Middle Peninsula Natural Hazards Mitigation Plan

The Middle Peninsula of Virginia includes:

Essex County, Middlesex County, Mathews County, Gloucester County, King and Queen County, and King William County

Town of West Point, Town of Urbanna, and the Town of Tappahannock

The Plan was developed in cooperation with the
Middle Peninsula Planning District Commission
PO Box 286
Saluda, Virginia 23149
November 4th, 2010

MIDDLE PENINSULA PLANNING DISTRICT COMMISSION
Saluda Professional Center, 125 Bowden Street, P.O. Box 286, Saluda, VA 23149-0286
Toll Free: 1-888-699-1733 Phone: (804) 758-2311 FAX: (804) 758-3221
E-mail: mppdc@mppdc.com Webpage: www.mppdc.com

TABLE OF CONTENTS **PAGE**

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 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."

The final plan must be adopted by each participating jurisdiction and approved by the Virginia Department of Emergency Management (VDEM) and the Federal Emergency Management Agency (FEMA).

The Middle Peninsula Planning District Commission guided the development of the first Regional Natural Hazard Mitigation Plan according to the requirements of DMA 2K. All 9 Middle Peninsula jurisdictions participated in the development of the first plan, which included Gloucester County, Mathews County, Middlesex County, King William County, King and Queen County, Essex County, the Town of West Point, the Town of Urbanna and the Town of Tappahannock. The first plan was adopted by the local jurisdictions in 2006 and later that year by FEMA.

Hazard Mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life or property from hazards. 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 which includes the following:

1) organize resources,
2) assess hazards and risks,
3) develop a mitigation plan, and
4) evaluate the plan.

The plan also utilizes the elements outlined in FEMA's Crosswalk Reference Document for Review and Submission of Local Mitigation Plans as published by FEMA in July, 2008 in accordance with 44 CFR 78.5.

Since the adoption of the Middle Peninsula Natural Hazards Mitigation Plan (MPNHMP) in 2006, the 9 Middle Peninsula jurisdictions noted above jointly participated in Revision #1 of the plan by developing detailed flood mitigation strategies to address the region's most critical natural hazard, which is flooding from severe storms.

Revision #2 was a review and update of the remaining non-flood related natural hazards facing the Middle Peninsula region. Once again, officials from all 9 Middle Peninsula jurisdictions noted above signed a letter of intent to update the 2006 MPNHMP as a regional project. The letters of intent to do so from officials in the 9 localities noted above are included in Appendix 1 of this update.

Since the original MPNHMP was adopted by all 9 Middle Peninsula localities and subsequently approved by FEMA on January 6, 2006, this plan update complies with the requirement to review/update the plan within 5 years of its adoption – which in this case is by January 6, 2011.

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

The planning process utilized to update the 2010 plan involved many community partners and extensive public involvement. Transitioning from the 2006 plan to the 2010 plan involved extensive dialog and protracted local discussion concerning the nature of critical, moderately-critical and non-critical hazards. Key stakeholders served as the project steering committee and became the local experts and determined the outcome of the plan and the plans substitutive content.

Key stakeholders in the 6-county and 3-town planning area were invited to participate and be actively engaged in the update. Those invited included the Chief Administrative Officers – County Administrators and Town Managers, Planning Directors, Emergency Services Coordinators, Virginia Department of Conservation and Recreation – Floodplain Division Staff, Virginia Department of Emergency Management Staff, Virginia Department of Transportation – Saluda Residency Administrator and our federal partners at the National Weather Service, U.S. Corps of Engineers and U.S. Coast Guard. These federal partners have staff working within or near the Middle Peninsula Region.

The local, state and federal staff/officials on the Steering Committee were targeted for their direct experience/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.

The Middle Peninsula Planning District Commissioners, made up of elected officials as well as business and community leaders from the region, have been kept abreast of progress with both Revision #1 and Revision #2 of the update in the form of written staff reports periodically at their monthly meetings, which are held on the 4th Wednesday of each month.

Faculty/staff at the Virginia Institute of Marine Science, a division of the College of William and Mary that is based at Gloucester Point, were made aware of the flood mitigation project. As a result of this awareness, the MPPDC Staff provided the Marine Sciences staff with feedback during the planning stage of their "Understanding Storm Tides and Sea Level Change Workshop" held on July 30, 2009 at the Deltaville Community Center in Middlesex County. Many of those in attendance are private business owners who operate marinas in the Deltaville area that are directly affected by storm tides and the resulting flooding in lower Middlesex County.

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 have provided meaningful input into their work.

Community-based meetings have been held in Mathews and Gloucester Counties during the project planning and grant writing phases of their residential mitigation projects. County officials and their project management contractual staff were able to engage the local residents since they were identifying and proposing specific mitigation projects on individual parcels of land in these 2 jurisdictions.

In order to provide consistency and continuity to this regional planning process, the MPPDC Regional Emergency Preparedness Planner, Ron Hachey, served as the facilitator and leader of the Steering Committee during both Revision #1 and Revision #2 of the update. A list of the Steering Committee members is listed in Appendix 2.

Project Time Lines with the Update

Revision #1, with its focus on flood mitigation planning, included the following tasks and timeline:

10/1/08 to 6/30/10

Tasks	Project Month(s)
Project Initiation	
1. Identify members of the FMA Guidance Team	1
2. Send letters to Team members describing project including work schedule/tasks	1
3. Hold organizational meeting of the Team	2
4. Based on Team input, finalize work schedule/tasks	2
Hazard Identification and Risk Analysis (HIRA)	
1. Review locality and FEMA flood maps - 6 Counties and 3 towns	1-3
2. Review of County historical data on flood events	1-3
3. Review of the USCOE 2008 Flood Surge Maps	1-3
4. Review of Repetitive Loss (RL) and Severe Repetitive Loss (SRL) data in each community	1-3
5. Review locality floodplain, storm water management and dam safety ordinances and regulations	1-3
6. Map RL, SRL and sites undergoing mitigation activities	1-3
7. Review of data inputs by Team before start of HIRA process	4
8. Undertake HIRA using HAZUS software system	4-6
9. Review of HIRA by Team members	6
10. Revise HIRA based on Team member input.	7
11. Gather public comments from locality officials with help of Team members	8-9
12. Revise HIRA as needed	9
13. Prepare and submit payment request to VDEM	9
Draft of Plan	
1. Create outline of plan document using FEMA's FMA guidance instructions	2
2. Develop list of mitigation alternatives	9
3. Develop locality specific mitigation goals and strategies with assistance of Team members	10-11
4. Complete draft of FMA plan	12
5. Present draft of FMA plan to Team members	13
6. Revise plan as needed	13-14
Plan Approval	
1. Submit draft plan to VDEM for their review	14
2. VDEM submits draft plan to FEMA for their review	15
3. Revise plan as needed as per VDEM/FEMA comments	15-16
4. Plan approved by VDEM/FEMA	16
Plan Adoption by Localities	
1. Present final plan to each local governing body with assistance of locality Team members	16-17

2.	Adoption by each of the Middle Peninsula governing bodies	17-18
3.	Prepare final payment request to VDEM	20

Post Adoption Activities

1.	Implement public outreach and awareness campaign of FMA activities by Team member	21+
2.	Yearly evaluation of FMA action activities by Team members	on-going
3.	Amend plan yearly after evaluation by each Middle Peninsula governing body	on-going

Appendix 3 includes copies of the minutes from their committee meetings.

A similar planning process was followed with Revision #2 of the update. The Steering Committee met monthly in the first half of 2010 to complete the update. A list of these Steering Committee members is shown in Appendix 4 with copies of their meeting minutes contained in Appendix 5.

Financial support for the update was provided by FEMA grant funds, administered by the Virginia Department of Emergency Management, as well as from funds contributed by the 9 local member jurisdictions of the MPPDC.

FEMA funded contracts usually run for 2 years and therefore, the time line shown below for Revision #2 reflects a 2-year period. Although the following tasks remained valid, a new compressed time line was developed so that the project would be substantially complete by 6/30/10. This compressed time line was required due to the ending of the Regional Emergency Preparedness Planning Program at the MPPDC due to budget cutbacks.

Since Revision #1 of the 2006 MPNHMP plan covered the most critical natural hazard threats facing the Middle Peninsula region with the development of flood mitigation strategies, the update of the remaining natural hazards facing this area was able to be accomplished in a compressed amount of time.

The following chart lists the tasks and other important information pertaining to Revision #2:

Task	Starting Point	Unit of Time	Duration	Work Completed By
Identify members of NHMP Update Team	1-15	Days	15 days	Regional Emergency Preparedness Planner (REPP)
Send letters to Team Members	16-30	Days	15 days	REPP
Hold Organizational Meeting of Team	31	Day	1 day	REPP and Team Members
Finalize work schedule/tasks with Team	31-60	Days	30 days	REPP and Team Members
Review Mitigation strategies in each locality	61-90	Days	30 days	REPP and locality specific Team Members

Summary of mitigation strategies implemented since NHMP adoption	91-120	Days	90 days	REPP
Write step-by-step strategy implementation procedures	121-150	Days	30 days	REPP
Create outline of plan update document using FEMA's NHMP guidance instructions	151-180	Days	30 days	REPP
Update hazard data since 2006 as applicable	181-240	Days	60 days	REPP
Develop list of new/revised mitigation activities	241-270	Days	30 days	REPP and Team Members
Develop locality specific mitigation strategies	271-300	Days	30 days	REPP and locality specific Team Members
Complete Draft of NHMP Update	301-330	Days	30 days	REPP
Present draft to Team members and revise as needed	301-330	Days	30 days	REPP
Submit draft plan to VDEM	330	Days	1 day	REPP
VDEM submits draft plan to FEMA for their review	330-360	Days	60 days	VDEM staff
Revise plan as per VDEM/FEMA	360-390	Days	30 days	REPP
Plan approved by VDEM/FEMA	390-420	Days	30 days	VDEM/FEMA staff
Present final plan to each local governing body	420-480	Days	60 days	REPP and locality specific Team Members

Adoption of plan by each governing body	480-540	Days	60 days	9 local governing bodies
Yearly evaluation of NHMP action activities	730+	Days	On-going	LESCs
Amend plan yearly	730+	Days	On-going	LESCs

Invitations for the MPNHMP update were extended to a similar list of participants/contributors as those noted in Revision #1.

The more active members of the Steering Committee were local government officials including the County Administrators, Planning Directors, Zoning Administrators, Building Codes Compliance Officials and Emergency Services Coordinators. These local government officials noted above constitute the core group of employees that are responsible for developing and implementing the strategies adopted in the MPNHMP update.

Once again, federal and state agency staff working in the Middle Peninsula region were invited to participate in the process – some of whom provided important technical information/data.

For continuity and productivity purposes, Steering Committee members with core policy and implementation emergency management responsibilities from the 9 participating jurisdictions were once again the key and essential players during the MPNHMP update process.

A lead Steering Committee Member from each of the 9 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 these tasks within the guidelines and time-frames noted below:

Hazard Identification/Capability Assessment

Completed a series of 5 tasks using the 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.

The recently completed Hazard Identification and Risk Assessment – a part of the flood mitigation planning project which was completed using the FEMA generated HAZUS software that shows anticipated damages from hurricanes and severe wind storms – was made available to the Steering Committee members to assist them with these tasks.

The natural hazard rankings from the 2006 MPNHMP were also made available to the Steering Committee members to assist them.

The Steering Committee members were asked to complete the worksheets by March 8, 2010 for compilation by the Regional Emergency Preparedness Planner by the March 10, 2010 Steering Committee meeting.

Review of the Strategies from the 2006 MPNHMP

The Steering Committee Members were given the spreadsheet showing the proposed strategies that were included in the 2006 plan as well as additional strategies that were completed by their jurisdictions as of 2008. The spreadsheet showed whether the mitigation strategy was **completed, deleted, not started, cancelled or in progress.**

The Steering Committee Members were asked to update this information as of 1/1/10 and return the updated spreads sheets by March 8, 2010 for distribution at the March 10, 2010 Steering Committee meeting.

Inform the Public – Hazard Identification/Assessment Phase

Once the natural hazards were identified and assessed, the Steering Committee members solicited comments/concerns from residents in their communities in mid-to-late March 2010.

In addition, the MPPDC Regional Emergency Preparedness Planner wrote and sent a press release to the 5 area newspapers that serve Middle Peninsula residents to solicit public input on natural hazards that affect them and/or their communities. The same press release was posted on the Middle Peninsula Planning District Commission's website between March 19, 2010 and April 2, 2010 to solicit additional input from residents about natural hazards. A copy of this press release is shown in Appendix 6.

Residents' comments were incorporated into the hazard assessment phase of the update by the jurisdictional Steering Committee Members.

Develop Goals and Objectives

At the April 7, 2010 Steering Committee meeting, the group reviewed existing mitigation goals and developed new regional goals and objectives for the MPNHMP update.

Also at their April meeting, the Committee members finalized the criteria used to develop their mitigation strategies. The criteria used was modeled, with some modifications, after those used by the City of Chesapeake for this purpose.

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?
1. 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.
2. Are the capital, maintenance and administrative costs accounted for with the proposed strategy?
3. Has the funding been secured for this project?
4. What burden will this strategy place on the locality's tax base or local economy?
5. 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?

Strategy Development

After the April 7, 2010 Steering Committee meeting, the members developed mitigation strategies to address the hazards that they determined adversely affected their communities. This task was completed by April 21, 2010.

Inform the Public – Strategy Development Phase

The jurisdictional Steering Committee members solicited comments from their residents and co-workers about the appropriateness and feasibility of their proposed mitigation strategies. Comments were solicited and incorporated into the proposed jurisdictional strategies; this task was completed by the May 5, 2010 Steering Committee meeting.

Proposed mitigation strategies were compiled and posted on the MPPDC website to solicit additional comments about their effectiveness and feasibility.

Draft Plan

The draft plan was completed by May 19, 2010 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 at their June 9, 2010 meeting.

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.

Public Input during Plan Development

Most of the Steering Committee members that are listed in Appendix 2/4 are staff from the Middle Peninsula localities that either develop or implement ordinances and policies that affect development in areas that are susceptible to damage from natural hazards. The other members are state agency staffers who oversee the floodplain program and/or other natural hazard mitigation initiatives.

The Steering Committee members' tasks were directed by the Regional Emergency Preparedness Planner hired by the Middle Peninsula Planning District Commission to undertake both Revision #1 and Revision #2 of the original plan. The Planner also undertook other emergency management planning projects in the region. The Planner has worked with the local government staff in the Middle Peninsula since 2003 – including being directly involved in the development and adoption of the Middle Peninsula Natural Hazards Mitigation Plan in 2006.

The meeting agendas in Appendix 3 show those critical components of the plan that were reviewed by the committee members at each of the meetings during Revision #1. The critical components reviewed included:

- Flood Information Data Gathering – Who has what?
- Review of Identified Flood Hazards in Each Locality
- Identification of Additional Flood Hazards
- Discussion of Possible Hazard Mitigation Strategies
- Second Review of Flood Hazards in Each Locality
- First Review of Proposed Hazard Mitigation Strategies

Local Emergency Services Coordinators were crucial in denoting the local flood hazards and the Virginia Department of Transportation Residency Administrators were instrumental with identifying critical transportation network flooding hazards.

Virginia Department of Conservation and Recreation Floodplain Engineers keep the locality Steering Committee members up to date on the availability of county updates of the digital FIRMs.

National Weather Service staff, located in Wakefield, Virginia, provided updated severe storm data for the Middle Peninsula from 2003 through 2008.

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.

Regulatory tools adopted as part of the mitigation strategies will be incorporated 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 the development of Revision #1, news releases were printed in each of the 5 local newspapers that serve portions of the Middle Peninsula, a copy of which is shown in Appendix 7. The article simply explains the purpose of the plan and requests that the public contact the Regional Emergency Preparedness Planner at the Middle Peninsula Planning District Commission with information about flooding problems that they are aware of in their area of the Middle Peninsula.

As a result of seeing the news release in their local newspaper, a resident of Essex County called to discuss the flooding problem along Route 617, a road located between Tappahannock and the

Rappahannock River. The resident stated that whenever there is a good rain event of 2” or more, there are 3 or 4 low points along this road where drainage pipes are overwhelmed during this intensity of a rain event when water on the road approaches depths of 6” to 12”. During Hurricane Isabel in 2003, portions of this road were under 4-feet of water. This road has been listed in the Essex County Flood Hazards section of the plan.

Also as a result of the news release, a Mathews County resident called to discuss flooding concerns in an area known as Bashi Shores along the Chesapeake Bay. This flooding problem is discussed later in the Mathews County section of the plan.

In anticipation of the Steering Committee’s meeting on August 27, 2009, the MPPDC Planner sent each of the Emergency Services Coordinators in the 9 Middle Peninsula localities copies of the Goals, Strategies and Implementation Sections of Revision #1 dealing with flooding hazards to give them enough time to review their locality specific strategies with other local officials to ensure that they were feasible within their jurisdiction’s local capabilities and resources.

The MPPDC Regional Emergency Preparedness Planner distributed copies of the Goals Strategies and Implementation Sections of Revision #1 to the 6 County Administrators and 3 Town Managers at their meeting on January 8, 2010 for their review and in anticipation of the public information and adoption process in each of their 9 localities. The MPPDC Planner asked that each of these chief appointed officials determine how they wanted to handle public review of the flood mitigation strategies in their locality and to let him know what role they wanted him to play in the adoption process.

During Revision #2, the region’s 5 local newspapers covering the Middle Peninsula published a news release about the plan update in the weekly edition of their newspapers during the week of March 8, 2010. A copy of the press release is included in Appendix 6.

The news release briefly explained the recently completed flood related mitigation strategies as well as the need to update mitigation strategies for the other non-flood related natural hazards identified in the 2006 MPNHMP. The news release asked for residents to contact the MPPDC to report adverse impacts from natural hazards that affect them.

The same news release was posted on the MPPDC website from March 19, 2010 until April 2, 2010 to solicit additional resident input on natural hazards that adversely affect their lives. A copy of the MPPDC’s website homepage is shown in Appendix 8. As a result of the news release, a Gloucester County resident called to discuss flooding concerns in the Holly Springs Subdivision near Gloucester Courthouse. This flooding problem is discussed later in the Gloucester County section of the plan.

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 in June /July 2010 included the following venues:

1. At the King William County Board of Supervisors meeting on June 28, 2010,
2. At the King William County Website starting on June 14, 2010,

3. At the King and Queen County website with a paper copy at the King and Queen County Library located at St. Stephens Church,
4. At the Essex County website with paper copies available for review at the Emergency Services Coordinator's Office and at the Essex County Public Library, both in Tappahannock, and
5. At a community meeting room at the Gloucester County Courthouse Complex on August 17, 2010 with residents from Middlesex, Gloucester and Mathews Counties invited to attend.

Summary of Steering Committee Actions and a Summary of Primary Revisions of the 2006 MPNHMP

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 includes the following:

- Reviewed and revised the natural hazard rankings using the Kaiser Permanente Assessment Tool
- Added Sea Level Rise as a new natural hazard to be included in the update
- Updated the community profiles with population and community improvement information
- Updated the coastal storm data from the National Weather Service which indicates a continued high vulnerability to hazards resulting from hurricanes and other coastal storms
- Utilized the jurisdictional websites to obtain public input on areas affected by natural hazards and proposed mitigation strategies to address them
- Included the newly generated HAZUS Risk Assessment data into the update
- Specified jurisdictional capabilities now that there is a 5-year history of stepped-up mitigation activities
- Added aerial maps showing the location of each structure in the 100-year floodplain
- Reporting on mitigation strategies implemented was added a new section in the update
- Jurisdictional capabilities were expanded in the update
- Developed straight forward criteria to evaluate the feasibility of proposed mitigation strategies
- A much boarder range of mitigation strategies addressed a wider range of natural hazards were developed in the update
- Incorporated Corrective-Action-Tasks that resulted from the 2009 regional training exercise concerning mutual aid agreements and interoperable communications into the mitigation strategies for some natural hazards
- The implementation schedule was more fully developed and put in tabular form for quick and easy reference by each locality
- The yearly plan progress reporting process was more fully developed with steps and responsible parties more specifically outlined
- Developed a new goal to ensure more effective incorporation of the mitigation strategies into the host of jurisdictional planning and policy tools that they have at their disposal

Section 3 - Community Profile of Virginia's Middle Peninsula

The planning process utilized to update the 2010 plan involved many community partners and extensive public involvement. Transitioning from the 2006 plan to the 2010 plan involved extensive dialog and protracted local discussion concerning the nature of community profile comprising the Middle Peninsula. The stakeholders forming the steering committee discussed the overall community profile of the Middle Peninsula as it relates to the nature of critical, moderately-critical and non-critical hazards.

Description of Area

The Middle Peninsula is located on the western shore of the Chesapeake Bay, bounded on the north by the Rappahannock River and on the south by the York River. It encompasses the counties of Essex, Gloucester, King and Queen, King William, Mathews and Middlesex plus the towns of Tappahannock, Urbanna and West Point.

The region is located in the Virginia coastal plain with a topography that is relatively flat along the Chesapeake Bay to gently rolling hills in the upper reaches of the Middle Peninsula. The southeastern most portions of the region are in close proximity to sea level and as you move in a northwesterly direction, the elevation rises to almost 200' above sea level.

The water table remains close to the land surface in the lower elevations of the Middle Peninsula – especially when the soils are saturated. Portions of all 9 localities in the Middle Peninsula Region can be subject to flooding from various severe storm events.

The Middle Peninsula lies in the moderate temperate zone of the Mid-Atlantic Region with seasonal variations in rainfall amounts. The region is known for its many waterways – broad rivers, meandering creeks, wide bays and tidal marshes – which contribute to its susceptibility to flooding from coastal storms. The region is vulnerable to flash flooding from summer thunderstorms, from hurricanes between the June 1st to November 30th time period and from nor'easters that can occur at any time given the right combination of climatic conditions. Tidal surges associated with severe storms often compound the flooding problem in low lying coastal areas.

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 which provide a focal point for commercial, industrial and residential development at a modest scale, and
- Government operation centers which provide another focal point of local activity in the region.

Over 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 starting to undergo conversion from woodlands to residential development, and
- 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 the Route 33 and Route 360 east-to-west transportation corridors.

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

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 resource-based industries and traditional rural lifestyle. With its abundance of waterway amenities, there is development pressure on or near the waterways throughout the Middle Peninsula.

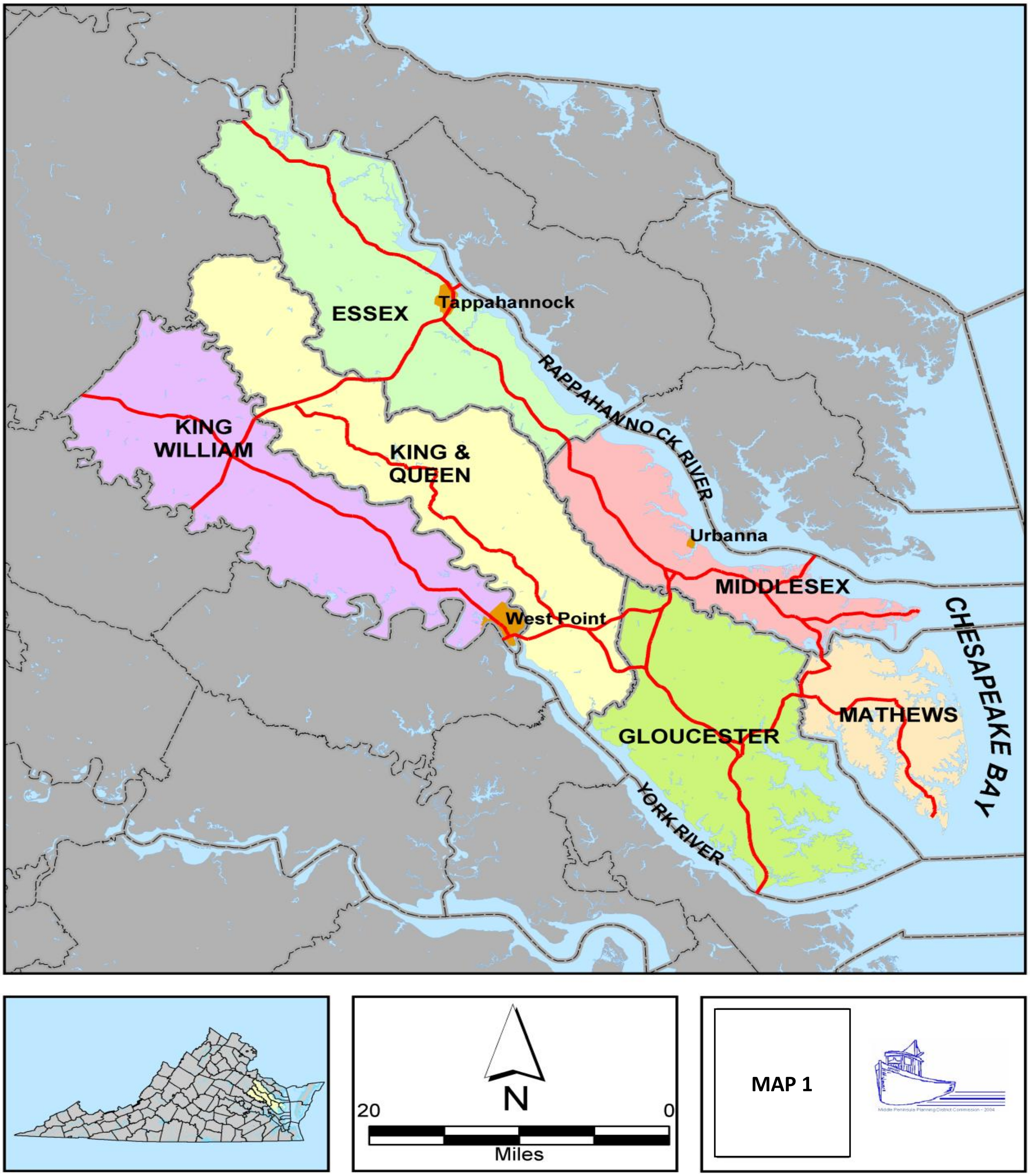
Since adoption of the MPNHMP in 2006, the Middle Peninsula has continued to remain a rural area and has experienced a slowing of the growth rate due to the prolonged economic recession between 2008 and the present time in 2010.

Since the 2010 U.S. Census is currently underway, updated comprehensive demographic data from this federal source will not be available until after the MPNHMP update has been completed.

However, the U.S. Census does update population estimates for towns in Virginia between the 10-year federal census counts. In addition, the Weldon Cooper Center for Public Service at the University of Virginia does estimate population counts for Virginia counties on a yearly basis between the 10-year federal census counts. Both sets of the most recent figures from these 2 data sources will be used to update the community profiles that follow.

The sections that follow briefly explain the geographic settings and population trends in each of the counties and towns of the Middle Peninsula region based on information contained within their respective Comprehensive Plans.

The Middle Peninsula Region



Essex County

Essex County is predominantly a rural county at the northern end of the Middle Peninsula. It is bounded on the north by King George and Westmoreland Counties, on the east by Richmond County, on the south by Middlesex County and on the west by Caroline and King and Queen Counties. The Rappahannock River forms the northeastern boundary of the County. The County comprises approximately 261 square miles (Essex County Comprehensive Plan, 2003).

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.

The 2000 Census figures showed the Essex County population to be 9,989 people, an increase of 1,300 (15%) over the 1990 census. County officials believe that the 1990 Census undercounted the population at that time and that true population growth has been steady at a low to moderate rate over the last 20 years. The population has also aged somewhat during this period, with a modest reduction in school age population. These trends suggest that County programs may at some point require redirection in meeting the specific needs (health care, transportation) of an older population. A low to moderate trend in growth is expected to continue in the county (Essex County Comprehensive Plan, 2003).

According to the 2009 provisional population estimate from the Weldon Cooper Center for Public Service at the University of Virginia, there are now 11,003 people living in Essex County. This represents a 10% growth rate between 2000 and 2009.

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 and other public facilities, an old airport and industrial center, a business corridor, and extensive wetland areas. Tappahannock serves as the county seat for Essex County.

The 2000 U. S. Census population of Tappahannock was 2,055 people, an increase of 345 persons (20.2%) over the 1990 total of 1,710. Population forecasts indicate that by 2010, there will be approximately 2,567 residents in the Town (Town of Tappahannock Comprehensive Plan 1998).

Tappahannock officials are aware that this potential growth of the town underscores the need for attention to growth management policies. The form, pattern and distribution of new developments will need to accommodate for this growth in population and it will need to be coupled with commercial and industrial development to meet the residents' shopping and employment needs; thereby strongly influencing their future quality of life.

The U.S. Census estimated that there were 2,172 people living in Tappahannock in 2007. This represents a 5.7% growth rate between 2000 and 2007, which was lower then what was anticipated by town officials in 1998.

A new airport has been built in central Essex County off of Route 360 in the Paul's Crossroads area. The old airport, located in the Tappahannock Industrial Park, is no longer being used for this purpose. It has been converted for other public uses including the town's maintenance shop.

Gloucester County

Gloucester County is located in the southeastern portion of Virginia's Middle Peninsula. The county is bounded on the south by the York River, on the north by the Piankatank River and on the east by Mobjack Bay. Gloucester County's industries have traditionally been associated with the abundant natural resources found in the area. With its advantageous location in the geographic center of the Eastern Seaboard, the county has experienced an increasing diversification of manufacturing activities.

Gloucester County is one of the fastest growing counties in the state, demonstrating an annual growth of 6.4% in the 1980's. It is the most populous county of the Middle Peninsula with a 2000 population of 34,780 persons. The 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 development pattern which is most pronounced at the southern reaches of the County.

Metropolitan residents to the south are lured to the County by the promise of lower taxes, lower housing costs, rural character, and relative freedom from the congestion evident in the jurisdictions closer to Newport News and the greater Hampton Roads area. This has created increased traffic volumes on highways not designed for such heavy use. Gloucester County has established a "Growth Management Philosophy" outlined as a "contained growth" strategy in the County's Comprehensive Plan to manage the future form, pattern, quantities, and distribution of growth in Gloucester County.

According to the 2009 provisional population estimate from the Weldon Cooper Center for Public Service at the University of Virginia, there were 36,647 people living in Gloucester County. This represented a 5.4% growth rate between 2000 and 2009.

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.

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 persons per square mile. Nearly three-fourths of the County's 318.1 square miles of land area is timberland. Over the past three decades, King and Queen County has experienced slow, but steady growth.

Between 1970 and 1980, the population increased 8.7% to 5,968 people; between 1980 and 1990, the population increased 5.4% to 6,289 people. In 2000, the population of King and Queen County rose to 6,630 people. 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.

According to the 2009 provisional population estimate from the Weldon Cooper Center for Public Service at the University of Virginia, there were 6,675 people living in King and Queen County. This represented less than a 1% growth rate between 2000 and 2009.

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 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.

The 2000 population in King William County was 13,146 people, an increase of 2,233 persons (20.5%) over the 1990 total of 10,913 people. Over the last 30 years, the County's population has steadily increased from 7,497 in 1970 and 9,334 in 1980 (King William County Comprehensive Plan, 2003). The Virginia Employment Commission projections indicate that King William County will continue to experience accelerated population growth. By the year 2010, it is estimated that the County's population will grow by 2,857 persons, or 21.7%. Growth management will become more problematic as competing uses vie for space and facilities.

According to the 2009 provisional population estimate from the Weldon Cooper Center for Public Service at the University of Virginia, there were 16,184 people living in King William County. This represented a 23% growth rate between 2000 and 2009.

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 rivers are tidal and have an approximate tidal range of three feet. The river areas surrounding West Point are primarily used for recreation and barge access to the Smurfit-Stone Containerboard Mill 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.

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 population of West Point in 2000 was 2,906 - a decrease of 32 persons (1%) below the 1990 census population of 2,938. Between 1960 and 1990, the town's population steadily increased from 1,678 in 1960, to 2,600 in 1970, to 2,726 in 1980, and to 2,938 in 1990 (West Point Comprehensive Plan, 2000). The 2000 U.S. Census figure puts the town's population at 2,906 people.

The U.S. Census estimated that there were 3,113 people living in West Point in 2007. This represented a 7% growth rate between 2000 and 2007.

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 borders Gloucester County, the County's perimeter is formed entirely 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. Local businesses are based on agriculture, trade, seafood, and tourism.

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 again reached the peak reported in 1910.

Mathews grew by 16.5% (1,180 persons) between 1970 and 1990. The 2000 U.S. Census reported a population of 9,207 (an increase of 10.3%, or 859 persons since 1990). 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 the 2009 provisional population estimate from the Weldon Cooper Center for Public Service at the University of Virginia, there were 9,501 people living in Mathews County. This represented a 3% growth rate between 2000 and 2009.

Middlesex County

Middlesex County, comprising 132 square miles with 135 linear miles of shoreline, is located at the eastern end of the Middle Peninsula. The County is bounded by the Rappahannock River to the northeast, the Piankatank River and Dragon Swamp to the southwest, the Chesapeake Bay to the east, and Essex County to the north.

Settlement of the county began in 1640 with the county being officially formed in 1669 from a portion of Lancaster County. The County's only town, Urbanna, was established in 1680 and served as a port for shipping agricultural products. Urbanna served as the county seat of government until 1852, when the seat was moved to its present location in the village of Saluda. To the east, almost to Stingray Point, the village of Deltaville is located between the mouths of the Rappahannock and Piankatank Rivers. Once a major center for wooden boat building, the village remains a commercial and recreational center today.

Middlesex has remained largely rural over the years with farming, forestry, fin and shell fishing providing the principal elements of the economic base. Its relatively remote geographical location and difficulties with early ground transportation has caused the area to retain its rural character. The County population has increased 57.2% since 1950. Population peaked in 2000 with 9,932 persons, over twice the population reported in 1790 (4,140). Bridge and highway construction will continue to make commuting to work centers easier for Middlesex County residents.

In 1990, nearly 30% of the housing units in the county were seasonal, approximately 28 times higher than the state average. Over 70% of the housing stock was built since 1960 and about 39% of the housing has been newly occupied since 1980, indicating an increasing number of new residents to the county. Only 3.5% of the housing in Middlesex is multi-family, a figure significantly lower than the state average of 22.7%. Over 15% of the housing units are mobile homes, which is higher than the state average of 6.4%.

According to the 2009 provisional population estimate from the Weldon Cooper Center for Public Service at the University of Virginia, there were 10,412 people living in Middlesex County. This represented a 5% growth rate between 2000 and 2009.

Town of Urbanna

The town of Urbanna is located in Middlesex County on the Rappahannock River on a finger of land bounded by both Perkins Creek and Urbanna Creek. The town is one of America's original harbor towns and is located approximately five miles from Saluda, the Middlesex County seat. Incorporated in 1902, the present town boundary comprises an area of about one-half square mile. The town operates an active boat harbor, maintained by the U.S. Army Corps of Engineers, which is the basis of fishing and recreational boating industries serving the area. The older part of the town is concentrated along a grid of streets oriented to three main thoroughfares: Rappahannock Avenue, Cross Street and Virginia Street.

The popular Urbanna Oyster Festival has been held in the town in November of each year since 1958. This annual 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 now number close to 75,000 people.

The population of Urbanna was 554 people in 2000. The Town Manager estimates that there is 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.

The U.S. Census estimates that there were 543 people living in Urbanna in 2007. This represented a 2% decrease in population between 2000 and 2007.

Section 4 – Hazard Identification

The hazard identification planning process utilized to update the 2010 plan involved many community partners and extensive public involvement. Transitioning from the 2006 plan to the 2010 plan involved extensive dialog and protracted local discussion concerning the nature of hazard identification across the Middle Peninsula. The stakeholders forming the steering committee discussed hazard identification of the Middle Peninsula as it relates to the nature of critical, moderately-critical and non-critical hazards.

The steering committee decided that an in depth analysis was needed for critical hazards. Non- Critical 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)]*, this HIRA only focused on natural hazards and their impact on the Middle Peninsula. It measured potential loss of life, personal injury, economic impairment, and property damage resulting from these 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 Steering Committee evaluated an extensive list of natural hazards that could potentially affect the Middle Peninsula including:

- Hurricanes
- Ice Storms
- Tornadoes
- Coastal Flooding/Nor'easters
- Coastal/ Shoreline Erosion
- Sea Level Rise (added in 2010)
- Snow Storms
- Riverine Flooding
- Wildfires
- High Winds/Windstorms
- Dam Failure
- Droughts
- Lightning
- Earthquakes
- Shrink-swell Soils
- Extreme Cold
- Extreme Heat
- Land Subsidence/Karst
- Landslides
- Tsunamis
- Volcanos

Using a modified Hazard Vulnerability Tool worksheet provided by VDEM staff (originally designed to estimate medical center hazard and vulnerability by Kaiser Permanente), readily available data, local knowledge and observations, the Steering Committee members evaluated these hazards.

In 2006, the Committee chose five criteria to rank the hazards from highest to lowest priorities. Those five categories included 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 1 were used as a standard for evaluation of all the hazards. Table 2 represented the committee's prioritization criteria and how each hazard was ranked.

Table 1: Prioritization Criteria for Hazards on the Middle Peninsula

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

Level

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 None

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 None

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 None

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 None

1 Many (over 3 cost effective mitigation options)

2 Several (2-3 cost effective mitigation options)

3 Few (1 cost effective mitigation option)

Table 2: Prioritization Worksheet for Hazards on the Middle Peninsula (2006 worksheet)

HAZARD TYPE	PROBABILITY	AFFECTED STRUCTURES	PRIMARY IMPACTS	SECONDARY IMPACTS	MITIGATION OPTIONS	RISK	RANK
	Likelihood hazard will occur	*Number of Structures affected*	*Damage to typical structure or industry in the community*	*Based on impacts to the community at large*	*Preplanning*	*threat increases with percentage*	
SCORE	1 = Unlikely 2 = Likely 3 = Highly Likely	0 = None 1 = Small 2 = Medium	0 = N/A 1 = Negligible 2 = Limited	0 = N/A 1 = Negligible 2 = Limited	0 = None 1 = Many 2 = Several	0 - 100%	
Hurricanes	3	3	3	3	2	92%	1
Winter Storm (Ice)	3	2	3	2	2	75%	2
Tornadoes	3	2	2	2	2	67%	3
Coastal Flooding	3	2	2	2	2	67%	3
Coastal / Shoreline Erosion	3	3	0	1	3	58%	4
Winter Storm (Snow)	2	3	3	2	2	56%	5
Riverine Flooding	2	3	2	2	2	50%	6
Wildfire	2	3	1	2	2	44%	7
High Wind / Windstorms	2	2	1	2	3	44%	7
Dam Failure	2	2	1	2	1	33%	8
Drought	3	0	0	2	1	25%	9
Lightning	2	0	1	1	1	17%	10
Earthquake	2	0	0	0	3	17%	10
Shrink-swell Soils	2	1	1	0	1	17%	10
Extreme Cold	2	0	1	1	0	11%	11
Extreme Heat	1	0	1	1	0	6%	12
Land Subsidence/Karst	1	0	0	0	0	0%	-
Landslides	1	0	0	0	0	0%	-
Tsunami	1	0	0	0	0	0%	-
Volcano	1	0	0	0	0	0%	-
AVERAGE SCORE	2.05	1.30	1.10	1.25	1.35	34%	

By examining the historical occurrence of each hazard, along with the potential impacts, the hazards that pose the most significant risks to the Middle Peninsula were identified. This risk analysis allowed the Middle Peninsula to focus on the hazards that will most likely cause future impacts to the region. The Steering Committee prioritized and ranked these hazards based on the criteria above. The four hazards that had the highest relative risk based on this analysis and are considered **"Critical Hazards"** included:

1. Hurricanes,
2. Winter Ice Storms,
3. Tornadoes, and
4. Coastal Flooding.

The hazards considered **"Moderately Critical"** are those that 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 included:

1. Winter Storms (snow),
2. Riverine Flooding,
3. Wildfire,
4. High Wind/Windstorms (excluding tornados),
5. Dam Failure, and
6. Drought.

Hazards considered **"Non-Critical"** are those that 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:

1. Lightning,
2. Sea Level Rise,
3. Earthquakes,
4. Shrink-swell Soils,
5. Extreme Cold,
6. Extreme Heat,
7. Land Subsidence/Karst,
8. Landslides,
9. Tsunami, and
10. Volcanos.

2010 Natural Hazard Ranking

At their February 18, 2010 meeting, the Steering Committee members discussed the continued use of the Kaiser Permanente Hazard Vulnerability Assessment Tool for the MPNHMP update. The Steering Committee members decided to use this same assessment tool in order to provide a measure of continuity and consistency between the 2006 plan and the 2010 MPNHMP update.

However, the Committee members added **Sea Level Rise** as a new natural hazard threat to assess in 2010 due to the emerging evidence of it is becoming a world-wide phenomena.

VDEM staff provided the Steering Committee members with a new and improved 2010 version of the Kaiser Permanente assessment tool. The Emergency Services Coordinator/Manager from each of the 9 jurisdictions was asked to complete the vulnerability worksheet for their locality and return it to the MPPDC Regional Emergency Preparedness Planner. The Regional Planner then used the tool to merge the data to create a regional ranking of natural hazards affecting the Middle Peninsula area, which is shown in Table 3 below.

The vulnerability of moderately-critical and non-critical hazards was not updated due to the low probability and impact as agreed upon by the committee

Table 3. The 2010 Regional Ranking of the Middle Peninsula Natural Hazards

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

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

The following sections describe natural hazards that are uncommon throughout the Middle Peninsula region and deemed "Non-Critical Hazards" to the Middle Peninsula by the Committee. These hazards are those that have occurred very infrequently, or have not occurred at all, in the available historical records and are not considered a widespread threat resulting in significant losses of property and life in the Middle Peninsula.

4.2.1. 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 National Weather Service does not issue warnings for ordinary thunderstorms nor for lightning. The National Weather Service does highlight the potential for thunderstorms in the daily forecasts and statements. The Virginia Department of Emergency Management 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.

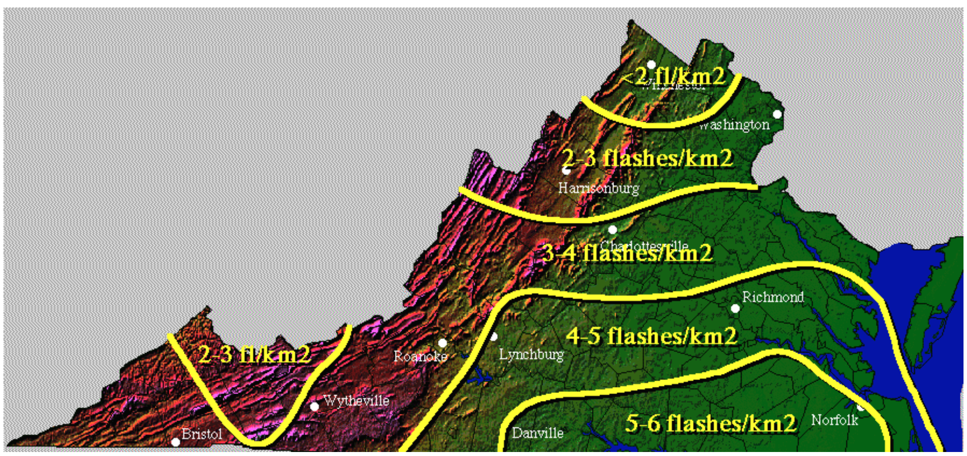


Figure 1: *Lightning Flash Density Map computed for 1989 (Electric Power Institute), courtesy of the University of Virginia, Climate Division:*

www.climate.virginia.edu/climate/lightning.density.html

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.

Between 1959 and 2000, lightning killed 58 people in Virginia and 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 1994, 13,057 people were casualties to lightning with 3239 deaths. Most

deaths were males between the ages of 20 and 40 years old who were caught outdoors on ball fields, near open water, or under trees.
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 1). 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 show 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.

During the 2010 hazard assessment, lightning was determined to be a "Moderately Critical Hazard – up from a "Non-Critical Hazard" assessment in the 2006 MPNHMP.

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.

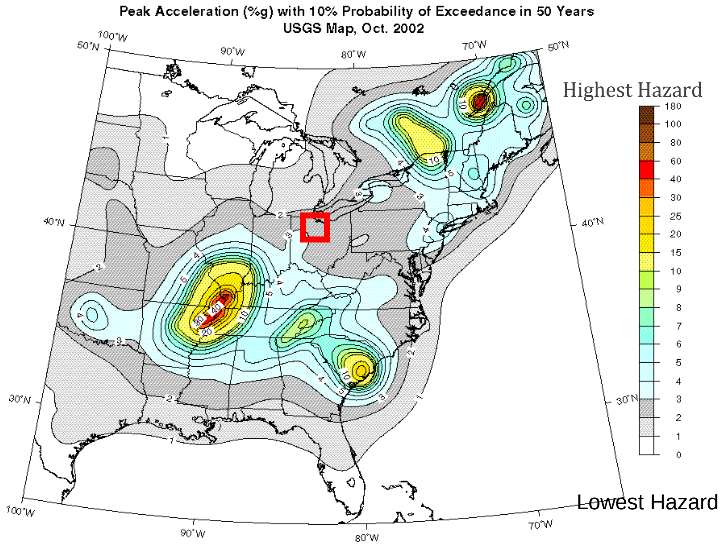
4.2.2. Earthquakes

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.

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.

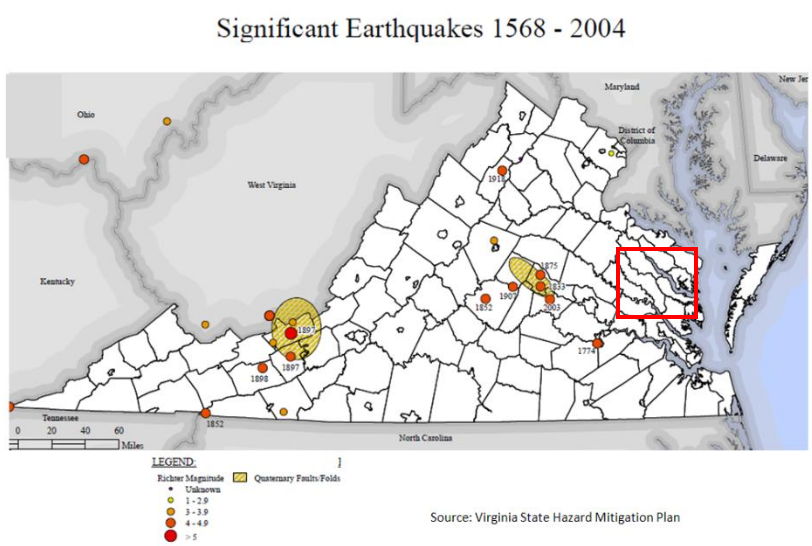
The United States Geological Survey (USGS) rates the susceptibility of areas of the United States to earthquakes and has published risk maps, which give the probability of various levels of ground motion being exceeded in 50 years. An approximate threshold for shaking that causes building damage (for pre-1965 dwellings or dwellings not designed to resist earthquakes) is 10 percent g. According to USGS predictions, the Middle Peninsula is located in an area of low (0-2%g) seismic risk contours (Figure 2), which means that there is a 1 in 475 chance of normal ground motion exceeding 2-3%g in a given year.

Figure 2: *Predicted earthquake hazard for the eastern United States, depicted by contour values of earthquake ground motions that have a 10% probability if being exceeded in 50 years. The Middle Peninsula of Virginia (hi-lighted by the red square on the map to the right) falls within the 2-3%g contour. Image courtesy of Frankel et al. (1997)*



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. The largest earthquake to occur in Virginia is the 1897 magnitude 5.8 Giles County Earthquake. This earthquake is the third largest in the eastern US in the last 200 years and was felt in twelve states. Seismic activity (seismicity) has been known for several decades to be strongest in and around Giles County and in central Virginia. This led researchers at the Virginia Tech Seismological Observatory to concentrate seismic monitoring stations in these two areas, as shown in Figure 3, which shows earthquakes (circles, scaled to magnitude) in and near Virginia from 1774 through 1994 (Stover and Coffman 1993). No earthquake epicenters were recorded to have fallen within the area of the Middle Peninsula.

Figure 3: *Historical earthquake epicenters in and near Virginia from 1568 through 2004, depicted by circles scaled to magnitude. The Middle Peninsula of Virginia (highlighted by the red square on the map at right) is void of any historic earthquake epicenters.*



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 by the Richter Magnitude scale. The following provides ranking and classification definitions for the two scales.

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. 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), 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, 1991). 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 (1994).

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 (1994).

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 (2001), 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, amended 1995). The Town's Comprehensive Plan states that individual sites should be examined in detail prior to any development.

4.2.4. 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 (i.e. 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 hazards extreme/excessive cold present is 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. 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. 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 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.

