns, grass, plants, home vegetable gardens, or any other vegetation except from a watering can or other container not exceeding five gallons

in capacity. This limitation shall not apply to commercial greenhouses, nursery stocks and sod growing, which may be watered in the minimum amount required to preserve plant life between 6:00 p.m. and 8:00 a.m.

b. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.

c. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state or local law.

d. The operation of any ornamental fountain or other structure making a similar use of water.

e. The filling of swimming or wading pools requiring more than five gallons of water, or the refilling of swimming or wading pools that were drained after the effective date of the declaration of emergency, except that pools may be filled to a level of two feet below normal, or water may be added to bring the level to two feet below normal, or as necessary to protect the structure from hydrostatic damage.

f. The use of water during outdoor recreational activities. This limitation shall not apply to water utilized for drinking and sanitary purposes during such activities.

g. The use of water from fire hydrants for any purposes other than fire suppression and related training exercises, unless otherwise approved by the county administrator.

h. The serving of drinking water in restaurants, except upon request.

i. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.

(3) *Condition 3.* In addition to the restrictions and prohibitions authorized under subsection (2) above, the county administrator is hereby further authorized during the duration of a water emergency to implement any or all of the following for any of the affected water systems:

a. For any publicly owned and operated public water utility:

i. Industrial, institutional, commercial, governmental, wholesale and all other nonresidential customers shall be allotted a percentage reduction based on that customer's average monthly water consumption for the same billing period of the previous calendar year's consumption.

ii. Individual residential customers shall be limited to a specific volume or percentage reduction of water per month.

Deleted: b.

Deleted: b.

If the allotted monthly water usage, as determined in subsection (3)a.i. and (3)a.ii. above, is exceeded, the customer shall be charged two times the existing service rate for consumption over the minimum monthly charge for every 1,000 gallons of water consumed above the allotted volume. Where prior consumption data is not available, the county administrator shall estimate allocations based upon the data available from similar activities of equal intensity.

iii. Declaration of a moratorium on new and expanded connections to the public water utility system, unless such connections are primarily intended and designed to provide fire protection and/or potable drinking water to lawfully permitted residential or nonresidential buildings that are existing or substantially constructed at the time that a water emergency is declared.

Deleted: c

b. For any privately owned and operated public water supply:

The system operator shall be required to demonstrate on a monthly schedule, compliance with the capacity requirements set forth by the Virginia Department of Health Waterworks Regulations (12 VAC5-590-520 and 12 VAC5-590-690).

(4) *Condition 4.* When crucially limited supplies of water are available, the county administrator shall restrict the use of water from any affected water system to purposes which are absolutely essential to life, health and safety. Such permitted uses of water may include, but may not be limited to, the provision of limited quantities of water for drinking and sanitation purposes to residents, health care facility patients and/or emergency shelter evacuees, who are unable to utilize their potable water supplies due to the loss of electrical power, storm events or other natural or manmade causes.

(5) *Failure to address leaks.* It shall be unlawful for the owner of any residential unit or units, or the owner of any commercial or industrial establishment which is found to be an excessive user of water due to leakage from waterlines or plumbing fixtures on the premises, to fail to take immediate action to repair and to stop such leakage after being so ordered by the county administrator or his agent.

(6) *Effective date.* The imposition of the restrictions above shall become effective upon their being printed in any newspaper of general circulation in the County of King William, or broadcasted upon any radio or television station serving the County of King William.

(7) *Appeals for exemptions.* Upon implementation of subsections (2), (3) or (4) above, the county administrator shall establish an appeals procedure to review customer applications for exemptions from the provisions of subsections (2), (3) or (4) on a case-by-case basis and, if warranted, to make equitable adjustments to such provisions. The county administrator shall also be empowered to establish regulations governing the granting of temporary exemptions applicable to all or some of the uses of the water supply set forth in subsections (2), (3) or (4). The county administrator shall, in rendering a decision on such applications, balance economic and other hardships to the applicant resulting from the imposition of water use restrictions or allocations against the individual and cumulative impacts to the water supply resulting from the granting of such exemptions and may impose reasonable conditions to ensure compliance with the terms of the exemption.

Any person subject to a decision rendered by the county administrator under this section may appeal such decision to the board of supervisors. The appeal shall be in writing and shall be submitted to the county administrator, as agent for and clerk to the board of supervisors.

The county administrator may issue temporary waivers or exemptions within the provisions of this subsection for such periods of time as may be necessary for the board of supervisors to formally consider action on the appeal.

The board of supervisors shall render a decision on the appeal and may: affirm, with or

without modification, the county administrator's decision; or approve the requested exemption, with or without modification. The board of supervisors may impose reasonable conditions to ensure compliance with the terms of any exemption granted hereunder.

Any decision rendered by the board of supervisors shall be subject to remedies provided by statute.

(d) *Penalty for violations.* Any person who shall violate any of the provisions of this section, or of any of the conservation regulations promulgated by the County of King William pursuant thereto, shall, upon conviction thereof, be subject to the penalties provided in section 78-190. Each act or each day's continuation of a violation shall be deemed a separate offense.

Deleted: (c)

In addition to the foregoing, the county administrator may suspend public water utility service to any person continuing to violate the provisions of this ordinance or the regulations promulgated hereunder.

If such public water utility service is terminated, the person shall pay a reconnection fee of $50.00 before service is restored.

(e) *Declaration of end of water emergencies.* The county administrator shall notify the board of supervisors when, in his opinion, the water emergency situation no longer exists. Upon concurrence of the board of supervisors, the water emergency shall be declared to have ended.

Deleted: (d)

(Ord. of 7-23-2007(1))

Tappahannock

ARTICLE IV. WATER

APPENDIX R

Section 58-124. Water emergencies and conservation.

(a) *Purpose and authority to declare water emergencies.* For purposes of this section, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any water utility system that is owned and/or operated "by a locality, authority, or company distributing water for a fee or charge".

In the event of an actual or anticipated shortage of potable water due to climatic, hydrological, mechanical and/or other extraordinary conditions, Tappahannock may determine that certain uses of water should be reduced, restricted, curtailed and/or prohibited. These reductions, restrictions, curtailments and/or prohibitions are intended to protect the health, safety and welfare of the residents of Tappahannock.

The Town Manager with the approval of the Town Council, or its subsequent ratification by the Town Council within 48 hours, is authorized to declare water emergencies in the Town as a whole or portions thereof, affecting the use of water.
A Drought Emergency declaration will be issued after consideration of the conditions of individual affected systems.

(b) Drought monitoring to anticipate water emergency conditions. The Town of Tappahannock Town Manager in cooperation with other jurisdictions of the Middle-Peninsula Water Supply Planning Region, will monitor the U.S. Drought Monitor operated by the U.S. Geological Service and made available through DEQ's website at: http://www.deq.virginia.gov/waterresources/drought.php. When the USGS Drought Monitor registers a condition "D1-Moderate Drought" for Tappahannock the Town Manager shall declare a Drought Watch alert for all water systems addressed by this ordinance.

(c) *Water conservation measures.* After the declaration of a water emergency under the authority provided by Virginia Code Sections 15.2-923 and 15.2-924, and upon a determination by the Town Manager of the existence of the following one or more conditions, the Town Manager shall take the following actions which shall apply to any person whose water supply is furnished from an affected water utility system:

(1) *Condition 1 (Drought Warning).* When moderate but limited supplies of water are available or when a "D2-Severe Drought" condition is registered on the USGS Drought Monitor, the Town Manager may, through appropriate means, call upon the affected population and entities to employ prudent restraint in water usage and to conserve water voluntarily by whatever methods available.

(2) *Condition 2 (Drought Emergency).* The Town Manager is hereby further authorized during the duration of a water emergency for which voluntary measures would be insufficient to order

the restriction or prohibition of any or all of the following water uses by users of an identified, affected water system after consultation with the affected water system owner/operator:

a. Watering of outside shrubbery, trees, lawns, grass, plants, home vegetable gardens, or any other vegetation except from a watering can or other container not exceeding five gallons in capacity. This limitation shall not apply to commercial greenhouses, nursery stocks and sod growing, which may be watered in the minimum amount required to preserve plant life between 6:00 p.m. and 8:00 a.m.
b. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.
c. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state or local law.
d. The operation of any ornamental fountain or other structure making a similar use of water.
e. The filling of swimming or wading pools requiring more than five gallons of water, or the refilling of swimming or wading pools that were drained after the effective date of the declaration of emergency, except that pools may be filled to a level of two feet below normal, or water may be added to bring the level to two feet below normal, or as necessary to protect the structure from hydrostatic damage.
f. The use of water during outdoor recreational activities. This limitation shall not apply to water utilized for drinking and sanitary purposes during such activities.
g. The use of water from fire hydrants for any purposes other than fire suppression and related training exercises, unless otherwise approved by the county administrator.
h. The serving of drinking water in restaurants, except upon request.
i. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.