4.2.5. Land Subsidence/Karst

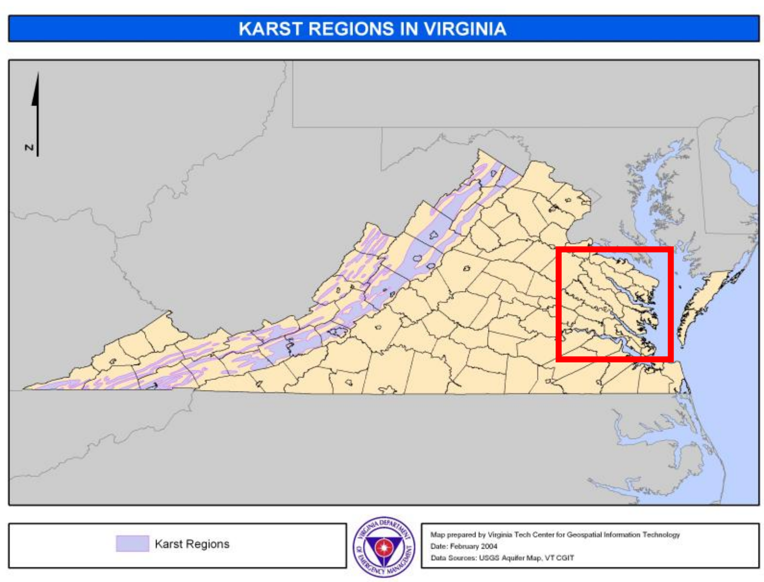
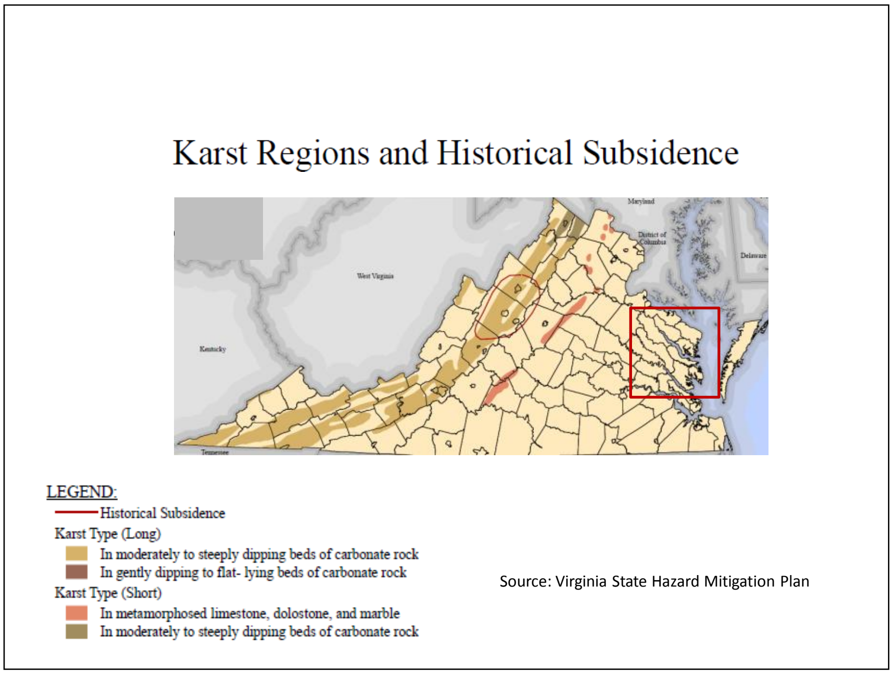


Figure 4: Karst Regions in Virginia (map courtesy of the Virginia Department of Emergency Management) are primarily limited to the mountainous regions of the state. The area encompassing the Middle Peninsula is highlighted on the map with a red square.

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.

Landslide Subsidence – Karst (Impact)



4.2.6. Landslides

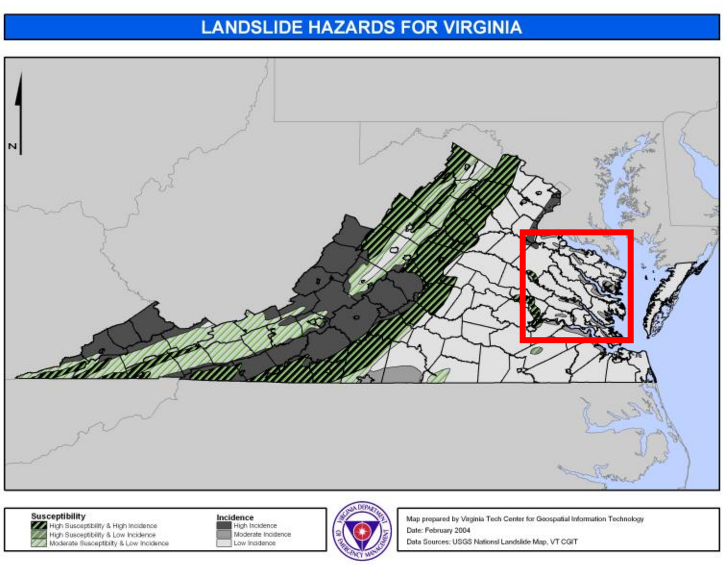


Figure 5: Landslide Hazard Regions in Virginia (map courtesy of the Virginia Department of Emergency Management) are primarily limited to the western and southwestern regions of the state. The area encompassing the Middle Peninsula is highlighted on the map with a red square.

Similar to karst, Figure 5 above 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.

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 5, the Middle Peninsula region is within an area of low susceptibility to landslides with low to moderate previous incidence.

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. These categories include:

High Risk

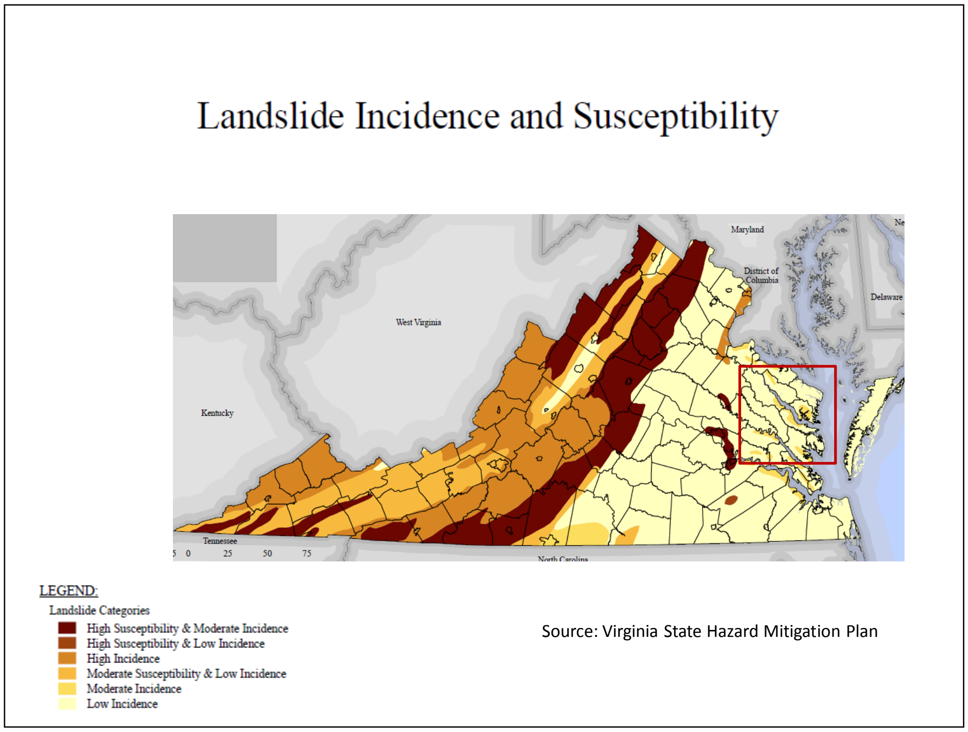
1. High susceptibility to landsliding and moderate incidence.
2. High susceptibility to landsliding and low incidence.
3. High landslide incidence (more than 15% of the area is involved in landsliding).

Moderate Risk

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

Low Risk

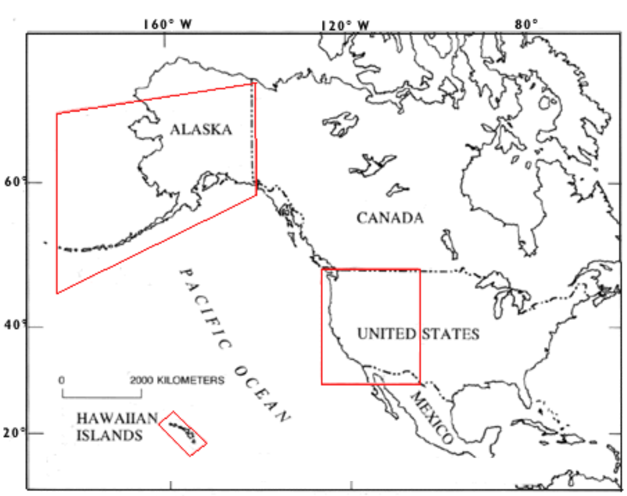
6. Low landslide incidence (less than 1.5 % of the area is involved in landsliding).



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.

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.



4.2.8. Volcanos

Figure 6: Map of United States showing areas where active volcanoes are located (image courtesy USGS).

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 remainder are widely distributed in the western part of the Nation.

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

2010 MPNHMP Update

The Steering Committee members reviewed the list of "Non-Critical Hazards" and determined that this group of natural hazards continued to pose a low risk for Middle Peninsula residents - except for lightning where a public education mitigation strategy could help to protect the public from this natural hazard.

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

The following sections describe natural 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 by the RAMP Committee.

4.3.1. Snow Storm

The winter months can bring a wide variety of natural 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-Altlantic 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.

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 (*Appendix 3*). 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, Urbanna will probably have snow of up to 8 inches on the ground for 8 days. In one year out of 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 (*Appendix 4*). 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.

At the West Point station in King William County, snow cover data was collected for 44 years between 1953 and 1997 (*Appendix 5*). 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.

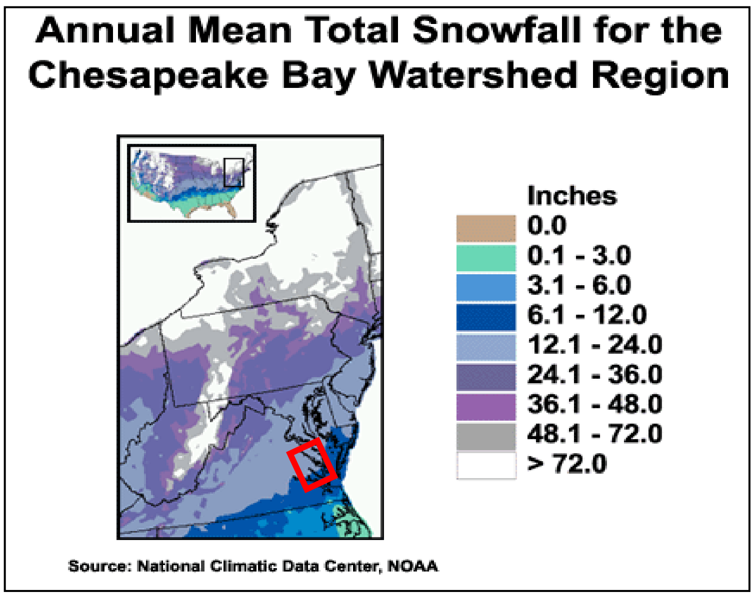


Figure 7: Map of annual mean total snowfall for the Chesapeake Bay Watershed region (StormCenter Communicatons 2003). The area encompassing the Middle Peninsula is highlighted on the map with a red square.

Compared to western, northern, and mountainous regions of the state, the risk of high snow accumulations in the Middle Peninsula is low (Figure 8). 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 the water bodies bordering the region (Chesapeake Bay and its tributaries) to the Atlantic Ocean allows the Bay to retain heat and buffer 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 (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 Saturday as airports shut down runways, rail service slowed and bus routes were suspended on the last weekend before Christmas. Record snowfall totals were reported Saturday afternoon at Washington Dulles and Reagan National airports -- and snow was still falling. 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 National Weather Service (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. This scale was developed because of the impact Northeast snowstorms can have on the rest of the country in terms of transportation and economic impact.

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 Pninsula. 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.

4.3.2. 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 location 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 National Flood Insurance Program,
2. Investigating the feasibility of undertaking a FEMA-promoted Community Rating System 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

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. 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 which 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.

4.3.3. 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 Virginia Department of Forestry (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 wildland areas also increase the risk of wildfire threats.

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 some many different factors, the VDOF developed a fire ranking map to assist to wildfire prevention efforts, as shown in Map 2. In 2002 and 2003, VDOF examined which factors influence the occurrence and advancement of wildfires and how these factors could be represented in a 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.

Middle Peninsula Wildfire Risk

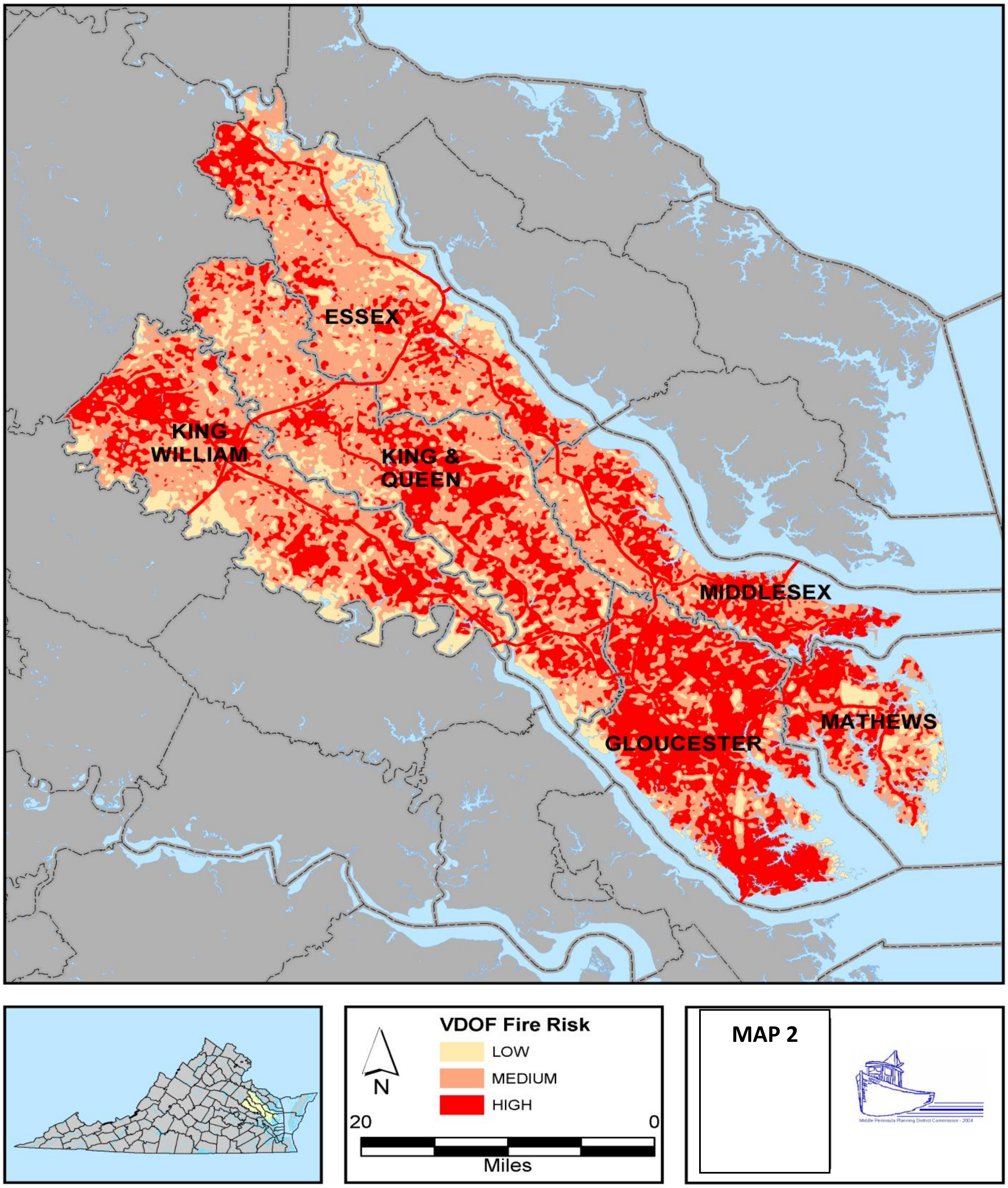


Table 4: Total area of each Middle Peninsula County within each Virginia Department of Forestry (VDOF) Fire Risk Category.

Area within each Fire Risk Category (acres)

	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	144,380	438,464	287,946	870,790

Table 5: Percent of each Middle Peninsula County's area within each Virginia Department of Forestry (VDOF) Fire Risk Zone.

Percent of County within each Risk Category

	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 Total	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 (Tables 3 and 4). It is noteworthy that nearly 60 percent of the area of Gloucester County falls within the "High" Fire Risk category (Table 4).

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 Virginia Department of Forestry 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.

The Committee was interested in including locality specific wildfire events since the 2006 plan. The following events were identified:

- 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 Virginia Department of Forestry, 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.

4.3.4. 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 National Weather Service (NWS) defines a severe thunderstorm as having winds 50 kts (58 mph) or hail greater than ¾" in diameter (about dime-sized). 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. Historically the most severe occur during the spring and summer.

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. 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. 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 National Weather Service 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. As with tornado watches and warnings, these are broadcast via the media (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 their 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 face book and twitter.

In addition, mitigation strategies formalizing mutual aid agreements to coordinate the region's fire and emergency medical response units to assist residents adversely affected by this natural hazard should be incorporated into the update.

4.3.5. Dam Failure

There are no established databases in Virginia of historical dam failures. Small, privately owned dams are located throughout the Middle Peninsula, but no database is readily available to map their locations. The Beaverdam Reservoir in the north of the Gloucester Courthouse area, contained by dam structures, covers approximately 635 acres. The reservoir is primarily surrounded by low density zoning and a 300 foot by 600 foot buffer surrounding the reservoir is owned by the county and makes up Beaverdam Park.

The Lake Anna dam near Mineral, Virginia creates an impoundment with a surface area of approximately 13,000 acres. Releases from this lake flow into the Pamunkey River, affecting the level of the river during major releases. The potential hazards of a major dam failure for King William County are flooding of lowlands and some roads and the potential loss of three bridges. There are no dwellings within the inundation area, but there are some agricultural structures that would be affected (King William County Emergency Operations Plan).

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).

Dam failure poses 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.

The Virginia Department of Conservation and Recreation, 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.

Failure of dams may result in a localized major impact. Impacts include loss of human life, economic loss, lifeline disruption, and environmental impact such as destruction of habitat. Secondary impacts from dam failure include flooding to the surrounding areas.

The hazard potentials are classified in the following manner:

- **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.

Dam Failure

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.

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. Below table provides additional information on these classes and the possible effects on downstream areas if dam failure were to occur.

Below table displays all of the regulated dams in the Middle Peninsula as provided by the Dam Safety Division of the Department of Conservation and Recreation.

Jurisdiction	Number of High Hazard Dams	Maximum Storage Capacity (AF)	Number of Significant Hazard Dams	Maximum Storage Capacity (AF)	Number of Low Hazard Dams	Maximum Storage Capacity (AF)	Total Number of Dams	Total Maximum Storage Capacity (AF)
Essex County	0	0	0	0	0	0	0	0
Gloucester County	1	20,523	1	931	0	0	2	21,454
King and Queen County	0	0	0	0	0	0	0	0
King William County	0	0	0	0	2	271	2	271
Mathews County	0	0	0	0	0	0	0	0
Middlesex County	0	0	0	0	0	0	0	0
Total	1	20,523	1	931	2	271	4	21,725

Dams are classified with a hazard potential depending on the downstream losses estimated in event of failure. 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. Frequency of dam inspection is dependent of how the dam is classified. 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.

When conducting research during the development of the flood mitigation planning work, it was clear that there are numerous dams located in the Middle Peninsula localities that do not come under the Virginia Department of Conservation and Recreation Permitting Program.

As a result, a mitigation strategy is included in this update to develop a data base of where these dams are located and an evaluation of their physical condition.

This data base will allow local land use officials to evaluate the hazard potential of land development proposals that are being proposed in flood inundation areas located below dam impoundments if a structural failure were to occur.

Dam Impoundments

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.

Dams are classified with a hazard potential depending upon the downstream losses anticipated in the event of a failure. The hazard potential is unrelated to the structural integrity of a dam, but rather it is directly related to potential adverse downstream impacts should the given dam fail.

The hazard potentials are classified in the following manner:

- **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.

The Virginia Department of Conservation and Recreation (VDCR) – 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.

There is no established database in Virginia of historical dam failures. Most dam failures occur due to a lack of maintenance of the dam facilities in combination with excessive precipitation events, such as hurricanes or 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 during this event and 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 State Route 610 between Route 608 and Route 609. The road was closed to traffic for several weeks (VDOT 2004).

Dam failures pose risks when there are large land areas with large populations located below the 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.

Failure of dams may result in a localized major impact. Impacts include loss of human life, economic loss, lifeline disruption, and environmental impact such as destruction of habitat. Secondary impacts from dam failure include flooding of the surrounding areas.

The Virginia Department of Conservation and Recreation - 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 physical 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.

In 2001, the dam inventory mapping and classification system was changed. The classes now range in descending order from Class I to Class IV with Class I having the greatest potential for adverse downstream impacts in event of failure. This classification is not related to the physical condition of the dam or the probability of its failure.

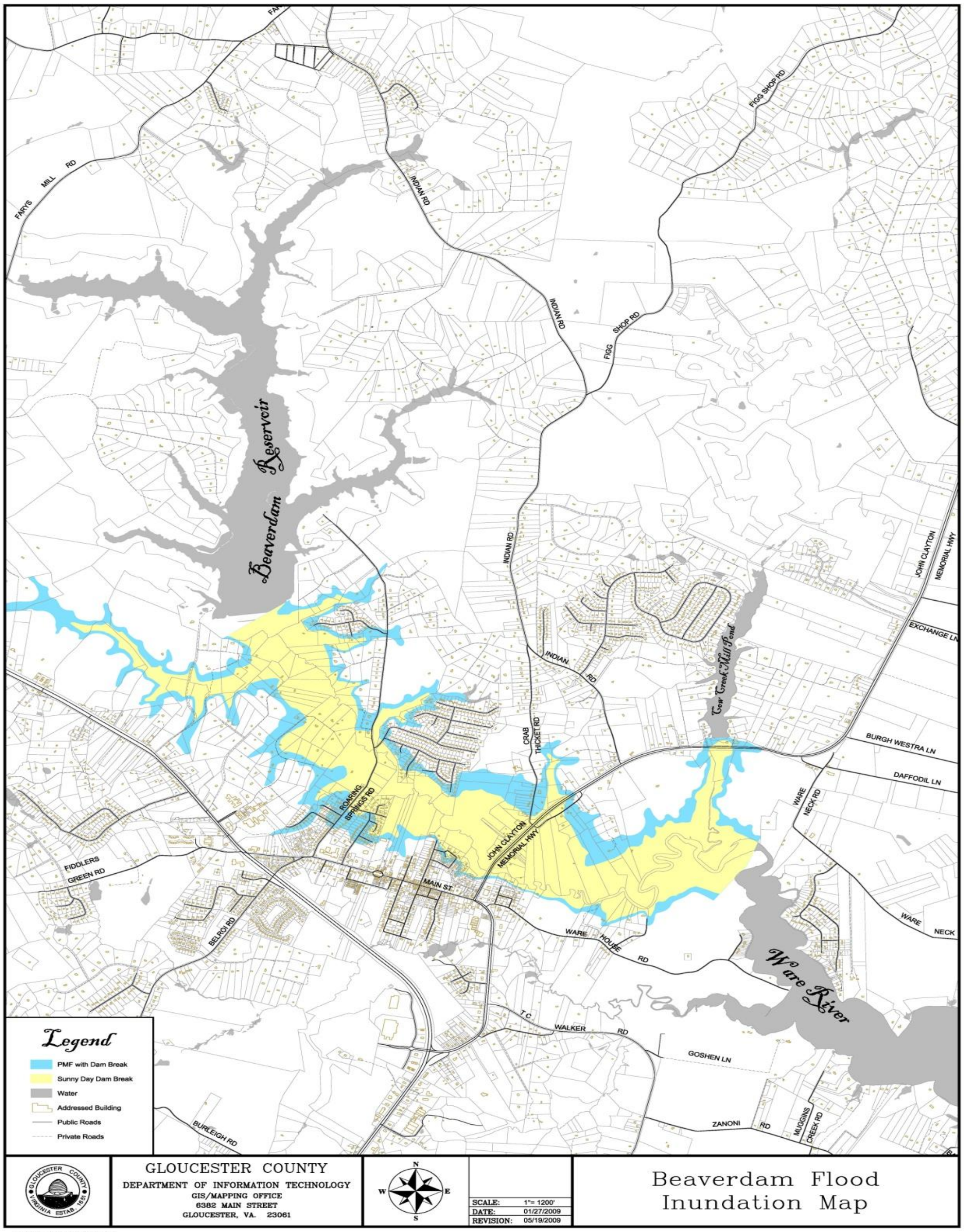
On the latest VDCR list of regulated dams dated September 26, 2008, there are only 3 dams on it that are located in the Middle Peninsula. One is located in King William County and the 2 others are located in Gloucester County. However, Gloucester County officials have a separate list of dams that includes 9 others that do not appear on the latest VDCR list.

All 11 dams in Gloucester County are listed later in this section of the plan.

Beaverdam Reservoir Dam

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.

The map below 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.


Beaverdam Reservoir
Ware River
Cow Creek Mill Pond
Legend
PMF with Dam Break
Sunny Day Dam Break
Water
Addressed Building
Public Roads
Private Roads
GLOUCESTER COUNTY
DEPARTMENT OF INFORMATION TECHNOLOGY
GIS/MAPPING OFFICE
6382 MAIN STREET
GLOUCESTER, VA. 23061
SCALE: 1"= 1200'
DATE: 01/27/2009
REVISION: 05/19/2009
Beaverdam Flood
Inundation Map

Map 7

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, 3 bridges along these roads, a scattering of residences and some agricultural structures.

4.3.6. Sea Level Rise

Climate change is an on-going process that is measured over an extended period of time. According to the Intergovernmental Panel on Climate Change, temperatures in Virginia are estimated to increase by 3˚ F in the winter, spring and summer and increase by 4˚F in the fall. Precipitation is estimated to increase by 20% in all seasons by 2100.

The National Wildlife Federation predicts that within the Upper Tidewater Region – where the Middle Peninsula is located – sea level will rise 11.2"by 2050 and 27.2" by 2100.

Temperature, precipitation and wind are considered the 3 direct factors attributed to climate change and they can create a number of associated impacts including the following:

- The frequency and intensity of flooding events may increase.
- Coastal ecosystems may experience increased coastal erosion and risk of pollution due to inundated infrastructure – a result of sea level rise as well as storm events.
- Increased rates of saltwater intrusion into freshwater resources may also occur.
- Loss of near shore habitats and coastal wetlands as sea level rises.
- Access to the roadway network may become limited as the frequency of flooded roads increase due to sea level rise and intense storms. This will increase the maintenance costs for impacted/damaged roads.
- Infrastructure may be impacted if located within floodplains or low lying coastal areas – causing insurance premiums to increase.
- Emergency response units may have to redefine service areas as roads become flooded due to sea level rise and/or storm events.

These anticipated impacts will have greater impacts for the more southern low-lying areas of the Middle Peninsula region and educational/informational mitigation strategies merit consideration with this update.

4.3.7. 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. Regions under the influence of semipermanent high pressure during all or a major portion of the year are usually deserts, such as the Sahara and Kalahari deserts of Africa and the Gobi Desert of Asia. 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).

Drought is a phenomenon that, in one form or another, 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 10), and creates major problems for public (reservoir/river) and private (well) water supplies.

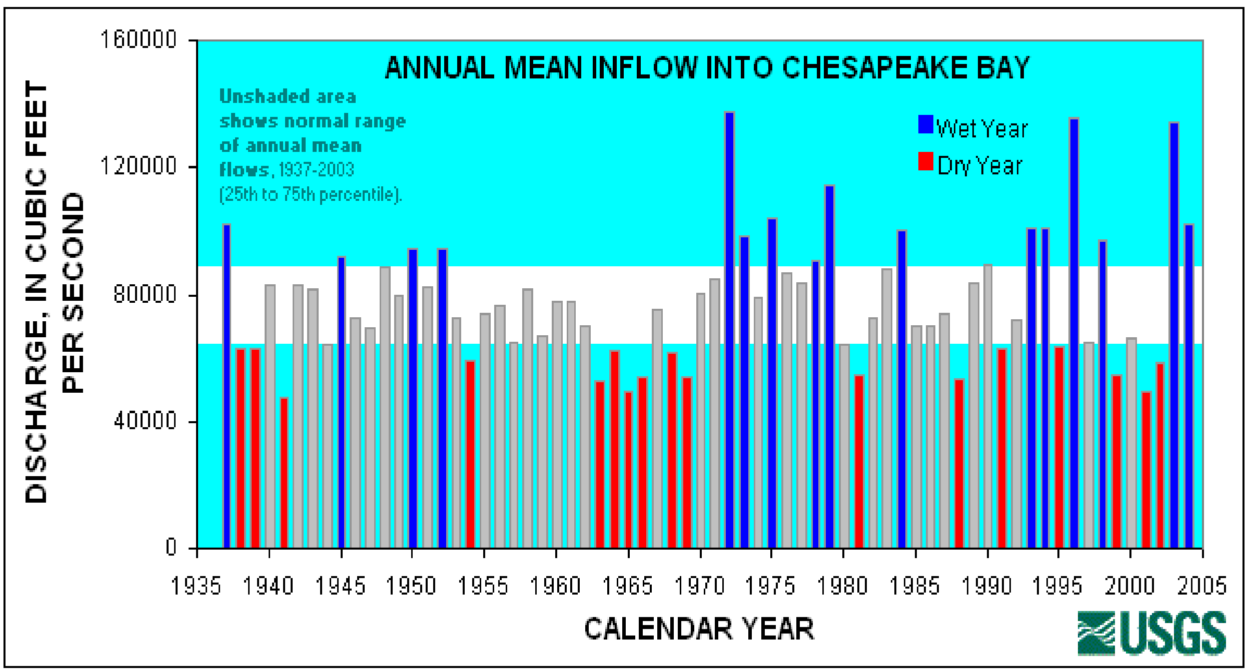


Figure 8: Annual mean stream inflow into Chesapeake Bay 1937 – 2003. (Figure courtesy of USGS).
Extended periods of drought can impact crop yields and hay yields, and significant crop losses can result. The impact of meteorological drought can vary significantly, depending upon dry years indicated by 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.

Table 6 provides a summary of drought categories and impacts. Notice that water restrictions start as voluntary and then become required.

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

There have been five major statewide droughts since the early 1900's (USGS 2002). The drought of 1930-32 was one of the most severe droughts recorded in the State. 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 37 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. Virginia's Plan emphasizes response strategies.

Eight of the nine Middle Peninsula localities participated in the development of the Middle Peninsula Regional Water Supply Plan (MPRWSP) in 2009. The ninth locality, Gloucester County, participated in the development of the Hampton Roads Regional Water Supply Plan.

The water supply plans contain proposed strategies/policies that the localities can undertake to mitigate the adverse affects of periodic droughts.

The localities should include a mitigation strategy that reinforces the implementation of the actions contained in their respective Drought Response and Contingency Plans. All localities, except Gloucester County, should adopt a mitigation strategy to support actions specified in Chapter 10 of the Middle Peninsula Regional Water Supply Plan developed in 2009. Likewise, Gloucester County should adopt a similar mitigation strategy to support actions specified in the Hampton Roads Regional Water Supply Plan.

The mitigation strategy should define what role the jurisdiction's Emergency Services Coordinator/Manager will have with the locality's County Administrator/Town Manager during the implementation of the Drought Response and Contingency Plan.

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

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

Flooding

Hazards that cause flooding in the Middle Peninsula include the following:

1. Hurricanes.
2. Nor'easters and severe coastal storms.
3. Thunderstorms.
4. Water releases/overflows from dam impoundments.

These hazards have the potential to cause the following types of flooding:

1. Coastal flooding.
2. Riverine flooding.
3. Flash flooding below dam impoundments.

Resources at potential risk of loss include the following:

1. Residential structures.
2. Businesses.
3. Roads/bridges.
4. Essential public community facilities.
5. Electric transmission/service lines.

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.

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.

Coastal high water is generally attributed to three causes: Astronomical high tides, high water from atmospheric events (such as surface run off from rain), and storm surge (from hurricanes and nor'easters). Astronomical high tides alone do not cause dangerous coastal erosion, but when these tides occur in tandem with a storm surge or onshore winds, coastal flooding and soil erosion is intensified.

Hurricane Wind 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 (Sustained winds 74-95 mph, 64-82 kt, or 119-153 km/hr).
Very dangerous winds will produce some damage

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 (Sustained winds 96-110 mph, 83-95 kt, or 154-177 km/hr).
Extremely dangerous winds will cause extensive damage

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 (Sustained winds 111-130 mph, 96-113 kt, or 178-209 km/hr).

Devastating damage will occur

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 Ivan (2004) is an example of a hurricane that brought Category 3 winds and impacts to coastal portions of Gulf Shores, Alabama with Category 2 conditions experienced elsewhere in this city.

Category Four Hurricane (Sustained winds 131-155 mph, 114-135 kt, or 210-249 km/hr).

Catastrophic damage will occur

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 (Sustained winds greater than 155 mph, greater than 135 kt, or greater than 249 km/hr).

Catastrophic damage will occur

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 became hurricanes with six becoming major hurricanes of Category 3 or higher on the Saffir-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 for 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. While experts cannot say that climate change will result in more hurricanes in the future, there is growing evidence and concern that tropical storms that do occur will be more intense than those in the past as the effects of global warming become even more pronounced in future years.
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.

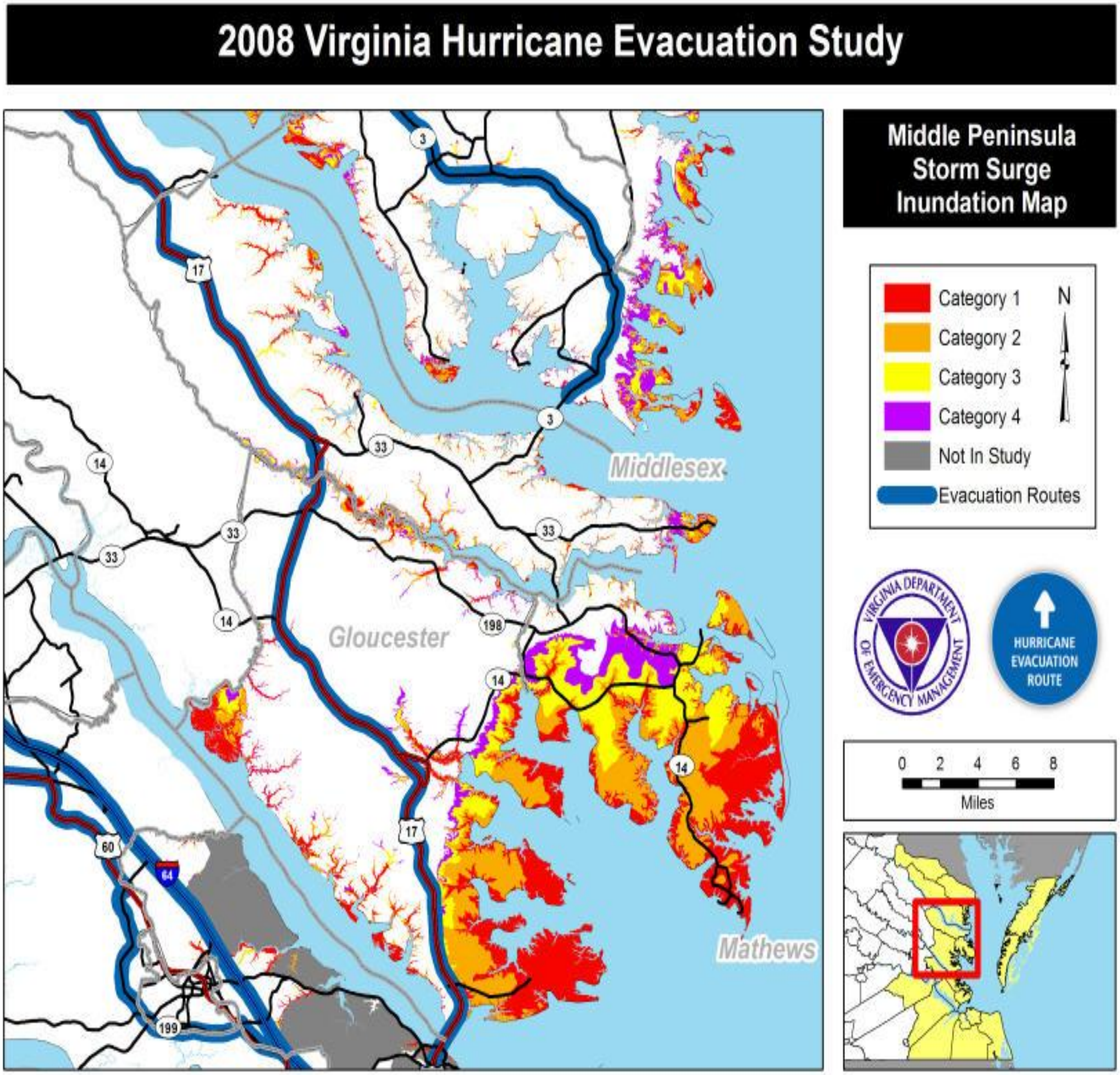
Prior to 1871, very early storms have been described in ship logs, newspaper accounts, history books, and countless other writings. The residents of coastal Virginia during Colonial times were very much aware of the weather. They were a people that lived near the water and largely derived their livelihood 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).

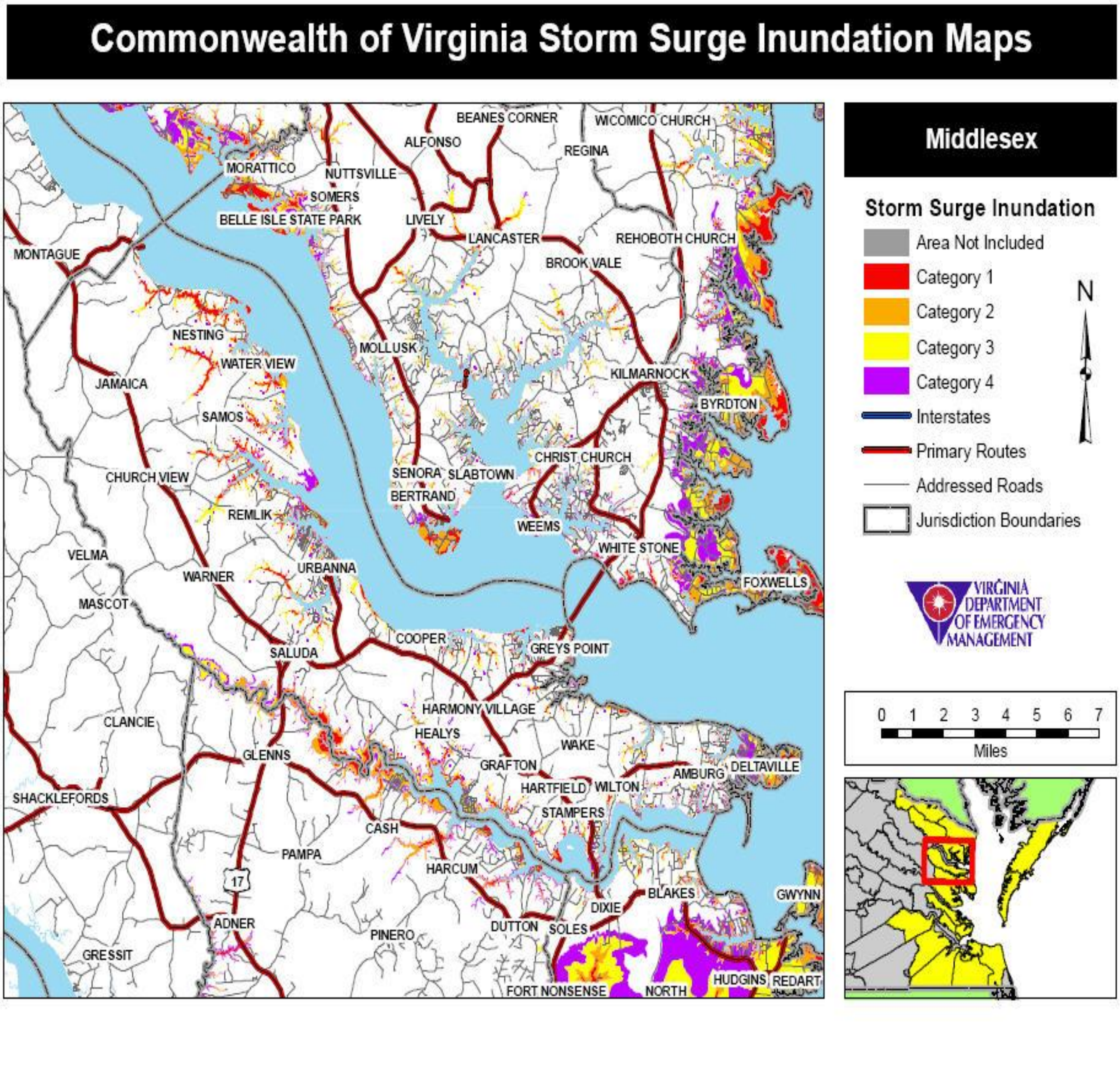
In order to estimate the geographic extent of potential damage from these hurricanes, a review of the 2008 Middle Peninsula Storm Surge Hazard Maps show the worst case scenario of hurricane storm surge inundation at mean tide. These maps were developed by the U.S. Corp of Engineers in conjunction with 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.

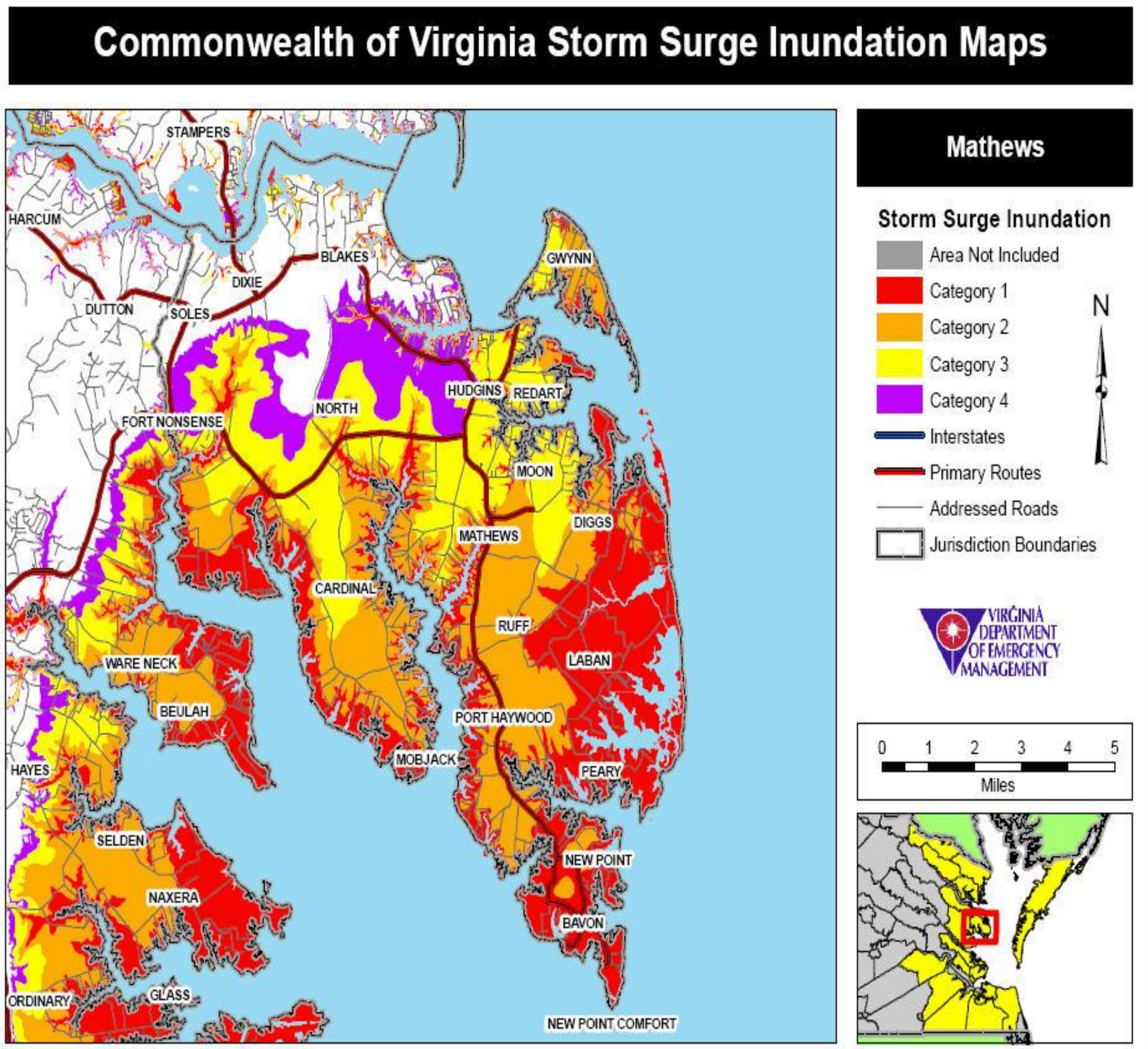
Map 3

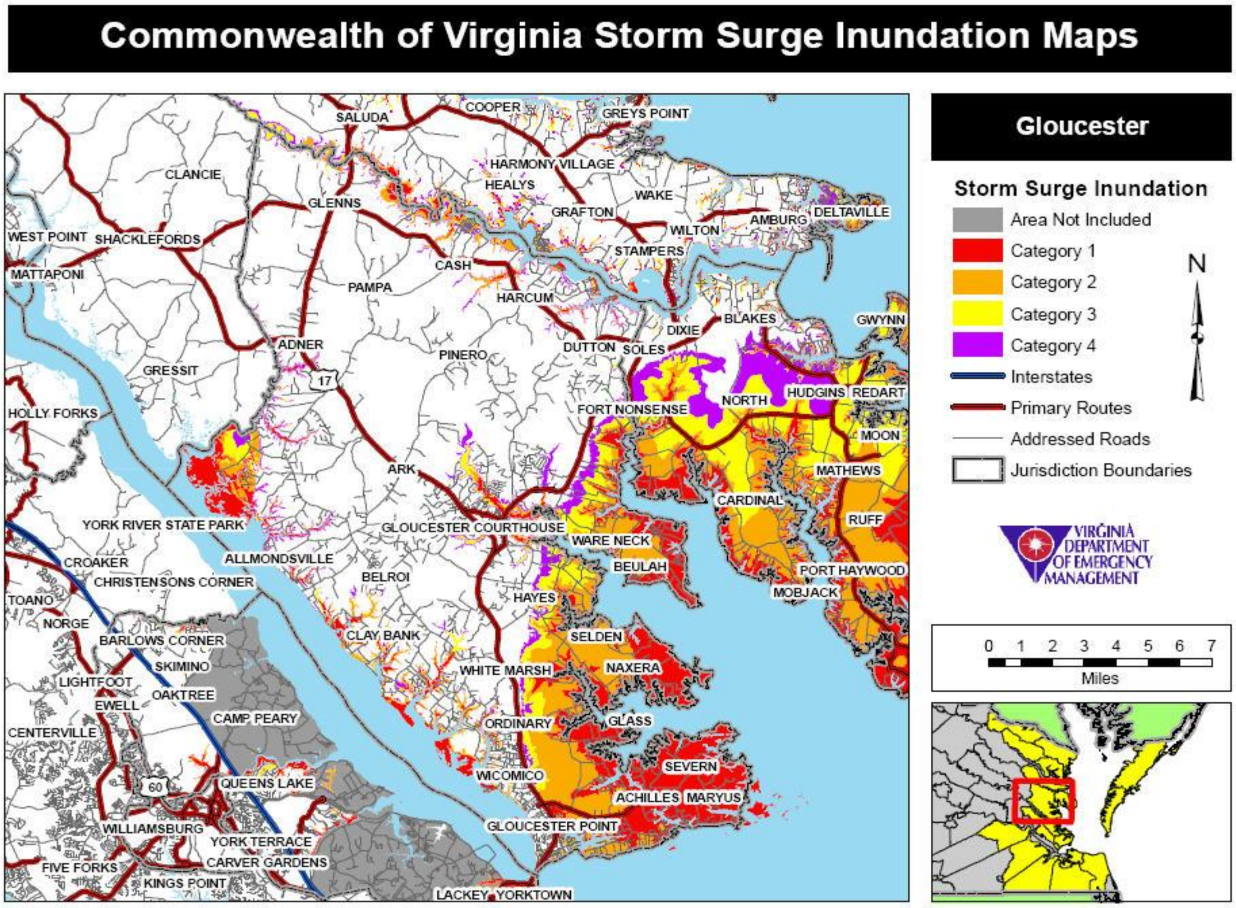

2008 Virginia Hurricane Evacuation Study
Middle Peninsula Storm Surge Inundation Map
Category 1
Category 2
Category 3
Category 4
Not In Study
Evacuation Routes
N
Middlesex
Gloucester
Mathews
VIRGINIA DEPARTMENT OF EMERGENCY MANAGEMENT
HURRICANE EVACUATION ROUTE
0 2 4 6 8
Miles
3
17
33
14
198
60
64
199

Map 4


Commonwealth of Virginia Storm Surge Inundation Maps
Middlesex
Storm Surge Inundation
Area Not Included
Category 1
Category 2
Category 3
Category 4
Interstates
Primary Routes
Addressed Roads
Jurisdiction Boundaries
N
VIRGINIA DEPARTMENT OF EMERGENCY MANAGEMENT
0 1 2 3 4 5 6 7
Miles
BEANES CORNER
WICOMICO CHURCH
ALFONSO
REGINA
MORATTICO
NUTTSVILLE
SOMERS
BELLE ISLE STATE PARK
LIVELY
LANCASTER
REHOBOTH CHURCH
BROOK VALE
MONTAGUE
NESTING
MOLLUSK
WATER VIEW
JAMAICA
KILMARNOCK
BYRDTON
SAMOS
CHRIST CHURCH
CHURCH VIEW
SENORA
SLABTOWN
BERTRAND
REMLIK
WEEMS
WHITE STONE
VELMA
WARNER
URBANNA
FOXWELLS
MASCOT
COOPER
GREYS POINT
SALUDA
HARMONY VILLAGE
CLANCIE
HEALYS
WAKE
GLENNS
GRAFTON
AMBURG
DELTAVILLE
SHACKLEFORDS
HARTFIELD
WILTON
STAMPERS
CASH
PAMPA
HARCUM
17
BLAKES
GWYNN
DIXIE
ADNER
DUTTON
SOLES
PINERO
GRESSIT
FORT NONSENSE
NORTH
HUDGINS
REDART

Map 5


Commonwealth of Virginia Storm Surge Inundation Maps
Mathews
Storm Surge Inundation
Area Not Included
Category 1
Category 2
Category 3
Category 4
Interstates
Primary Routes
Addressed Roads
Jurisdiction Boundaries
N
VIRGINIA DEPARTMENT OF EMERGENCY MANAGEMENT
0 1 2 3 4 5
Miles
STAMPERS
HARCUM
BLAKES
DIXIE
GWYNN
DUTTON
SOLES
HUDGINS
REDART
NORTH
FORT NONSENSE
MOON
DIGGS
MATHEWS
CARDINAL
RUFF
LABAN
WARE NECK
BEULAH
PORT HAYWOOD
MOBJACK
PEARY
HAYES
SELDEN
NEW POINT
NAXERA
BAVON
ORDINARY
GLASS
NEW POINT COMFORT



Map 6

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.