(3) *Condition 3.* In addition to the restrictions and prohibitions authorized under subsection (2) above, the Town Manager is hereby further authorized during the duration of a water emergency to implement any or all of the following for any of the affected water systems:

a. For any publicly owned and operated public water utility:
i. Industrial, institutional, commercial, governmental, wholesale and all other nonresidential customers shall be allotted a percentage reduction based on that customer's average monthly water consumption for the same billing period of the previous calendar year's consumption.
ii. Individual residential customers shall be limited to a specific volume or percentage reduction of water per month.
iii. If the allotted monthly water usage, as determined in subsection (3)a.i. and (3)a.ii. above, is exceeded, the customer shall be charged two times the existing service rate for consumption over the minimum monthly charge for every 1,000 gallons of water consumed above the allotted volume. Where prior consumption data is not available, the county administrator shall estimate allocations based upon the data available from similar activities of equal intensity.
iv. Declaration of a moratorium on new and expanded connections to the public water utility system, unless such connections are primarily intended and designed to provide

fire protection and/or potable drinking water to lawfully permitted residential or nonresidential buildings that are existing or substantially constructed at the time that a water emergency is declared.

b. For any privately owned and operated public water supply:
The system operator shall be required to demonstrate on a monthly schedule, compliance with the capacity requirements set forth by the Virginia Department of Health Waterworks Regulations (12 VAC5-590-520 and 12 VAC5-590-690).

(4) *Condition 4.* When crucially limited supplies of water are available, the Town Manager shall restrict the use of water from any affected water system to purposes which are absolutely essential to life, health and safety. Such permitted uses of water may include, but may not be limited to, the provision of limited quantities of water for drinking and sanitation purposes to residents, health care facility patients and/or emergency shelter evacuees, who are unable to utilize their potable water supplies due to the loss of electrical power, storm events or other natural or manmade causes.

(5) *Failure to address leaks.* It shall be unlawful for the owner of any residential unit or units, or the owner of any commercial or industrial establishment which is found to be an excessive user of water due to leakage from waterlines or plumbing fixtures on the premises, to fail to take immediate action to repair and to stop such leakage after being so ordered by the Town Manager or his agent.

(6) *Effective date.* The imposition of the restrictions above shall become effective upon their being printed in any newspaper of general circulation in Tappahannock, or broadcasted upon any radio or television station serving Tappahannock.

(7) *Appeals for exemptions.* Upon implementation of subsections (2), (3) or (4) above, the Town Manager shall establish an appeals procedure to review customer applications for exemptions from the provisions of subsections (2), (3) or (4) on a case-by-case basis and, if warranted, to make equitable adjustments to such provisions. The Town Manager shall also be empowered to establish regulations governing the granting of temporary exemptions applicable to all or some of the uses of the water supply set forth in subsections (2), (3) or (4). The Town Manager shall, in rendering a decision on such applications, balance economic and other hardships to the applicant resulting from the imposition of water use restrictions or allocations against the individual and cumulative impacts to the water supply resulting from the granting of such exemptions and may impose reasonable conditions to ensure compliance with the terms of the exemption.

Any person subject to a decision rendered by the Town Manager under this section may appeal such decision to the Town Council. The appeal shall be in writing and shall be submitted to the Town Manager, as agent for and clerk to the Town Council.

The Town Manager may issue temporary waivers or exemptions within the provisions of this subsection for such periods of time as may be necessary for the Town Council to formally consider action on the appeal.

The Town Council shall render a decision on the appeal and may: affirm, with or without modification, the Town Managers decision; or approve the requested exemption, with or without

modification. The Town Council may impose reasonable conditions to ensure compliance with the terms of any exemption granted hereunder.
Any decision rendered by the Town Council shall be subject to remedies provided by statute.
(d) *Penalty for violations.* Any person who shall violate any of the provisions of this section, or of any of the conservation regulations promulgated by Tappahannock pursuant thereto, shall, upon conviction thereof, be subject to the penalties provided in Section 1-18 of this code each act or each day's continuation of a violation shall be deemed a separate offense.
In addition to the foregoing, the Town Manager may suspend public water utility service to any person continuing to violate the provisions of this ordinance or the regulations promulgated hereunder.
If such public water utility service is terminated, the person shall pay a reconnection fee of $25.00 before service is restored.

(e) *Declaration of end of water emergencies.* The Town Manager shall notify the Town Council when, in his opinion, the water emergency situation no longer exists. Upon concurrence of the Town Council, the water emergency shall be declared to have ended.

Urbanna

Article V. Water Emergencies and Conservation

§15.1-5.1 Definitions

For purposes of this section, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any water utility system that is owned and/or operated "by a locality, authority, or company distributing water for a fee or charge".

§15.1-5.2 Purpose and Authority

In the event of an actual or anticipated shortage of potable water due to climatic, hydrological, mechanical and/or other extraordinary conditions, the Town of Urbanna may determine that certain uses of water should be reduced, restricted, curtailed and/or prohibited. These reductions, restrictions, curtailments and/or prohibitions are intended to protect the health, safety and welfare of the residents of the Town of Urbanna.

(1) The Town Administrator, with the approval of the Town Council, or its subsequent ratification by the Council within 48 hours, is authorized to declare water emergencies in the Town of Urbanna, as a whole or portions thereof, affecting the use of water.

(2) A Drought Emergency declaration will be issued after consideration of the conditions of individual affected systems. The Town Administrator may order mandatory restrictions on water use in response to specific conditions, such as when any system exceeds 90 percent of the permitted capacity for 3 consecutive months. The Town Administrator may intervene to declare a drought emergency for privately-owned systems if the private system operation is unable to restrict water usage when needed.

§15.1-5.3 Drought Monitoring to Anticipate Water Emergency Conditions

The Town of Urbanna, in cooperation with other jurisdictions of the Middle-Peninsula Water Supply Planning Region, will monitor the U.S. Drought Monitor operated by the U.S. Geological Service and made available through DEQ's website at: http://www.deq.virginia.gov/waterresources/drought.php. When the USGS Drought Monitor registers a condition "D1-Moderate Drought" for The Town of Urbanna, the Town Administrator shall declare a Drought Watch alert for all water systems addressed by this ordinance.

§15.1-5.4 Water Conservation Measures

After the declaration of a water emergency under the authority provided by Virginia Code Sections 15.2-923 and 15.2-924, and upon a determination by the Town Administrator of the existence of the following one or more conditions, the Town Administrator shall take the following actions which shall apply to any person whose water supply is furnished from an affected water utility system:

(1) Condition 1 (Drought Warning). When moderate but limited supplies of water are available or when a "D2-Severe Drought" condition is registered on the USGS Drought Monitor,

the Town Administrator may, through appropriate means, call upon the affected population and entities to employ prudent restraint in water usage and to conserve water voluntarily by whatever methods available.

(2) Condition 2 (Drought Emergency). The Town Administrator is hereby further authorized during the duration of a water emergency for which voluntary measures would be insufficient to order the restriction or prohibition of any or all of the following water uses by users of an identified, affected water system after consultation with the affected water system owner/operator:

a. Watering of outside shrubbery, trees, lawns, grass, plants, home vegetable gardens, or any other vegetation except from a watering can or other container not exceeding five gallons in capacity. This limitation shall not apply to commercial greenhouses, nursery stocks and sod growing, which may be watered in the minimum amount required to preserve plant life between 6:00 p.m. and 8:00 a.m.

b. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.

c. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state or local law.

d. The operation of any ornamental fountain or other structure making a similar use of water.

e. The filling of swimming or wading pools requiring more than five gallons of water, or the refilling of swimming or wading pools that were drained after the effective date of the declaration of emergency, except that pools may be filled to a level of two feet below normal, or water may be added to bring the level to two feet below normal, or as necessary to protect the structure from hydrostatic damage.

f. The use of water during outdoor recreational activities. This limitation shall not apply to water utilized for drinking and sanitary purposes during such activities.

g. The use of water from fire hydrants for any purposes other than fire suppression and related training exercises, unless otherwise approved by the county administrator.

h. The serving of drinking water in restaurants, except upon request.

i. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.