The maps summarize surge height estimates using the SLOSH (Sea, Lake, and Overland Surges from Hurricane) Model. The model was developed by Chester Jelesnianski of the National Oceanic and Atmospheric Administration, National Weather Service. 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.

Historical Occurrences

In evaluating localized threats of hurricanes and tropical storms to the Middle Peninsula Region, NOAA hurricane tracking data from 1851 to 2008 was analyzed to identify storms that may have posed a threat to the region.

Based on these data, 42 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
- 10 were extra-tropical storms.

Over the same period of time, 60 storms passed within 50 nautical miles of the region and

- 4 of these storms were hurricanes,
- 31 were tropical storms,
- 11 were tropical and subtropical depressions, and
- 14 were extra-tropical storms.

Table 10. Historic Storm Tracks within 50 and 25 nautical mile radii of the Middle Peninsula between 1851 and 2008

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	10
Total:	**60**	**42**

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 MLLW. 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

Coastal Flooding

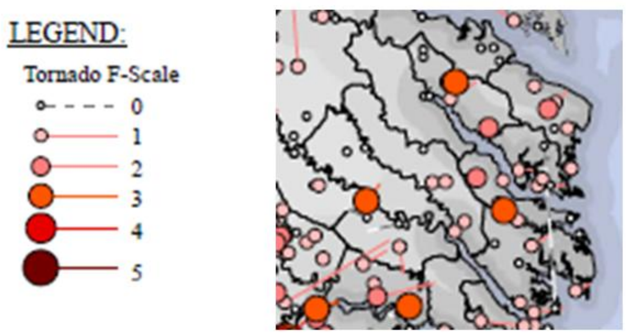
Flooding is the most frequent and costly natural hazard in the United States - besides fire. Nearly 90% of Presidential Disaster Declarations result from natural events where flooding is a major component. Excess water from snowmelt, rainfall, or storm surge accumulates and overflows onto adjacent floodplains 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.

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.

Tornadoes
The National Weather Service 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; 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). But 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 9) are most common on the Middle Peninsula and often last only a minute before dissipating. From 1950 through the year 2001, 376 tornadoes were documented in Virginia (Watson 2002). July is 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. 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. One reason is that waterspouts are common. Occasionally a waterspout will 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 reason 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 2004, eleven tornadoes were reported in Gloucester County, six in Middlesex, five in Mathews, three each in King and Queen and Essex Counties, and two in King William (Watson 2002; NCDC Storm Event Database). The Virginia State Hazard Plan illustration below shows historic tornado touchdowns within the Middle Peninsula. While the historic data appears to show that the Middle Peninsula has a low annual probability of being struck by a tornado (Figures 15 and 16), 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.

Historic Tornado Touchdowns and Tracks: 1950 - 2006



Source: Virginia State Hazard Mitigation Plan

Tornado Vulnerability

Weak tornadoes may break branches or damage signs. Damage to buildings (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.

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

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

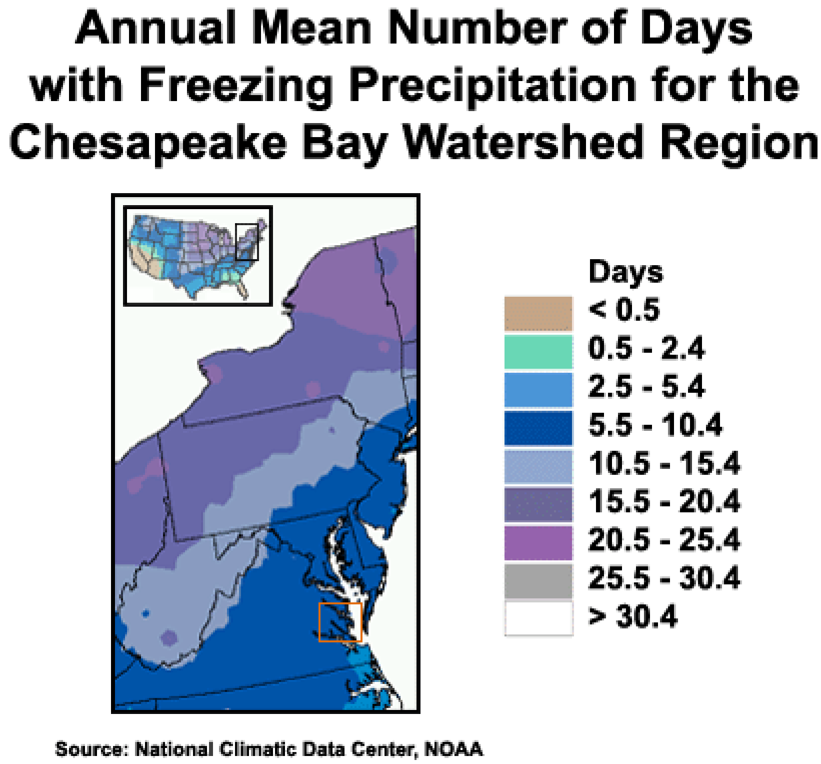
Winter Ice Storms

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).

Winter Ice Storms occur generally as freezing rain, when precipitation, first 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.

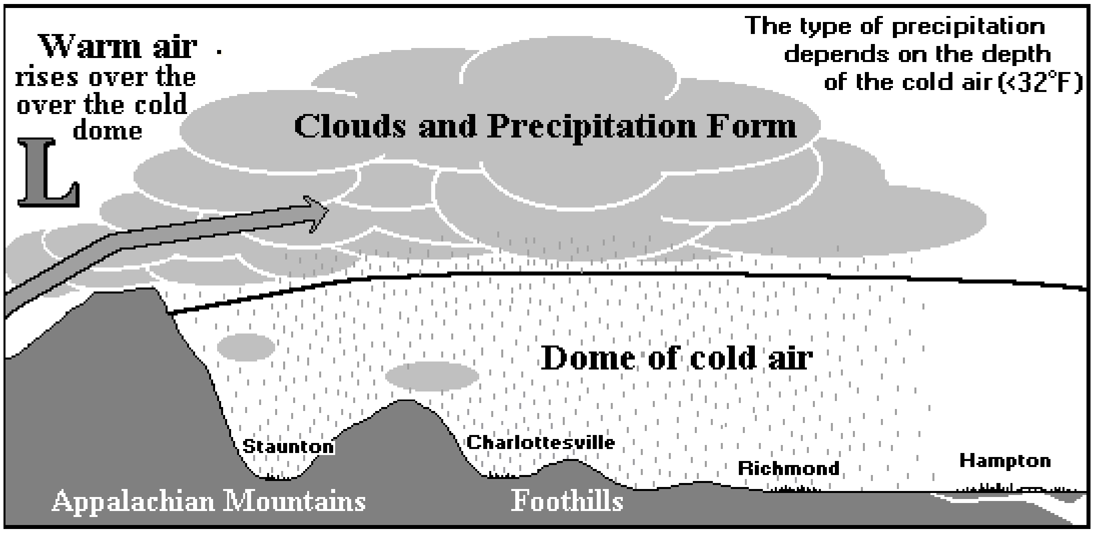
For a good Nor'easter to develop, the jet stream entering the West Coast of the United States splits. The northern branch crosses the northern Rockies and Canada while the southern branch dips to cross the Gulf Coast states, where it picks up a disturbance that it carries northeast across Virginia to 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 lowpressure 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).

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.



(Map of annual mean number of days with freezing precipitation (rain or drizzle) for the Chesapeake Bay Watershed region (StormCenter Communicatons 2003). 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. Illistration above 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 can not 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 (see below- Watson and Sammler 2004). 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).



Ice Storm-Formation (from 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).

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 affects 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:

2007

Mathews County

2008

King and Queen County
King William County – including the Town of West Point
Essex County - including the Town of Tappahannock

2009

Middlesex County - including the Town of Urbanna
Gloucester County

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

When creating the FIRMs, 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, AE and X.

Table 11. FEMA Flood Zone Designations found in the Middle Peninsula Region

Zone VE	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. *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. *Mandatory flood insurance purchase requirements apply.*
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.*

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 Community Information System dated June 2, 2008, there are a total of 4,021 flood insurance policies covering Middle Peninsula properties. The following is a summary of flood insurance policy data by locality:

Table 12. Flood Insurance Policies

Locality	# of Zone V Policies	# of Zone A Policies	Total Policies	# of Claims Since 1978	Total Value of Claims
Essex	0	154	228	230	$ 6,020,190
Tappahannock	0	3	17	16	$ 193,571
Gloucester	67	1,038	1,528	1,050	$ 27,091,827
King and Queen	0	24	40	20	$ 508,576
King William	0	3	12	6	$ 142,556
West Point	0	66	102	72	$ 2,109,280
Mathews	56	1,339	1,647	993	$ 17,867,100
Middlesex	32	254	419	205	$ 2,700,774
Urbanna	0	23	28	11	$ 277,745
Totals	**155**	**2,904**	**4,021**	**2,603**	**$ 56,911,619**

Repetitive Loss Properties

Community	# of Properties	# of Claims	Total Building Claims	Average Claim
Essex County	25	63	$ 1,346,219.00	$ 21,368.56
Mathews County	146	326	$ 6,470,833.00	$ 19,849.18
Gloucester County	90	217	$ 4,591,553.00	$ 21,159.23
Middlesex County	30	36	$ 485,801.00	$ 13,494.47
Town of Urbanna	2	4	$ 27,360.00	$ 6,840.00
Town of Tappahannock	2	4	$ 46,526.00	$ 11,631.50
Town of West Point	7	15	$ 463,417.00	$ 30,894.47

Locality Specific Critical Facilities and Public Utilities

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 includes 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 VFDs and 2 VRSs 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

There are no residential structures on FEMA's lists of Repetitive or Severe Repetitive Loss Properties as of 5/31/10.

Table 13. King and Queen County Flood Prone Roads

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

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 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
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

Route	Road Name	Location of Flooding
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 K&Q/ Gloucester County line

Public Boat Ramps

There are 3 public boats ramps in the county along the Mattaponi River that are operated/maintained by the Virginia Department of Game and Inland Fisheries (VDGIF).

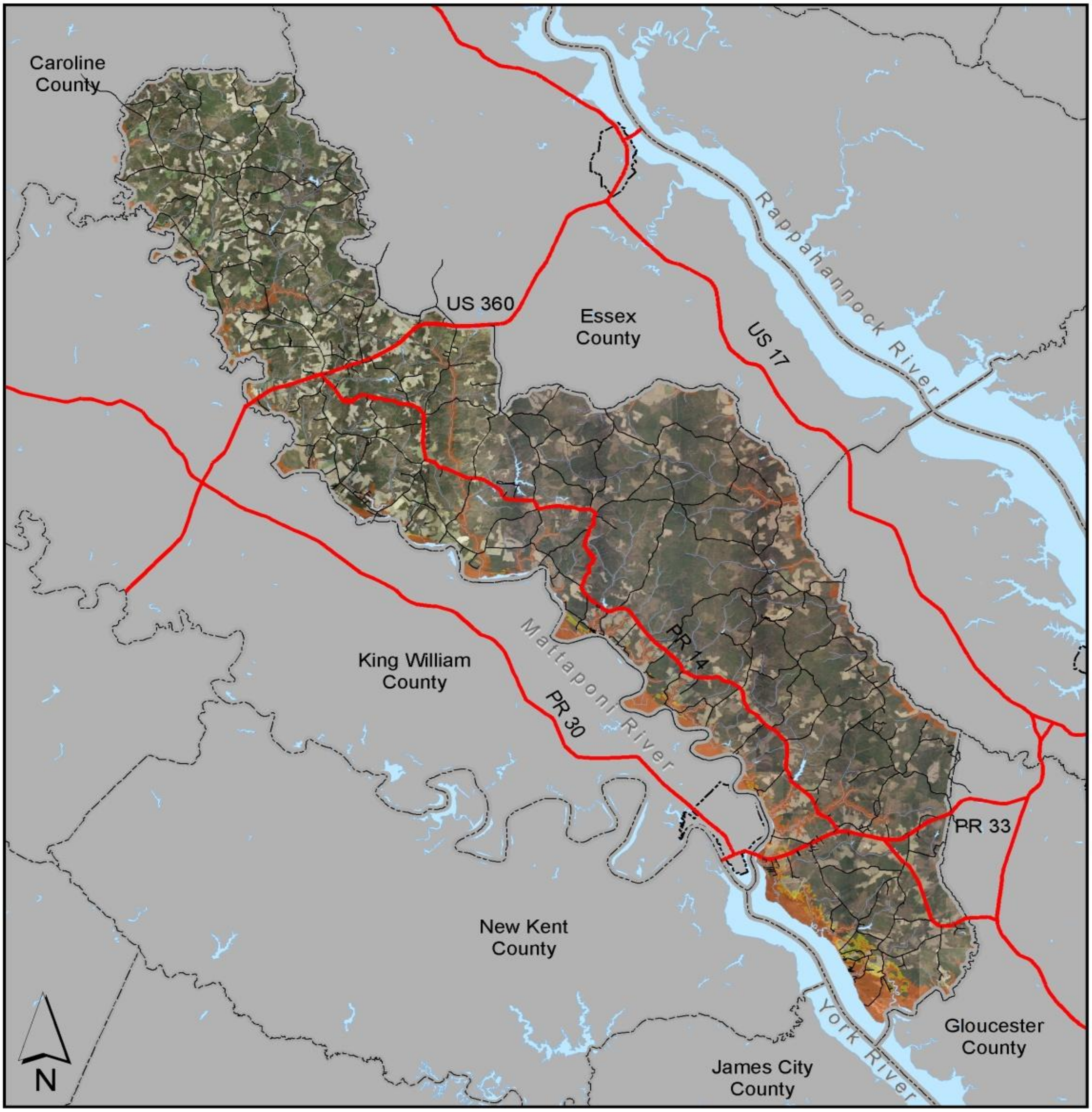
There is a relatively large facility at Walkerton at the base of the bridge that goes over the Mattaponi River. In addition, there are 2 small boat ramps – one at the end of State Routes 602, known as Melrose Landing and another one at the end of State Route 610, known as Waterfence Landing.

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 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. This 2004 information is the latest structure data available.

King and Queen County
Flood Plain



Legend

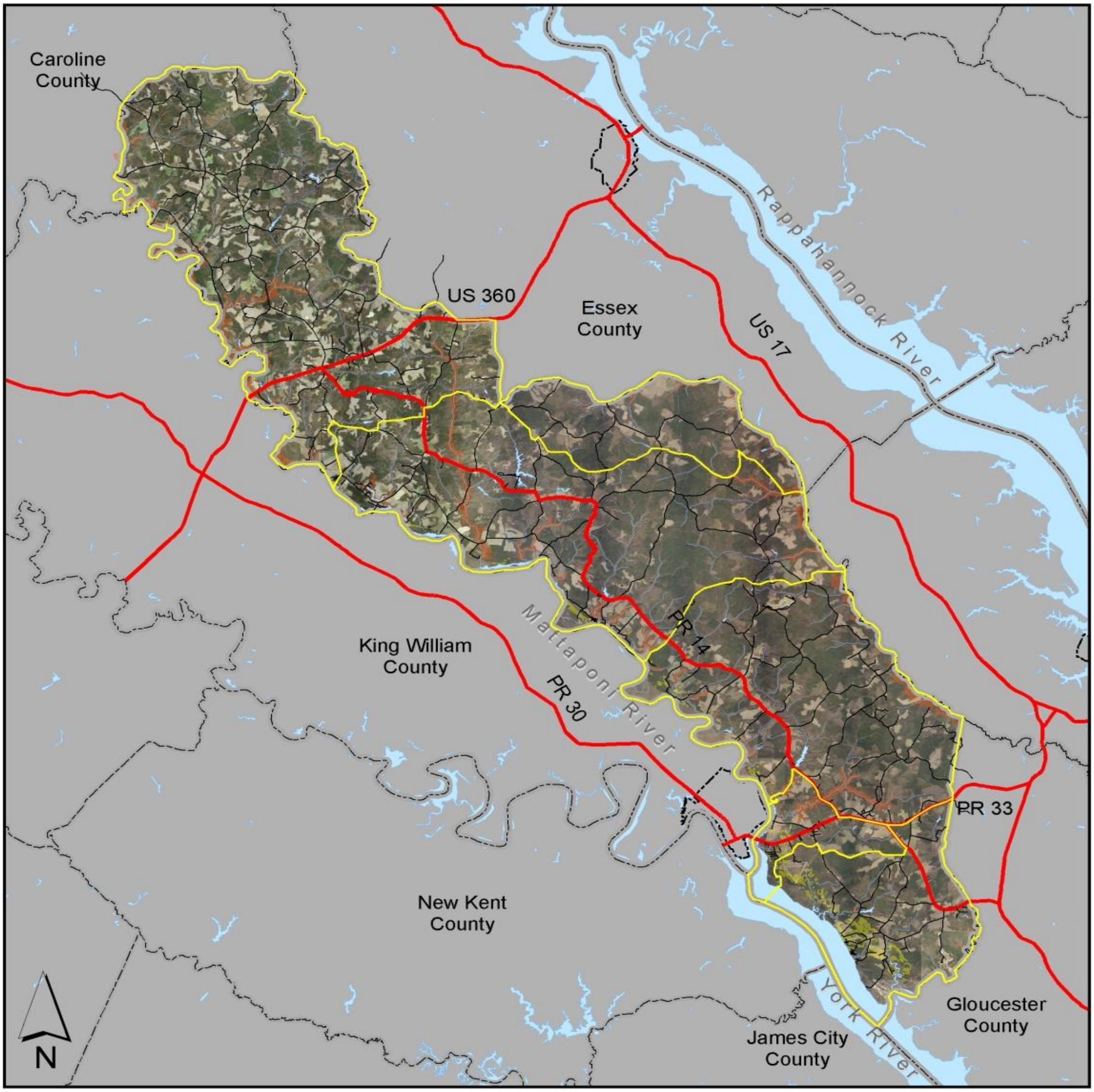
Flood Plain

- 100-Year Flood Plain
- 500-Year Flood Plain

0 3 6 Miles

Map 8

King and Queen County
Block Groups



Legend

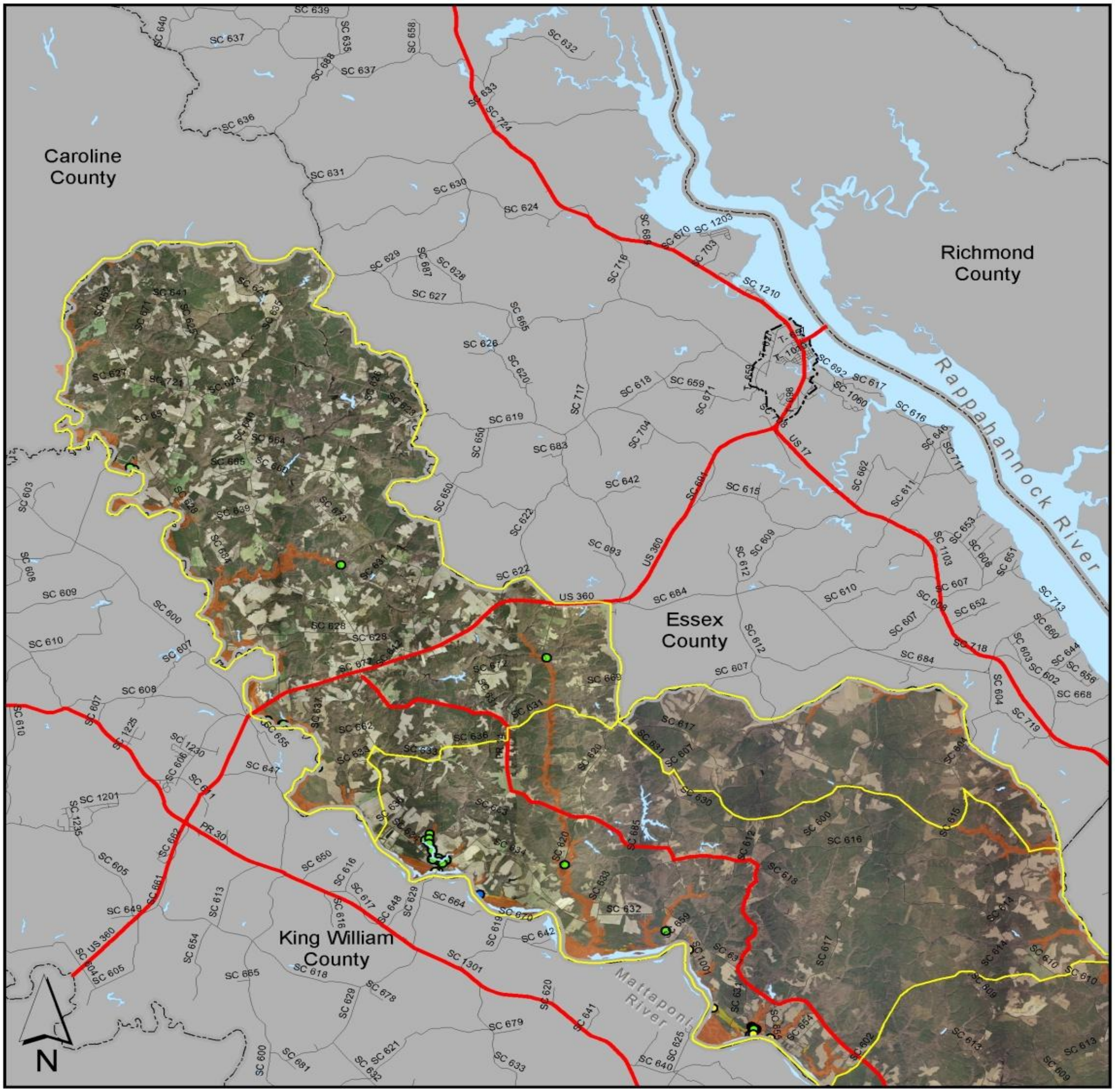
Census Block Groups

0 3 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 9

King and Queen County Flood Plain
Block Group 95041



Legend

Flood Plain

100-Year Flood Plain

500-Year Flood Plain

Affected Structures

0.2% ANNUAL CHANCE FLOOD HAZARD

Zone A

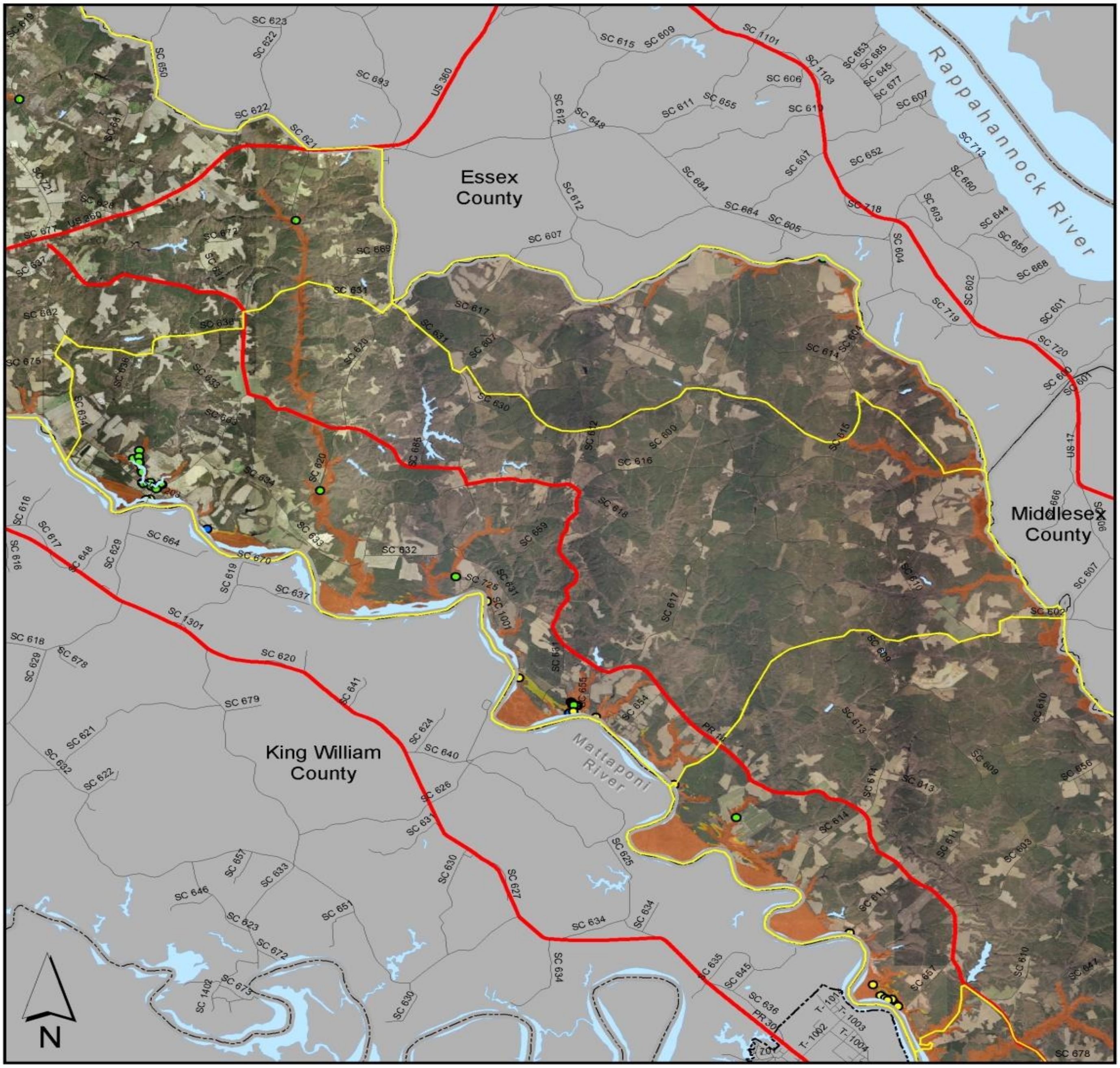
Zone AE

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 10

King and Queen County Flood Plain
Block Group 95042



Legend

Flood Plain

100-Year Flood Plain

500-Year Flood Plain

Affected Structures

0.2% ANNUAL CHANCE FLOOD HAZARD

Zone A

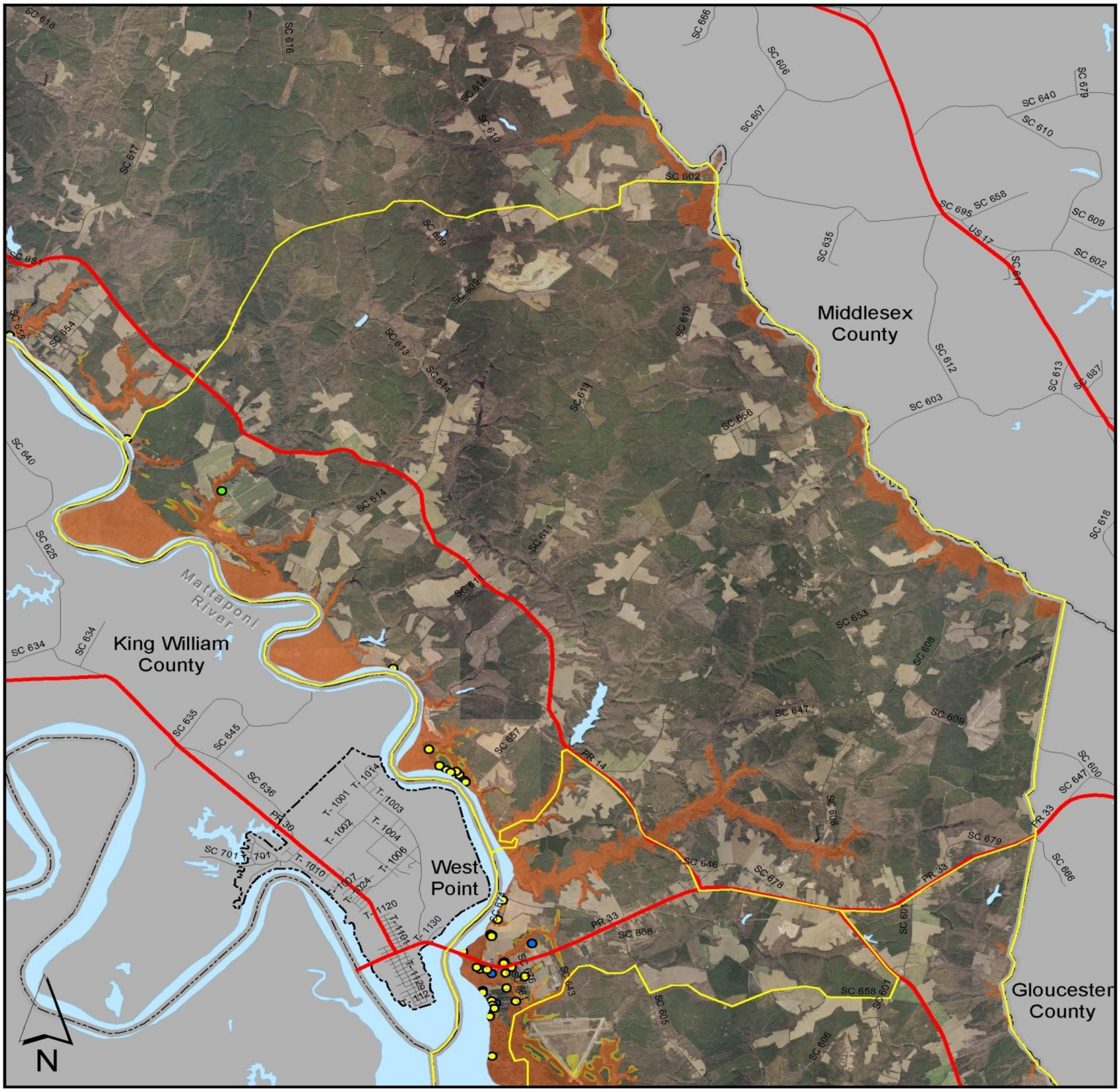
Zone AE

0 1.5 3 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in

Map 11

King and Queen County Flood Plain
Block Group 95051



Legend

Flood Plain

- 100-Year Flood Plain
- 500-Year Flood Plain

Affected Structures

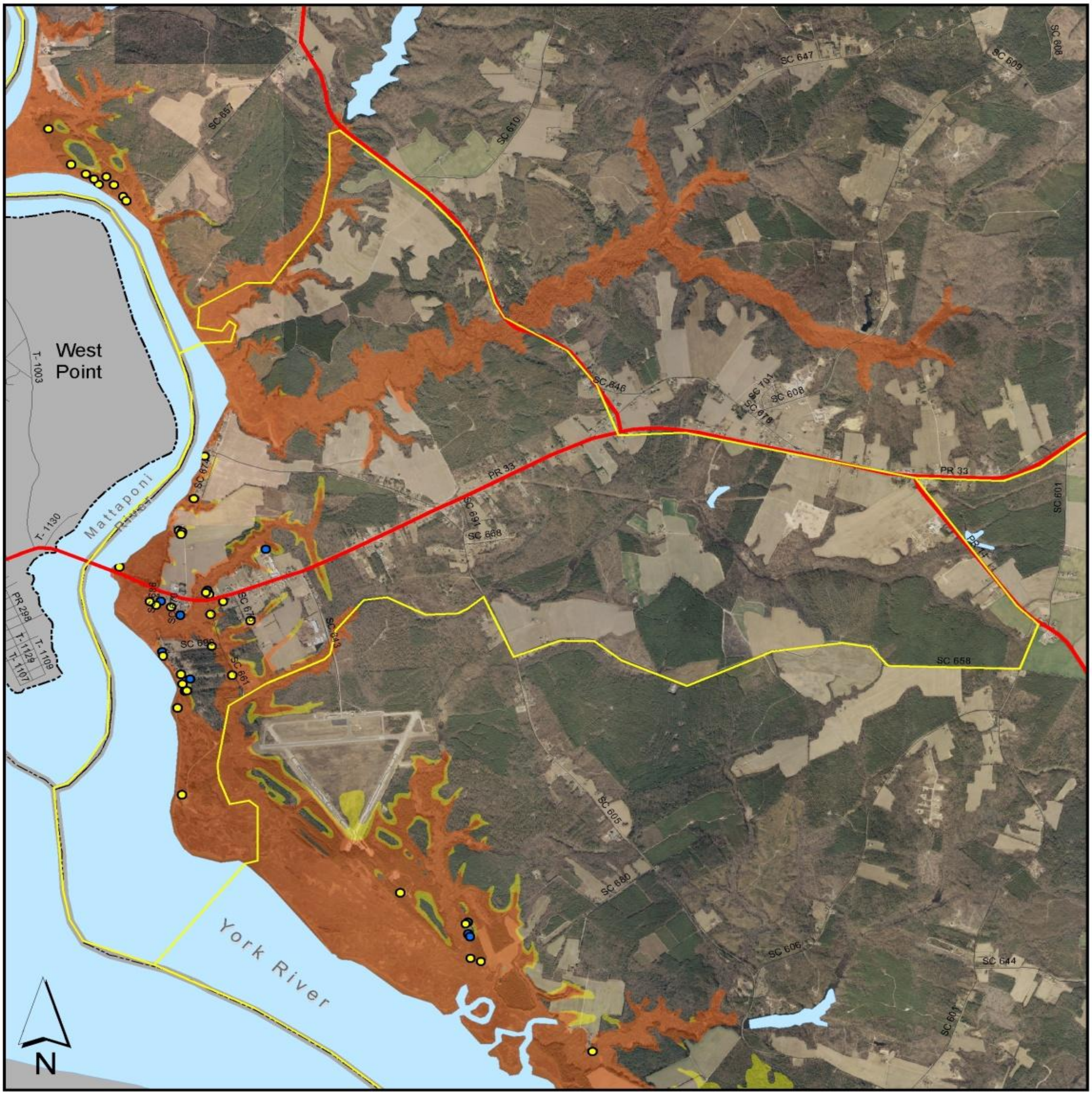
- 0.2% ANNUAL CHANCE FLOOD HAZARD
- Zone A
- Zone AE

0 1 2 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 12

King and Queen County Flood Plain
Block Group 95052



Legend

Flood Plain

- 100-Year Flood Plain
- 500-Year Flood Plain

Affected Structures

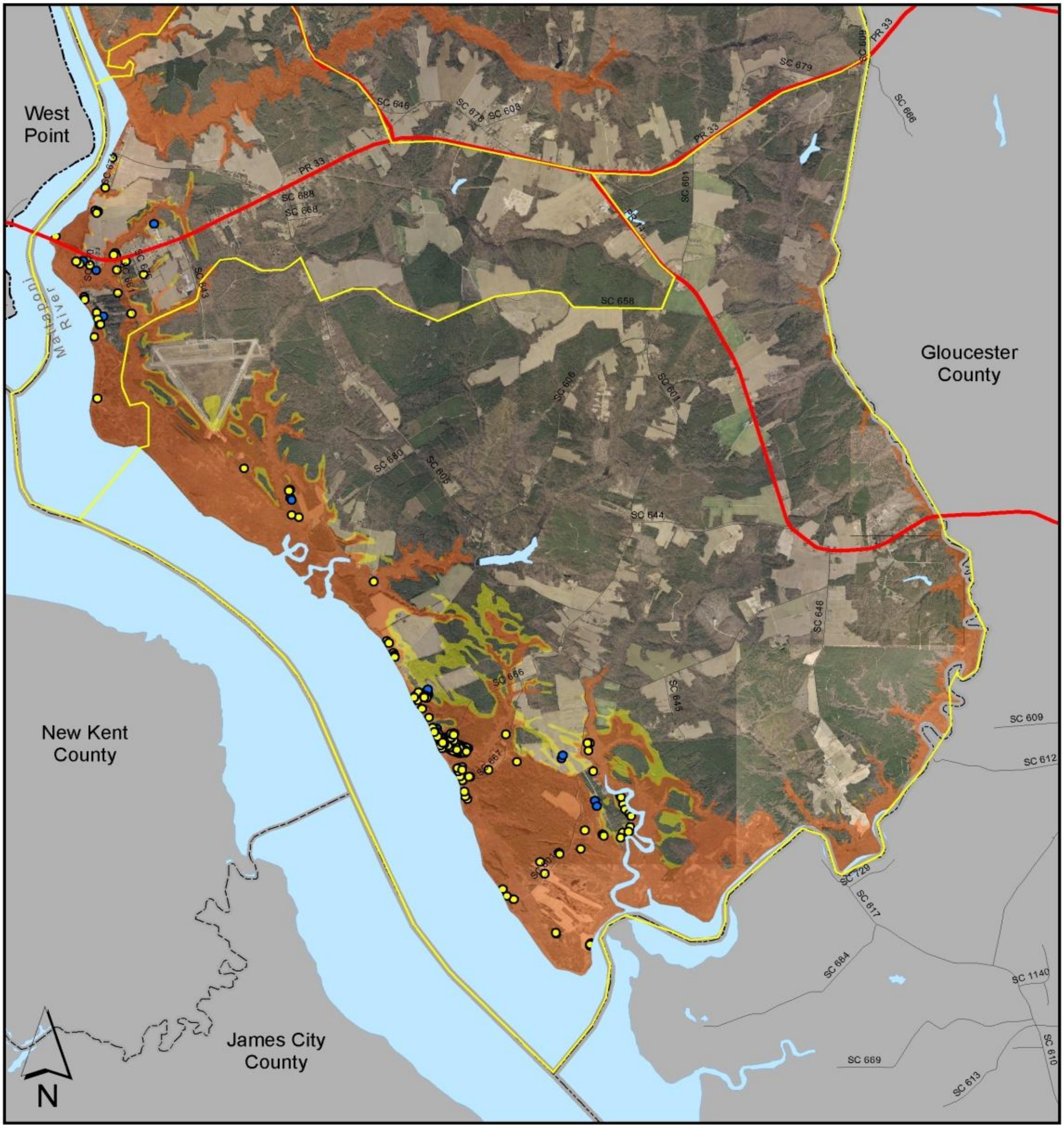
- 0.2% ANNUAL CHANCE FLOOD HAZARD
- Zone A
- Zone AE

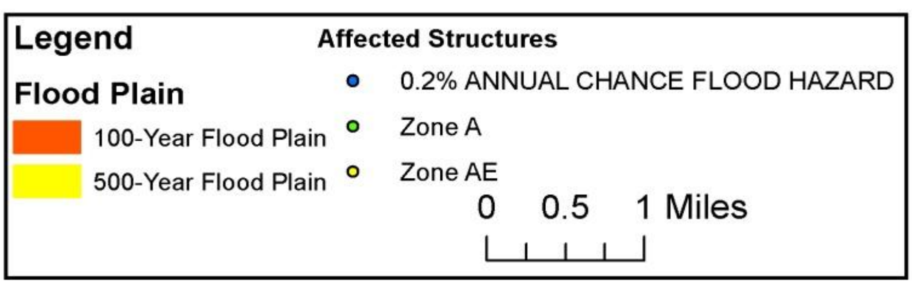
0 0.45 0.9 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 13

King and Queen County Flood Plain
Block Group 95053





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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 14

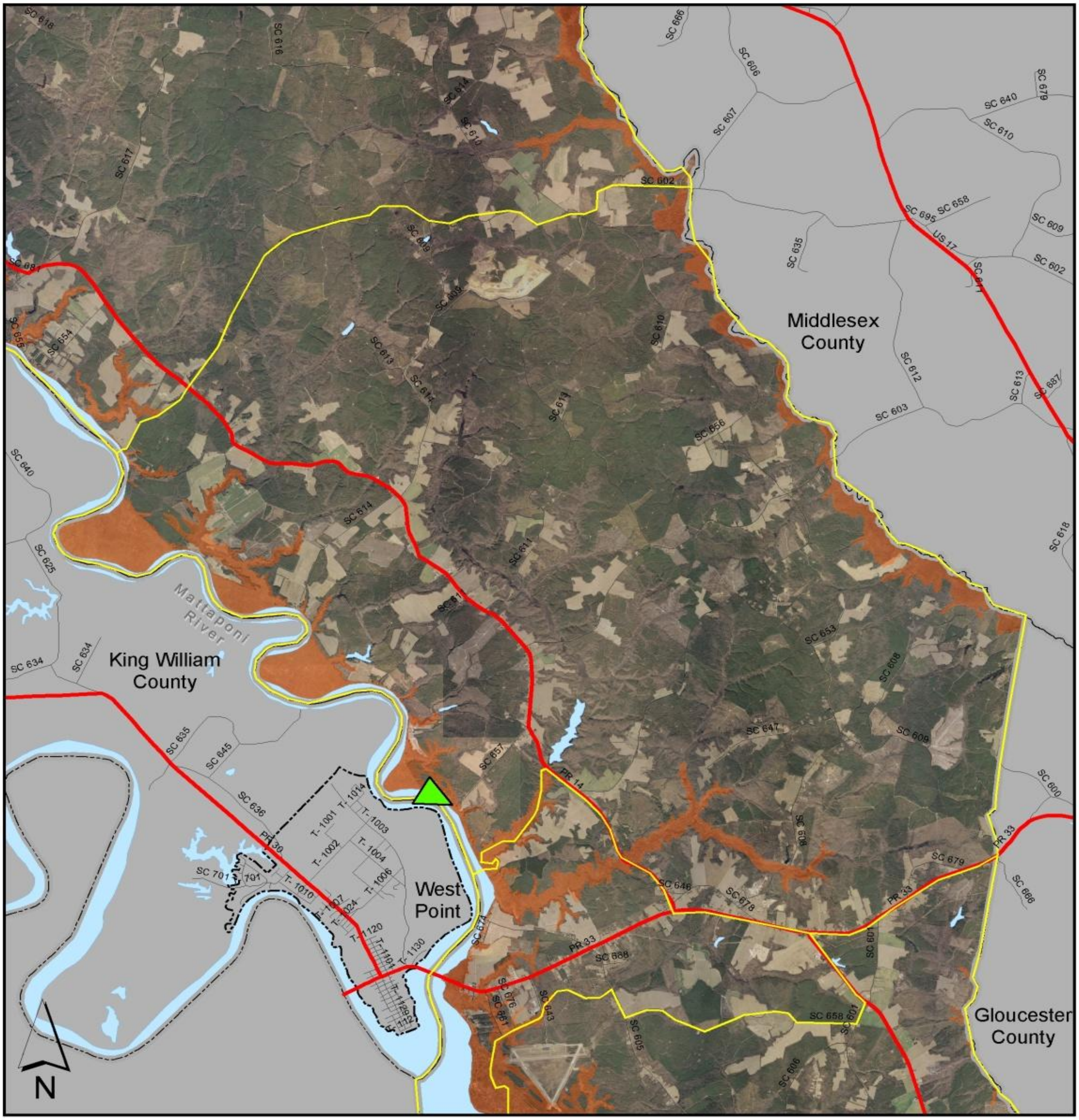
The Virginia Department of Health regulations have changed dramatically in recent years to keep pace with improvements in technology. Now, there are a number of what are termed "alternative on-site sewage disposal systems" that are allowed to be constructed where poor soils and/or a high water table 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.

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

Photograph 1. Worker installing Puraflo System in the Middle Peninsula

King and Queen County Alternative OSDS in Flood Plain
Block Group 95051



Legend

100-Year Flood Plain

Alternative OSDS in 100-Year Flood Plain = 1 System

0 1 2 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 15

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.

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. Plans to alleviate this bottleneck during flood-prone times have been proposed by town and county officials to VDOT, but road improvement plans remain on the drawing board due to a lack of VDOT/Federal funding for this project.

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.

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.

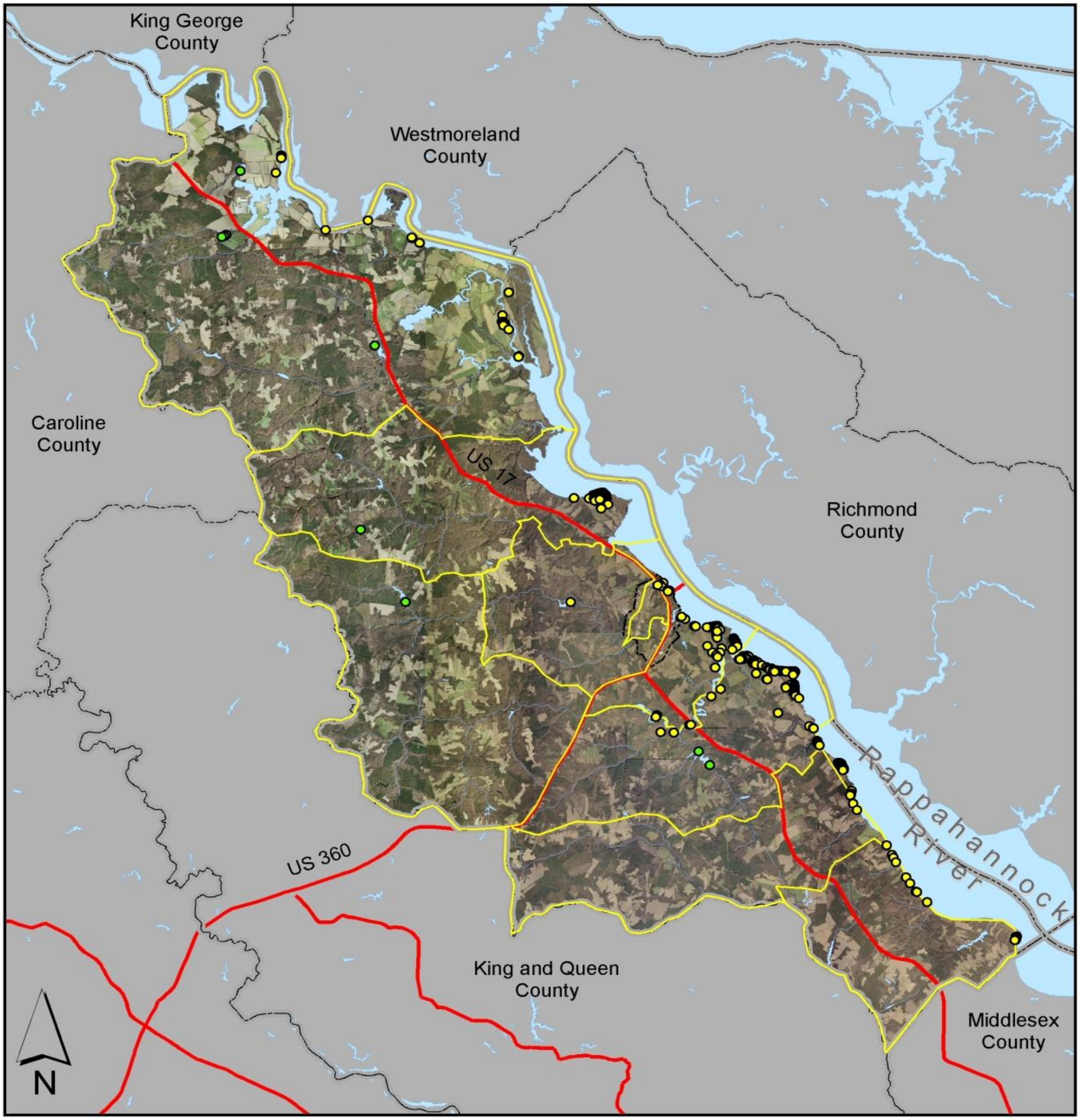
The wastewater treatment plant is located along Hoskins Creek on the west side of Route 17. The wastewater treatment plant does not suffer damage during severe flooding events. However, there is one sewerage pump station located along Newbill Drive that does receive flood damage during hurricane strength storms. The damage occurs to the electrical controls at this pump station site. During Hurricane Isabel in 2003, the electrical controls needed to be repaired. In addition, Newbill Drive does suffer roadway damage and soil erosion during severe storms.

Repetitive and Severe Repetitive Loss Residential Structures in Tappahannock

According to FEMA's records, there are 26 residential properties on the Repetitive Loss and the Severe Repetitive Loss Lists in Essex County in addition to 2 properties in Tappahannock as of 5/31/10. These properties are listed in Appendix 9 at the end of this document.

Properties In 100-year Floodplain by Census Block Groups Flood Zone A or in Flood Zone AE. This 2004 information is the latest structure data available. The legend is color coded to indicate the specific flood zone in which the structure lies.

Essex County
Block Groups



Legend

Affected Structures

- Zone A
- Zone AE

0 1.252.5 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 16

Essex County Flood Plain
Block Group 95061

Legend

Affected Structures

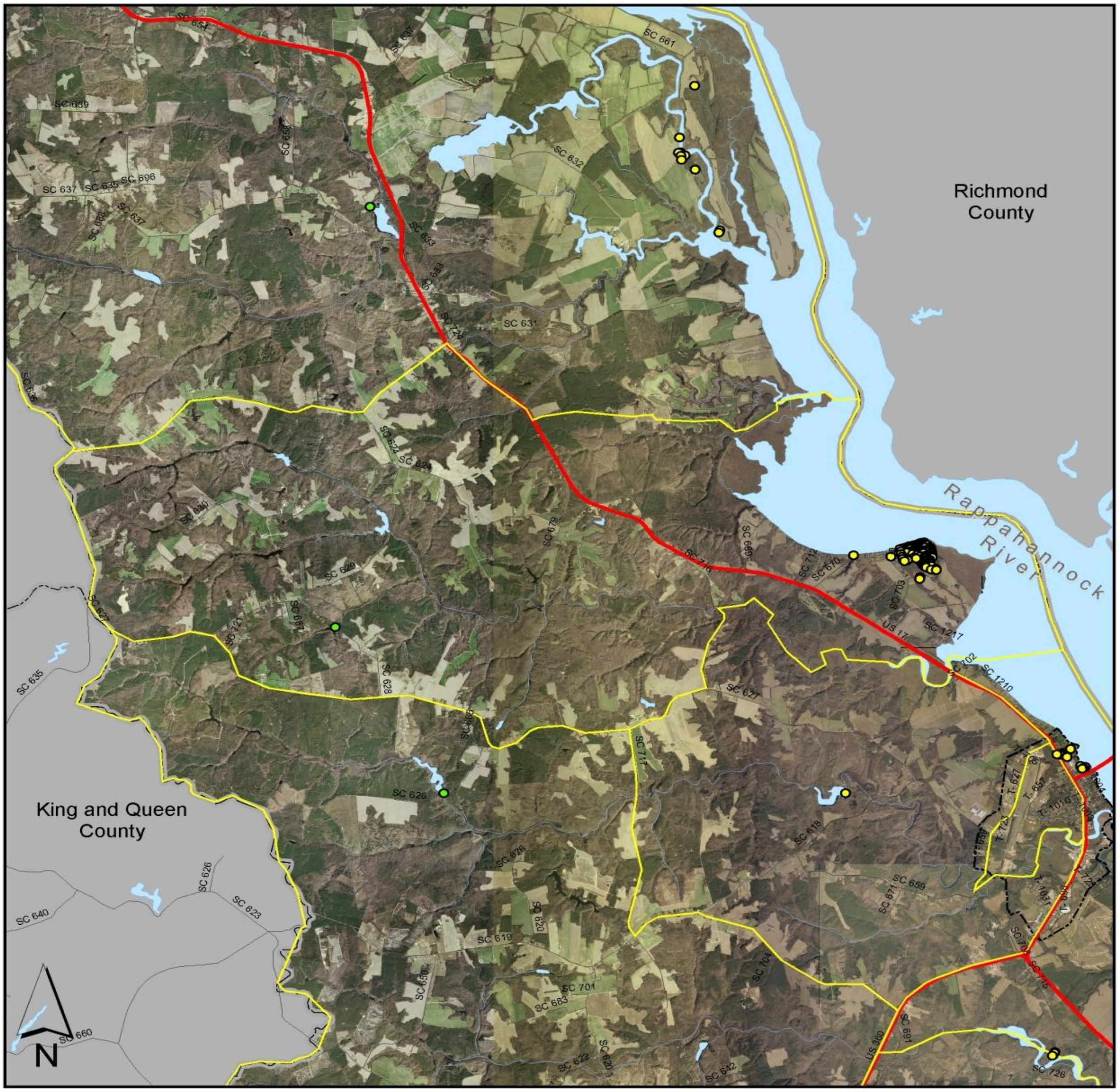
- Zone A
- Zone AE

0 1.5 3 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 17

Essex County Flood Plain
Block Group 95062



Legend

Affected Structures

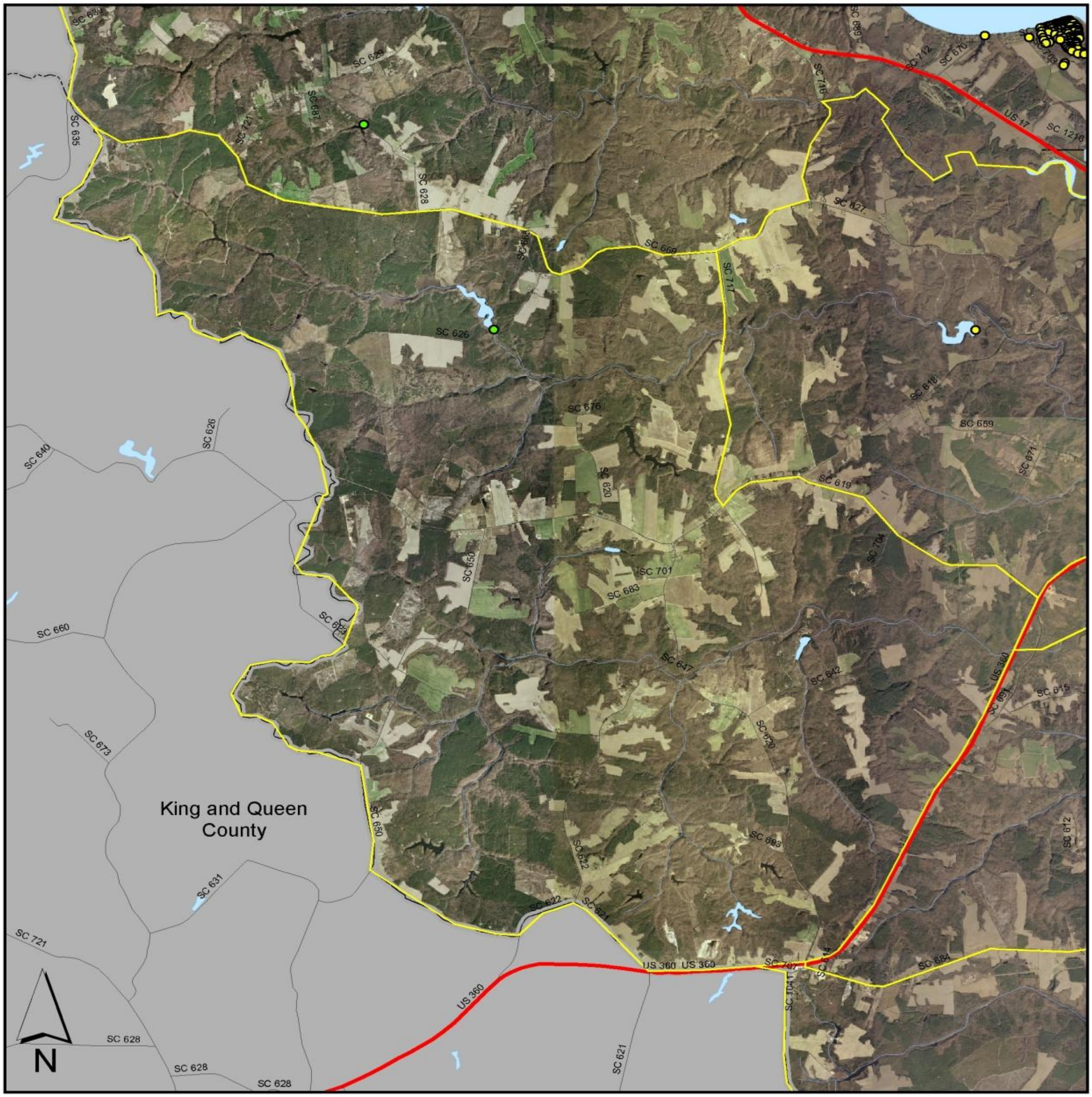
- Zone A
- Zone AE

0 1.25 2.5 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 18

Essex County Flood Plain
Block Group 95063



Legend

Affected Structures

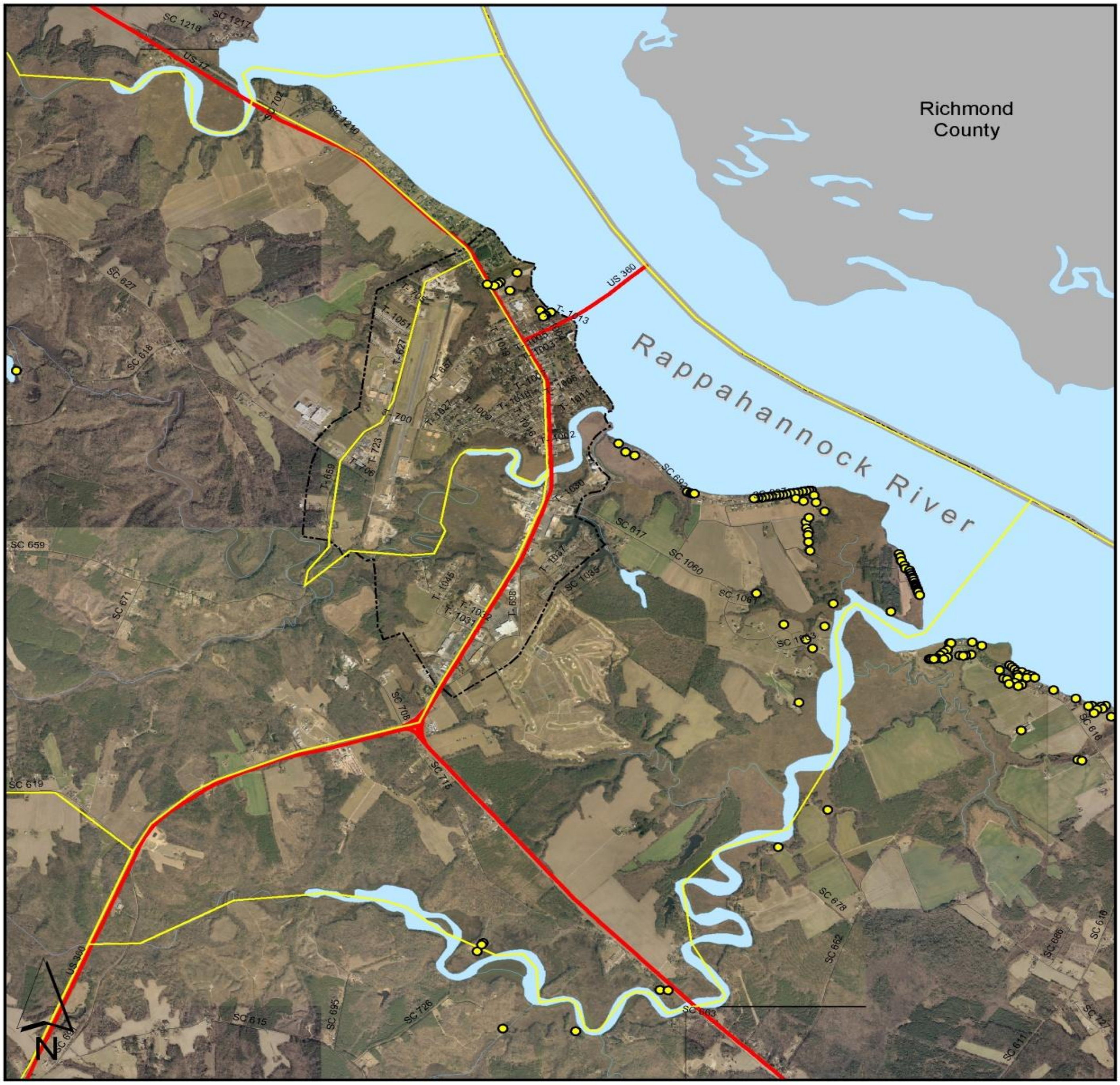
- Zone A
- Zone AE

0 1 2 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 19

Essex County Flood Plain
Block Group 95071



Legend

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 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 20

Essex County Flood Plain
Block Group 95072

Legend

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 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 21

Essex County Flood Plain
Block Group 95073

Legend

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 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 22

Essex County Flood Plain
Block Group 95081

Legend

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 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 23

Essex County Flood Plain
Block Group 95083

Legend

Affected Structures

- Zone A
- Zone AE

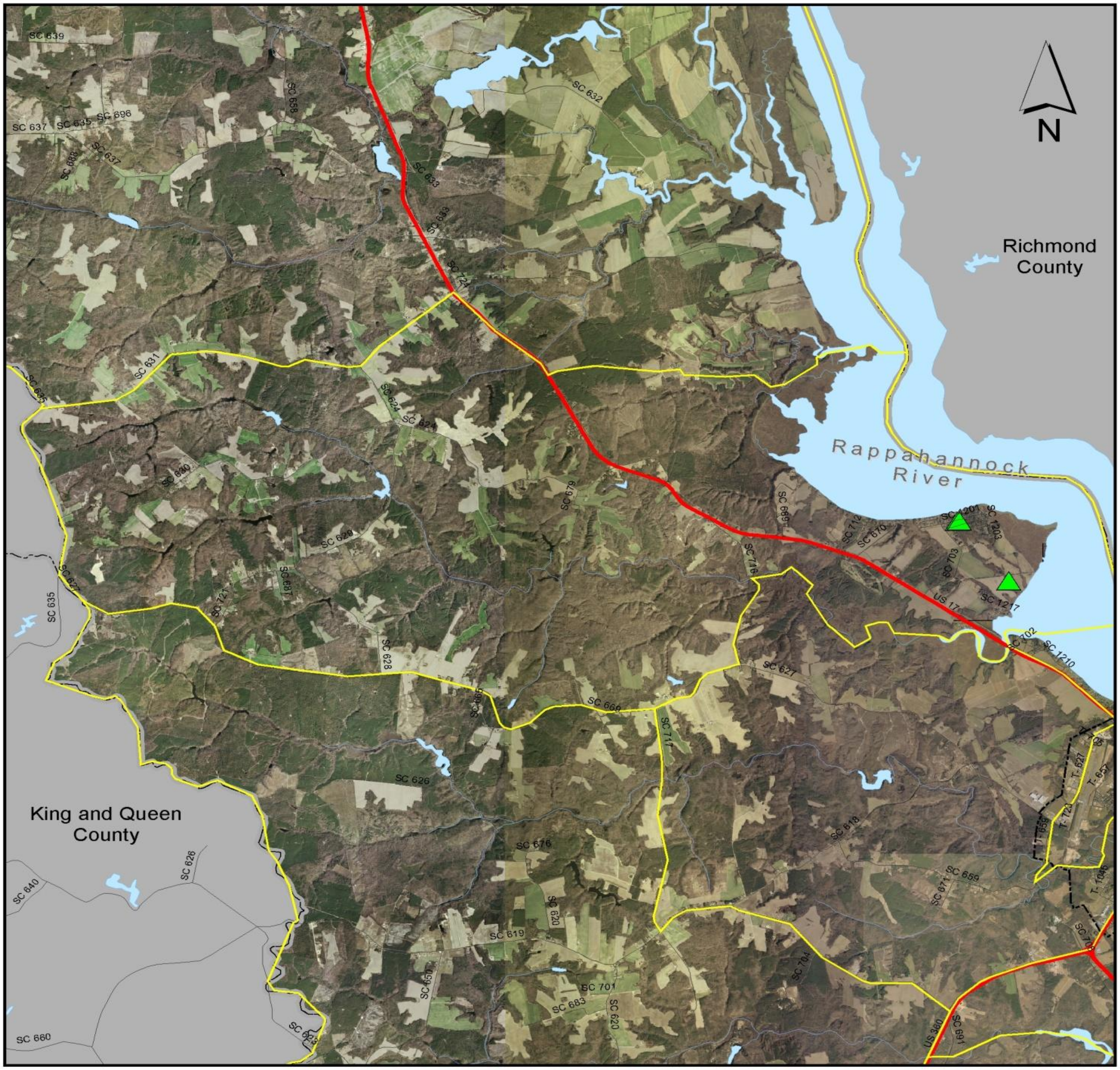
0 0.3 0.6 Miles

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 25

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

Essex County Alternative OSDS Located in Flood Plain
Block Group 95062



Legend

▲ Alternative OSDS Located in 100-Year Flood Plain = 3 Systems

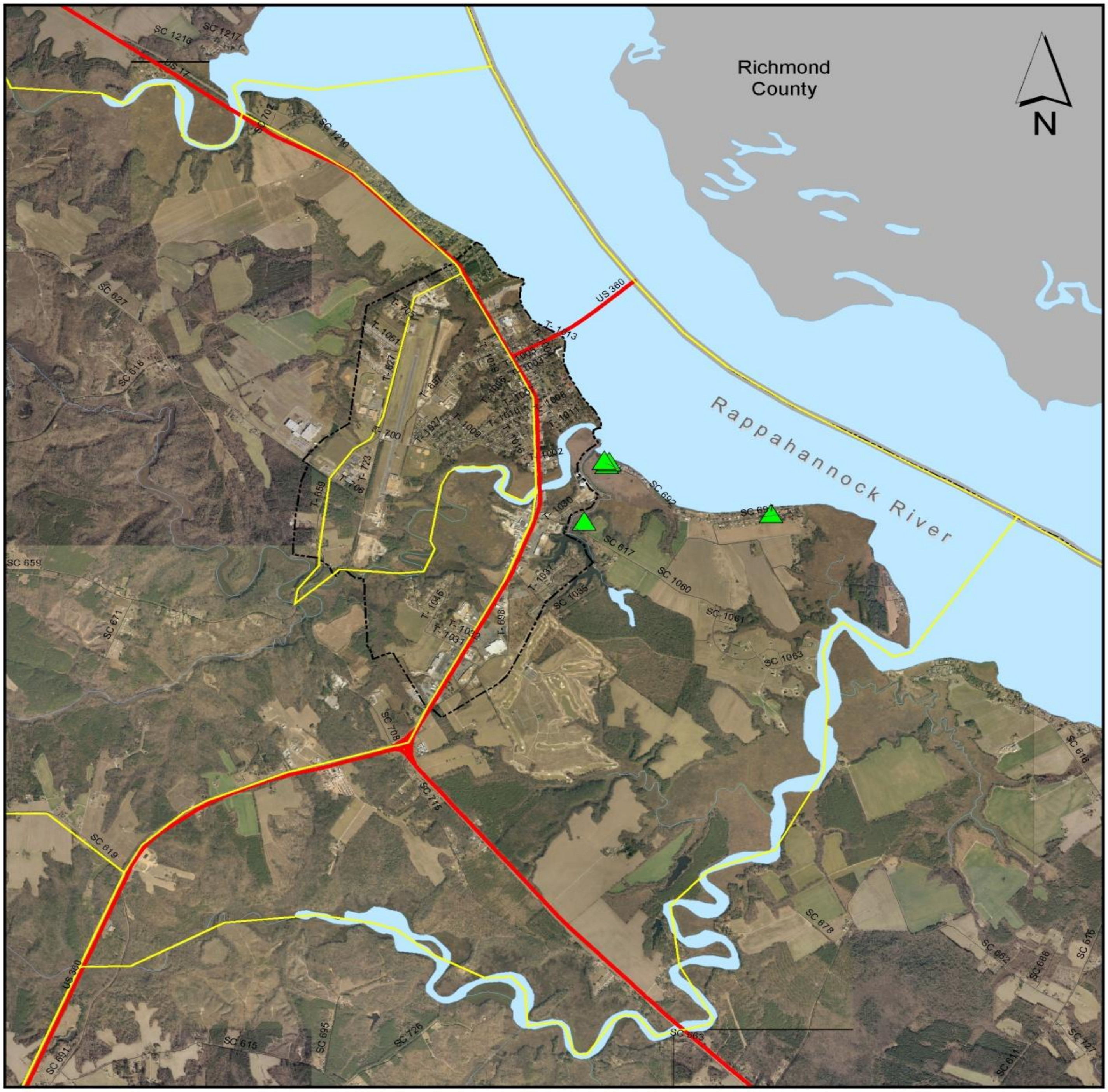
Note: The 100-Year Flood Plain was unable to be illustrated on this map.

0 1 2 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 26

Essex County Alternative OSDS Located in Flood Plain
Block Group 95071



Legend

▲ Alternative OSDS Located in 100-Year Flood Plain = 5 Systems

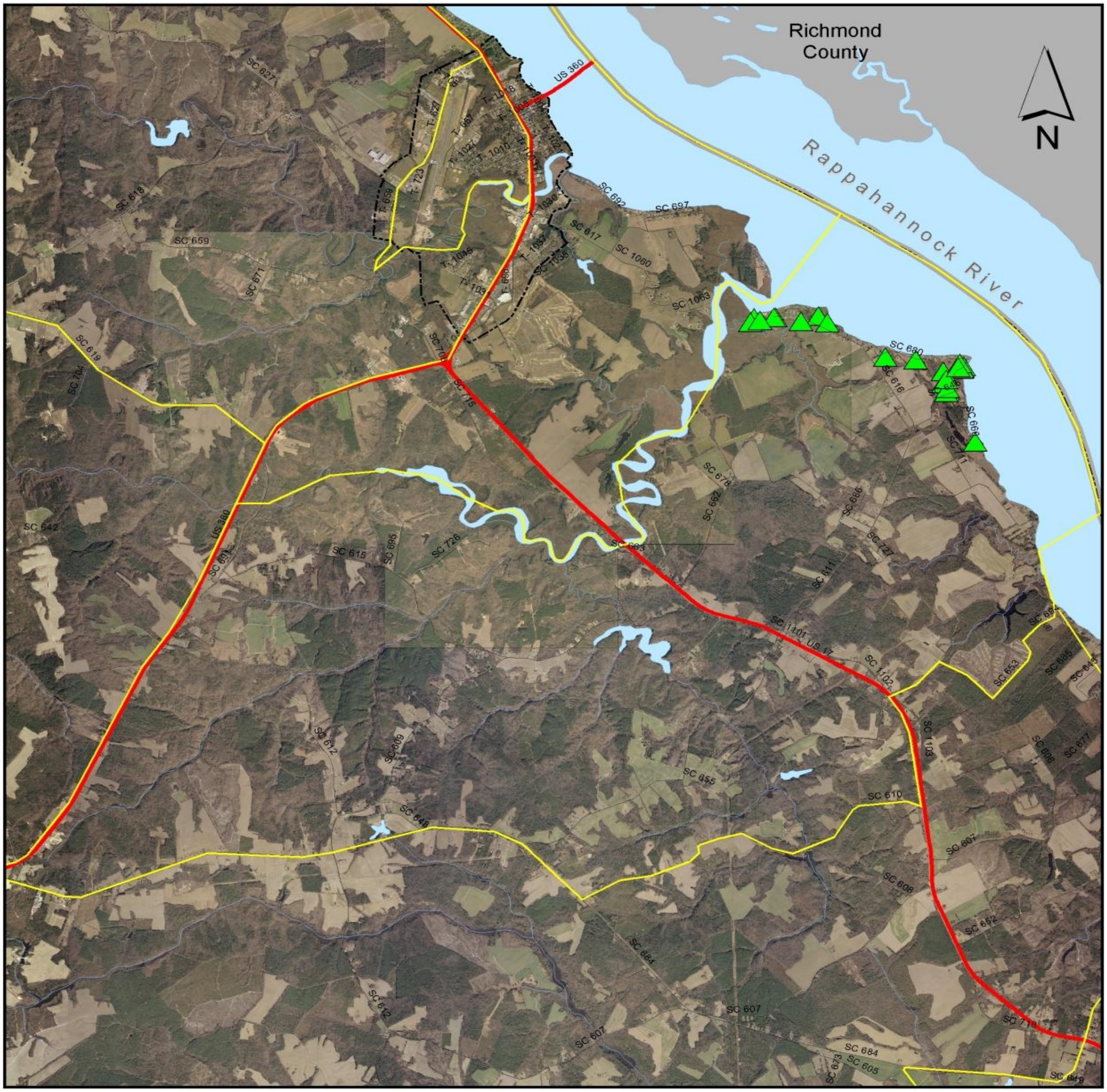
Note: The 100-Year Flood Plain was unable to be illustrated on this map.

0 0.5 1 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 27

Essex County Alternative OSDS Located in Flood Plain
Block Group 95081



Legend

▲ Alternative OSDS Located in 100-Year Flood Plain = 22 Systems

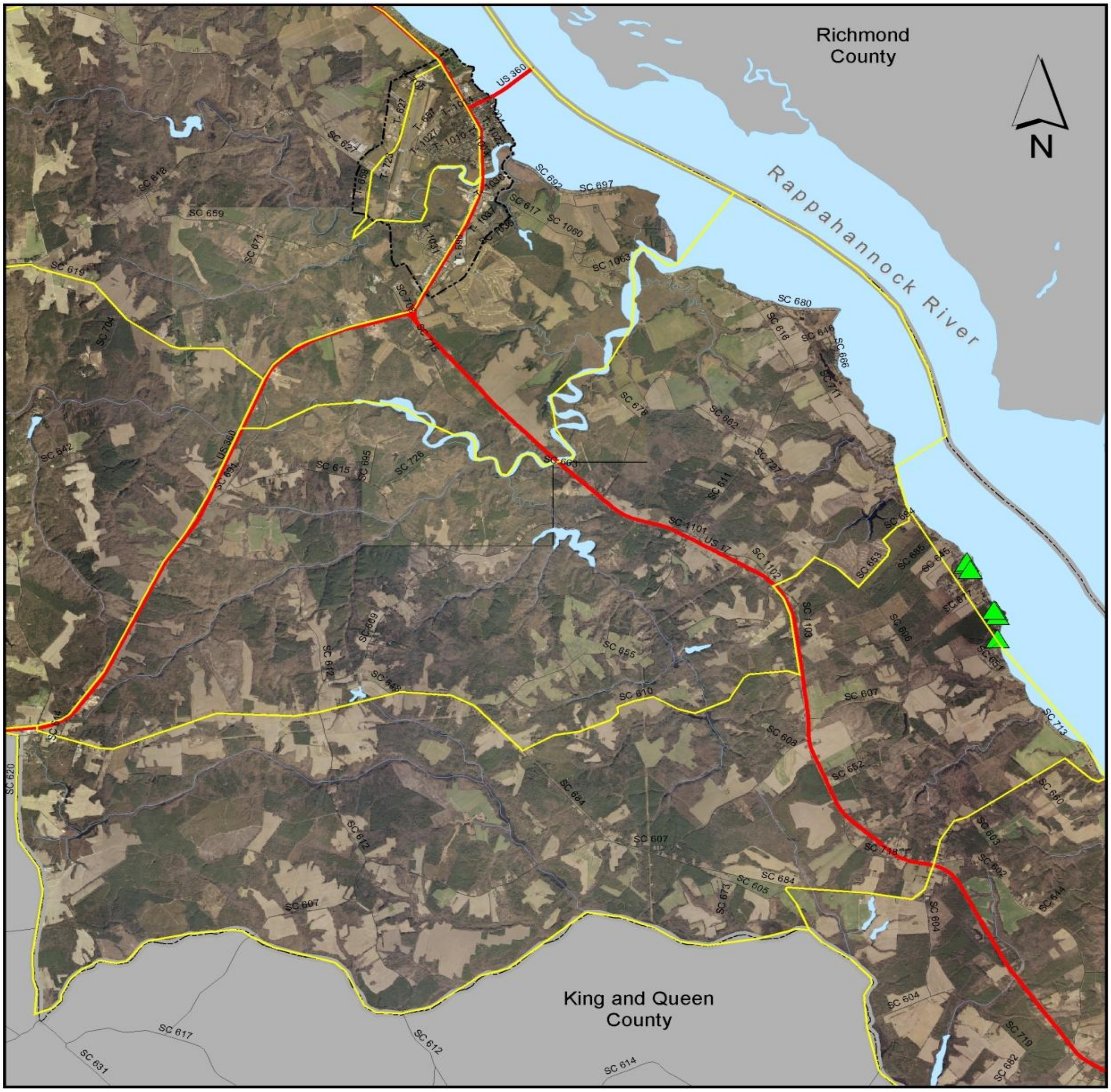
Note: The 100-Year Flood Plain was unable to be illustrated on this map.

0 0.5 1 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 28

Essex County Alternative OSDS Located in Flood Plain
Block Group 95082



Legend

Alternative OSDS Located in 100-Year Flood Plain = 7 Systems

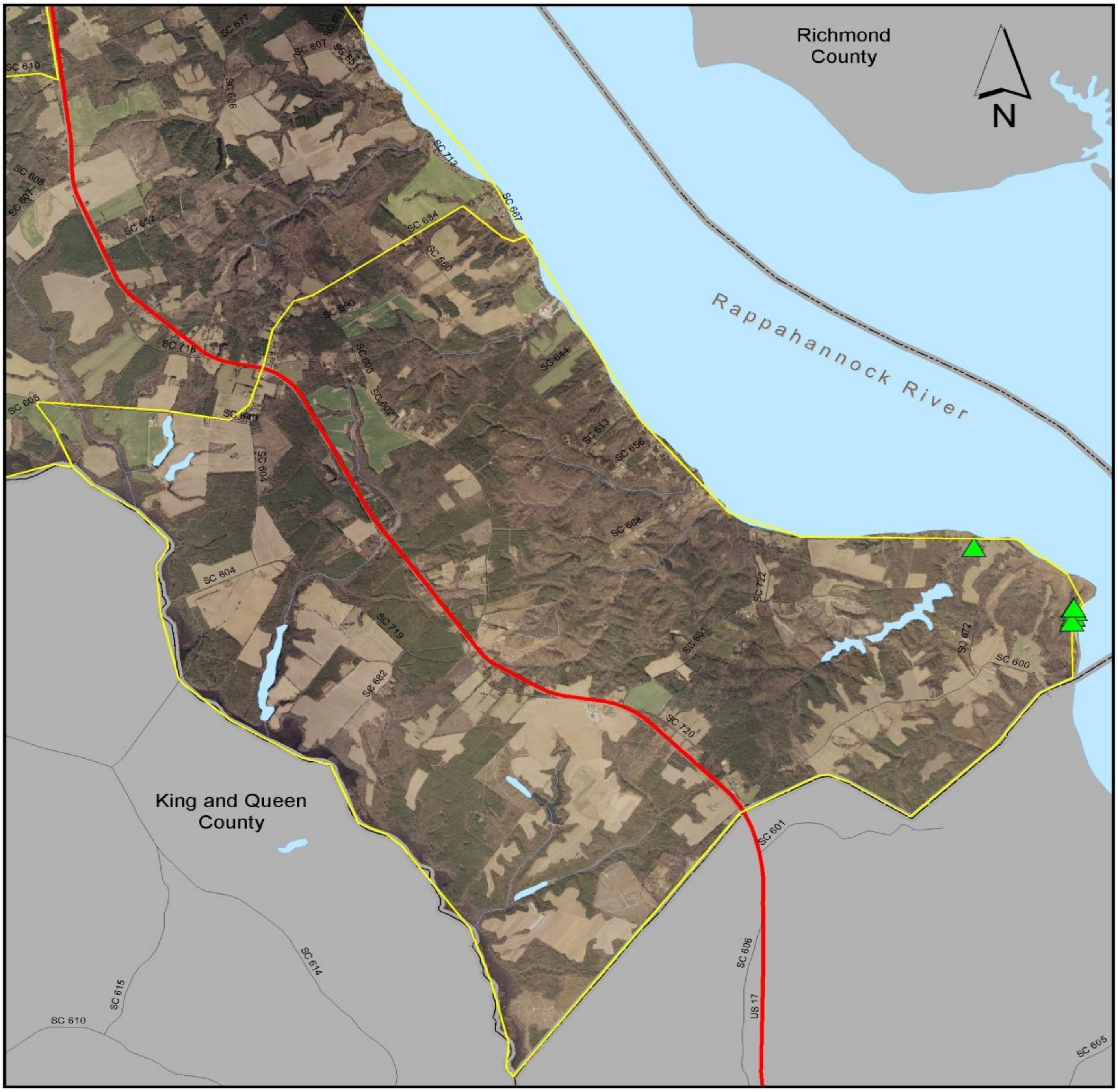
Note: The 100-Year Flood Plain was unable to be illustrated on this map.

0 1 2 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 29

Essex County Alternative OSDS Located in Flood Plain
Block Group 95083



Legend

Alternative OSDS Located in 100-Year Flood Plain = 6 Systems

Note: The 100-Year Flood Plain was unable to be illustrated on this map.

0 0.5 1 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 30

Table 14. Essex/Tappahannock Flood Prone Roads

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

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

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

Public Boat Landings

There are 2 public boat landings located in Tappahannock along the Rappahannock River. The boat landing at Prince Street is owned and operated by VDOT. The road at this boat landing does suffer minor damage during severe storm events. The boat landing at Dock Street is owned by the Town of Tappahannock and operated by the Virginia Department of Games of Inland Fisheries. This boat landing does not sustain damage from flood waters according to town officials.

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.

Table 5. King William County/West Point Flood Prone Roads

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

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 Street
n/a	1st to 7th Streets	Between Kirby St. and Pamunkey R.
n/a	2nd to 5th Streets	Between Lee St. and Mattaponi R.

Public Boat Landings

There are 2 public boat ramps along the Mattaponi River in King William County. There is a very small canoe/kayak launce at Zoar State Forest located a few miles north of Route 360. There is a larger boat ramp in Aylett immediately south of Route 360 with a ramp and a fishing dock.

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.

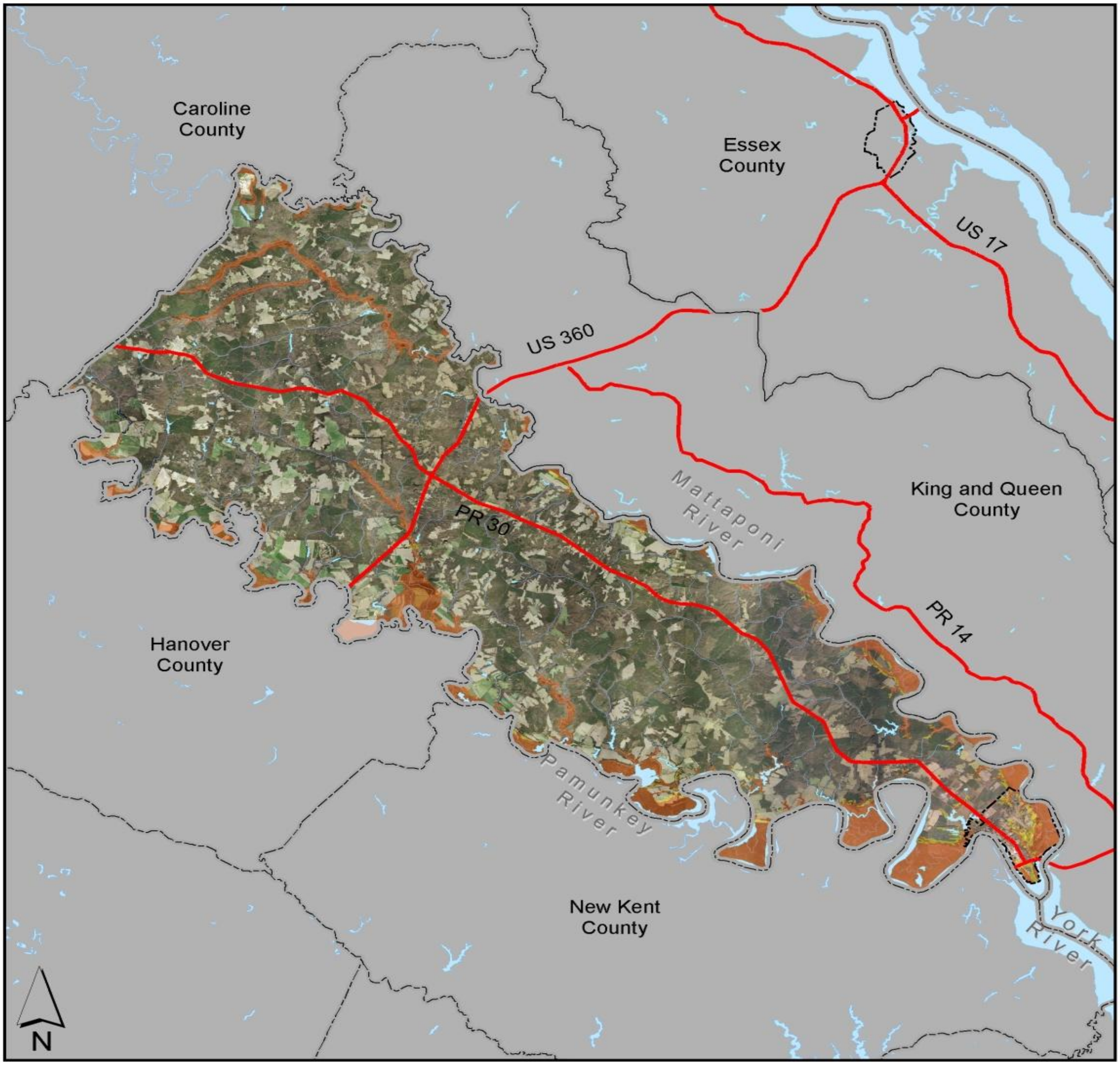
Repetitive and Severe Repetitive Loss Residential Structures in King William County

There are no residential structures on FEMA's lists of Repetitive or Severe Repetitive Loss Properties as of 5/31/10.

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. This 2004 information is the latest structure data available.

King William County
Flood Plain



Legend

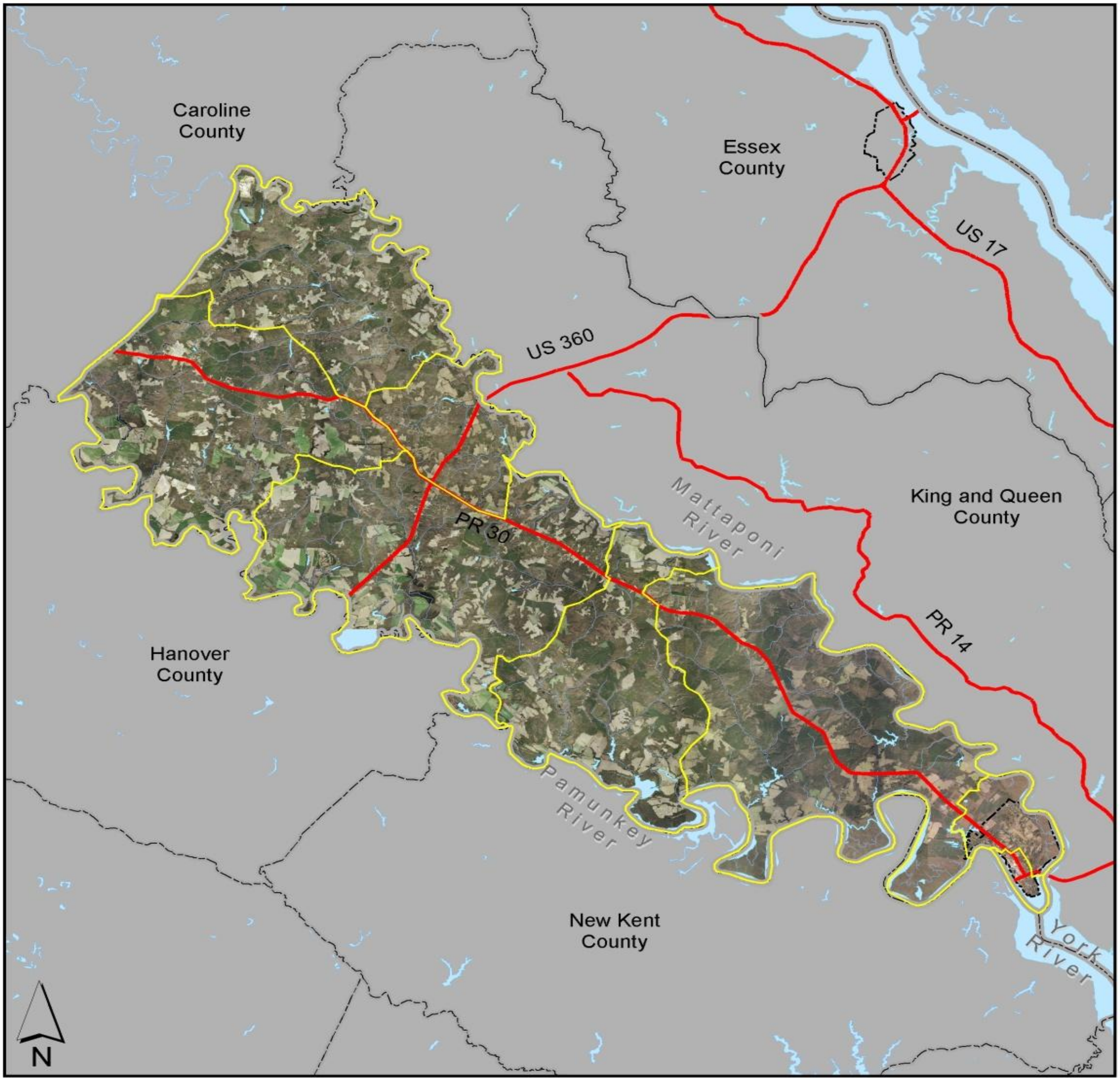
100-Year Flood Plain

500-Year Flood Plain

0 2 4 Miles

Map 31

King William County
Block Groups



Legend

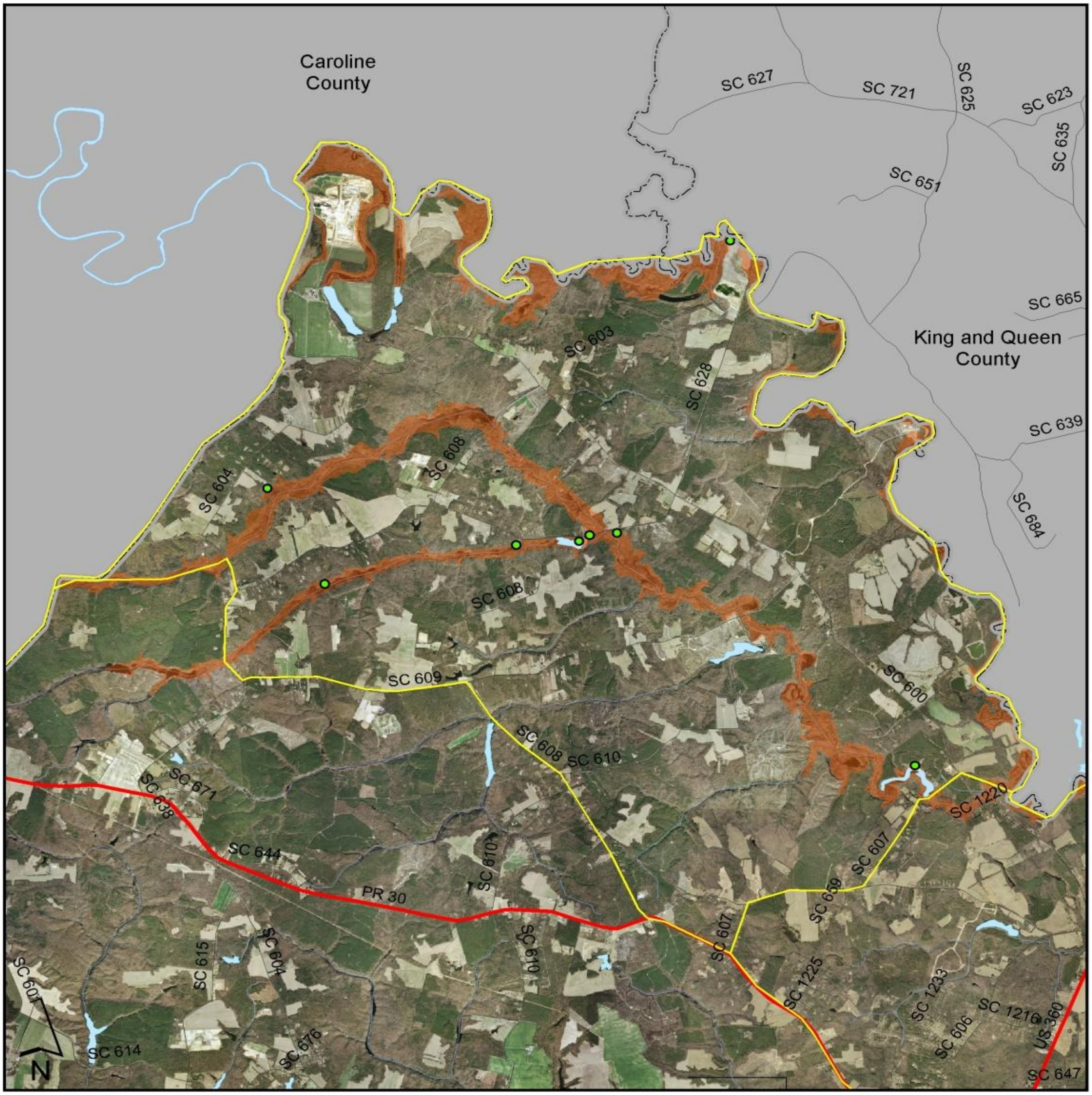
Census Block Groups

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 32

King William County Flood Plain
Block Group 95011



Legend

- 100-Year Flood Plain
- 500-Year Flood Plain

Affected Structures

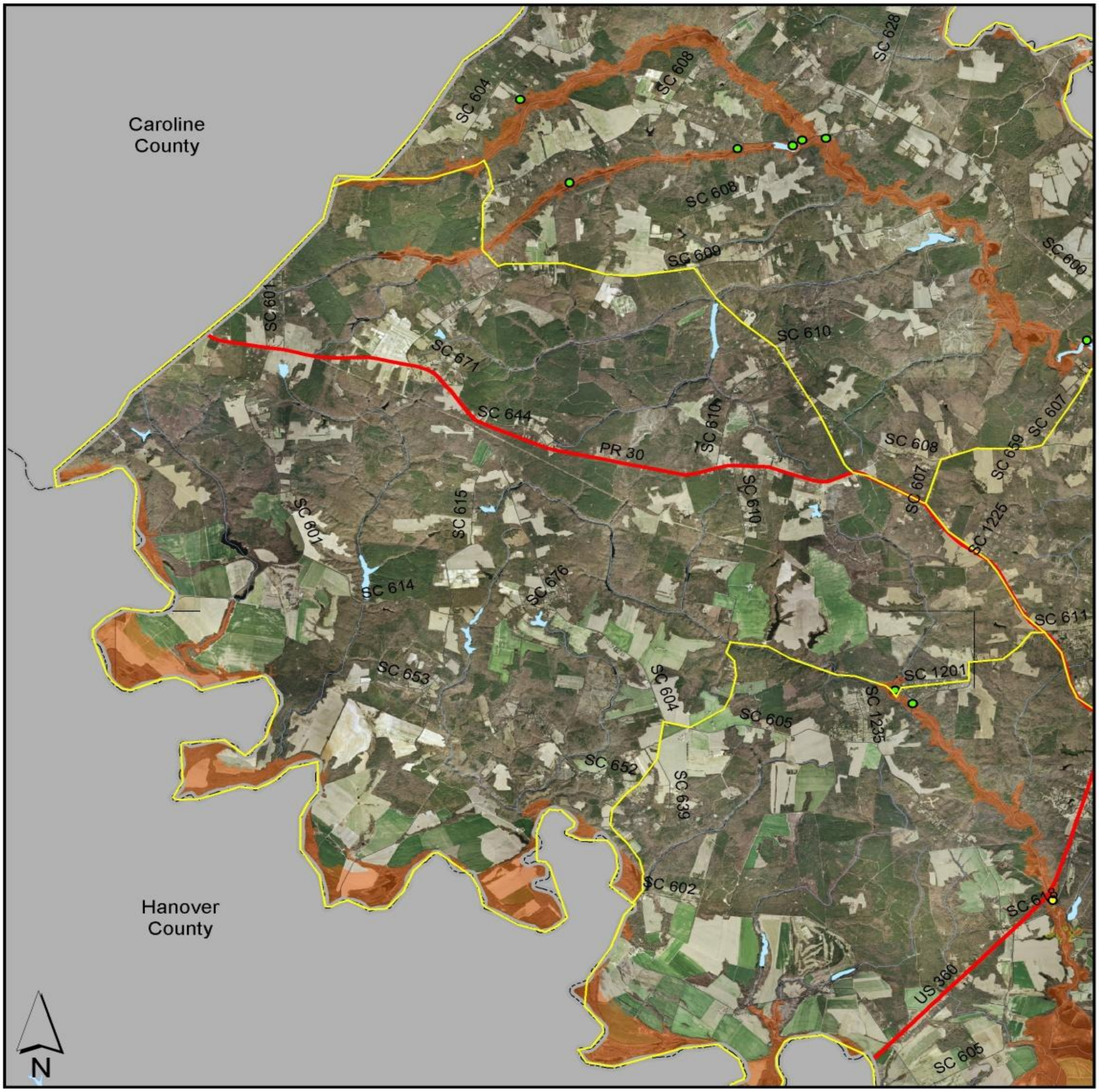
- 0.2% ANNUAL CHANCE FLOOD HAZARD
- Zone A
- Zone AE

0 0.5 1 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 33

King William County Flood Plain
Block Group 95012



Legend

100-Year Flood Plain
500-Year Flood Plain

Affected Structures

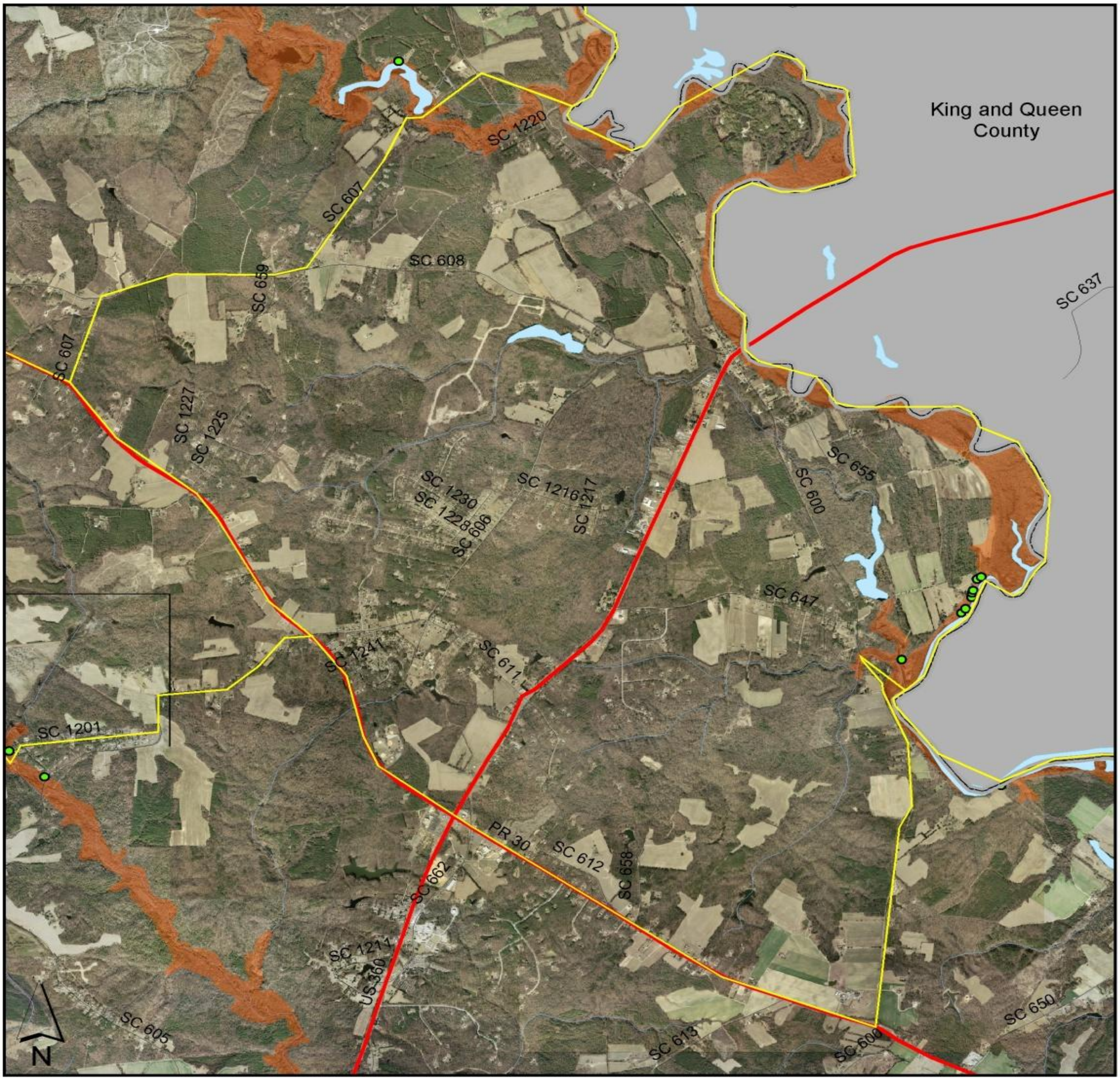
0.2% ANNUAL CHANCE FLOOD HAZARD
Zone A
Zone AE