(3) Condition 3. In addition to the restrictions and prohibitions authorized under subsection (2) above, the Town Administrator is hereby further authorized during the duration of

a water emergency to implement any or all of the following for any of the affected water systems:

a. Industrial, institutional, commercial, governmental, wholesale and all other nonresidential customers shall be allotted a percentage reduction based on that customer's average monthly water consumption for the same billing period of the previous calendar year's consumption.

b. Individual residential customers shall be limited to a specific volume or percentage reduction of water per month.

c. If the allotted monthly water usage, as determined in subsection (3)a. and (3)b. above, is exceeded, the customer shall be charged two times the existing service rate for consumption over the minimum monthly charge for every 1,000 gallons of water consumed above the allotted volume. Where prior consumption data is not available, the county administrator shall estimate allocations based upon the data available from similar activities of equal intensity.

d. Declaration of a moratorium on new and expanded connections to the public water utility system, unless such connections are primarily intended and designed to provide fire protection and/or potable drinking water to lawfully permitted residential or nonresidential buildings that are existing or substantially constructed at the time that a water emergency is declared.

(4) Condition 4. When crucially limited supplies of water are available, the Town Administrator shall restrict the use of water from any affected water system to purposes which are absolutely essential to life, health and safety. Such permitted uses of water may include, but may not be limited to, the provision of limited quantities of water for drinking and sanitation purposes to residents, health care facility patients and/or emergency shelter evacuees, who are unable to utilize their potable water supplies due to the loss of electrical power, storm events or other natural or manmade causes.

§15.1-5.5 Failure to Address Leaks

It shall be unlawful for the owner of any residential unit or units, or the owner of any commercial or industrial establishment which is found to be an excessive user of water due to leakage from waterlines or plumbing fixtures on the premises, to fail to take immediate action to repair and to stop such leakage after being so ordered by the Town Administrator or his agent.

§15.1-5.6 Effective Date

The imposition of the restrictions above shall become effective upon their being printed in any newspaper of general circulation in the Town of Urbanna, or broadcasted upon any radio or television station serving the Town of Urbanna.

§15.1-5.7 Appeals for Exemptions

(1) Upon implementation of §15.1-5.4(2), (3) or (4) above, the Town Administrator shall establish an appeals procedure to review customer applications for exemptions from the provisions of §15.1-5.4 (2), (3) or (4) on a case-by-case basis and, if warranted, to make equitable adjustments to such provisions. The Town Administrator shall also be empowered to establish regulations governing the granting of temporary exemptions applicable to all or some of the uses of the water supply set forth in §15.1-5.4(2), (3) or (4). The Town Administrator shall, in rendering a decision on such applications, balance economic and other hardships to the applicant resulting from the imposition of water use restrictions or allocations against the individual and cumulative impacts to the water supply resulting from the granting of such exemptions and may impose reasonable conditions to ensure compliance with the terms of the exemption.

(2) Any person subject to a decision rendered by the Town Administrator under this section may appeal such decision to the Town Council. The appeal shall be in writing and shall be submitted to the Town Administrator, as agent for and clerk to the Town Council.

(3) The Town Administrator may issue temporary waivers or exemptions within the provisions of this subsection for such periods of time as may be necessary for the Town Council to formally consider action on the appeal.

(4) The Town Council shall render a decision on the appeal and may: affirm, with or without modification, the Town Administrator's decision; or approve the requested exemption, with or without modification. The Town Council may impose reasonable conditions to ensure compliance with the terms of any exemption granted hereunder.

(5) Any decision rendered by the Town Council shall be subject to remedies provided by statute.

§15.1-5.8 Penalty for Violation

Any person who shall violate any of the provisions of this section, or of any of the conservation regulations promulgated by the Town of Urbanna pursuant thereto, shall, upon conviction thereof, be subject to the penalties provided in section 1-7 of this Code. Each act or each day's continuation of a violation shall be deemed a separate offense. In addition to the foregoing, the Town Administrator may suspend public water utility service to any person continuing to violate the provisions of this ordinance or the regulations promulgated hereunder. If such public water utility service is terminated, the person shall pay a reconnection fee of $50.00 before service is restored.

§15.1-5.9 Declaration of End of Water Emergencies

The Town Administrator shall notify the Town Council when, in his opinion, the water emergency situation no longer exists. Upon concurrence of the Town Council, the water emergency shall be declared to have ended.

Adopted:

ORDINANCE NO. 11-11

ORDINANCE NO. 11-11 AMENDS THE WEST POINT TOWN CODE, CHAPTER 62, "WATER, SEWERS AND SEWAGE DISPOSAL," BY ADDING TO ARTICLE I, SECTION 62-9, "WATER EMERGENCIES AND CONSERVATION" TO IMPLEMENT A SYSTEM FOR WATER RESTRICTIONS IN THE EVENT OF A WATER SHORTAGE. ORDINANCE NO. 11-11 INCLUDES PENALTIES FOR VIOLATIONS: A FIRST OFFENSE RESULTS IN A WRITTEN WARNING, A SECOND OFFENSE RESULTS IN A $ 50 FINE, A THIRD OFFENSE RESULTS IN A $ 100 FINE, A FOURTH OFFENSE RESULTS IN A $ 250 FINE AND WATER SERVICE SUSPENSION. THERE SHALL BE A $ 50 FEE ASSOCIATED WITH ANY RESTORATION OF WATER SERVICE AFTER SUSPENSION. ORDINANCE NO. 11-11 IS CONSIDERED PURSUANT TO THE GRANTS OF AUTHORITY CONTAINED IN VA CODE SECTIONS 15.2-923, 15.2-924 AND 15.2-1429.

BE IT ORDAINED by the West Point Town Council that the West Point Town Code be amended by adding to Chapter 62, "Water, Sewers and Sewage Disposal" Section 62-9, "Water emergencies and conservation" to read in its entirety as follows:

"Section 62-9, "Water emergencies and conservation"

(a) *Purpose and authority to declare water emergencies.* For purposes of this section, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any water utility system that is owned and/or operated "by a locality, authority, or company distributing water for a fee or charge".

In the event of an actual or anticipated shortage of potable water due to climatic, hydrological, mechanical and/or other extraordinary conditions, the Town of West Point may determine that certain uses of water should be reduced, restricted, curtailed and/or prohibited. These reductions, restrictions, curtailments and/or prohibitions are intended to protect the health, safety and welfare of the residents of the Town of West Point.

The Town Manager, with the concurrence of the Town Council, and its subsequent ratification by the Council, is authorized to declare water emergencies in the Town, as a whole or portions thereof, affecting the use of water.

A Drought Emergency declaration will be issued after consideration of the conditions of individual affected systems. The Town Manager may order mandatory restrictions on water use in response to specific conditions, such as when any system exceeds 90 percent of the permitted capacity for 3 consecutive months. The Town Manager may intervene to

declare a drought emergency for privately-owned systems if the private system operation is unable to restrict water usage when needed.

(b) Drought monitoring to anticipate water emergency conditions. The Town of West Point, in cooperation with other jurisdictions of the Middle-Peninsula Water Supply Planning Region, will monitor the U.S. Drought Monitor operated by the U.S. Geological Service and made available through DEQ's website at: http://www.deq.virginia.gov/waterresources/drought.php. When the USGS Drought Monitor registers a condition "D1-Moderate Drought" for the Town of West Point, the Town Manager shall declare a Drought Watch alert for all water systems addressed by this ordinance.

(c) *Water conservation measures.* After the declaration of a water emergency under the authority provided by Virginia Code Sections 15.2-923 and 15.2-924, and upon a determination by the Town Manager of the existence of the following one or more conditions, the Town Manager shall take the following actions which shall apply to any person whose water supply is furnished from an affected water utility system:

(1) *Condition 1 (Drought Warning).* When moderate but limited supplies of water are available or when a "D2-Severe Drought" condition is registered on the USGS Drought Monitor, the Town Manager may, through appropriate means, call upon the affected population and entities to employ prudent restraint in water usage and to conserve water voluntarily by whatever methods available.