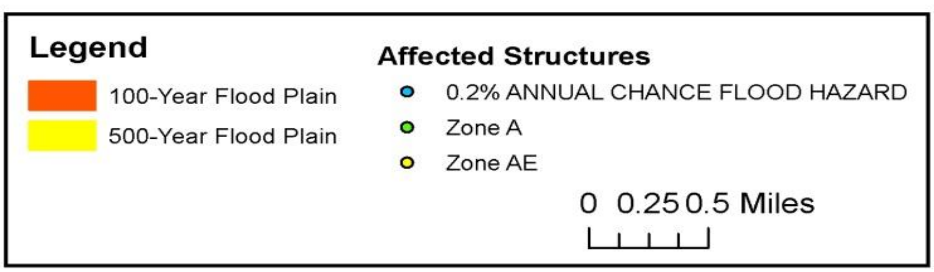
0 0.5 1 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 34

King William County Flood Plain
Block Group 95013

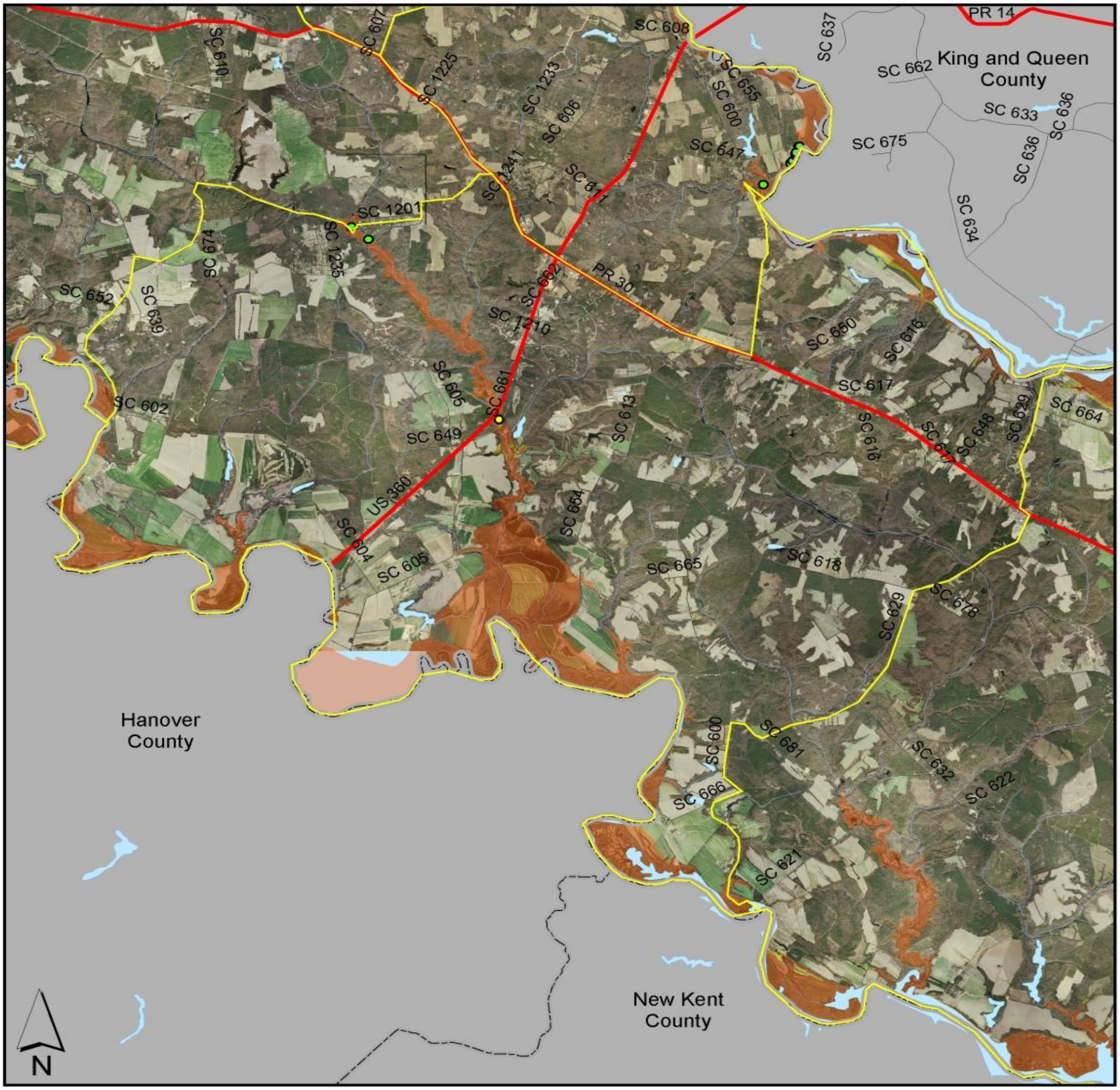




Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warranty, expressed or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 35

King William County Flood Plain
Block Group 95014



Legend

100-Year Flood Plain	
500-Year Flood Plain	

Affected Structures

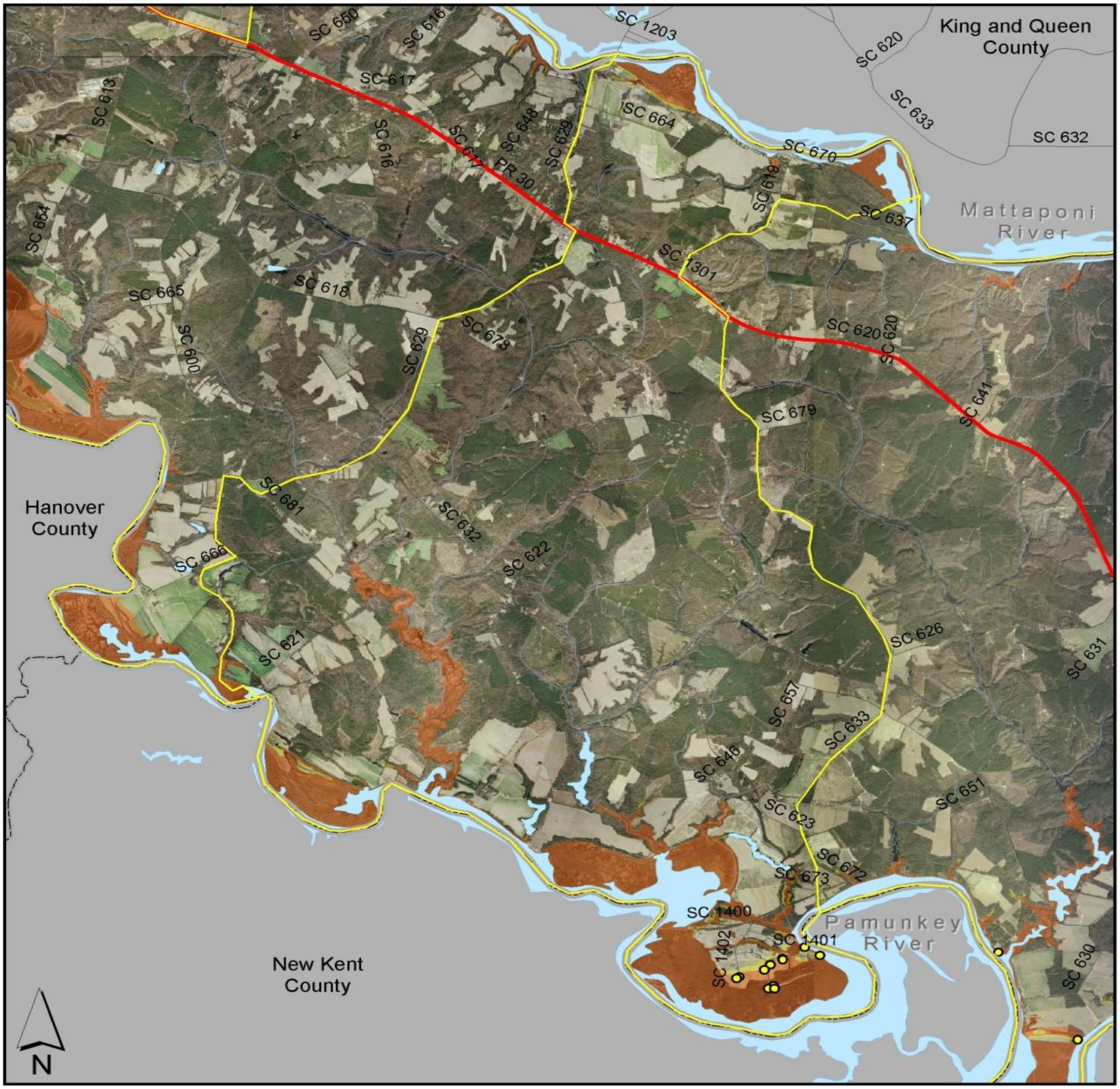
- 0.2% ANNUAL CHANCE FLOOD HAZARD
- Zone A
- Zone AE

0 0.5 1 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 36

King William County Flood Plain
Block Group 95021



Legend

100-Year Flood Plain	500-Year Flood Plain

Affected Structures

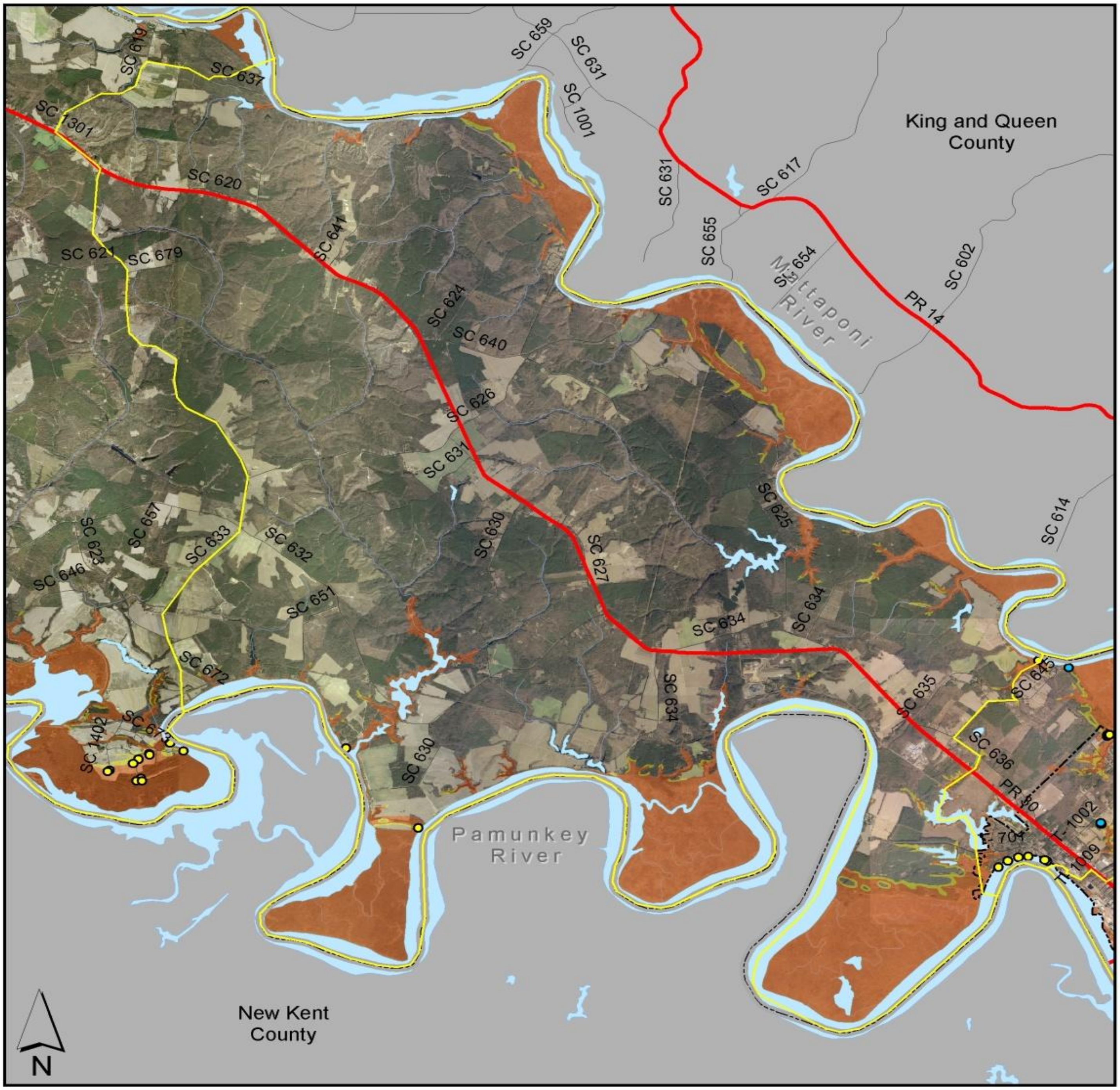
- 0.2% ANNUAL CHANCE FLOOD HAZARD
- Zone A
- Zone AE

0 0.45 0.9 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 37

King William County Flood Plain
Block Group 95022



Legend

100-Year Flood Plain

500-Year Flood Plain

Affected Structures

0.2% ANNUAL CHANCE FLOOD HAZARD

Zone A

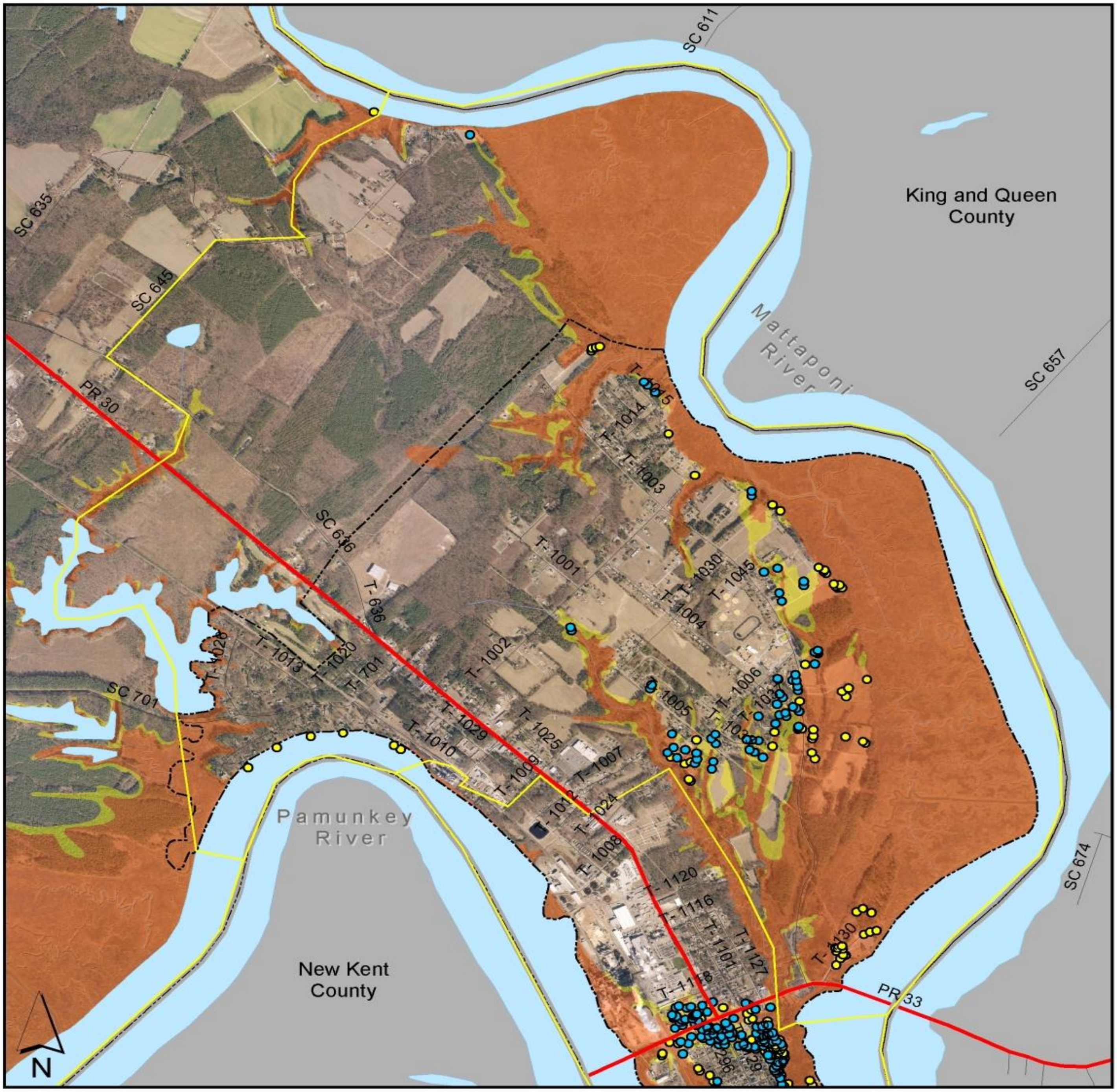
Zone AE

0 0.5 1 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 38

King William County Flood Plain
Block Group 95031



Legend

100-Year Flood Plain

500-Year Flood Plain

Affected Structures

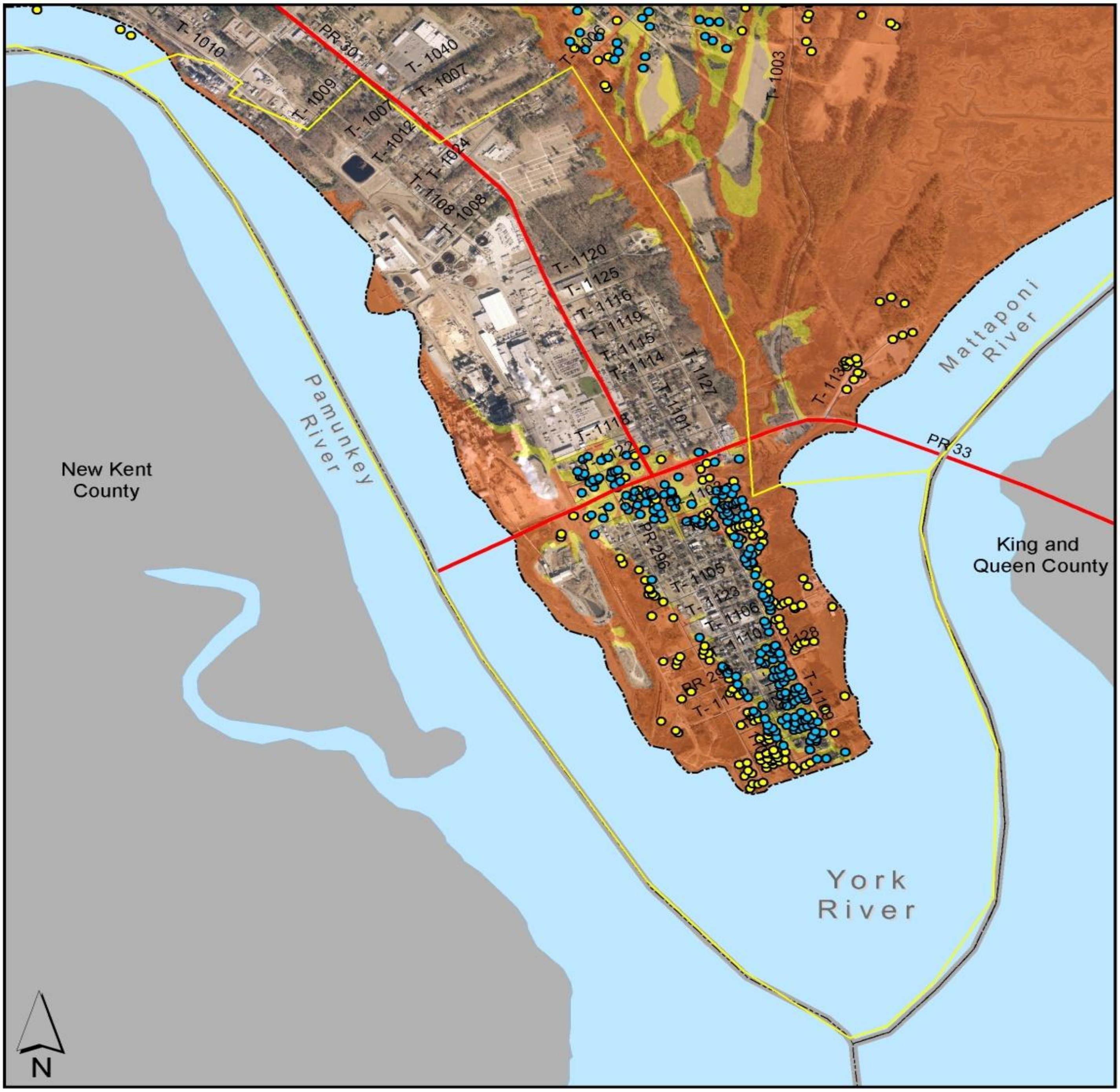
- 0.2% ANNUAL CHANCE FLOOD HAZARD
- Zone A
- Zone AE

0 0.150.3 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 39

King William County Flood Plain
Block Group 95032



Legend

100-Year Flood Plain

500-Year Flood Plain

Affected Structures

0.2% ANNUAL CHANCE FLOOD HAZARD

Zone A

Zone AE

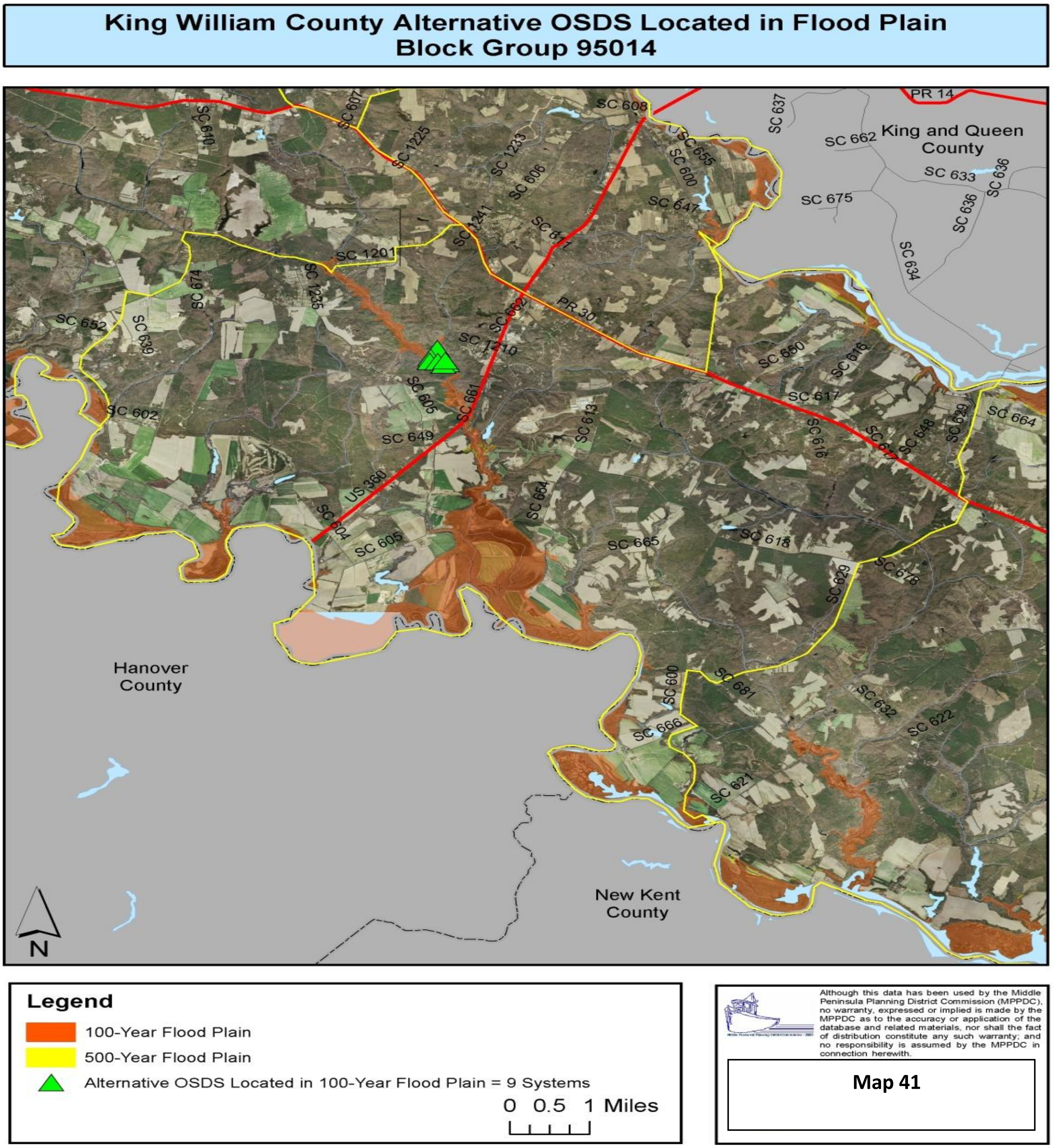
0 0.1 0.2 Miles

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 40

Alternative On-site Sewage Disposal Systems (OSDS)

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



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 dryed 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.

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, there are 9 residential properties on the Repetitive Loss List and 0 on the Severe Repetitive Loss List as of 5/31/10. These properties are listed in Appendix 9 at the end of this document.

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. After Hurricane Isabel in 2003, approximately xx homes/businesses sustained some level of damage from flooding and/or the winds. 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.

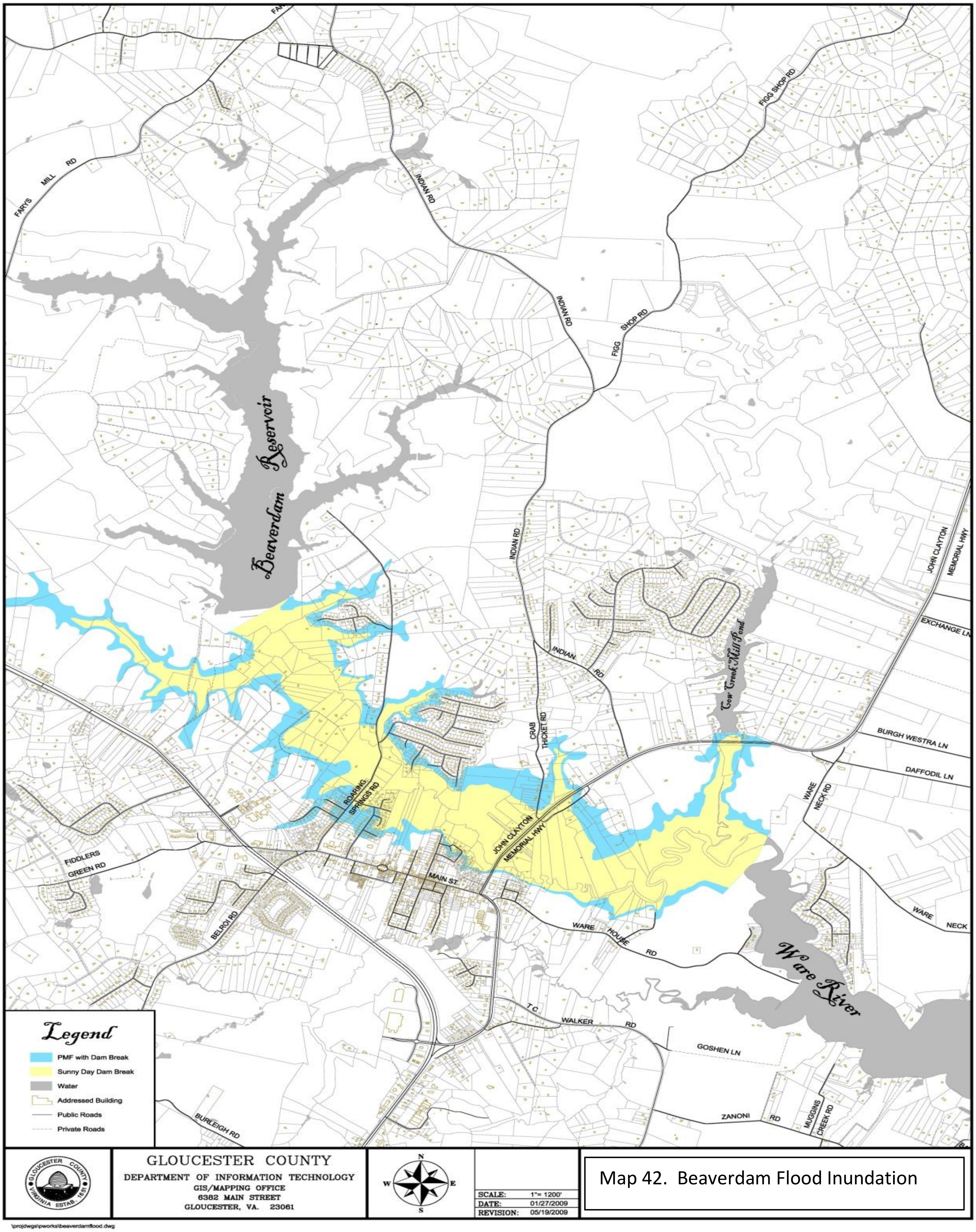
Gloucester Critical Facilities and Public Utilities

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 Virginia Department of Conservation and Recreation.

However, the impoundment did overflow during Hurricane Floyd in 1999 and the excess water flowed downstream using the emergency spillway. There was no flood damage to the dam, the spillway or to the 200 homes located below the dam.

Below is the Beaverdam Reservoir inundation map, produced by Gloucester County, showing the location of the 200 homes below the dam that would flood if the structure were to fail.

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.



Map 42. Beaverdam Flood Inundation

Table 15. 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	3	16	219	Wilson Creek
Cow Creek	2	16	931	Cow Creek
Burke	3	20	481	Burke Mill Stream
Cypress Shores	3	15	143	Piankatank River
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.

Table 16. Gloucester County Flood Prone Roads

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

Route	Road Name	Location of Floodwaters
684	Starvation Road	from Big Oak Lane to ESM
662	Allmondsville Road	from Rt. 606 to Rte. 618
618	Chappahosic Road	from Rte. 662 to Rt. 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 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

Public Boat Ramps

There are **X** public boat landings in Gloucester County that are owned and operated by the Virginia Department of Game and Inland Fisheries.

Repetitive and Severe Repetitive Loss Residential Structures in Gloucester County

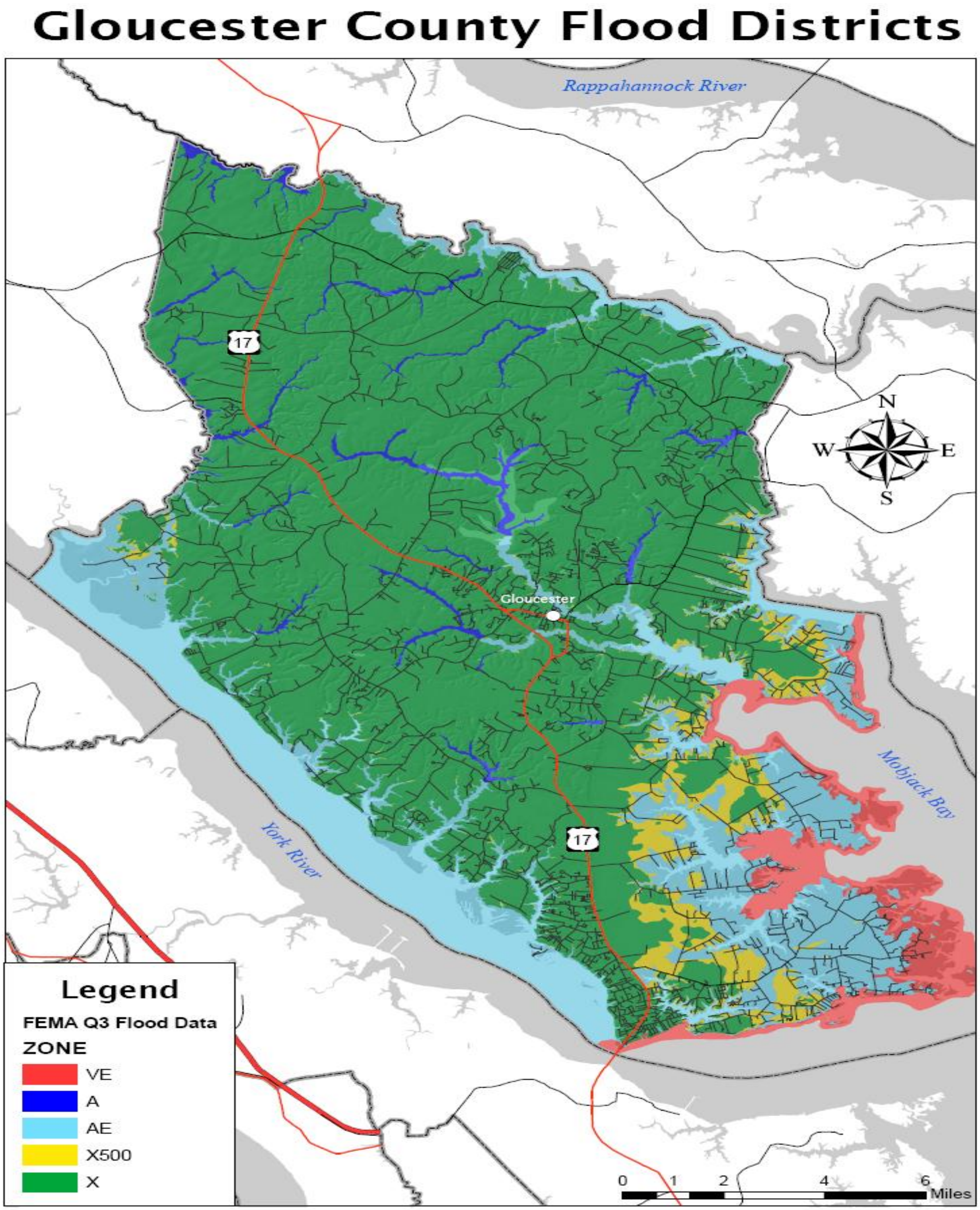
According to FEMA's records, there are 103 residential properties on the Repetitive Loss List and 1 on the Severe Repetitive Loss List as of 5/31/10. These properties are listed in Appendix 9 at the end of this document.

The property owner located at 7764 Spring Court in the Holly Springs Subdivision, near the Gloucester Courthouse area, called the MPPDC Regional Planner to inform him that the property around his is subject to flood damage during severe storms due to the homes being built on "shifting sands" and nearby springs.

Properties In 100-year Floodplain by Census Block Group

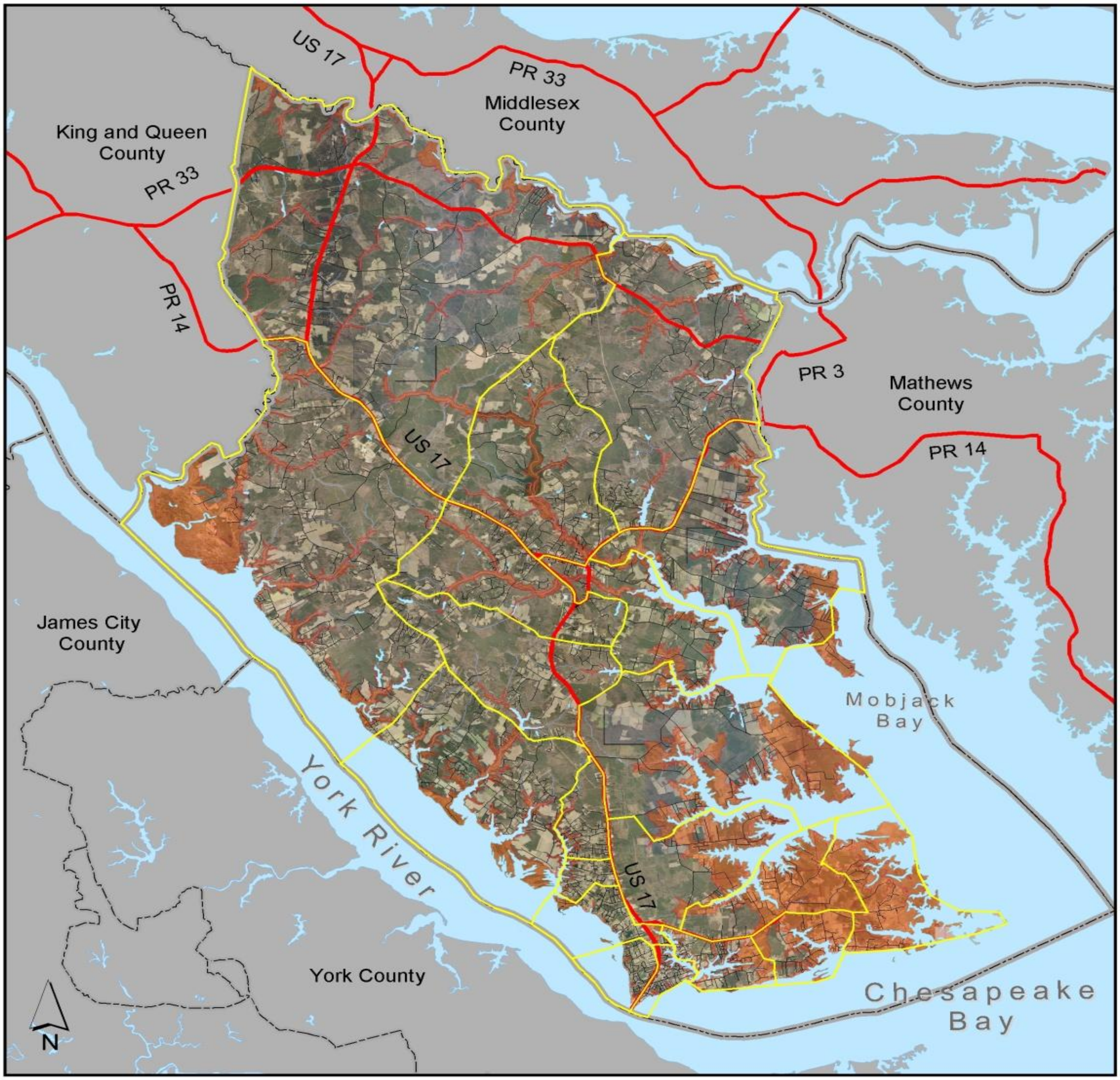
The following series of maps show the location of structures in Gloucester County that are in Flood Zone A, Flood Zone AE or Flood Zone VE. This 2004 information is the latest structure data available. The legend is color coded to indicate the specific flood zone in which each structure lies.

Map 43



The source of this map include base GIS layers provided by the United States Census Bureau and the Q3 GIS layers provided by Mindsites Group, LLC.