(2) *Condition 2 (Drought Emergency).* The Town Manager is hereby further authorized during the duration of a water emergency for which voluntary measures would be insufficient to order the restriction or prohibition of any or all of the following water uses by users of an identified, affected water system after consultation with the affected water system owner/operator:

a. Watering of outside shrubbery, trees, lawns, grass, plants, home vegetable gardens, or any other vegetation except from a watering can or other container not exceeding five gallons in capacity. This limitation shall not apply to commercial greenhouses, nursery stocks and sod growing, which may be watered in the minimum amount required to preserve plant life between 6:00 p.m. and 8:00 a.m.

b. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.

c. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state or local law.

d. The operation of any ornamental fountain or other structure making a similar use of water.

e. The filling of swimming or wading pools requiring more than five gallons of water, or the refilling of swimming or wading pools that were drained after

the effective date of the declaration of emergency, except that pools may be filled to a level of two feet below normal, or water may be added to bring the level to two feet below normal, or as necessary to protect the structure from hydrostatic damage.

f. The use of water during outdoor recreational activities. This limitation shall not apply to water utilized for drinking and sanitary purposes during such activities.

g. The use of water from fire hydrants for any purposes other than fire suppression and related training exercises, unless otherwise approved by the county administrator.

h. The serving of drinking water in restaurants, except upon request.

i. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.

(3) *Condition 3.* In addition to the restrictions and prohibitions authorized under subsection (2) above, the Town Manager is hereby further authorized during the duration of a water emergency to implement any or all of the following for any of the affected water systems:

a. For any publicly owned and operated public water utility:

i. Industrial, institutional, commercial, governmental, wholesale and all other nonresidential customers shall be allotted a percentage reduction based on that customer's average monthly water consumption for the same billing period of the previous calendar year's consumption.

ii. Individual residential customers shall be limited to a specific volume or percentage reduction of water per month.

iii. If the allotted monthly water usage, as determined in subsection (3)a.i. and (3)a.ii. above, is exceeded, the customer shall be charged two times the existing service rate for consumption over the minimum monthly charge for every 1,000 gallons of water consumed above the allotted volume. Where prior consumption data is not available, the county administrator shall estimate allocations based upon the data available from similar activities of equal intensity.

iv. Declaration of a moratorium on new and expanded connections to the public water utility system, unless such connections are primarily intended and designed to provide fire protection and/or potable drinking water to lawfully permitted residential or nonresidential buildings that are existing or substantially constructed at the time that a water emergency is declared.

b. For any privately owned and operated public water supply:

The system operator shall be required to demonstrate on a monthly schedule, compliance with the capacity requirements set forth by the Virginia Department of Health Waterworks Regulations (12 VAC5-590-520 and 12 VAC5-590-690).

(4) *Condition 4.* When crucially limited supplies of water are available, the Town Manager shall restrict the use of water from any affected water system to purposes which are absolutely essential to life, health and safety. Such permitted uses of water may include, but may not be limited to, the provision of limited quantities of water for drinking and sanitation purposes to residents, health care facility patients and/or emergency shelter evacuees, who are unable to utilize their potable water supplies due to the loss of electrical power, storm events or other natural or manmade causes.

(d) *Failure to address leaks.* It shall be unlawful for the owner of any residential unit or units, or the owner of any commercial or industrial establishment which is found to be an excessive user of water due to leakage from waterlines or plumbing fixtures on the premises, to fail to take immediate action to repair and to stop such leakage after being so ordered by the Town Manager or his agent.

(e) *Effective date.* The imposition of the restrictions above shall become effective upon the restrictions being posted on the Town's website, the restrictions being printed in any newspaper of general circulation in the Town of West Point, or the broadcasting of the restrictions on any radio or television station serving the Town of West Point.

(f) *Appeals for exemptions.* Upon implementation of subsections (2), (3) or (4) above, the Town Manager shall establish an appeals procedure to review customer applications for exemptions from the provisions of subsections (2), (3) or (4) on a case-by-case basis and, if warranted, to make equitable adjustments to such provisions. The Town Manager shall also be empowered to establish regulations governing the granting of temporary exemptions applicable to all or some of the uses of the water supply set forth in subsections (2), (3) or (4). The Town Manager shall, in rendering a decision on such applications, balance economic and other hardships to the applicant resulting from the imposition of water use restrictions or allocations against the individual and cumulative impacts to the water supply resulting from the granting of such exemptions and may impose reasonable conditions to ensure compliance with the terms of the exemption.
Any person subject to a decision rendered by the Town Manager under this section may appeal such decision to the Town Council. The appeal shall be in writing and shall be submitted to the Town Manager, as agent for and clerk to the Town Council.
The Town Manager may issue temporary waivers or exemptions within the provisions of this subsection for such periods of time as may be necessary for the Town Council to formally consider action on the appeal.
The Town Council shall render a decision on the appeal and may: affirm, with or without modification, the Town Manager's decision; or approve the requested exemption, with or without modification. The Town Council may impose reasonable conditions to ensure compliance with the terms of any exemption granted hereunder.
Any decision rendered by the Town Council shall be subject to remedies provided by statute.

(g) *Penalty for violations.* Any person who shall violate any of the provisions of this section, or of any of the conservation regulations promulgated by the Town of West Point pursuant thereto, shall, be subject to the following penalties:

(1) First offense: Written warning;
(2) Second offense $50 fine;
(3) Third offense $100 fine;
(4) Fourth offense $250 fine and water service suspension.

Each act or each day's continuation of a violation shall be deemed a separate offense. In addition to the foregoing, the Town Manager may suspend public water utility service to any person continuing to violate the provisions of this ordinance or the regulations promulgated hereunder. If such public water utility service is terminated, the person shall pay a reconnection fee of $50.00 before service is restored.

(h) *Declaration of end of water emergencies.* The Town Manager shall notify the Town Council when, in his opinion, the water emergency situation no longer exists. Upon concurrence of the Town Council, the water emergency shall be declared to have ended."

Those members voting:

James H. Hudson
Deborah Ball
Tina Gulley
Charles Gordon
Paul Kelley
Joshua Lawson
Otto Shreaves
Christopher Vincent

Gloucester County

DIVISION 2. - EMERGENCY WATER CONSERVATION

Sec. 19-9.1. - Emergency water conservation procedures.

(a) For the purposes of this section, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any sanitary district or the county water distribution system.

(b) Drought watch—Water conservation alert: The county administrator shall proclaim a water conservation alert when the level of water in the Beaverdam Reservoir decreases to ninety (90) percent of its operating volume, which occurs when the reservoir is at an elevation of thirty-nine and eight-tenths (39.8) feet. Such an alert shall be rescinded when the level in the Beaverdam Reservoir has been raised to ninety-five (95) percent of its operating volume, which occurs when the reservoir is at an elevation of forty and two-tenths (40.2) feet. During a drought watch alert, the county administrator shall instruct the county staff to issue public announcements detailing the conditions and encouraging the public to conserve water. Those announcements shall include, but shall not be limited to, announcements over radio and other media.

(c) Drought warning: The county administrator shall proclaim a drought warning when the level of water in the Beaverdam Reservoir decreases to eighty (80) percent of its operating volume, which occurs when the reservoir is at an elevation of thirty-eight and nine-tenths (38.9) feet. The drought warning shall be rescinded when the level in the reservoir has been raised to ninety (90) percent of its operating volume, which occurs when the reservoir is at an elevation of thirty-nine and eight-tenths (39.8) feet. During a drought warning, the county administrator and staff shall request that the public, including residents and commercial, industrial, and institutional facilities, conserve water. The goal of activities conducted during a drought warning shall be the voluntary reduction in community usage of five (5) to ten (10) percent.

(d) Drought emergency: The county administrator shall proclaim a drought emergency when the level of water in the Beaverdam Reservoir decreases to seventy (70) percent of its operating volume, which occurs when the reservoir has been lowered to an elevation of thirty-eight (38) feet. The drought emergency shall be rescinded when the level in the reservoir has been raised to eighty (80) percent of its operating volume, which occurs when the reservoir is at an elevation of thirty-eight and nine-tenths (38.9) feet. During a drought emergency, it shall be unlawful for any person to use water for any of the following purposes:

    (1) The washing of automobiles, trucks, trailers, or any other type of mobile equipment except in vehicle wash facilities operating with a water recycling system approved by the county with a prominently displayed sign in public view so stating.