Gloucester County
Flood Plain



Legend

100-Year Flood Plain

0 1.25 2.5 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 44

Gloucester County
Block Groups

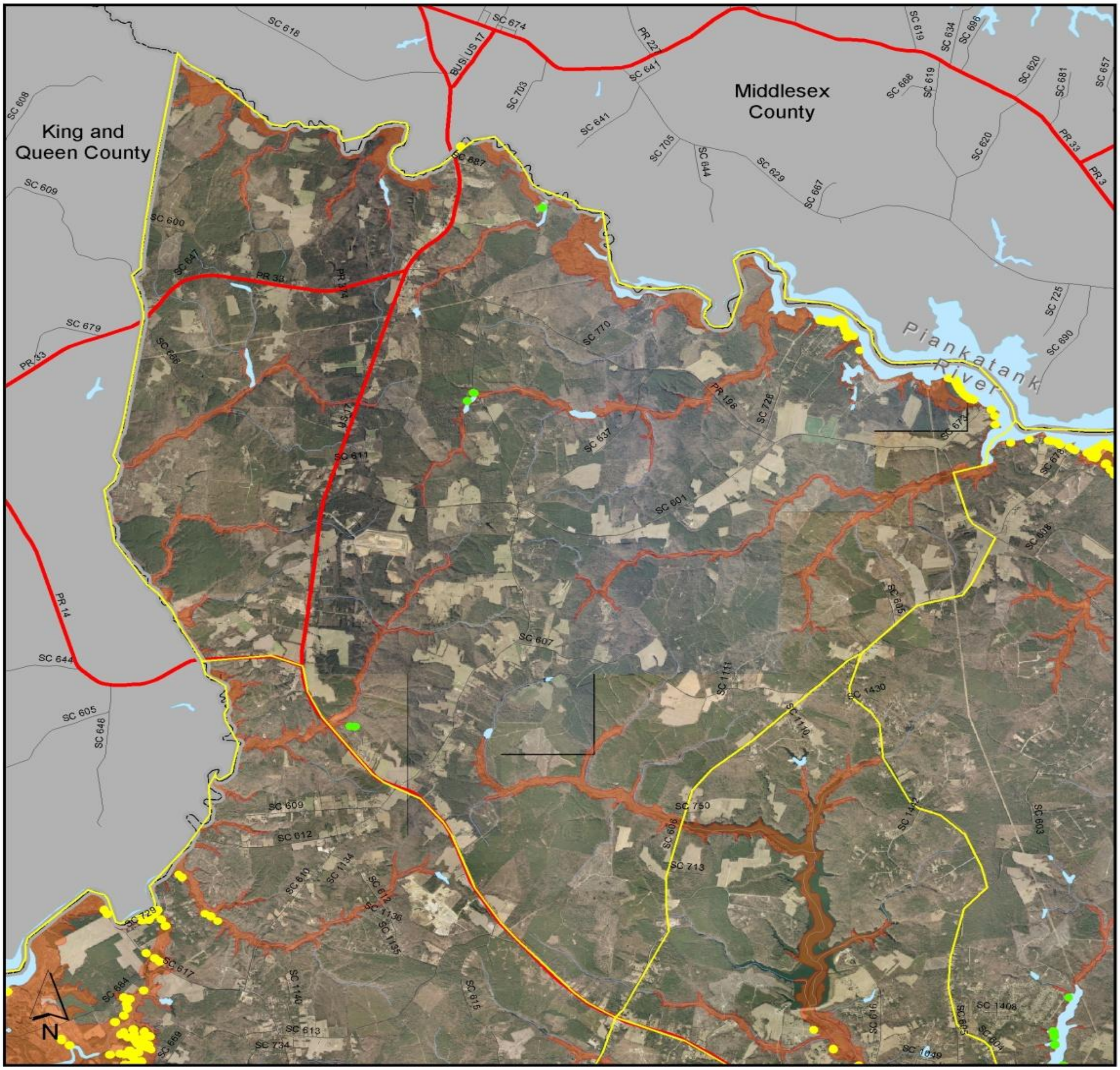
Legend

Census Block Groups

0 1.25 2.5 Miles

Map 45

Gloucester County Flood Plain
Block Group 10011



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

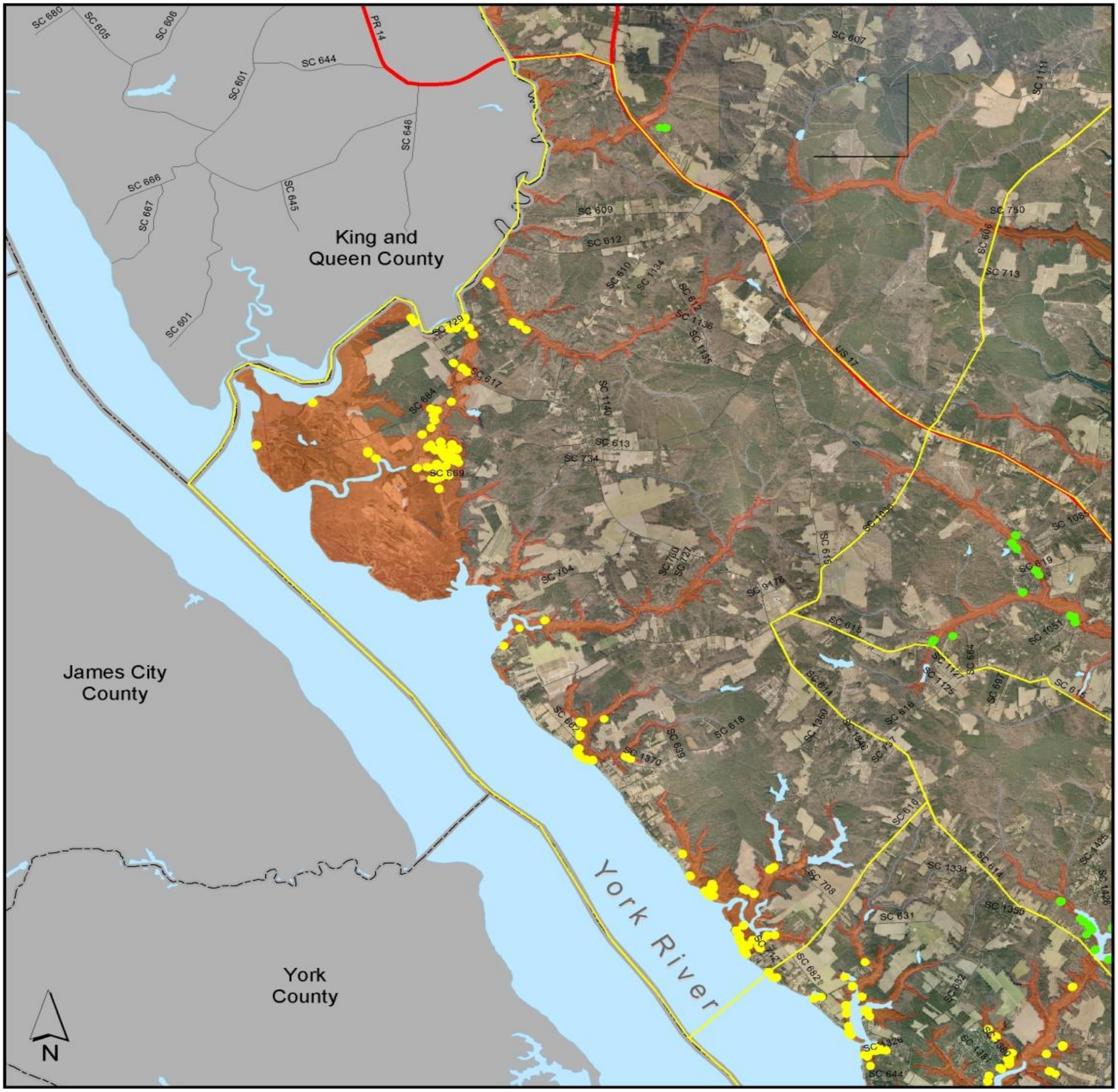
Zone VE

0 1 2 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 46

Gloucester County Flood Plain
Block Group 10012



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

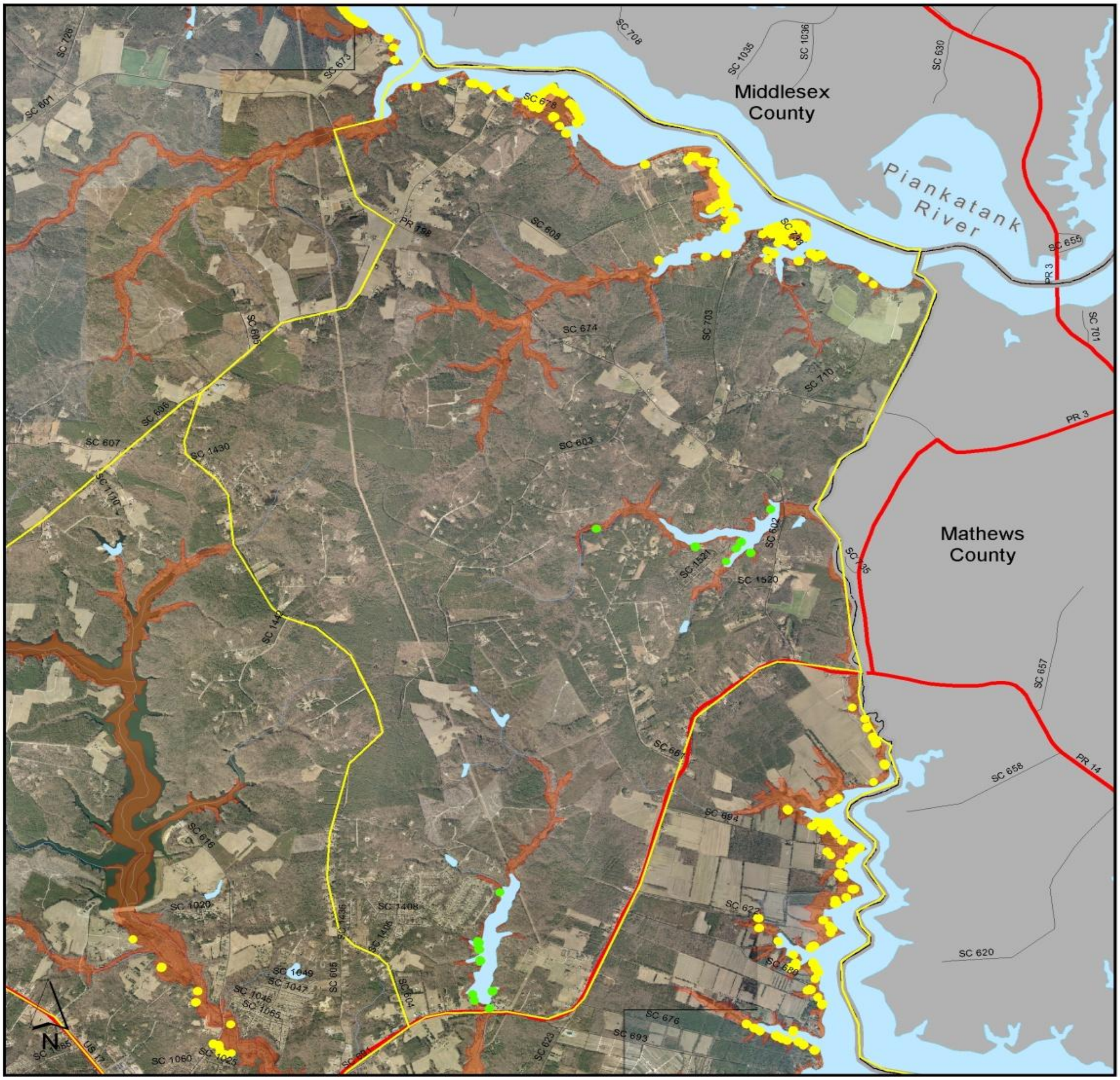
Zone VE

0 1 2 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 47

Gloucester County Flood Plain
Block Group 10021



Legend

100-Year Flood Plain

Affected Structures

Zone A

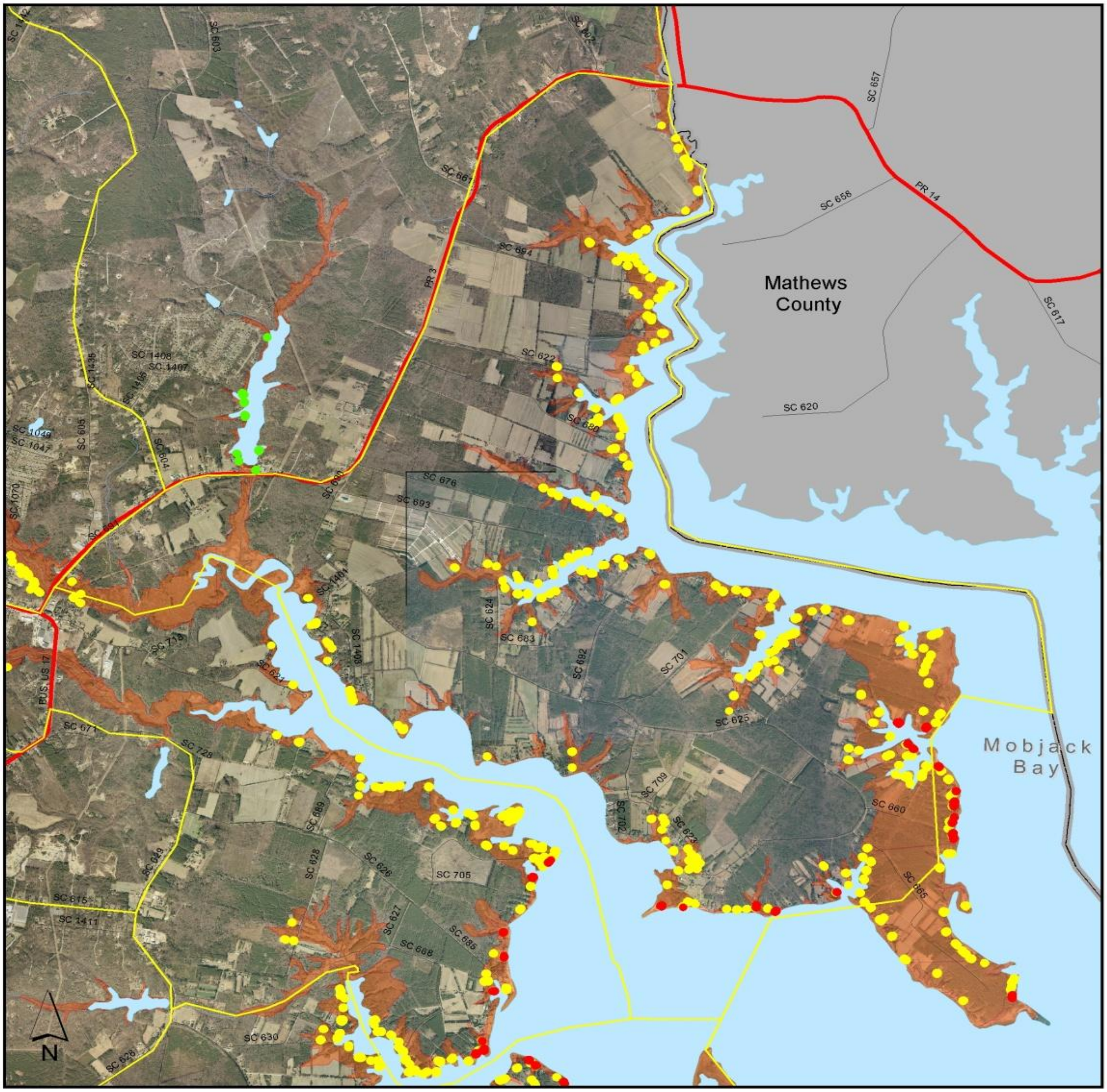
Zone AE

Zone VE

0 0.5 1 Miles

Map 48

Gloucester County Flood Plain
Block Group 10022



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

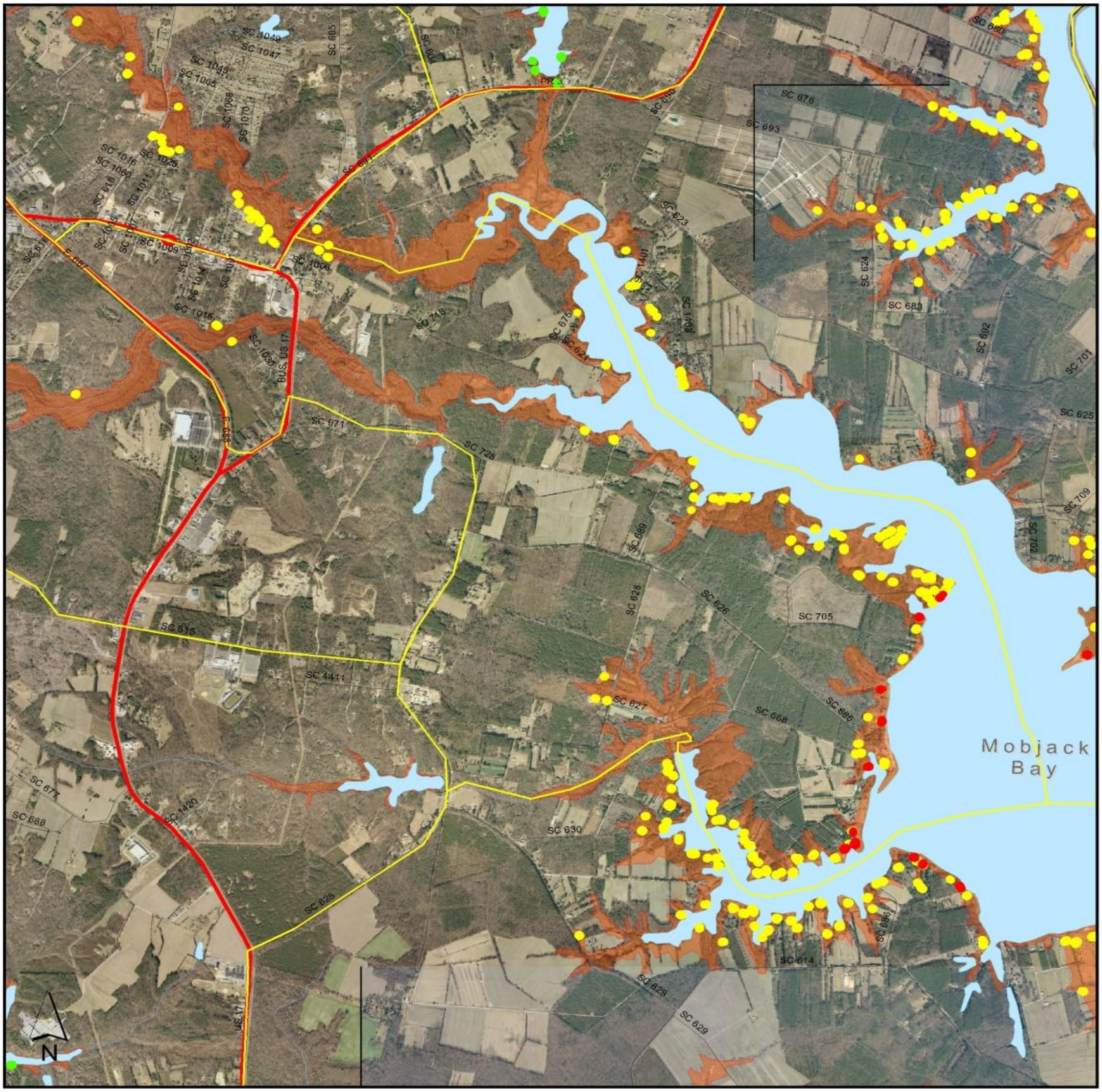
Zone VE

0 0.5 1 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 49

Gloucester County Flood Plain
Block Group 10023



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

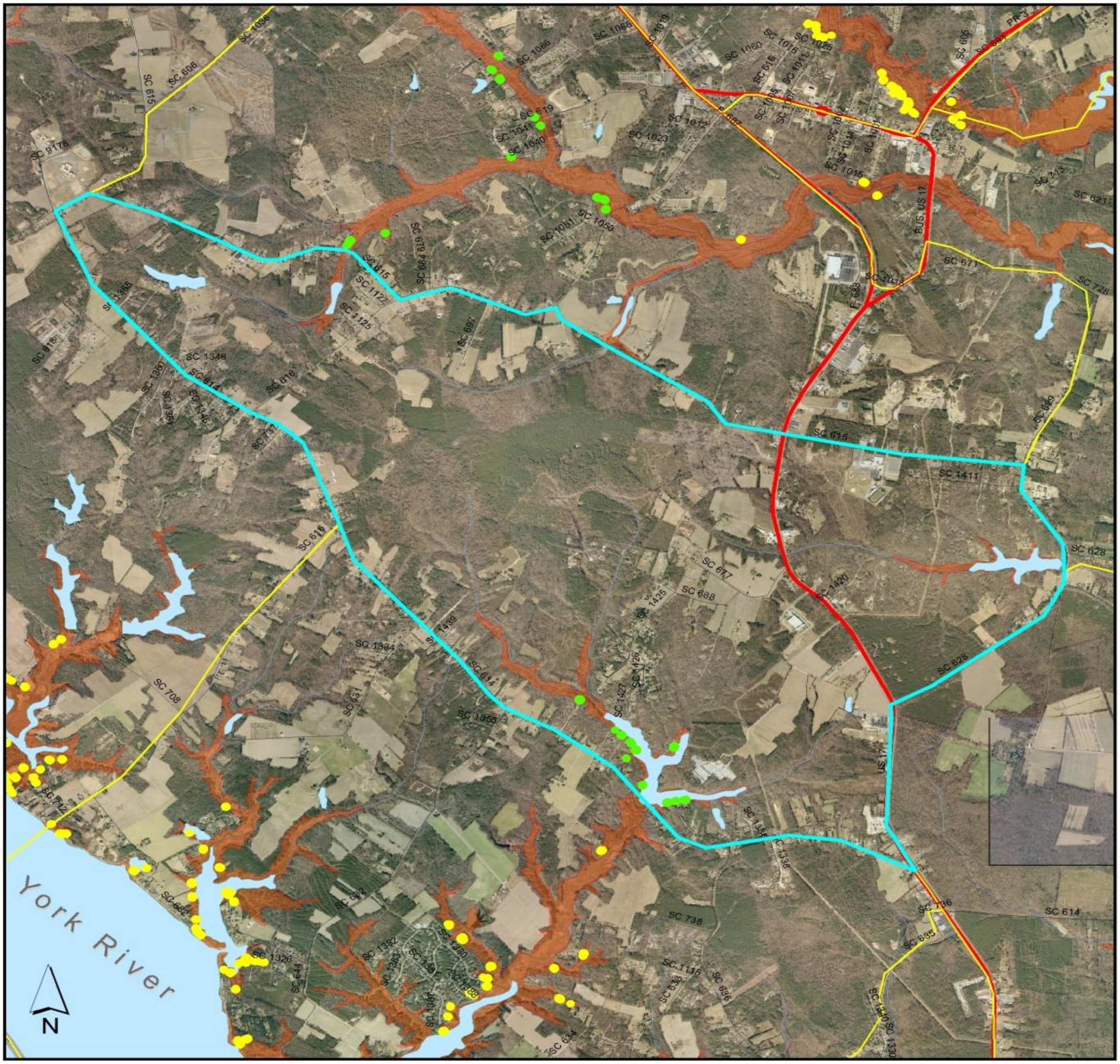
Zone VE

0 0.35 0.7 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 50

Gloucester County Flood Plain
Block Group 10024



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

Zone VE

0 0.45 0.9 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 51

Gloucester County Flood Plain
Block Group 10025

Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

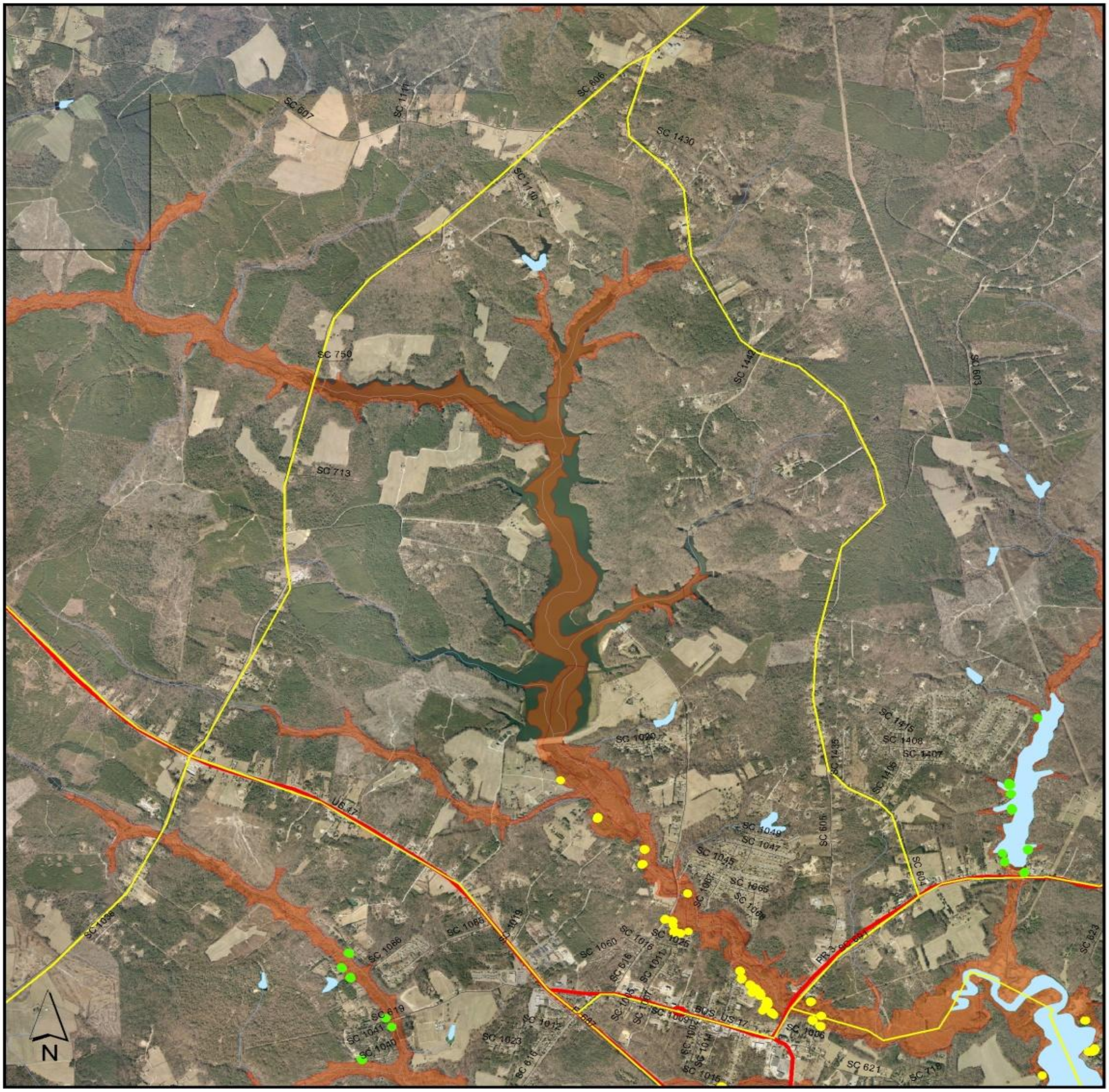
Zone VE

0 0.4 0.8 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 52

Gloucester County Flood Plain
Block Group 10026



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

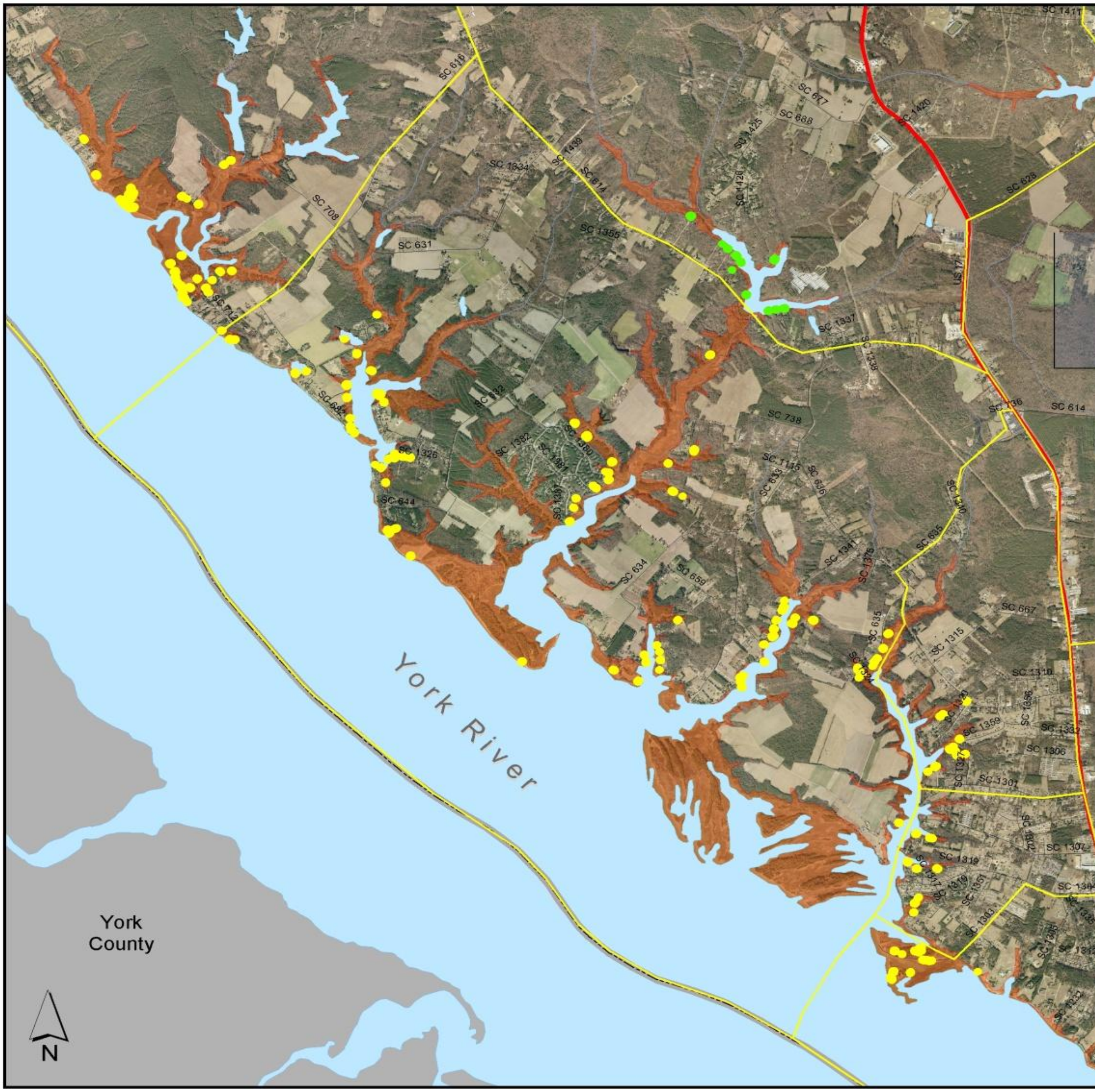
Zone VE

0 0.45 0.9 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 53

Gloucester County Flood Plain
Block Group 10031



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

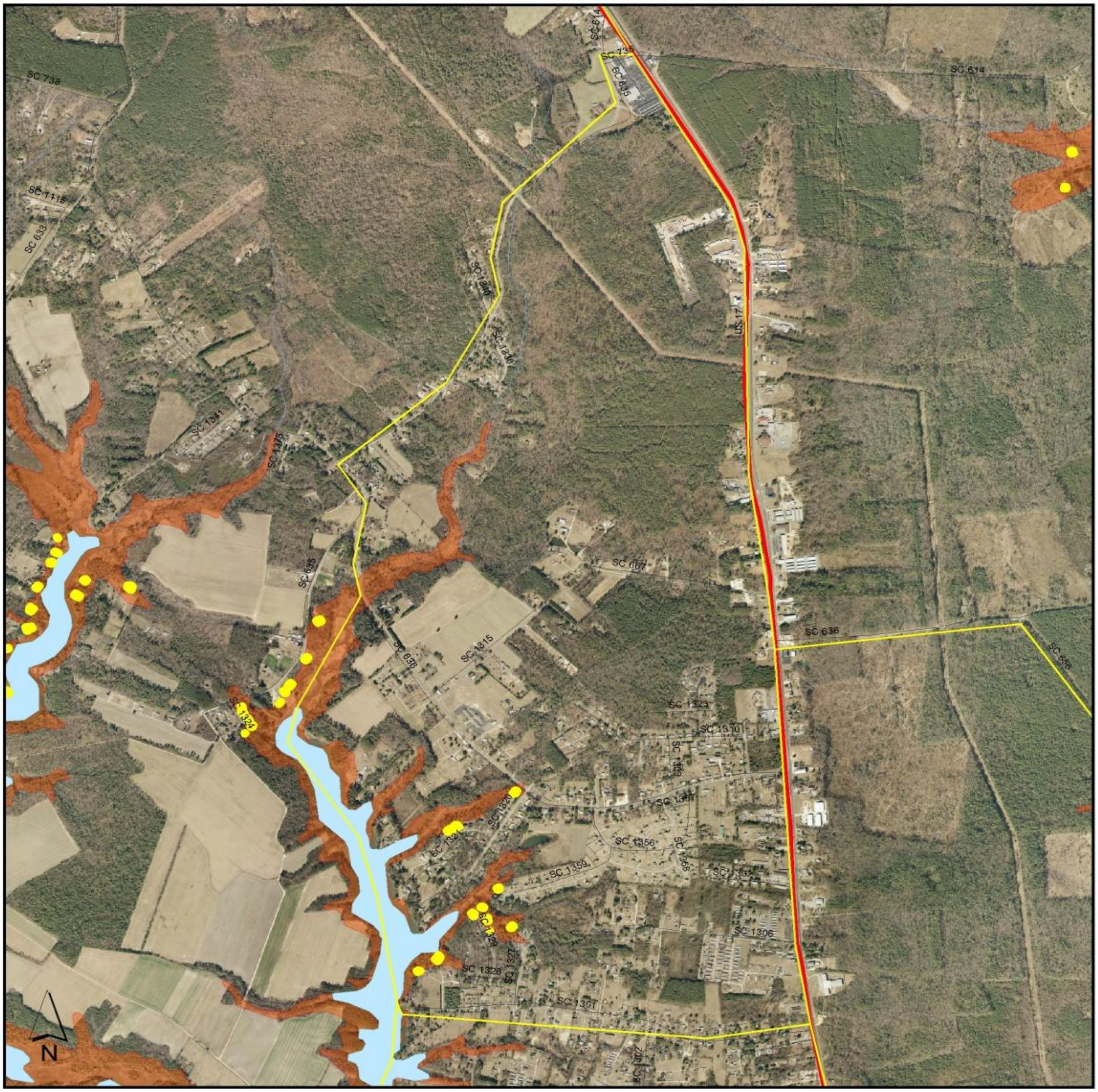
Zone VE

0 0.45 0.9 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 54

Gloucester County Flood Plain
Block Group 10032



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

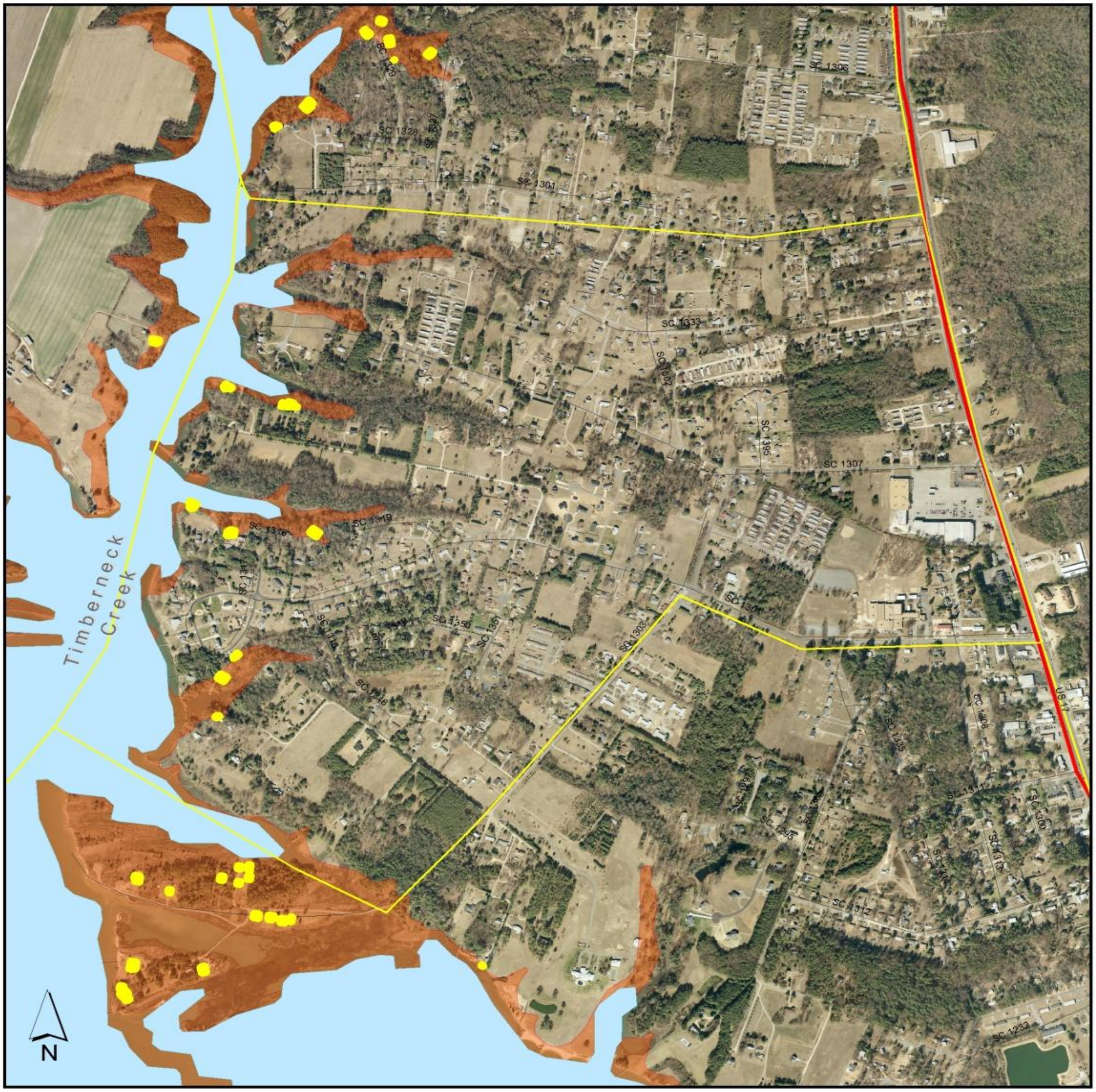
Zone VE

0 0.2 0.4 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 55

Gloucester County Flood Plain
Block Group 10033



Legend

100-Year Flood Plain

Affected Structures

Zone A

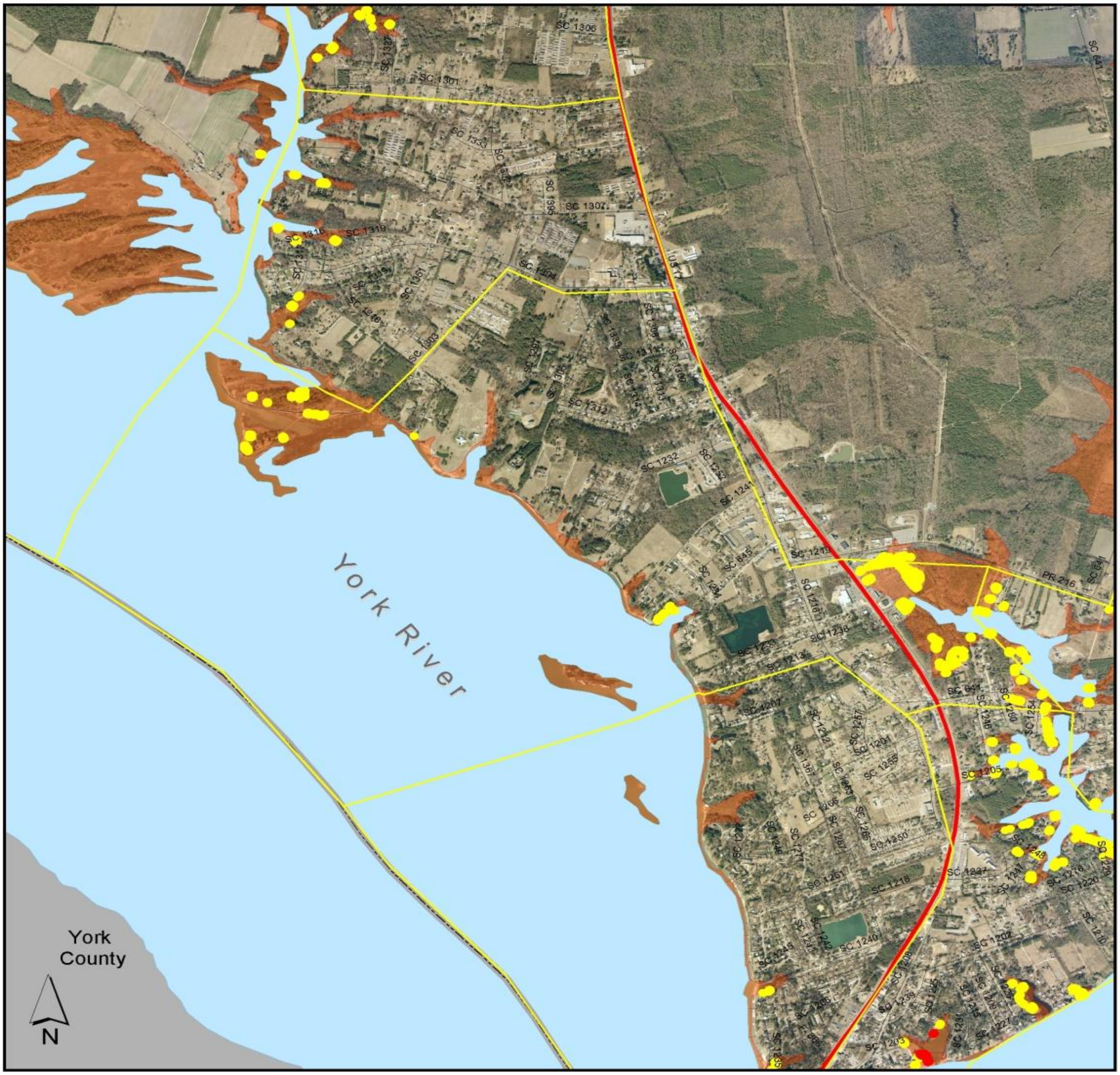
Zone AE

Zone VE

0 0.1 0.2 Miles

Map 56

Gloucester County Flood Plain
Block Group 10034



Legend

100-Year Flood Plain

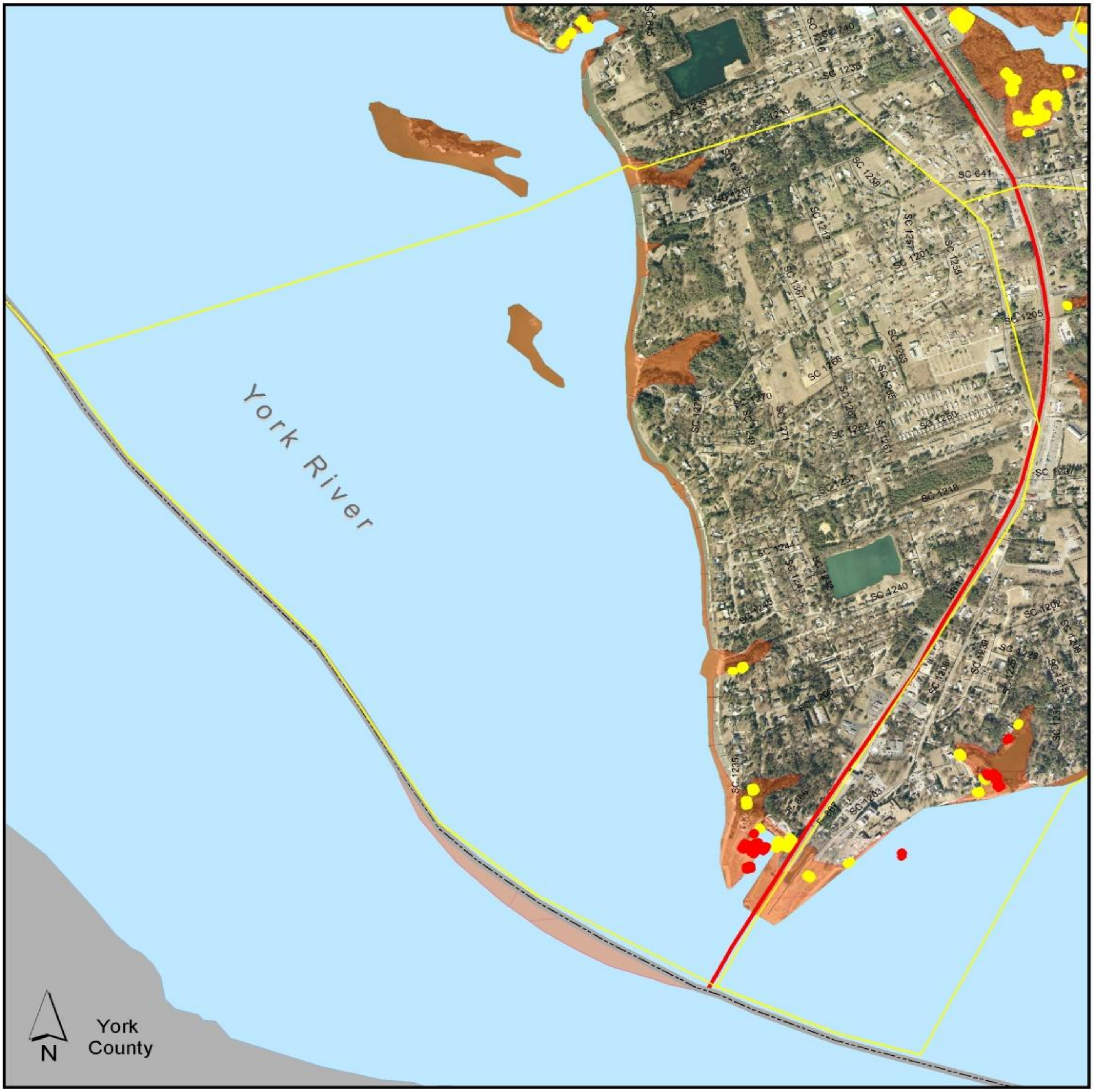
Affected Structures

Zone A
Zone AE
Zone VE

0 0.25 0.5 Miles

Map 57

Gloucester County Flood Plain
Block Group 10035



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

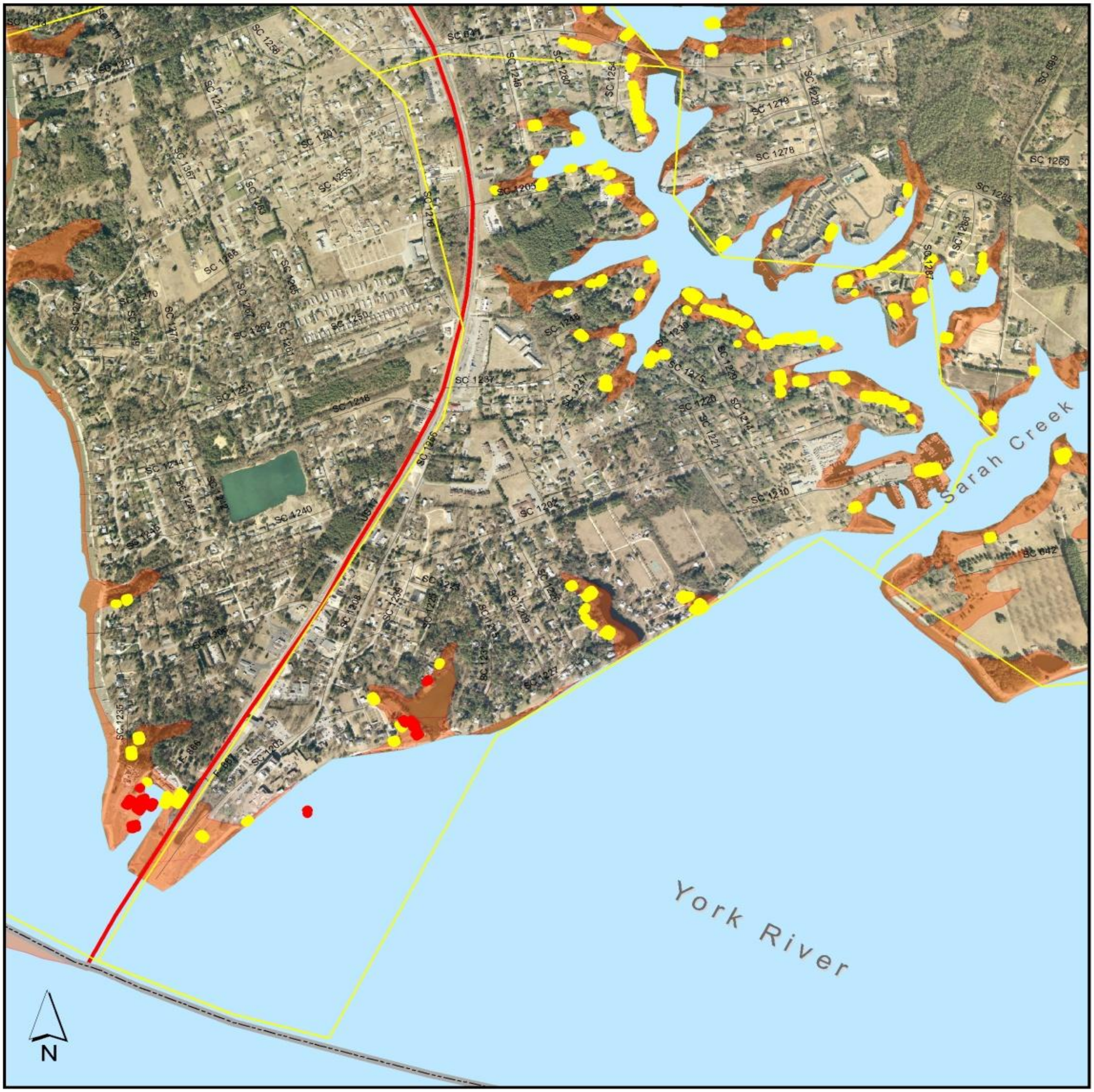
Zone VE

0 0.125 0.25 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 58

Gloucester County Flood Plain
Block Group 10036



Legend

100-Year Flood Plain	

Affected Structures

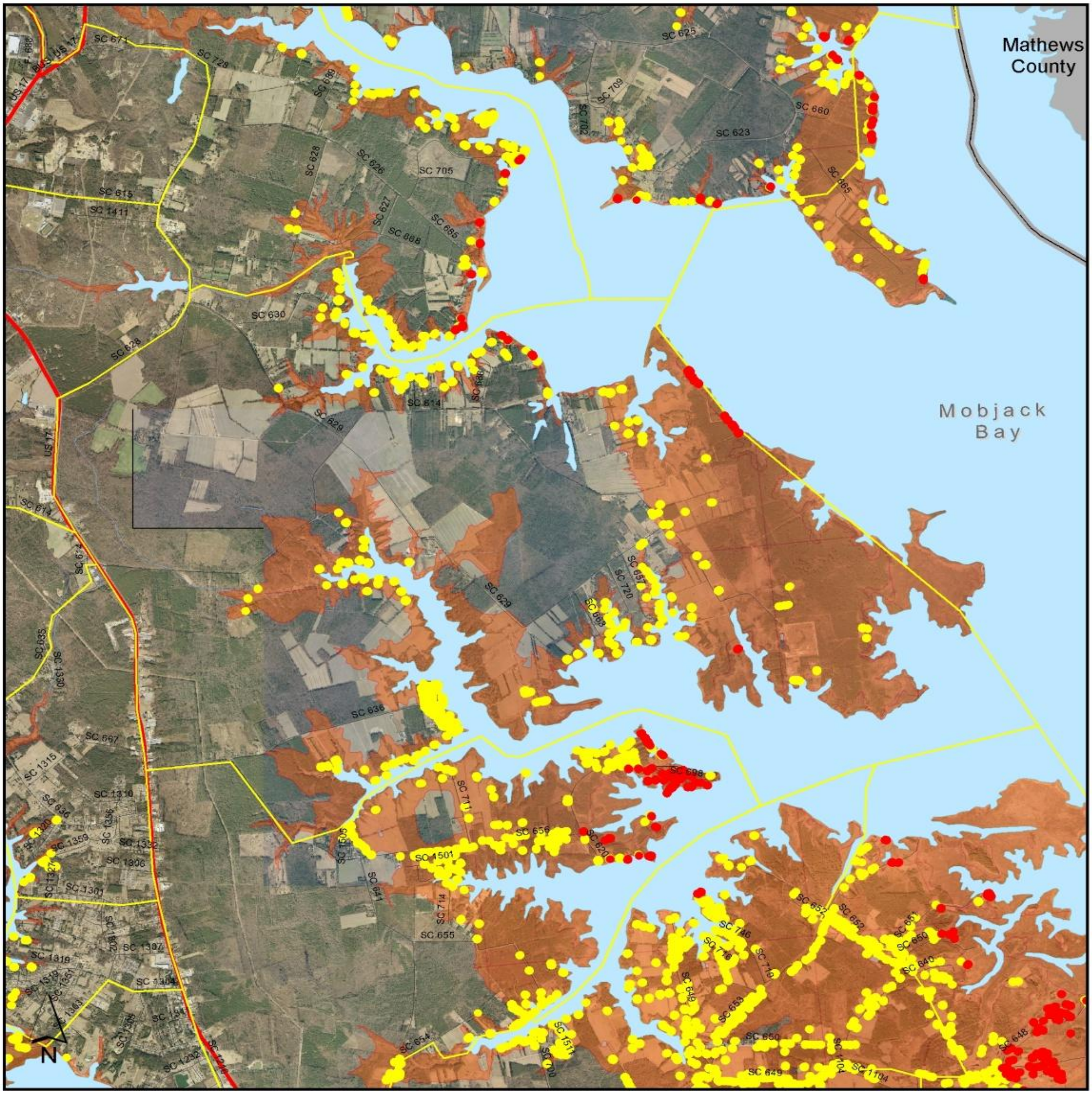
- Zone A
- Zone AE
- Zone VE

0 0.125 0.25 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 59

Gloucester County Flood Plain
Block Group 10041



Legend

100-Year Flood Plain

Affected Structures

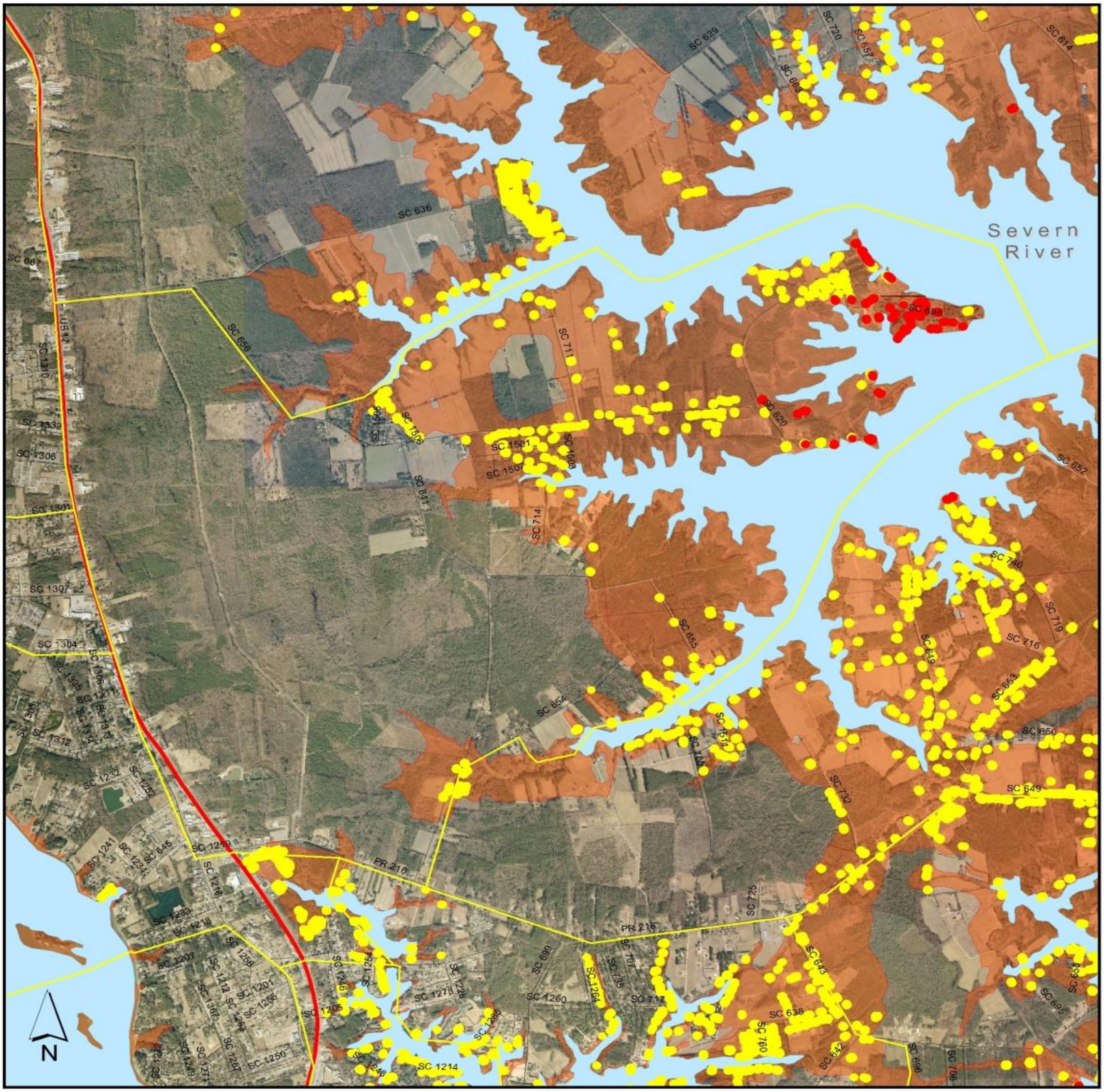
Zone A
Zone AE
Zone VE

0 0.45 0.9 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 60

Gloucester County Flood Plain
Block Group 10042



Legend

100-Year Flood Plain

Affected Structures

Zone A

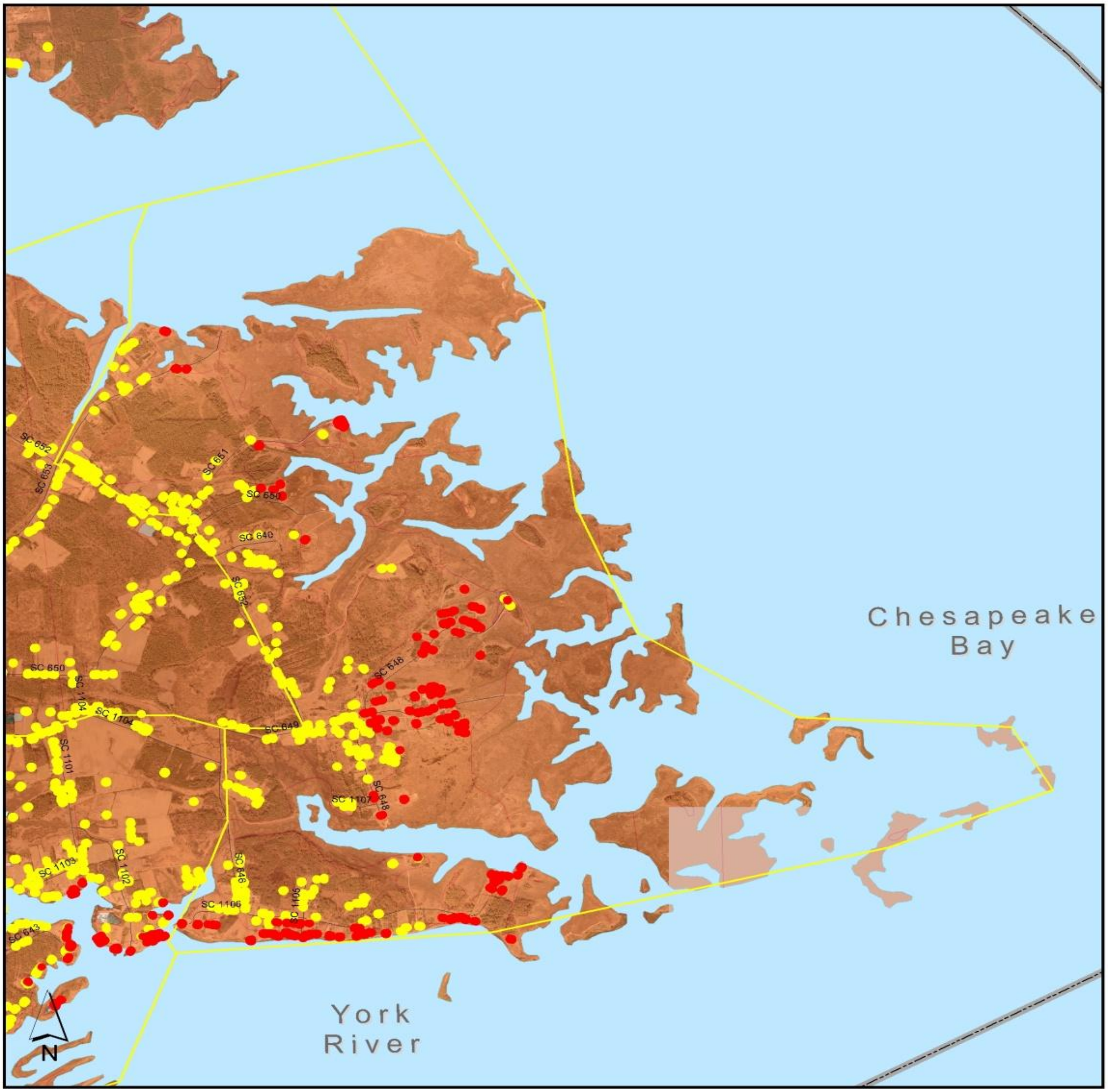
Zone AE

Zone VE

0 0.3 0.6 Miles

Map 61

Gloucester County Flood Plain
Block Group 10051



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

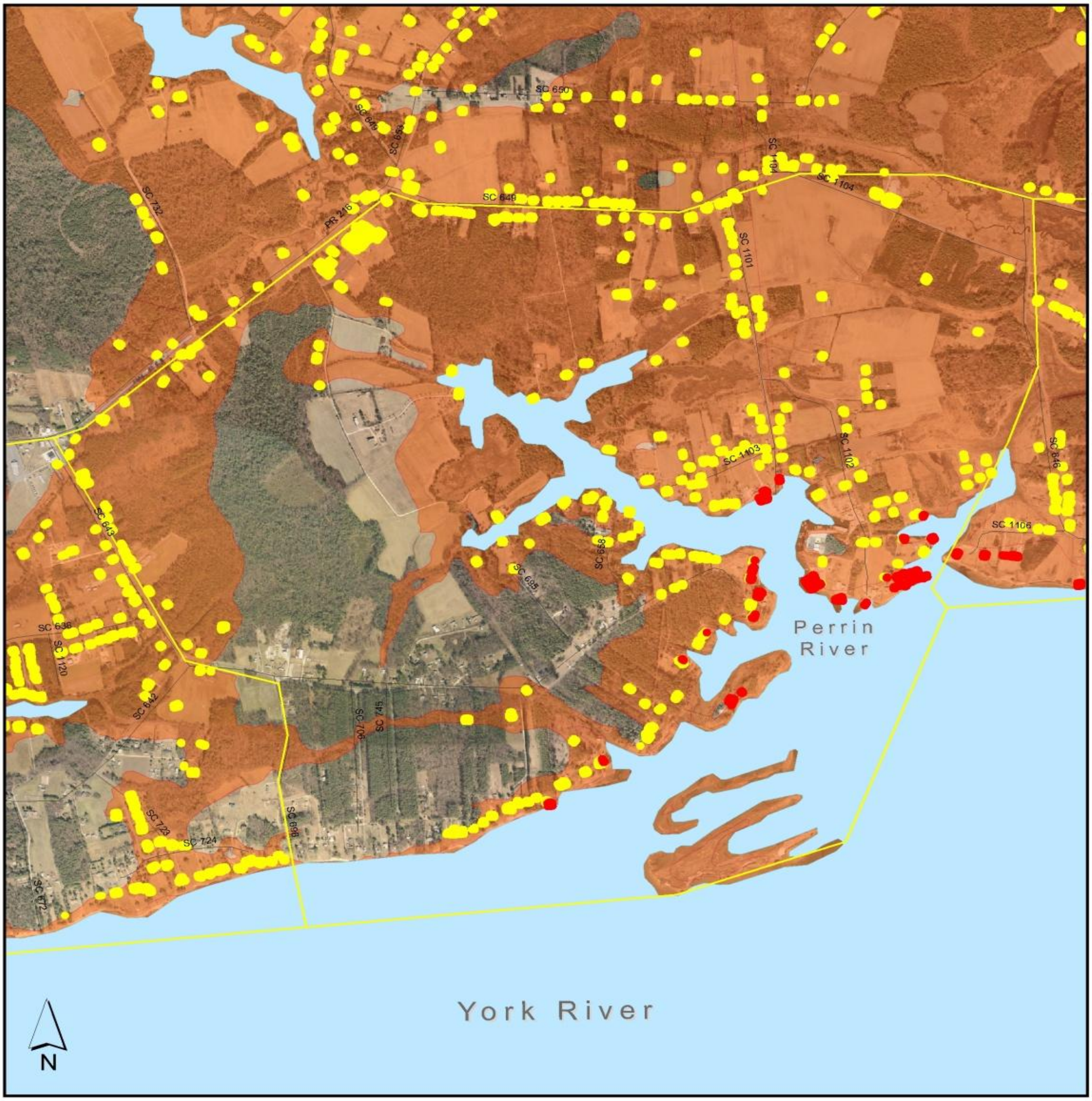
Zone VE

0 0.25 0.5 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 62

Gloucester County Flood Plain
Block Group 10052



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

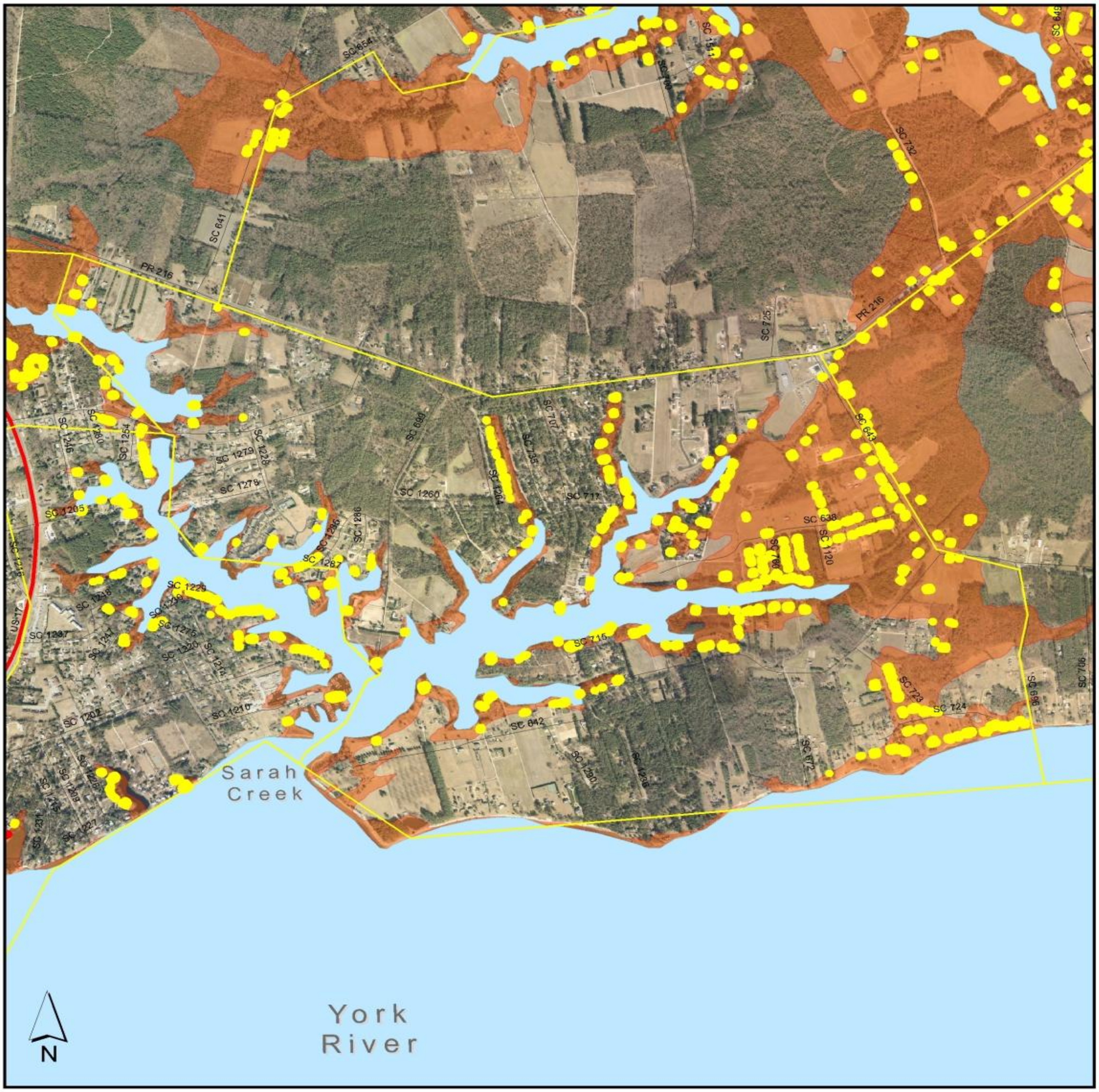
Zone VE

0 0.15 0.3 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 63

Gloucester County Flood Plain
Block Group 10053



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

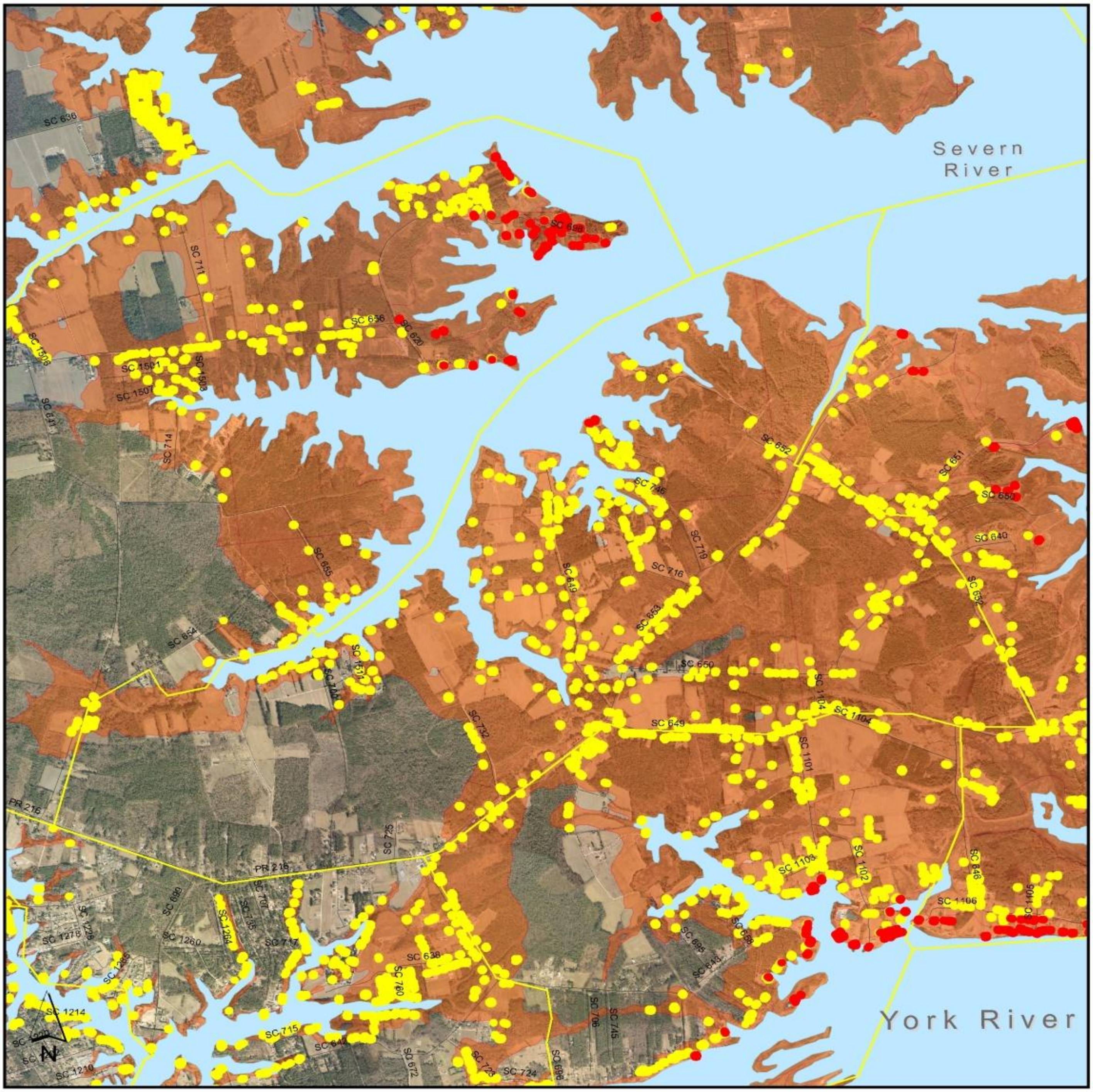
Zone VE

0 0.15 0.3 Miles

Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 64

Gloucester County Flood Plain