    (2) The washing of streets, driveways, parking lots, service station aprons, office buildings, exteriors of homes or apartments or other outdoor surfaces.

    (3) Watering of outside shrubbery, trees, lawns, grass, plants or any other vegetation, except from a watering can or other container not exceeding three (3) gallons' capacity. This limitation shall not apply to greenhouse or nursery stocks which may be watered in the minimum amount required to preserve plant life between 6:00 p.m. and 8:00 a.m.

    (4) The operation of any ornamental fountain or other structure making a similar use of water.

    (5) The filling of swimming or wading pools requiring more than five (5) gallons of water, or the filling or refilling of swimming or wading pools requiring more than five (5) gallons of water which were drained after commencement of a water conservation alert period, except that pools contracted to be filled prior to commencement of a water conservation alert may be filled to a level of two (2) feet below normal to protect the structure from hydrostatic damage.

    (6) The service of drinking water in restaurants except upon request.

(7) The use of water from fire hydrants for any purpose other than fire suppression unless otherwise specifically approved by the county administrator.

(e) During a drought emergency, it shall be unlawful for any owner of any residential unit or units or any owner of any commercial or industrial establishment to fail to take immediate action to repair and stop water leakage from waterlines or plumbing fixtures on the premises after being so ordered by the county administrator.

(f) Exemptions.

(1) Any person subject to this section may apply to the board for an exemption. Such application shall be in writing and filed with the county administrator.

(2) The board may, upon written application, permit an exemption or less than full compliance with any terms of this section when, in its judgment, full compliance or compliance to any extent would create an unjust hardship.

(3) The county administrator shall be authorized to issue temporary waivers or exemptions within the provisions of this section for such periods of time as may be necessary for the board formally to consider such or for the board to take appropriate action.

(g) Every decision of the board under this section shall be final, subject to such remedy as any aggrieved party might have at law or in equity.

(h) The county sheriff shall issue summonses to effect compliance with this section.

(Ord. of 6-23-81, § 2-14; Ord. of 8-2-83; Ord. of 6-6-2000; Ord. of 9-1-2009)

AT A REGULAR MEETING OF THE BOARD OF SUPERVISORS OF MATHEWS COUNTY, VIRGINIA, HELD IN THE MATHEWS COUNTY MEMORIAL LIBRARY THEREOF ON TUESDAY, NOVEMBER 19, 2013 AT 1:00 P.M.

IN RE: PUBLIC HEARING ORDER
PROPOSED DROUGHT ORDINANCE AS MANDATED BY THE COMMONWEALTH OF VIRGINIA

A hearing was held to solicit public comment on a proposed Drought Ordinance as mandated by the Commonwealth of Virginia. Ms. Moran gave a brief overview of the proposed ordinance and Ms. Casey opened the public hearing at 1:03 p.m.

There being no speakers on the matter, Ms. Casey closed the public hearing at 1:05 p.m.

On motion of Ms. Burns, seconded by Mr. Cole, the Mathews County Board of Supervisors voted 5-0-0 as follows: Ms. Casey – aye; Ms. Putt – aye; Mr. Ingram – aye; Mr. Cole – aye; Ms. Burns – aye; to adopt the proposed Drought Ordinance as presented. A copy of which is attached to these minutes.

Melinda Moran, Clerk and
County Administrator

cc: Lewis L. Lawrence, Executive Director, Middle Peninsula Planning District Commission
Scott W. Kudlas, Director Office of Water Supply, Dept. of Environmental Quality
General Code Publishers

County of Mathews, Virginia Water Conservation Policy

Water emergencies and conservation.

(a) *Purpose and authority to declare water emergencies.* For purposes of this section, unless the context clearly requires a contrary meaning, the term "water" shall mean potable water withdrawn from any water utility system that is owned and/or operated "by a locality, authority, or company distributing water for a fee or charge".

In the event of an actual or anticipated shortage of potable water due to climatic, hydrological, mechanical and/or other extraordinary conditions, the County of Mathews may determine that certain uses of water should be reduced, restricted, or curtailed. These reductions, restrictions, and curtailments are intended to protect the health, safety and welfare of the residents of Mathews County, Virginia.

The County Administrator, with the approval of the Board of Supervisors, or its subsequent ratification by the Board within 48 hours, is authorized to declare water emergencies in the County, as a whole or portions thereof, affecting the use of water.
A Drought Emergency declaration will be issued after consideration of the conditions of individual affected systems.

(b) Drought monitoring to anticipate water emergency conditions. Mathews County, in cooperation with other jurisdictions of the Middle-Peninsula Water Supply Planning Region, will monitor the U.S. Drought Monitor operated by the U.S. Geological Service and made available through DEQ's website at: http://www.deq.virginia.gov/waterresources/drought.php. When the USGS Drought Monitor registers a condition "D1-Moderate Drought" for Mathews County, the County Administrator shall declare a Drought Watch alert for all water systems addressed by this ordinance.

(c) *Water conservation measures.* After the declaration of a water emergency under the authority provided by Virginia Code Sections 15.2-923 and 15.2-924, and upon a determination by the County Administrator of the existence of the following one or more conditions, the County Administrator shall take the following actions which shall apply to any person whose water supply is furnished from an affected water utility system:

(1) *Condition 1 (Drought Warning).* When moderate but limited supplies of water are available or when a "D2-Severe Drought" condition is registered on the USGS Drought Monitor, the County Administrator may, through appropriate means to include newspaper, radio and postings at public buildings, call upon the affected population and entities to employ prudent restraint in water usage and to conserve water voluntarily by whatever methods available.

(2) *Condition 2 (Drought Emergency).* The County Administrator is hereby further authorized during the duration of a water emergency to formally request of citizens and businesses the

restriction or prohibition of any or all of the following water uses by users of an identified, affected water system after consultation with the affected water system owner/operator:

a. Watering of outside shrubbery, trees, lawns, grass, plants, home vegetable gardens, or any other vegetation except from a watering can or other container not exceeding five gallons in capacity. This limitation shall not apply to commercial greenhouses, nursery stocks and sod growing, which may be watered in the minimum amount required to preserve plant life between 6:00 p.m. and 8:00 a.m.
b. Washing of automobiles, trucks, trailers, or any other type of mobile equipment, except in licensed commercial vehicle wash facilities.
c. Washing of sidewalks, streets, driveways, parking lots, service station aprons, exteriors of homes or apartments, commercial or industrial buildings or any other outdoor surface, except where mandated by federal, state or local law.
d. The operation of any ornamental fountain or other structure making a similar use of water.
e. The filling of swimming or wading pools requiring more than five gallons of water, or the refilling of swimming or wading pools that were drained after the effective date of the declaration of emergency, except that pools may be filled to a level of two feet below normal, or water may be added to bring the level to two feet below normal, or as necessary to protect the structure from hydrostatic damage.
f. The use of water during outdoor recreational activities. This limitation shall not apply to water utilized for drinking and sanitary purposes during such activities.
g. The use of water from fire hydrants for any purposes other than fire suppression and related training exercises, unless otherwise approved by the county administrator.
h. The serving of drinking water in restaurants, except upon request.
i. The operation of any water-cooled comfort air conditioning that does not have water-conserving equipment in operation.

(3) *Condition 3.* In addition to the restrictions and prohibitions authorized under subsection (2) above, the County Administrator is hereby further authorized during the duration of a water emergency to implement any or all of the following for any of the affected water systems:

a. For any publicly owned and operated public water utility:
i. Industrial, institutional, commercial, governmental, wholesale and all other nonresidential customers shall be allotted a percentage reduction based on that customer's average monthly water consumption for the same billing period of the previous calendar year's consumption.
ii. Individual residential customers shall be limited to a specific volume or percentage reduction of water per month.
iii. If the allotted monthly water usage, as determined in subsection (3)a.i. and (3)a.ii. above, is exceeded, the customer shall be charged two times the existing service rate for consumption over the minimum monthly charge for every 1,000 gallons of water consumed above the allotted volume. Where prior consumption data is not available, the county administrator shall estimate allocations based upon the data available from similar activities of equal intensity.
iv. Declaration of a moratorium on new and expanded connections to the public water utility system, unless such connections are primarily intended and designed to provide

fire protection and/or potable drinking water to lawfully permitted residential or nonresidential buildings that are existing or substantially constructed at the time that a water emergency is declared.

b. For any privately owned and operated public water supply:
The system operator shall be required to demonstrate on a monthly schedule, compliance with the capacity requirements set forth by the Virginia Department of Health Waterworks Regulations (12 VAC5-590-520 and 12 VAC5-590-690).

(4) *Condition 4.* When crucially limited supplies of water are available, the County Administrator shall restrict the use of water from any publicly-owned or operated affected water system to purposes which are absolutely essential to life, health and safety. Such permitted uses of water may include, but may not be limited to, the provision of limited quantities of water for drinking and sanitation purposes to residents, health care facility patients and/or emergency shelter evacuees, who are unable to utilize their potable water supplies due to the loss of electrical power, storm events or other natural or manmade causes.

(5) *Effective date.* The imposition of the restrictions above shall become effective upon their being printed in any newspaper of general circulation in Mathews County, or broadcasted upon any radio or television station serving Mathews County.

(6) Penalty for Violations: The County Administrator may suspend publicly-owned water utility service to any person who continues to violate the provisions of this section or any of the conservation regulations promulgated by the County of Mathews.

(7) *Declaration of end of water emergencies.* The County Administrator shall notify the Board of Supervisors when, in his opinion, the water emergency situation no longer exists. Upon concurrence of the Board of Supervisors, the water emergency shall be declared to have ended.

Appendix N –
MOU amongst Rappahannock Fire Association Participants

GVFRS

MEMORANDUM OF UNDERSTANDING AND COOPERATION

THIS AGREEMENT, made and entered into this 25th day of August 2011, by and among the rated fire and rescue departments of the Rappahannock Volunteer Fireman's Association.

WITNESSETH:

THAT, WHEREAS, the General Assembly of Virginia did enact into law act as Va. Code Section 27-1, which provides, in part, "**Whenever the necessity arises during any actual or potential emergency resulting from fire, personal injury, or other public disaster, the fire fighters or emergency medical technicians of any county, city or town may, together with all necessary equipment, lawfully go or be sent beyond the territorial limits of such county, city or town to any point within or without the Commonwealth, to assist in meeting such emergency.**"

WHEREAS, when responding to a call and while working at a fire or other emergency outside the territorial limits which it normally services, members and employees of county, municipal corporation, fire protection district, sanitary district and incorporated fire departments shall have all of the laws, ordinances, and regulations, and shall have all of the benefits and immunities from liability and exemptions including coverage under the Workmen's Compensation Laws, as they have when responding to a call and while working at a fire or other emergency inside the territorial limits normally served; and

WHEREAS, the purpose of this agreement is to provide a mechanism for each of the parties hereto, through their mutual cooperation, by which they may render aid to each other in case of conflagration, holocaust, civil disorder or natural disaster, which requires fire services beyond the existing capabilities of any party; and

WHEREAS, it is in the public interest for the parties hereto to enter into an agreement for mutual assistance in fire protection in order to increase fire defenses and to assure the community of adequate protection; and

WHEREAS, fire departments within the Rappahannock Volunteer Fireman's Association desire a mechanism to receive mutual aid assistance from and to send mutual aid assistance to other fire service agencies within the region;

NOW THEREFORE, in consideration of the mutual covenants contained herein by and among the parties hereto, it is hereby agreed as follows:

1. Upon receipt of a request for assistance, the Chief of the responding party will determine whether the request may be honored without impairing the respondent's capacity to provide fire protection within its own jurisdiction. The Chief or officer in charge of the responding party may authorize or provide such equipment, manpower and assistance to the requesting party, as he deems appropriate. The decision to respond and the degree of response shall remain in the discretion of the Chief of other officer in charge of the responding party.

2. No party to this agreement shall be bound to dispatch equipment, supplies or personnel to assist any other party, but every effort should be made to furnish such assistance and resources as are indicated so long as, in the judgment of the chief officer of that party, such dispatch would not seriously impair the fire defenses and protection of his own jurisdiction.

3. The Chief or other officer in charge of the party in whose jurisdiction the emergency exists and who requests assistance shall, in all instances, be in command of the emergency, controlling strategy, fire control tactics and direction of the operations.

4. It shall be the responsibility of the responding party to ensure that all personnel responding to the request for assistance are adequately trained. Each of the parties hereto shall be responsible for the conduct and actions of its personnel.

5. Each party to this agreement shall assume all liability and financial responsibility for death of or injury to any member of its own command responding to a request for assistance.

6. A party responding under the terms of this agreement shall not be responsible or financially liable for property damaged or destroyed at the scene of any civil disorder,

holocaust, conflagration or natural disaster due to firefighting and rescue operations, fire control tactics and strategy or other operations as may be required or ordered; said liability and responsibility shall rest solely with the party requesting such aid and within whose boundaries the property shall exist, or the incident occurs.

7. The party responding to the request for mutual aid under the terms of this agreement shall assume all liability and responsibility for damage to its own apparatus and/or equipment. The responding party shall also assume liability and responsibility for any damage caused by its apparatus or equipment while en route to or returning from a specific location.

8. The party who requests mutual aid shall in no way be deemed liable or responsible for the personal property of the members of the responding party which may be lost, stolen or damaged while they are performing their duties under the response terms herein.

9. Each party to this agreement shall assume all costs of salaries, wages, bonuses or other compensation for its own personnel responding for duty under the terms of this agreement and shall assume all costs of the responding party's apparatus, equipment, and supplies used in the response. The responding party shall make no charge for such use to the party requesting assistance except for any special chemicals or supplies by the responding party. Such chemicals shall be paid for by the party requesting aid upon receipt of an itemized statement of costs.

10. Any party may, at any time, terminate this agreement upon thirty-day written notice to all signatories within the agreement. Written notice shall be sent by registered mail to each department.

11. When fire department personnel are sent to another jurisdiction pursuant to this agreement, all rights, privileges and immunities as employees or agents of the responding party, including Workmen's Compensation insurance coverage, shall be extended to include their activities when acting within the scope of this agreement.

12. If a party to this agreement does not attempt to send requested assistance aid, with the provision that such aid would not seriously impact the party's own fire protection needs, it should not request or expect to receive assistance from other parties to this agreement.

13. The parties to this mutual aid agreement may amend or alter the agreement by written amendment, signed by each of the Fire Chief of all parties involved.

14. This mutual aid agreement shall remain in force for an initial term of five years, and may be extended by authorization of the governing board of any party.

THEREFORE, the governing boards of each agency agree to this regional mutual aid agreement and cause this instrument to be signed and adopted by their duly authorized officers.

Walkerton V. F. D.

Chief Herb Austin
Abingdon Volunteer Fire and Rescue, Inc.

Chief J.D. Clements
Gloucester Volunteer Fire and Rescue

Chief ~~Jimmy Brand~~ DAVID B. WOOLARD
Callao Volunteer Fire Department

King William Volunteer Fire Department
Skip Hardesty

Chief Jimmy Walden
Lower Middlesex Volunteer Fire Department

Chief Ricky Thompson
Mathews Volunteer Fire Department

Quinton Volunteer Fire Department
David R. Pitts Jr.

~~Chief Paul Richardson~~
Tappahannock Volunteer Fire Department
Deputy chief Ronnie Thomas

Chief ~~Guy Williams~~ Robert W. Wilson
Upper Middlesex Volunteer Fire Department

Chief ~~Guy Williams~~ Robert W. Wilson
West Point Volunteer Fire and Rescue

Fairfields V.F.D
Phillip Keyser Chief

Whitestone V.F.D.

Chief Wayne South
Central King and Queen Volunteer Fire Department

Chief Tommy Lewis Greg Hicks President
Cople District Volunteer Fire Department

Chief Benny Balderson Benny Balderson Sign
Kilmarnock Volunteer Fire Department

Chief Jeff Calhoun
Lower King and Queen Volunteer Fire Department

Luke Heller
Chief ~~Les Cosby~~ Sign C. Rick Crabtree Pres.
Mangohick Volunteer Fire Department

Chief Bill Thrift
Middlesex Volunteer Fire Department

Chief Brian Davis
Richmond County Volunteer Fire Department

Chief Eddie Weston
Westmoreland Volunteer Fire Department

J.D. Akers Sr.
Chief ~~Lindsey Beckham~~ James D. Akers Sr.
Upper Lancaster Volunteer Fire Department

Hartfield V.F.D.
David Milby

Appendix O –
Adopting the 2016 Plan: Resolutions and Other Information

NOTE: This is a place holder. Resolutions and BOS/Town Council meeting minutes will be included following the plan adoption at the local level. This will take place after FEMA approves the 2016 plan.