Block Group 10054



Legend

100-Year Flood Plain

Affected Structures

Zone A

Zone AE

Zone VE

0 0.25 0.5 Miles

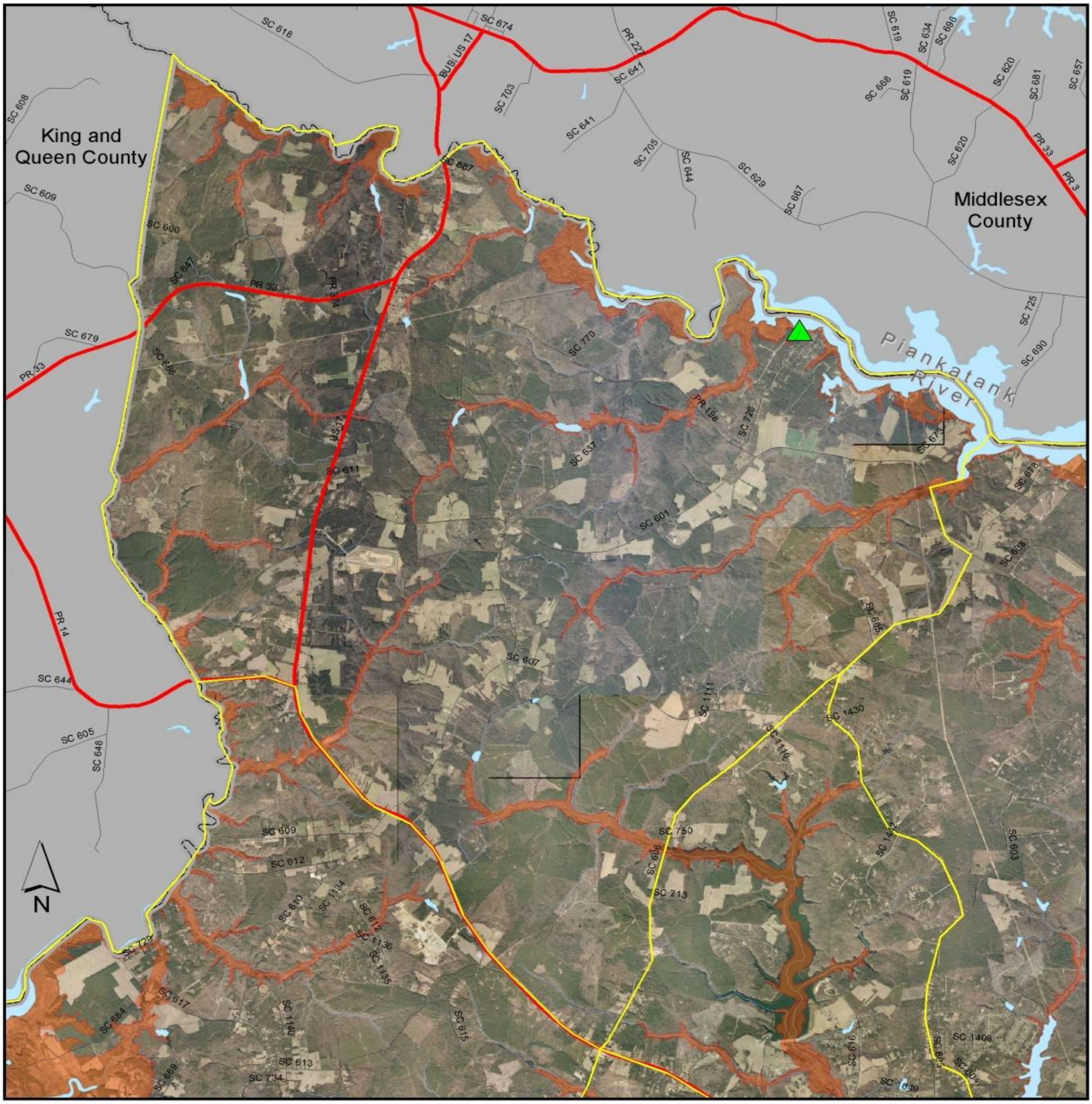
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warranty, expressed or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 65

Alternative On-site Sewage Disposal Systems (OSDS)

The following maps show the locations of the installed OSDS facilities constructed in the 100-year floodplain in Gloucester County.

Gloucester County Alternative OSDS Located in Flood Plain
Block Group 10011



Legend

100-Year Flood Plain

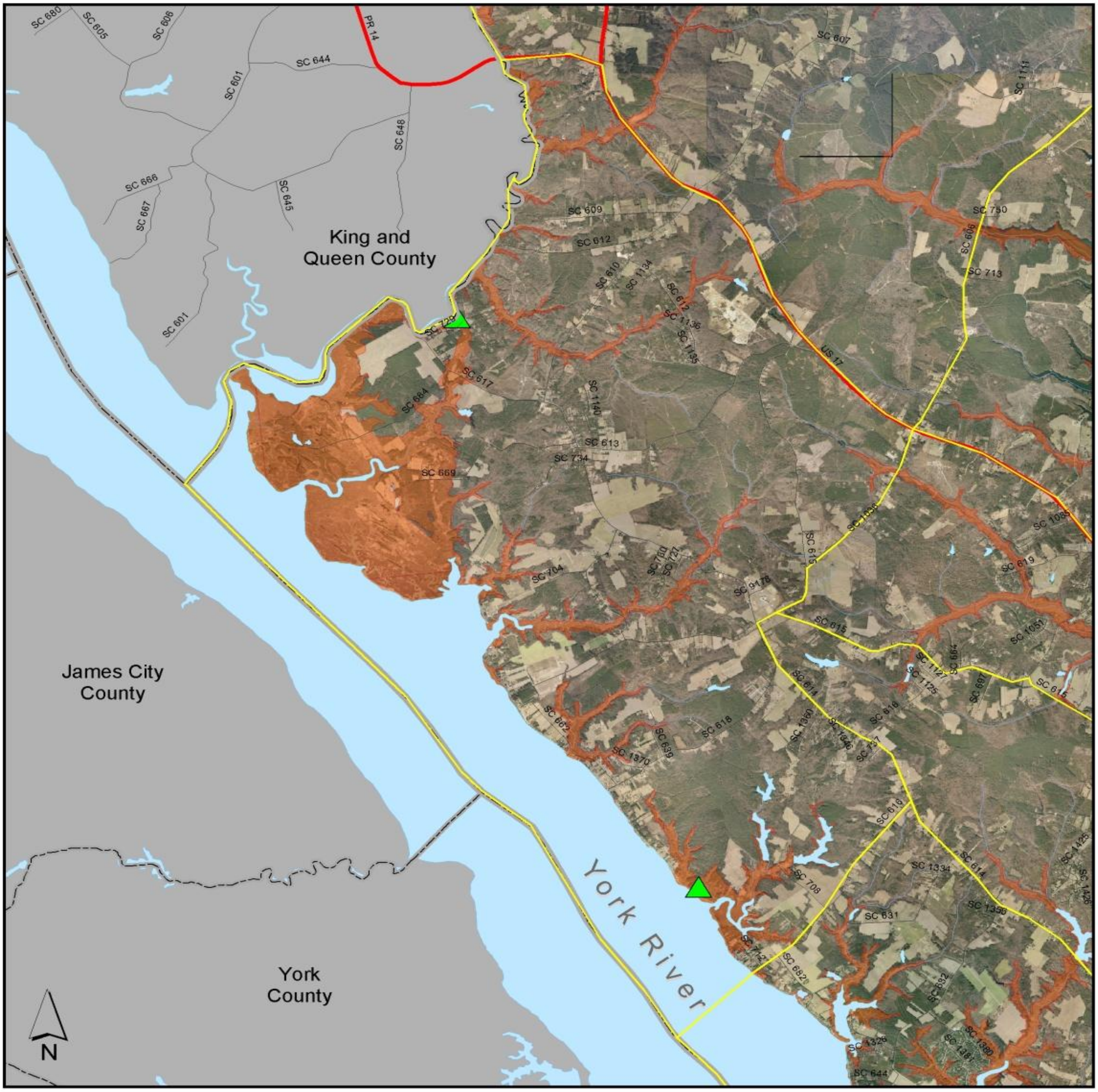
Alternative OSDS in 100-Year Flood Plain=1 System

0 1 2 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.
Alternative Septic done 9-09 by CRC.

Map 66

Gloucester County Alternative OSDS Located in Flood Plain
Block Group 10012



Legend

100-Year Flood Plain

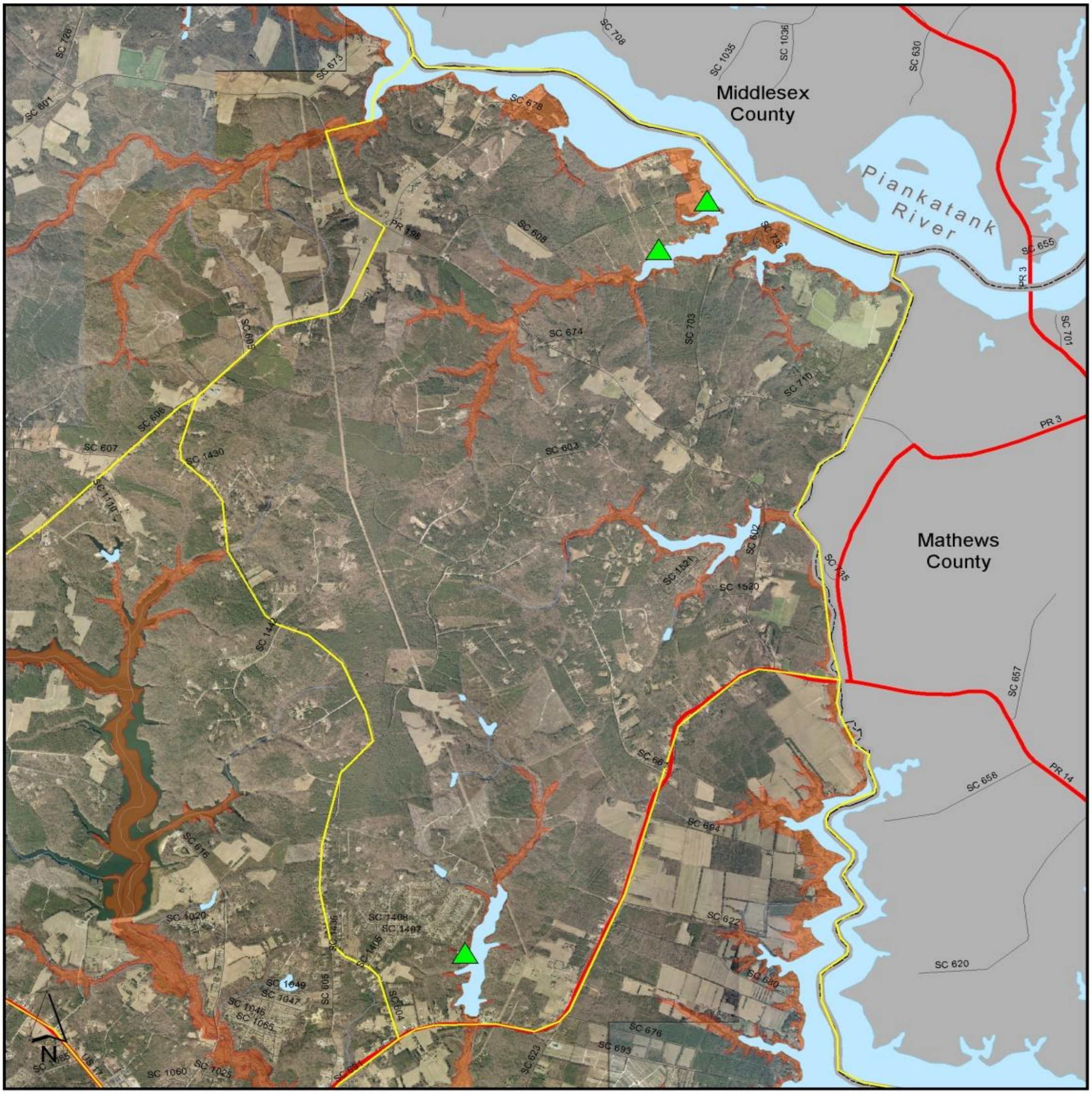
Alternative OSDS in 100-Year Flood Plain = 2 Systems

0 1 2 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 67

Gloucester County Alternative OSDS Located in Flood Plain
Block Group 10021



Legend

100-Year Flood Plain

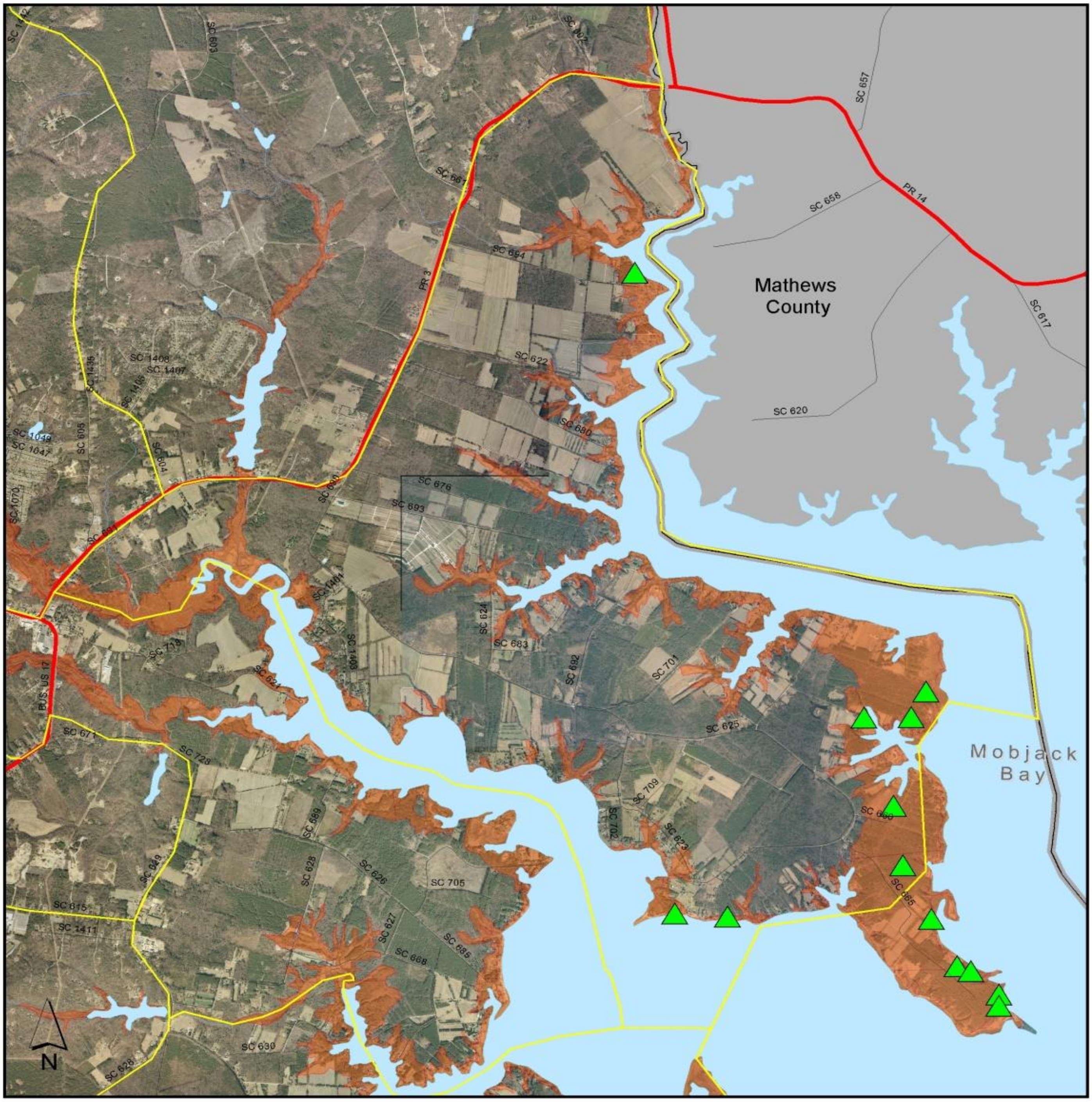
Alternative OSDS in 100-Year Flood Plain = 3 Systems

0 0.5 1 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 68

Gloucester County Alternative OSDS Located in Flood Plain
Block Group 10022



Legend

100-Year Flood Plain

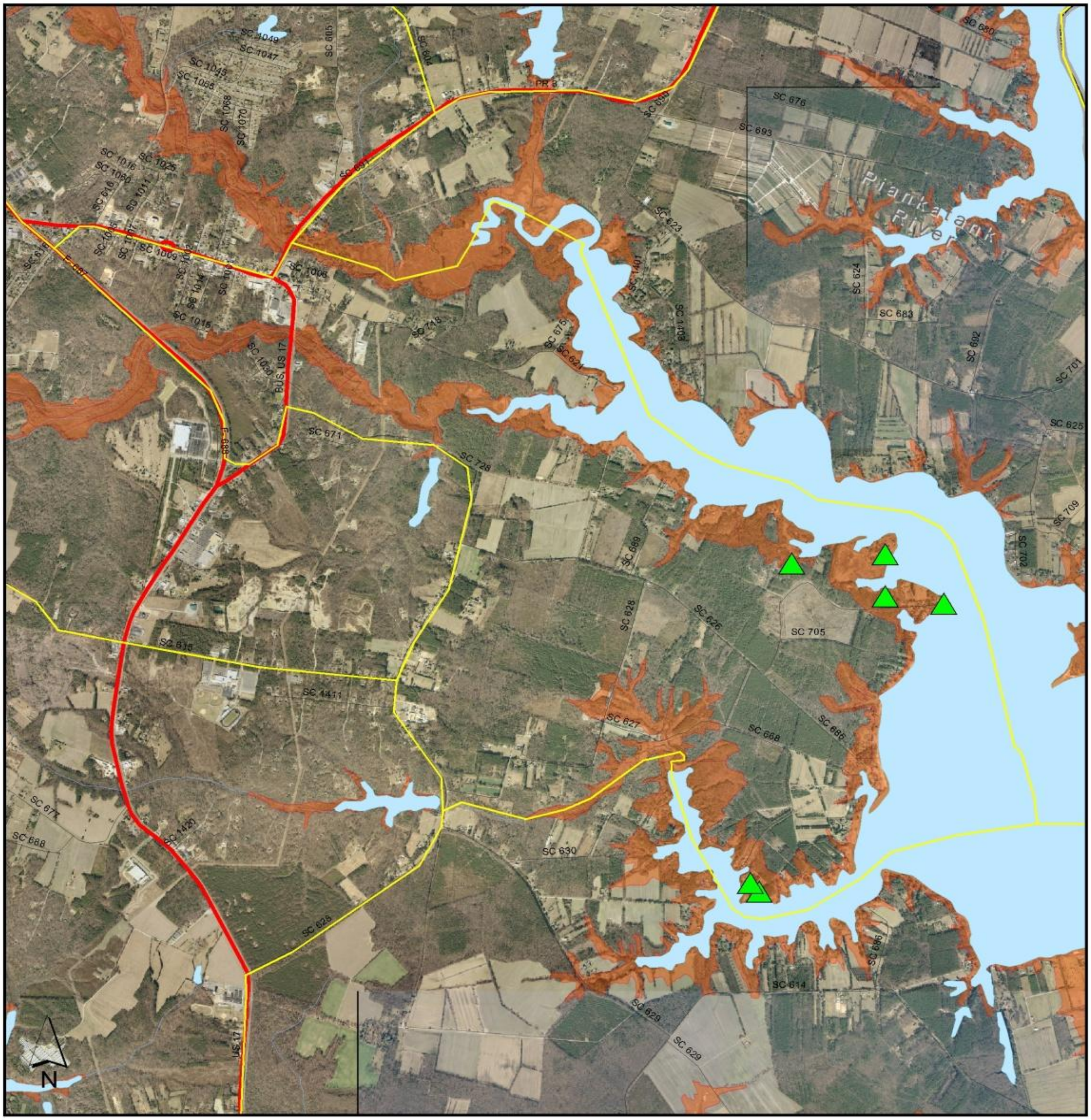
Alternative OSDS in 100-Year Flood Plain = 13 Systems

0 0.5 1 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 69

Gloucester County Alternative OSDS Located in Flood Plain
Block Group 10023



Legend

100-Year Flood Plain

Alternative OSDS in 100-Year Flood Plain = 6 Systems

0 0.35 0.7 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 70

Gloucester County Alternative OSDS Located in Flood Plain
Block Group 10031

Legend

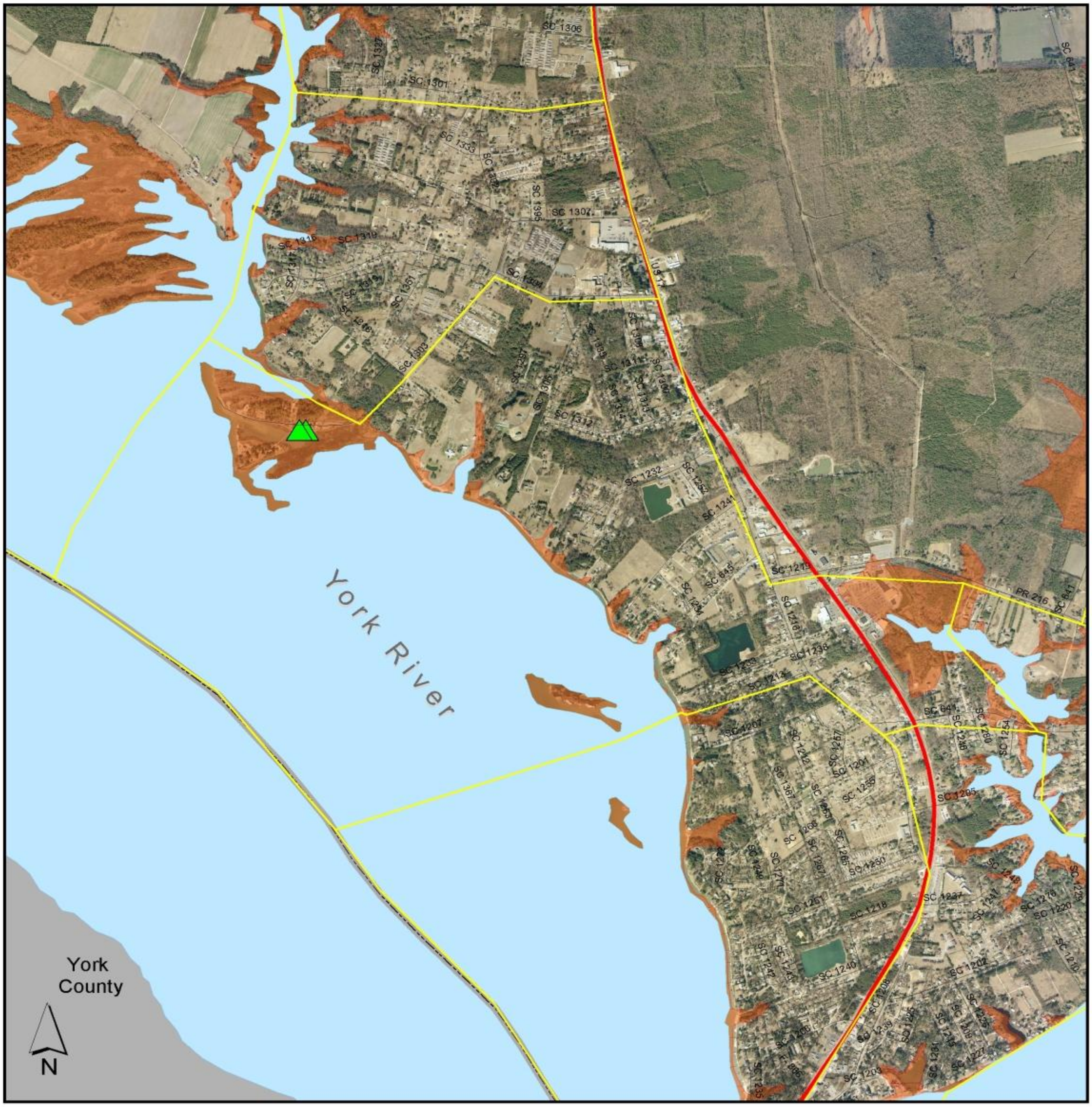
100-Year Flood Plain

Alternative OSDS Located in 100-Year Flood Plain = 2 Systems

0 0.45 0.9 Miles

Map 71

Gloucester County Alternative OSDS Located in Flood Plain
Block Group 10034



Legend

100-Year Flood Plain

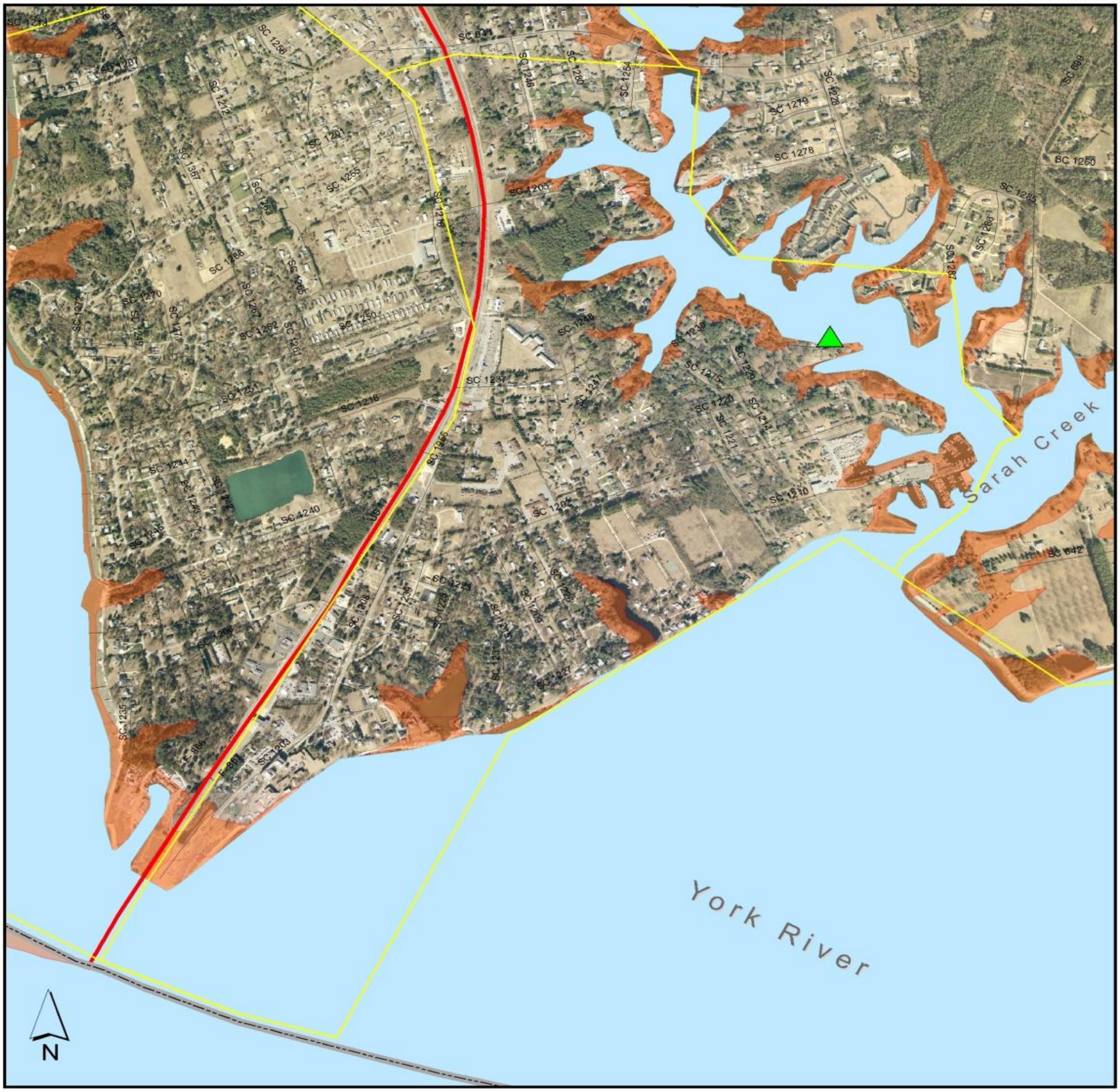
Alternative OSDS Located in 100-Year Flood Plain = 2 Systems

0 0.25 0.5 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 72

Gloucester County Alternative OSDS Located in Flood Plain
Block Group 10036



Legend

100-Year Flood Plain

Alternative OSDS Located in 100-Year Flood Plain = 1 System

0 0.125 0.25 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 73

Mathews Critical Facilities and Public Utilities

The Mathews Courthouse Wastewater Treatment Plant serves the businesses, residences and governmental offices in the courthouse area. This village-like area is located in the geographic center of Mathews County. The plant is operated and maintained by the Hampton Roads Sanitation District (HRSD). The plant is adversely affected by floodwaters and HSRD has a mitigation action plan to take this wastewater facility off line and to pump the sewerage thru a force main to Gloucester County. The sewerage will then be pumped to HRSD's York River Wastewater Treatment Plant located in York County. This project is being undertaken to ensure protection from environmental damages and continual operation during future flooding events.

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.

Table 17. Mathews County Flood Prone Roads

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

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 Rd.	from Rte. 14 to ESM
611	Tabernacle Road	from Rte. 613 to Rte. 610
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. 663 to Rte. 636
608	Potato Neck Road	from Rte. 649 to ESM
644	Bandy Ridge Road	from Rte. 611 to Rte. 614

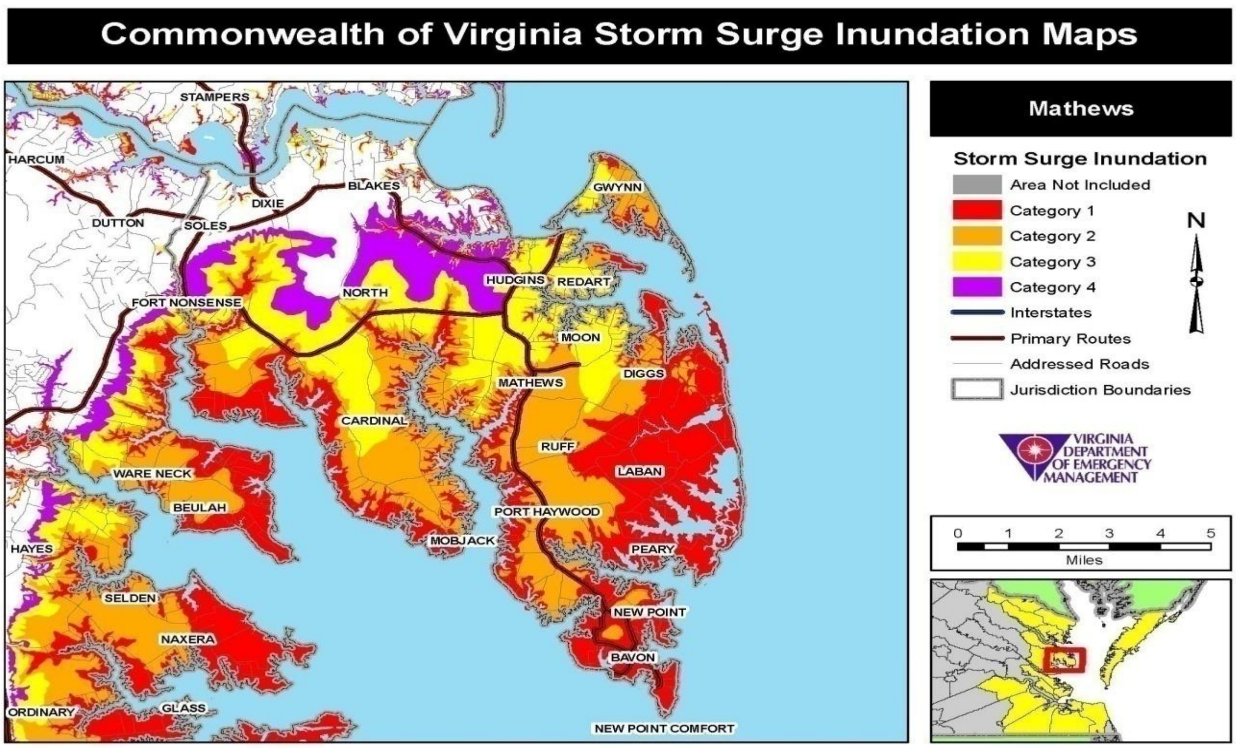
Repetitive and Severe Repetitive Loss Residential Structures in Mathews County

According to FEMA's records, there are 155 residential properties on the Repetitive Loss List and 1 on the Severe Repetitive Loss List as of 5/31/10. These properties are listed in Appendix 9 at the end of this document.

Public School Properties

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

Map 74. 2008 Hurricane Storm Surge Hazard Map – Mathews County



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 floodplain. 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.