Appendix P –
Strategy Evaluation Spreadsheet Sample

King William County 2016 Mitigation Strategies Status Updates							
FEMA Community ID#	**Mitigation Strategy #**	**Mitigation Strategies**	**Strategy Mitigation (H= High M= Medium L=Low)**	**Strategy Status (Completed/ In-progress/ On-going/ Delayed/ Canceled/ Not Started)**	**If Completed, when? Add Date**	**If delayed or canceled please explain why? (Lack of funding, support, manpower, etc) If in-progress or on-going, please explain the progress since the last AHMP Plan?**	**Other Comments**
510304	1.1.5	Improve/maintain main evacuation route used by Middle Peninsula residents as well as Tidewater residents evacuation severe coastal weather events					
510304	1.1.6	Improve/maintain/reconstruct public roads that hinder the evacuation of the Middle Peninsula & Tidewater residents fleeing flood waters from severe hurricanes					
510304	1.1.8	Review locality's compliance with the National Flood Insurance Program with a bi-annual review of their Floodplain Ordinance and any newly permitted activity in the 100-year floodplain	L	Completed	Spring 2015		
510304	1.1.9	Investigate the FEMA Community Rating System Program in the Middle Peninsula Localities that are not currently participating in it	L	Completed	Spring 2015		Not interested in joining.
510304	1.1.10	Investigate increasing building elevation requirements for structures proposed in flood zones	L	Completed	Spring 2015		Adopted 1.5’ freeboard
510304	1.1.12	Limit future development in inundation areas located below large water impoundments.	L				
510304	1.1.13	Strongly encourage the USDA-Natural Resources Conservation Services staff and the Virginia Soil and Water Conservation District Office staff to ensure that farm pond dams remain structurally sound.					
510304	1.1.14	Develop storm water management plans and polices for urban development areas		Completed			
510304	1.1.15	Promote coastal construction techniques that will minimize soil erosion and shoreline damage caused by coastal storm surges	L	On-going			
510304	1.1.16	Add evacuation route insignia to public streets that are part of the hurricane evacuation route		Not-Started			Lack of Funding
510304	1.1.17	Install flood gauges and create erosion monitoring locations to inspect at regular intervals		Completed			
510304	1.1.18	Create a GIS layer of data showing pond locations, their size, inspection data, and dry hydrant information to improve fire response	L	On-going	August 2015		Added stormwater BMP layer
510304	1.2.1	Decrease the adverse affects of drought conditions for residents - Adopt a Drought Response and Contingency Plan and ordinance		Completed			Ordinance adopted 1-23-2012
510304	2.2.1	Formalize mutual aid agreements to coordinate the region's fire and emergency medical units to ensure to quick and efficient response to these severe weather events		Completed			
510304	2.2.2	Formalize mutual aid agreements to coordinate the region's fire unites to ensure quick and efficient response to wildfires		Completed			

510304	3.1.1	Enhance/implement the use of rapid notification systems to warn residents of approaching flooding waters and mandatory evacuation notices.		Completed			
510304	3.1.2	Encourage private property owners to perform regular and routine maintenance of ditches and culverts in order to keep them freed of debris, with a special emphasis on road sections where there are chronic flooding problems		Not started			
510304	3.1.3	Encourage the two power companies operating in the Middle Peninsula Region to maintain system components, including power line rights-of–way, to minimize interruptions of the electrical power grid for severe weather.					
510304	3.1.4	Promote public education programs to ensure that property owners are fully informed about the flood hazards on the property that they own.		Not started			Very little development around flood plains
510304	3.1.5	Develop a public education campaign for residents living in the 100-year floodplain, especially those living on FEMA's list of SRL and RL properties, listing methods for them to decrease flood damage including the availability of any FEMA grant funds for elevation or relocation projects.		Not started			Very little development around flood plains
510304	3.1.6	Increase resident and emergency responder safety during severe winter ice storm events by developing a public education campaign to inform residents about the importance of keeping tree limbs away from their homes and electric lines.					
510304	3.1.7	Develop a public education program to ensure that property owners are fully informed about the long range affects that sea level rise will have on low-lying property that they own.		Not started			Threat level of sea rise limited in this community.
510304	3.1.8	Promote a public education program to ensure that property owners protect their property by decreasing flammable forest fuels surrounding homes located in wooded settings.		Not started			
510304	3.2.1	Incorporate the newly digitized local floodplain maps into each County's GIS database after adoption by the local governing body.		Completed			
510304	3.2.2	1. HAZUS flood runs for the 1 sq. mi. threshold. In most cases, this will need to be done on priority stream reaches as the program does not run efficiently at this level. 2. Refine and update data sets for GBS and essential facilities, and 3. Re-run HAZUS for plan update to reflect 2010 census data		In-progress		1.HAZUS flood runs for the 1 square mile threshold was completed in the 2015 HAZUS completed by Dewberry 2. During the 2015 HAZUS completed by Dewberry the newest version of HAZUS software (version 2.2) which consisted of new dasymetric Census data (ie. general building stock). 3.2010 Census was not included in HAZUS.	
510304	4.1.1	All Natural Hazards: Adopt and Implement Plan		In-progress		Adopted a floodplain overlay district as a component of the County's zoning ordinance.	

Section 13: **Literature Cited**

AirNow (2015). *Air Quality Index*. Retrieved from https://airnow.gov/index.cfm?action=aqibasics.aqi

Ananthaswamy, A. (2003). Historic storms live again. *New Scientist*, Magazine issue 2414, 27 September 2003, pp 14

Beven, J. and H. Cobb (2004). *Tropical Cyclone Report: Hurricane Isabel, 6 - 19 September 2003 - NOAA/ National Weather Service, National Centers for, Environmental Prediction, National Hurricane Center, Tropical Prediction Center*. Retrieved from http://www.tpc.ncep.noaa.gov/2003isabel.shtml

Boon, J.D., J.M. Brubaker and D.R. Forrest. 2010. Chesapeake Bay land subsidence and sea level change: An evaluation of past and present trends and future outlook. Virginia Institute of Marine Science, Special Report No. 425 in Applied Marine Science and Ocean Engineering. Gloucester Point, VA. 41 pp. plus appendices.

Brantley, S.R. (1997). *Volcanoes of the United States.* Retrieved from http://pubs.usgs.gov/gip/volcus/version.html

Brinkley, M. K. (1999). The Hurricane History of Colonial Virginia to 1775. Electronic Journal of Emergency Management, Issue 1.

Bureau of Labor Statistics (2012). Employment in Hurricane Storm Surge Flood Zones. Retrieved from: http://www.bls.gov/cew

Coniglo, M.C., D.J. Stensrud, and M.B. Richmond. 2004. An Observation Study of Derecho-Producing Convective System. Weather and Forecasting 19: 320-337.

Davis, G.H. 1987. Land subsidence and sea level rise on the Atlantic Coastal Plain of the United States. Environmental Geology and Water Science 10(2): 67-80.

Douglas, B.C. 1991. Global sea level rise. Journal of Geophysical Research 96(C4): 6981-6992.

Federal Emergency Management Agency (2002). *NFIP Flood Studies and Maps*. Retrieved from https://www.fema.gov/pdf/floodplain/nfip_sg_unit_3.pdf

Federal Emergency Management Agency (2015). *Coastal Flood Risk Study Process*. Retrieved from https://www.fema.gov/coastal-flood-risk-study-process

Gloucester County (2009). *A Coastal Floodplain Management Plan for Gloucester County, Virginia.* Retrieved from http://www.gloucesterva.info/Portals/0/es/documents/AdoptedFloodplainManagementPlan9-2-14.pdf

Gloucester – Mathews Gazette Journal (2011). *Powerful tornado strikes Gloucester: Three dead; Page Middle School devastated*. Retrieved from http://www.gazettejournal.net/index.php/news/news_article/powerful_tornado_strikes_gloucester_three_dead_page_middle_school_devastate/

Holdahl, S.R. and N.L. Morrison. 1974. Regional investigations of vertical crustal movements in the U.S., using precise relevelings and mareograph data. Technophysics 23: 373-390.

Johnson, G.H., S.E. Kruse, A.W. Vaughn, J.K. Lucey, C.H. Hobbs III and D.S. Powars. 1998. Postimpact deformation associated with the late Eocene Chesapeake Bay impact structure in southeastern Virginia. Geology 26(6): 507-510.

Kocin, P. J. and L. W. Uccellini, 2004: A Snowfall Impact Scale Derived From Northeast Storm Snowfall Distributions. *Bull. Amer. Meteor. Soc.*, 85, 177-194

Ludlum, D. M. (1963) Early American Hurricanes 1492-1870. Boston: American Meteorological Society.

Mathews County (2015). *Photos from Mathews County Planning Department*. Retrieved from John Shaw.

Mickelson, D.M. and P.M. Colgan, P.M. 2003. The southern Laurentide Ice Sheet in the United States. In: Gillespie, A.R. and S. Porter (eds.*). Quaternary History of the United States.* International Quaternary Association (INQUA) Special Volume for 2003 International Meeting in Reno, NV., p. 1-16.

Middlesex County (2009). *Middlesex County Comprehensive Plan*. Retrieved from http://www.co.middlesex.va.us/PDF/Middlesex%20Comprehensive%20plan%20adopted%2012-1-09.pdf

Mountford, K. (2003). *Past is Prologue: Comparing 1933 to 2003: Which storm dealt the bigger blow?* Retrieved from http://www.bayjournal.com/article.cfm?article=668

Musick, S. (2005). *Tsunamis Data Tip*. Retrieved from www.vims.edu/bridge

National Drought Mitigation Center (2004). *Predicting Drought*. Retrieved from: http://drought.unl.edu/whatis/predict.htm

National Drought Mitigation Center (2004). Predicting Drought. Retrieved from http://drought.unl.edu/DroughtBasics/PredictingDrought.aspx

National Centers for Environmental Information (2015). *Storm Events Database*. Retrieved from https://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=51%2CVIRGINIA

National Oceanic and Atmospheric Administration (2015). *Shallow Coastal Flooding*. Retrieved from https://coast.noaa.gov/tidalfloodingvis/

National Science and Technology Council (2015). *Progress Made in Implementing the Ocean and Coastal Mapping Integration Act 2011-2014*. Retrieved from https://www.whitehouse.gov/sites/default/files/microsites/ostp/NSTC/ocean_mapping_2015_-_final.pdf

National Weather Service (2012). *The Ohio Valley/Mid-Atlantic Derecho of June 2012*. Retrieved from http://www.spc.noaa.gov/misc/AbtDerechos/casepages/jun292012page.htm

NOAA Laboratory for Satellite Altimetry (2008). *CEOS EO Handbook – Case Studies Satellite Observations in Support of Climate Challenges.* Retrieve from http://www.eohandbook.com/eohb2008/casestudy_sea.html.

Petersen, M.D., M.P. Moschetti, P.M. Powers, C.S. Mueller, K.M. Haller, A.D. Frankel, ... A.H. Olsen (2014). *Documentation for the 2014 Update of the United States National Seismic Hazard Maps.* Retrieved from http://pubs.usgs.gov/of/2014/1091/pdf/ofr2014-1091.pdf

Pope, J.P. and T.J. Burbey. 2004. Multiple aquifer characterization from single borehole extensometer records. Ground Water 41(1): 45-58.

Powars, D.S. and T.S. Bruce. 1999. The effects of the Chesapeake Bay impact crater on the geological framework and correlation of geohydrologic units of the lower York-James Peninsula, Virginia. U.S. Geological Survey Professional Paper 1612.

Pyke, C.R., R.G. Najjar, M.B. Adams, D. Breitburg, M. Kemp, C. Hershner, R. Howarth, M. Mulholland, M. Paolisso, D. Secor, K. Sellner, D. Wardrop, and R. Wood (2008). Climate change and the Chesapeake Bay: State-of-the-science review and recommendations. A Report from the Chesapeake Bay Program Science and Technical Advisory Committee (STAC), Annapolis, MD. 59 pp.

Rayburn, E. B. and J. Lozier (2001). *Virginia Snow Cover Risk and History*. Retrieved from http://www.wvu.edu/~agexten/forglvst/VAsnow/index.htm

Roth, D. and H. Cobb (2001). *Virginia Hurricane History*. http://www.hpc.ncep.noaa.gov/research/roth/vahur.htm

Shedlock, K. M. & L. C. Pakiser (1997). *Earthquakes.* Retrieved from http://pubs.usgs.gov/gip/earthq1/index.html

Sperry, Sidney (2009). *SPIA Index*. Retrieved from: http://www.spia-index.com/copyright.php

StormCenter Communications (2003). *Let It Snow Weather News*. Retrieved from http://www.stormcenter.com/envirocast/2003-01-01/envirocast-article1.php

Stover, C.W. and J.L. Coffman (1993). Seismicity of The United States, 1568-1989 (Revised), USGS Professional Paper 1527, pp 376-378.

Tornado History Project (2015). *Tornadoes in Virginia*. Retrieved from http://www.tornadohistoryproject.com/tornado/Virginia

Town of Tappahannock (2015). Retrieved from http://www.essex-virginia.org/UserFiles/Servers/Server_62876/File/PlanCom/CompPlanFinalVersion07142015.pdf

Town of Urbanna (2012). *Comprehensive Plan*. Retrieved from http://urbannava.gov/PDF%20files/ComprehensivePlan.pdf

Town of West Point (2000). *A Comprehensive Plan*. Retrieved from http://www.west-point.va.us/pages/Departments_Services/dept_serv_pdfs/2000compplan.PDF

United States Geological Survey (1997). Retrieved from http://pubs.usgs.gov/gip/volcus/page03.html

United States Geological Survey (1999). *Pyroclastic Flows and Their Effects*. Retrieved from http://volcanoes.usgs.gov/Hazards/What/PF/pcflows.html

United States Geological Survey (2002). *Seasonal Streamflow Conditions and Historic Droughts in Virginia*. Retrieved from http://va.water.usgs.gov/drought/histcond.htm

United States Geological Survey (2016). *Estimated Streamflow Entering Chesapeake Bay.* Retrieved from http://md.water.usgs.gov/waterdata/chesinflow/

University of Virginia Climatology Office (1989). *Lightning Strike Density Map for Virginia*. Retrieved from http://www.climate.virginia.edu/lightning/lightning.density.html

U.S. Water News Online (2002). *Virginia dams in distress and need of repair.* Retrieved from http://www.uswaternews.com/archives/arcpolicy/2virdam1.html

Virginia Employment Commission (2013). *Virginia Community Profile: Gloucester County*. Retrieved from http://virginialmi.com/report_center/community_profiles/5104000073.pdf

Virginia Department of Emergency Management (2013). *Commonwealth of Virginia Hazard Mitigation Plan*. Retrieved from http://www.vaemergency.gov/em-community/recovery/haz-mit-plans

Virginia Department of Emergency Management (2014). *Know Your Storm Surge Risk*. Retrieved from http://www.vaemergency.gov/readyvirginia/stay-informed/hurricane/storm-surge

Virginia Department of Environmental Quality (2014). *Emission Inventory*. Retrieved from http://www.deq.virginia.gov/Programs/Air/AirQualityPlanningEmissions/EmissionInventory.aspx

Virginia Department of Forestry (2015). *Wildfire Data*. Retrieved from Frederick Turak at the Department of Forestry.

Virginia Department of Game and Inland Fisheries (2015). Public Boating Access. Retrieved from http://www.dgif.virginia.gov/boating/access/

Virginia Department of Transportation (2004). *Many Roads Remain Closed in King William County*. Retrieved from http://www.virginiadot.org/newsroom/fredericksburg/roads_remain_closed_due54180.asp

Virginia State Climatology Office (2002). *Drought Report From The State Climatology Office, March 12, 2002*. Retrieved from http://climate.virginia.edu/advisory/2002/ad02-02.htm

Ward, S.N. and S. Day (2001). Cumbre Vieja Volcano -- Potential collapse and tsunami at La Palma, Canary Islands. Geophysical Research Letters

Watson, B. (2001). *Virginia Thunderstorms and Lightning*. Retrieved from http://www.vdem.state.va.us/library/lightning/va-lightning.htm

Watson, B. (2002). *Virginia tornadoes*. Retrieved from http://www.vdem.state.va.us/library/vatorn/va-tors.htm

Watson, B. and B. Sammler (2004). *Virginia winters: Snow, wind, ice and cold*. Retrieved from http://www.vdem.state.va.us/library/vawinter/va-win.htm