Mathews County
Flood Plain

Legend

100-Year Flood Plain

0 1 2 Miles

Map 75

Mathews County
Block Groups

Legend

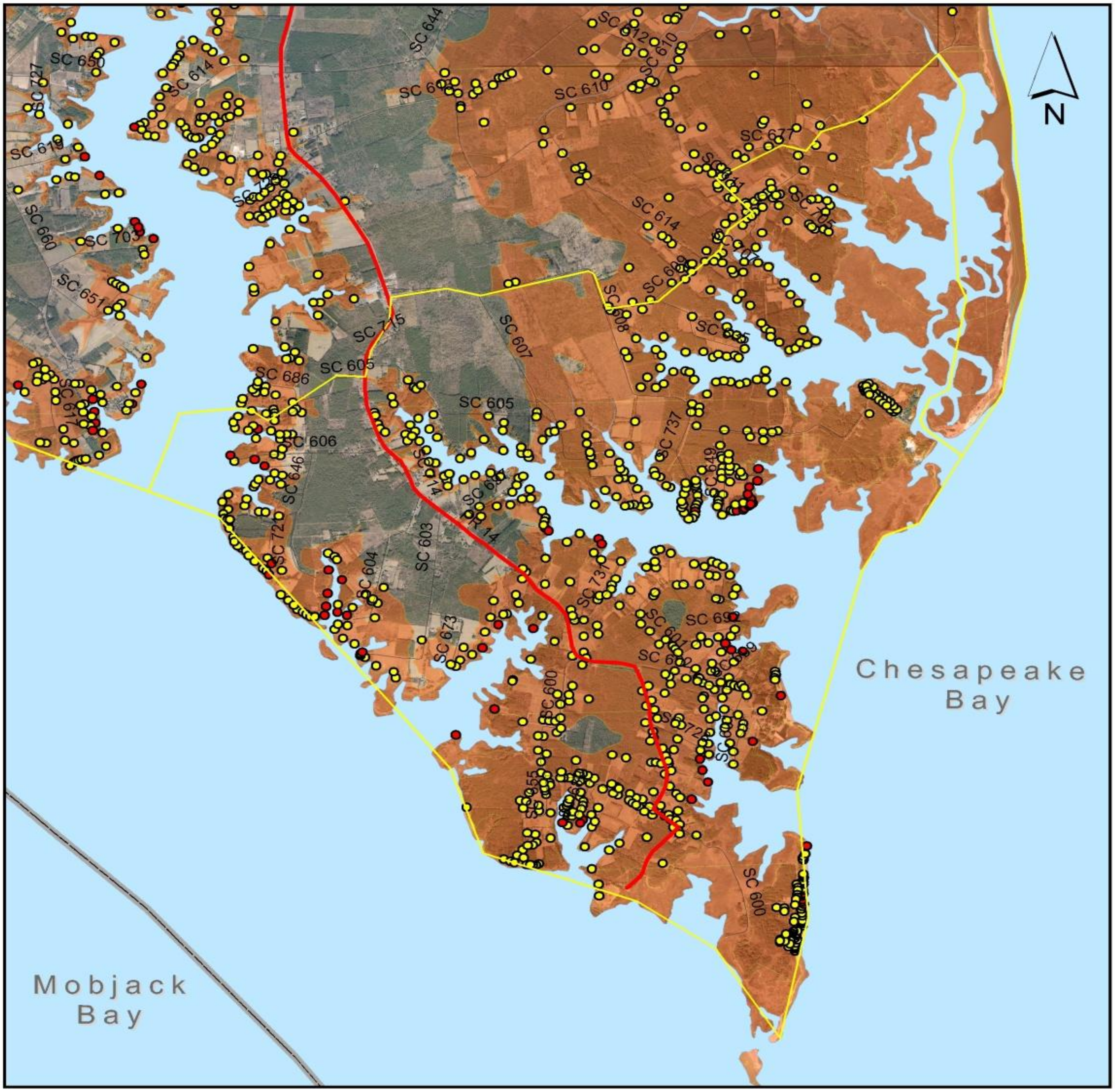
Census Block Groups

0 1 2 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 76

Mathews County Flood Plain
Block Group 95142



Legend

100-Year Flood Plain

0 0.3 0.6 Miles

Affected Structures

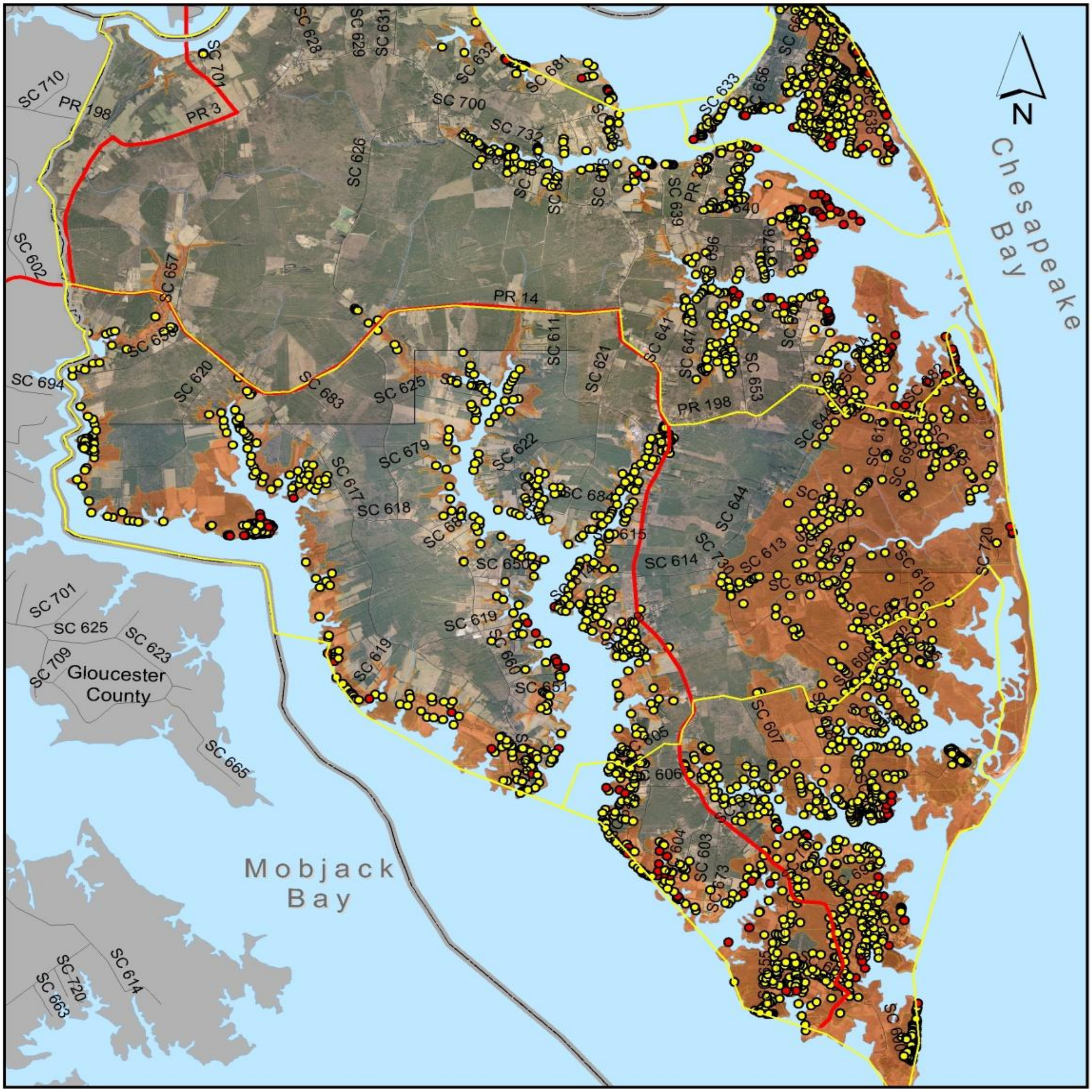
Zone AE

Zone VE

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 77

Mathews County Flood Plain
Block Group 95141



Legend

100-Year Flood Plain

0 0.5 1 Miles

Affected Structures

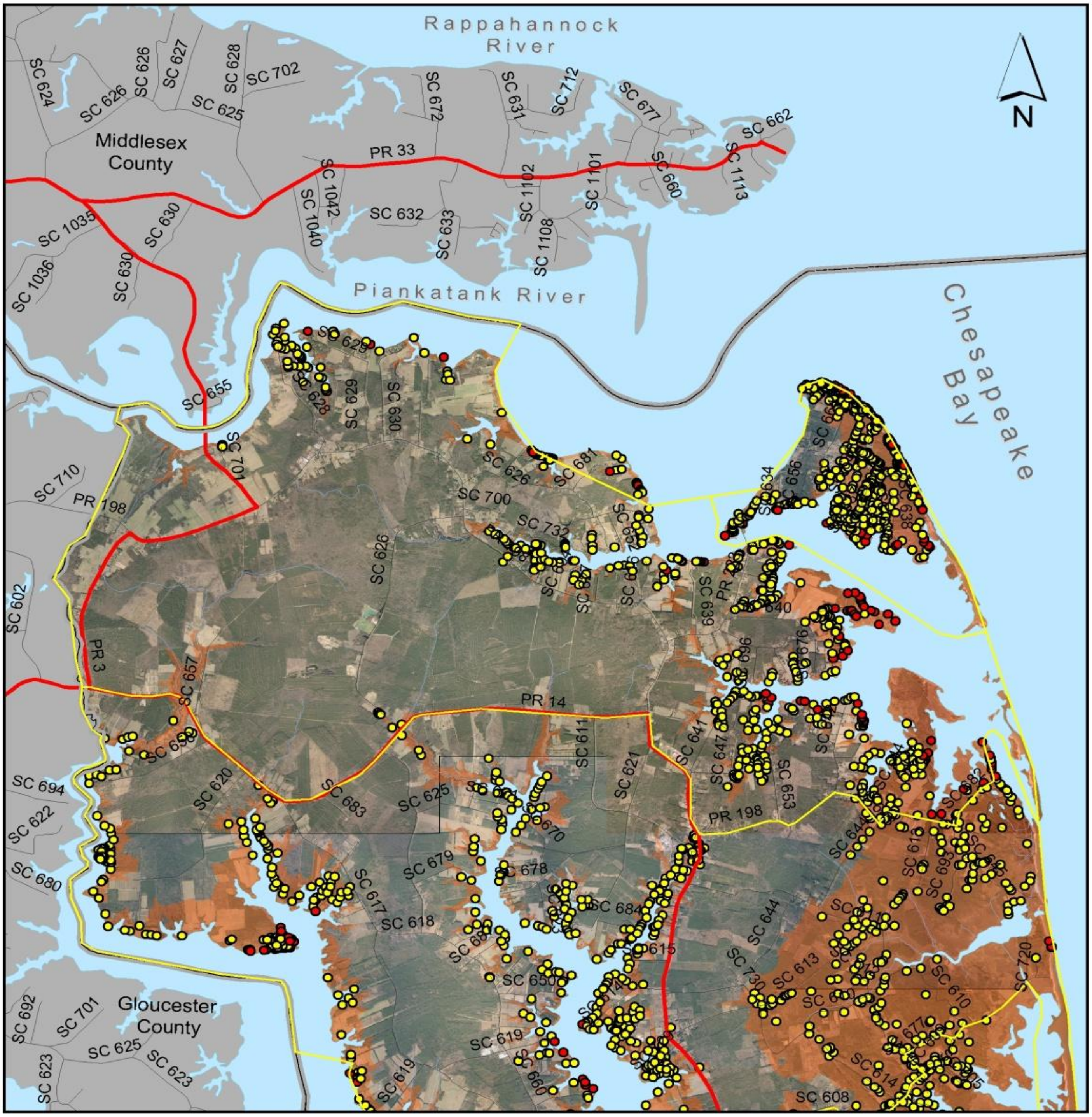
Zone AE

Zone VE

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 78

Mathews County Flood Plain
Block Group 95132



Legend

100-Year Flood Plain

0 0.5 1 Miles

Affected Structures

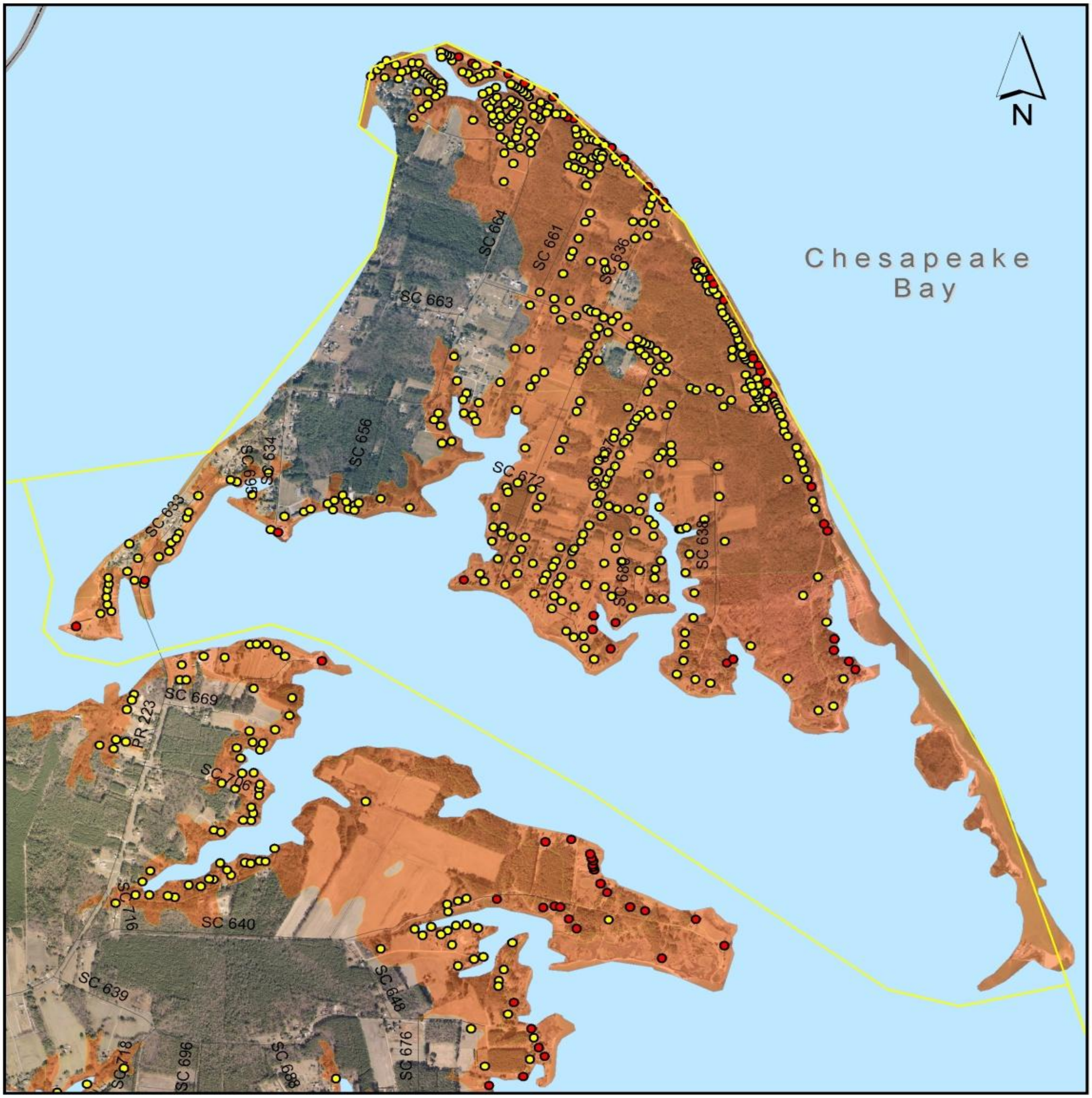
Zone AE

Zone VE

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 79

Mathews County Flood Plain
Block Group 95131



Legend

100-Year Flood Plain

Affected Structures

Zone AE

Zone VE

0 0.2 0.4 Miles

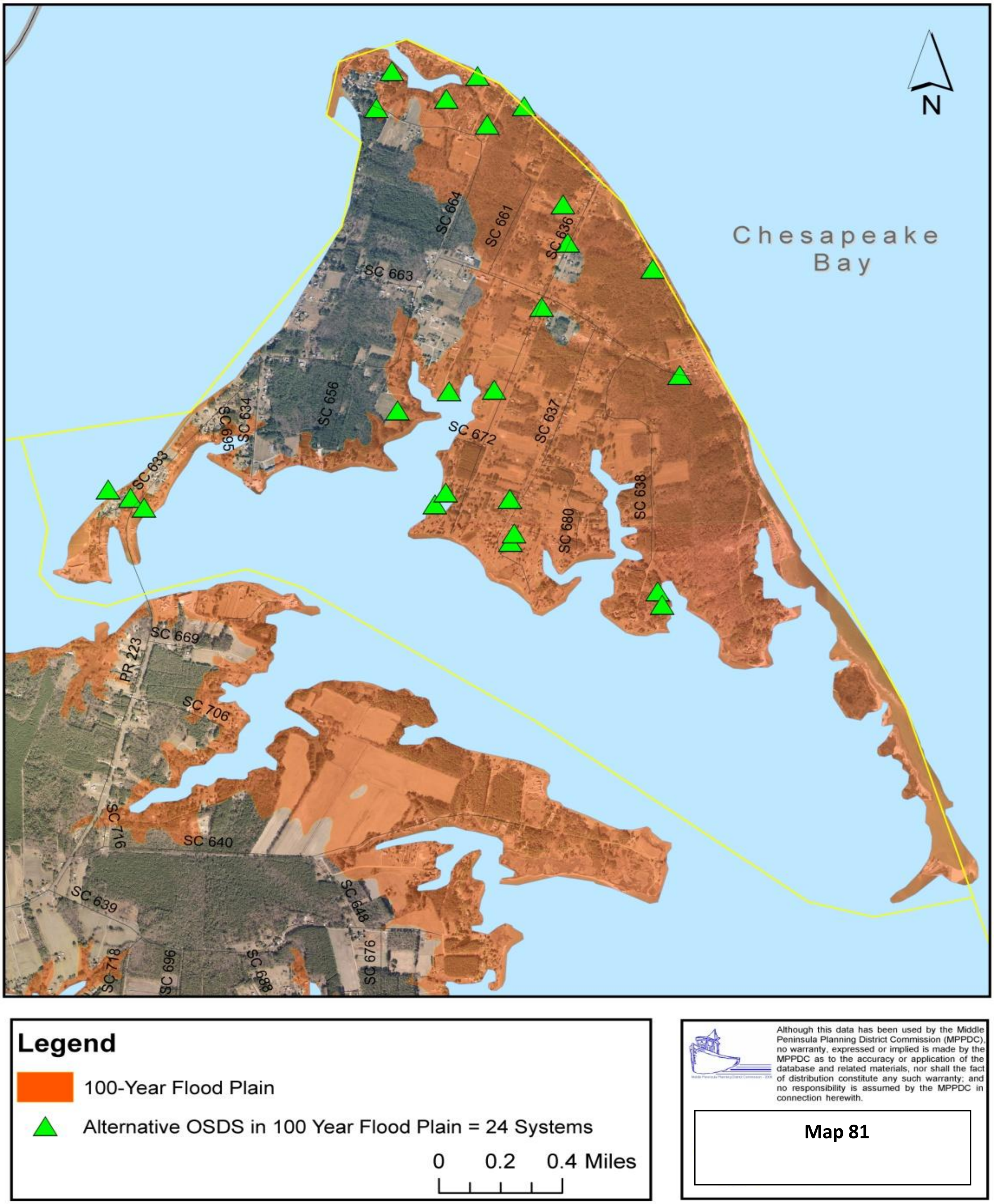
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warranty, expressed or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 80

Alternative On-site Sewage Disposal Systems (OSDS)

The following maps show the location of the OSDS facilities constructed in the 100-year floodplain in Mathews County.

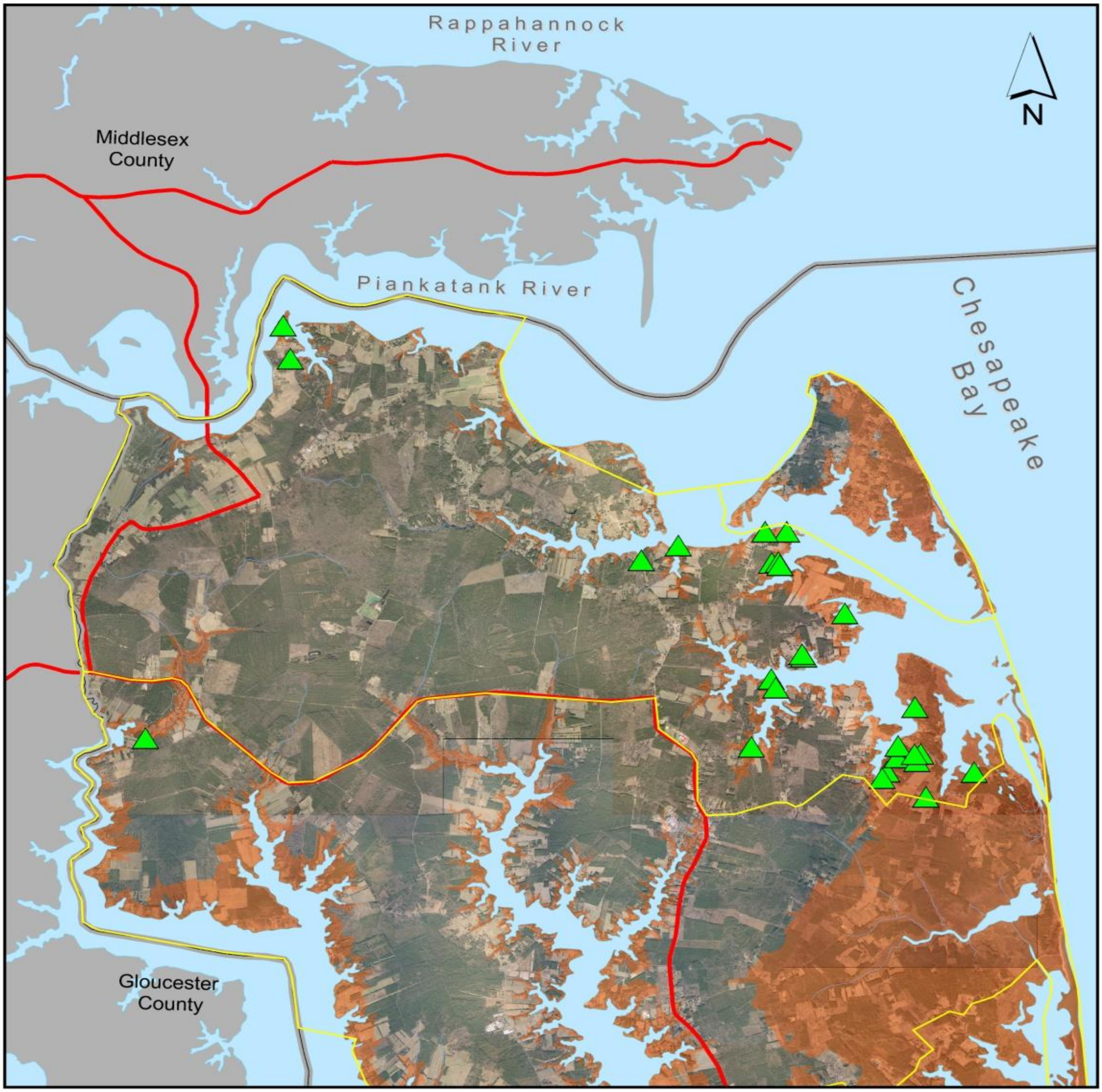
Mathews County Atlernative OSDS Located inFlood Plain
Block Group 95131



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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 81

Mathews County Alternative OSDS Located in Flood Plain
Block Group 95132



Legend

100-Year Flood Plain

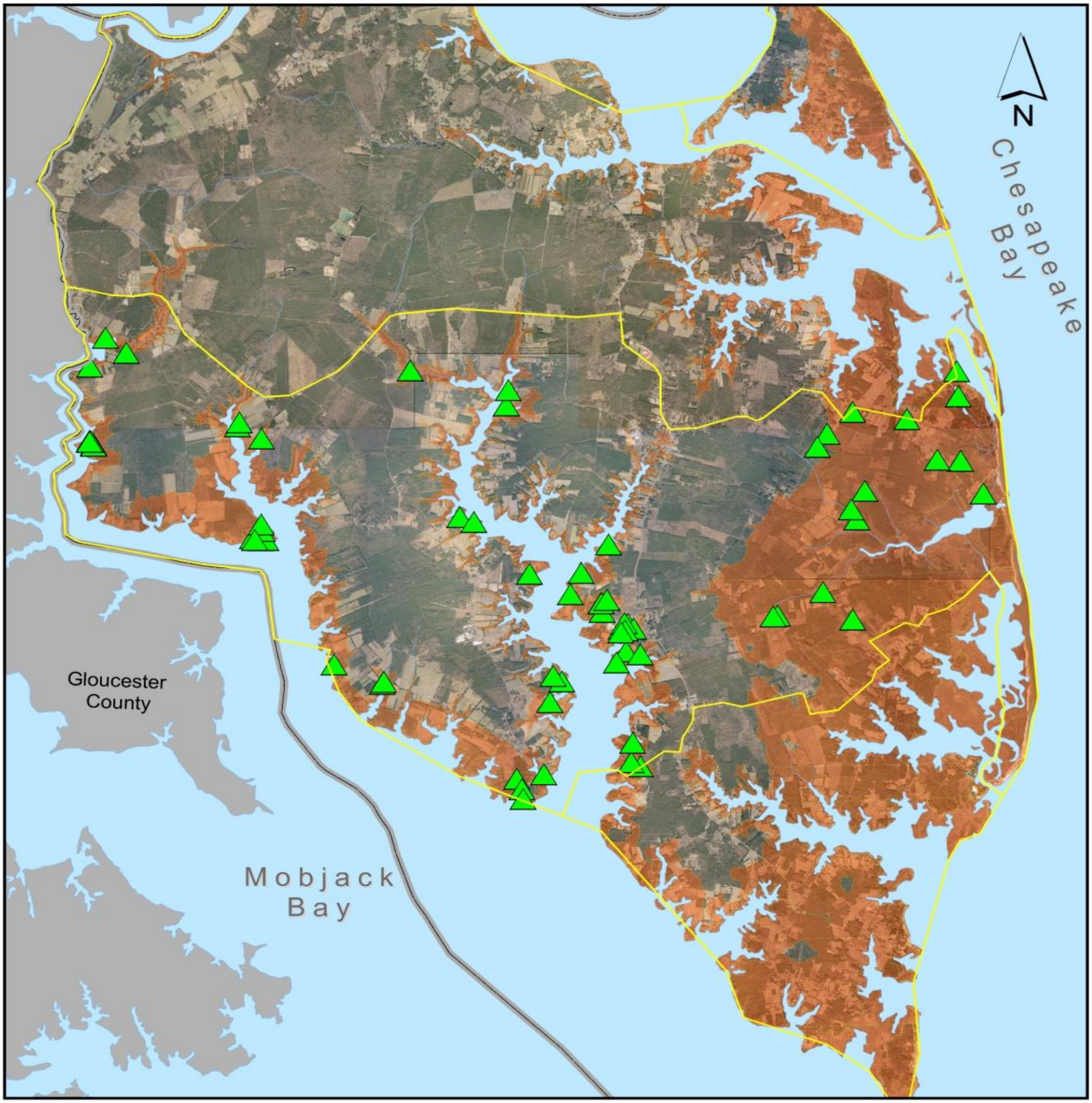
Alternative OSDS in 100 Year Flood Plain = 26 Systems

0 0.5 1 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 82

Mathews County Alternative OSDS Located in Flood Plain
Block Group 95141



Legend

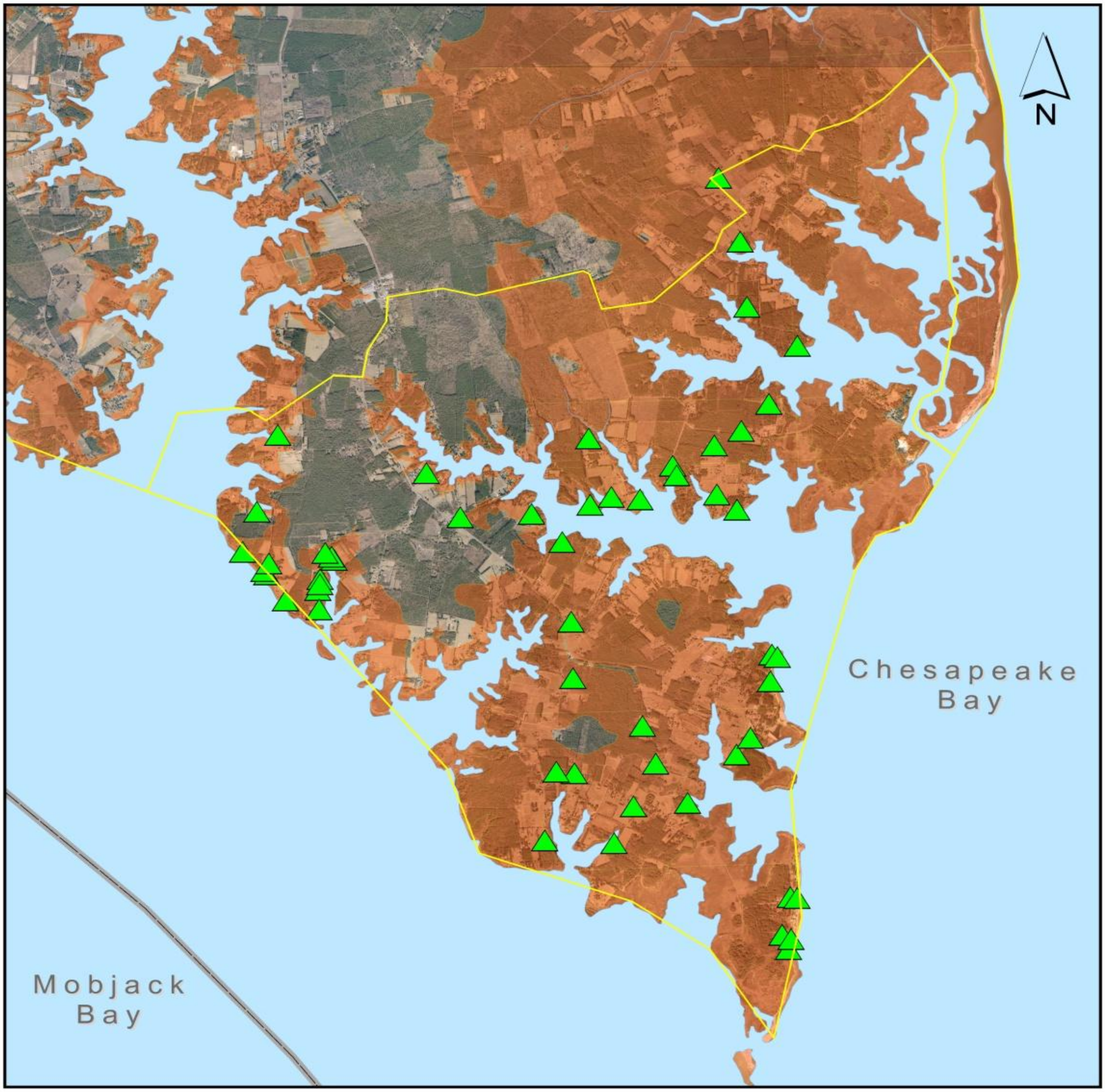
100-Year Flood Plain

Alternative OSDS in 100 Year Flood Plain = 68 Systems

0 0.5 1 Miles

Map 83

Mathews County Alternative OSDS Located in Flood Plain
Block Group 95142



Legend

100-Year Flood Plain

Alternative OSDS in 100 Year Flood Plain = 53 Systems

0 0.3 0.6 Miles

Map 84

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.

Table 18. Middlesex County/Urbanna Flood Prone Roads

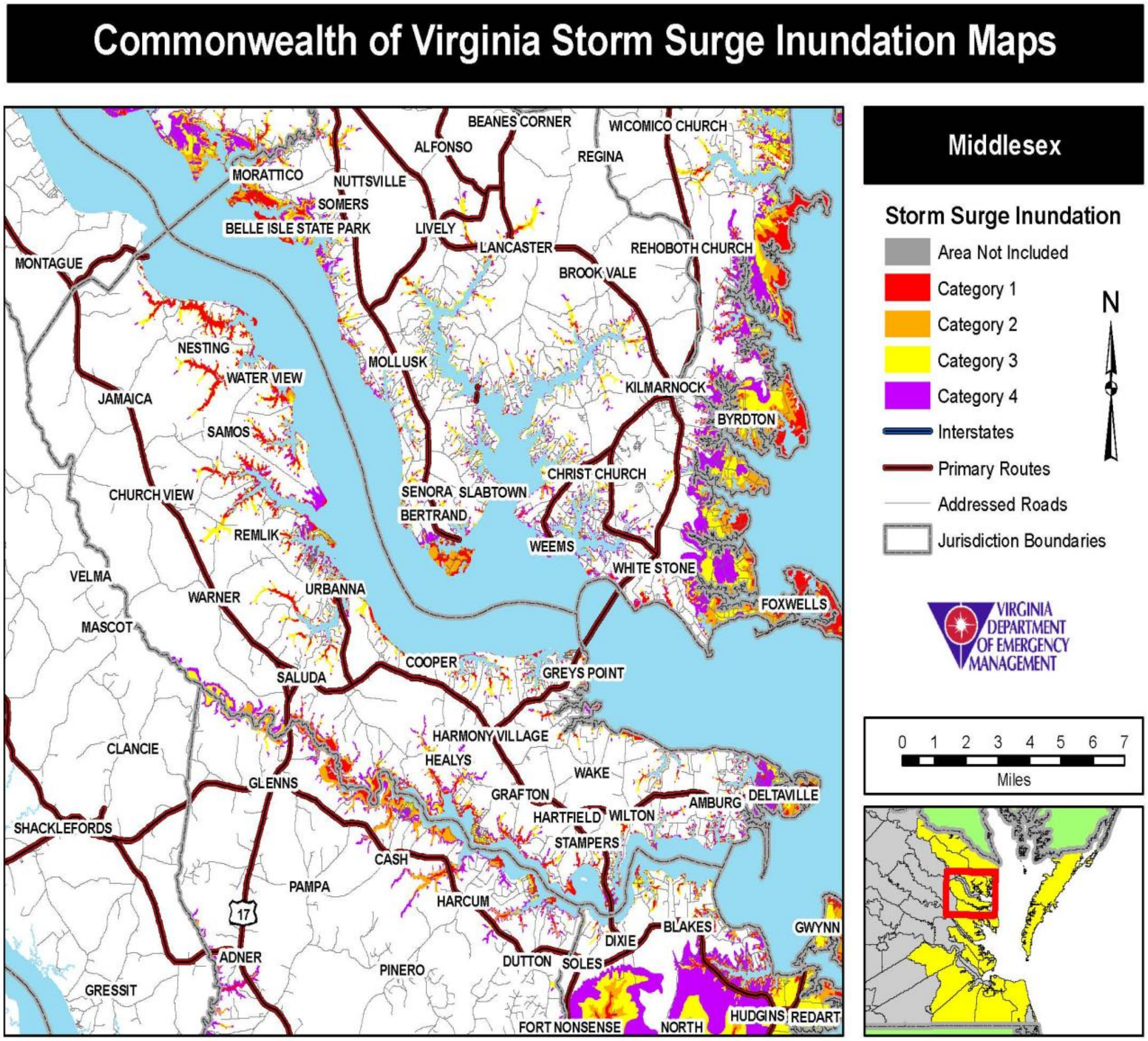
According to VDOT officials, flood prone roads in Middlesex County/Urbanna include the following:

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 643 to Rte. 659

Repetitive and Severe Repetitive Loss Residential Structures in Middlesex County

According to FEMA's records, there are 32 residential properties on the Repetitive Loss List and 0 on the Severe Repetitive Loss List as of 5/31/10. These properties are listed in Appendix 9 at the end of this document.

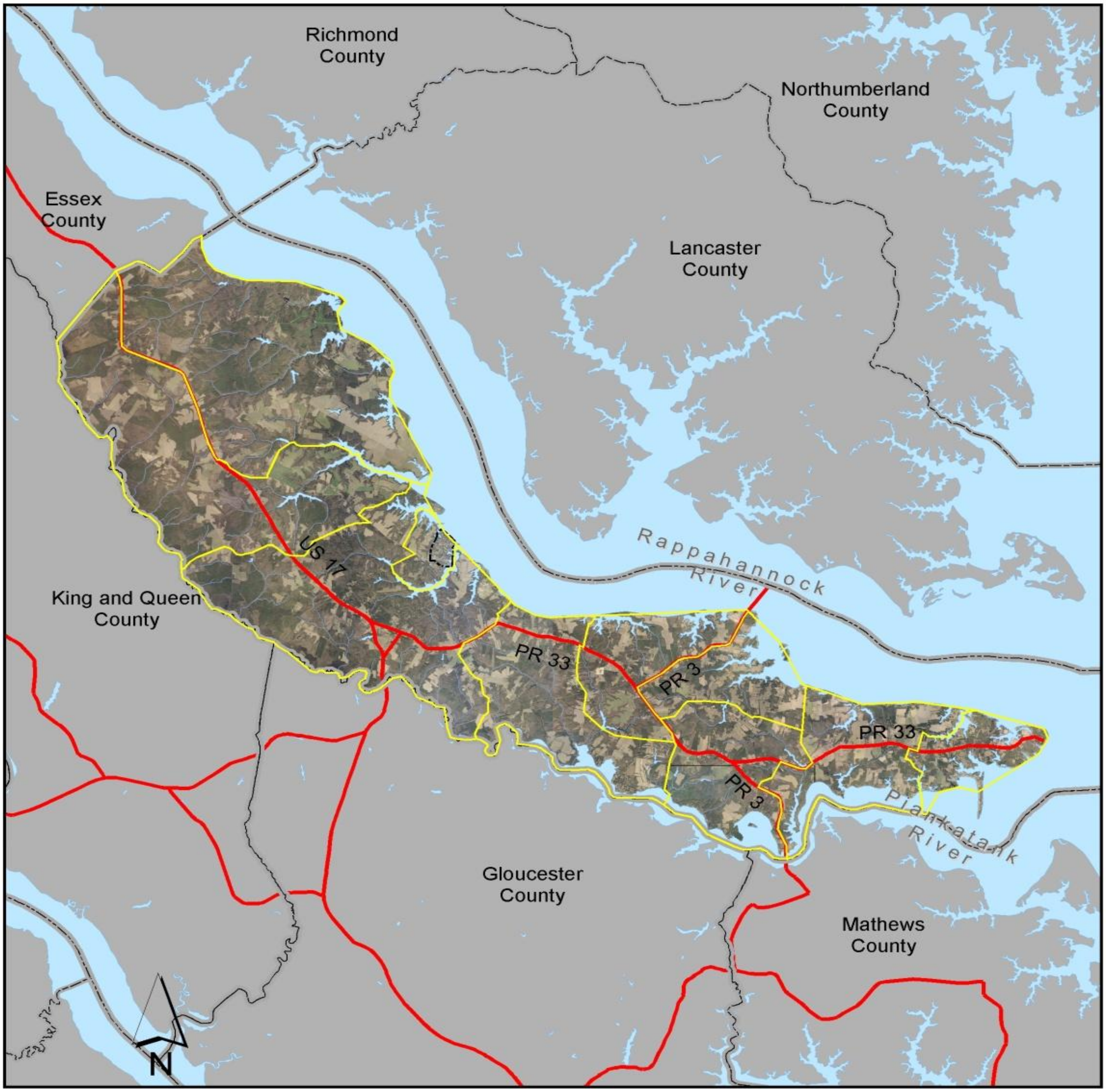
Map 85. 2008 Virginia Hurricane Surge Hazard Map – Middlesex County



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 floodplain. 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.

Middlesex County
Block Groups



Legend

Census Block Groups

0 1 2 Miles

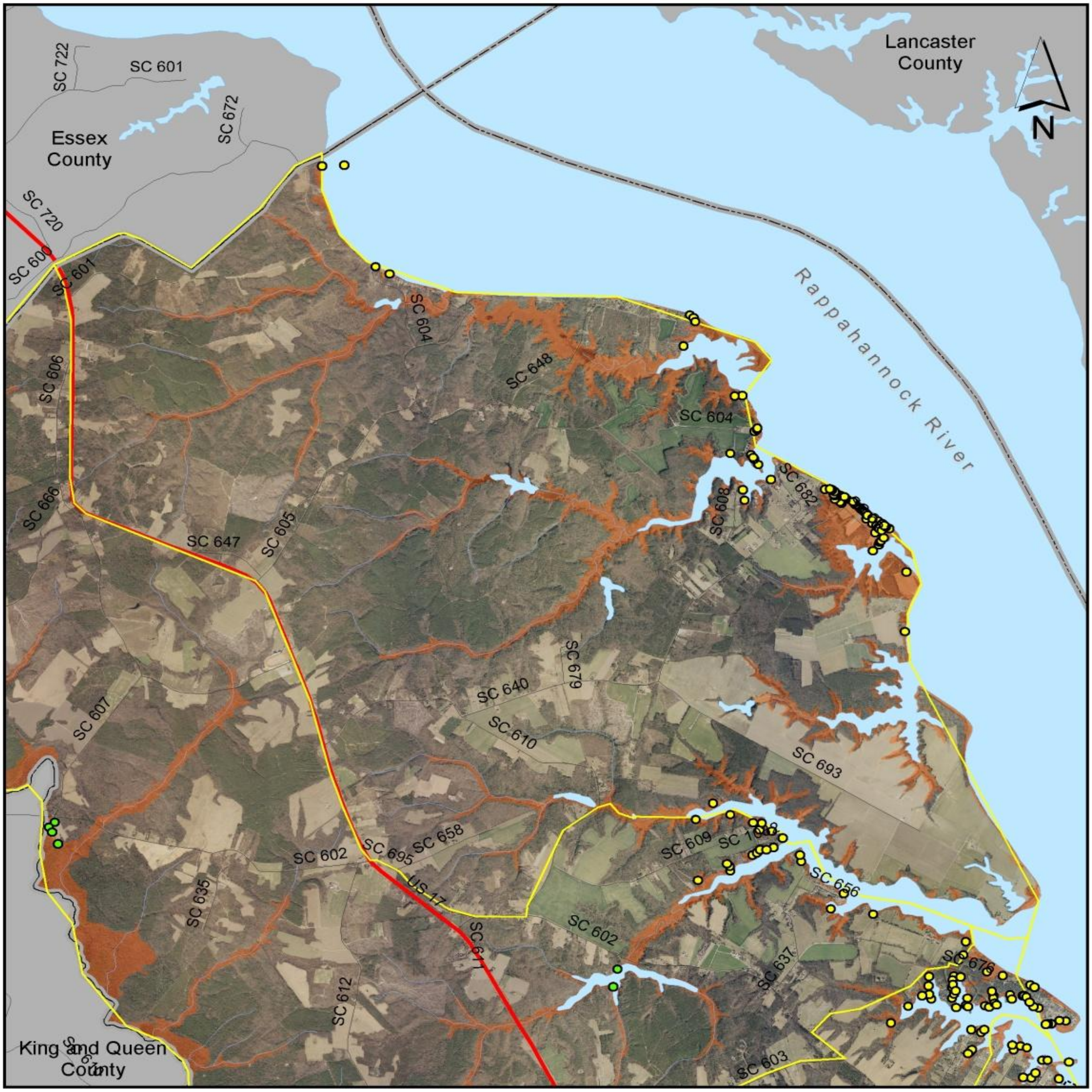
Affected Structures

- Zone A
- Zone AE
- Zone VE

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 86

Middlesex County Flood Plain
Block Group 95091



Legend

100-Year Flood Plain

0 0.5 1 Miles

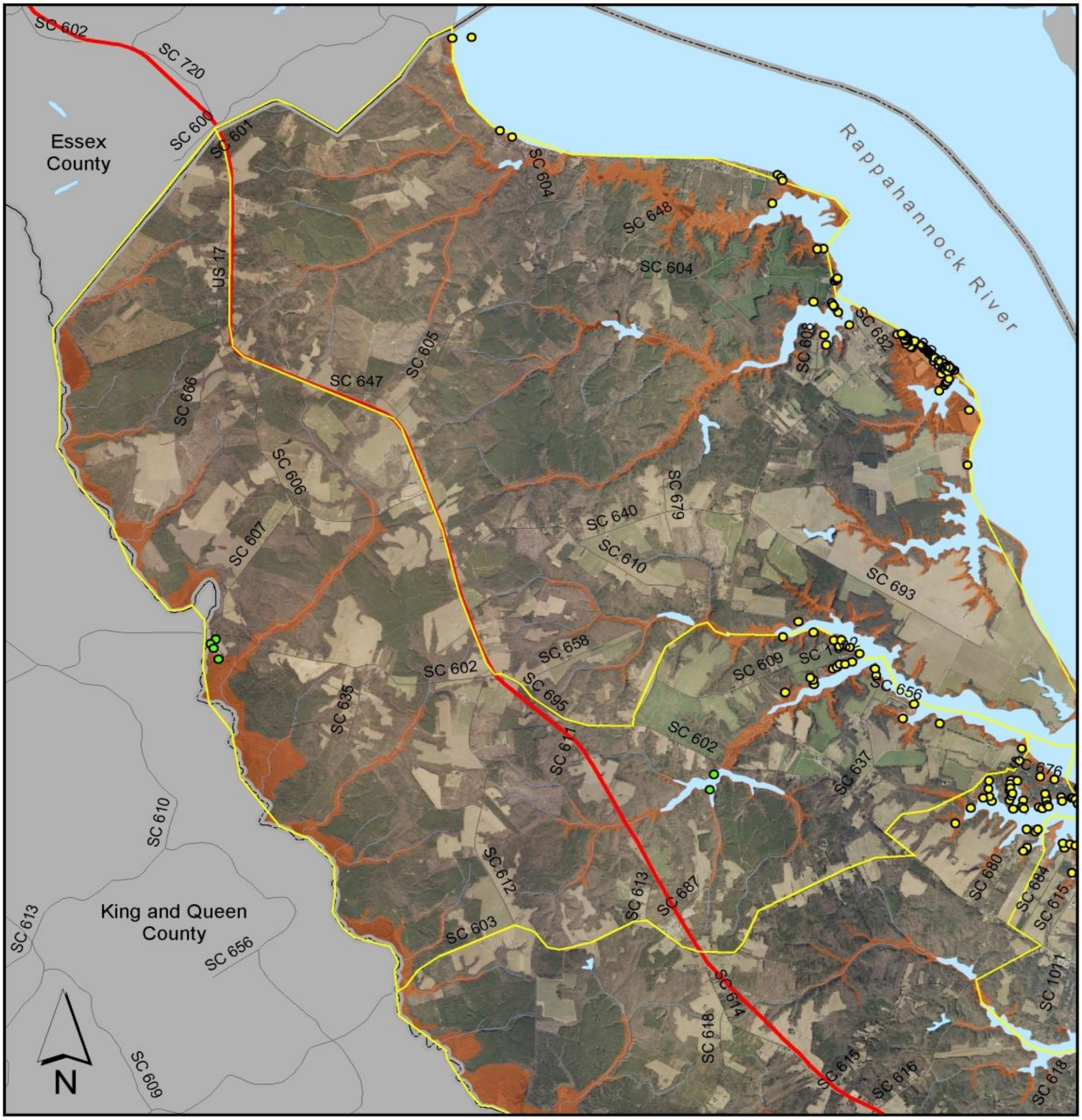
Affected Structures

- Zone A
- Zone AE
- Zone VE

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 87

Middlesex County Flood Plain
Block Group 95092



Legend

100-Year Flood Plain

0 0.5 1 Miles

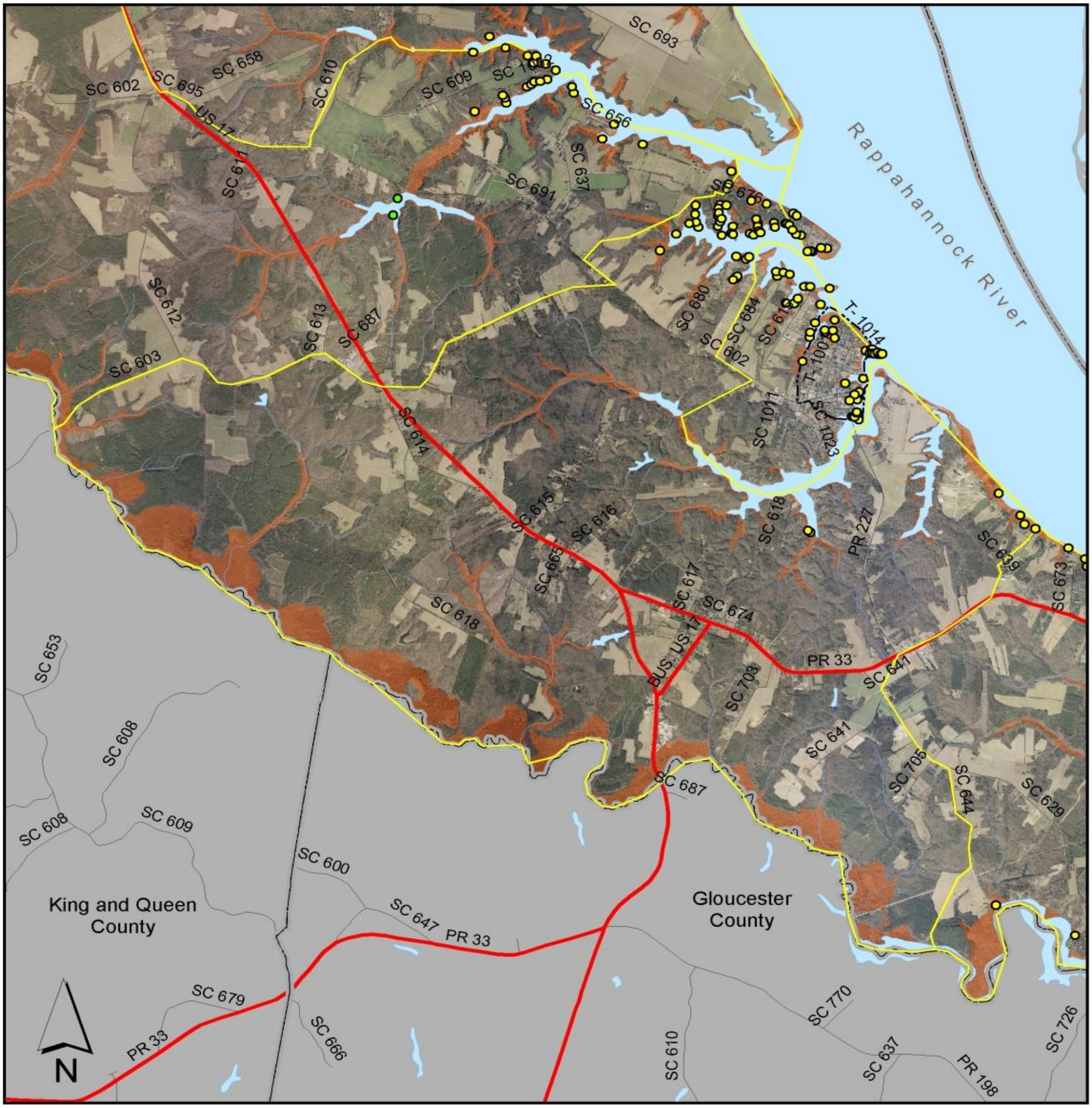
Affected Structures

- Zone A
- Zone AE
- Zone VE

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 88

Middlesex County Flood Plain
Block Group 95101



Legend

100-Year Flood Plain

0 0.45 0.9 Miles

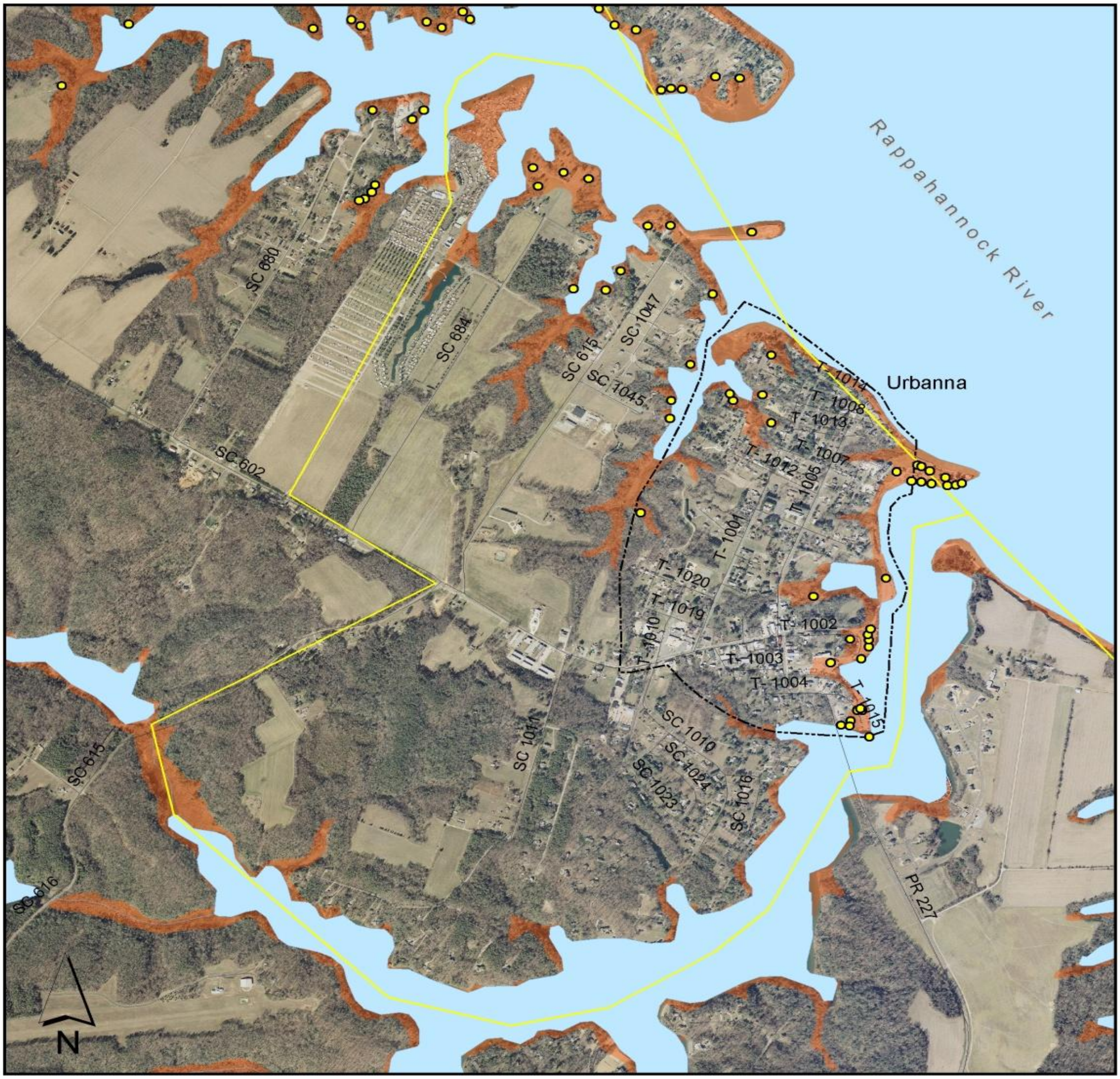
Affected Structures

- Zone A
- Zone AE
- Zone VE

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

May 89

Middlesex County Flood Plain
Block Group 95102



Legend

100-Year Flood Plain

0 0.1 0.2 Miles

Affected Structures

- Zone A
- Zone AE
- Zone VE

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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 90

Middlesex County Flood Plain
Block Group 95103

Legend

100-Year Flood Plain

0 0.250.5 Miles

Affected Structures

Zone A

Zone AE

Zone VE

Map 91

Middlesex County Flood Plain
Block Group 95111

Legend

100-Year Flood Plain

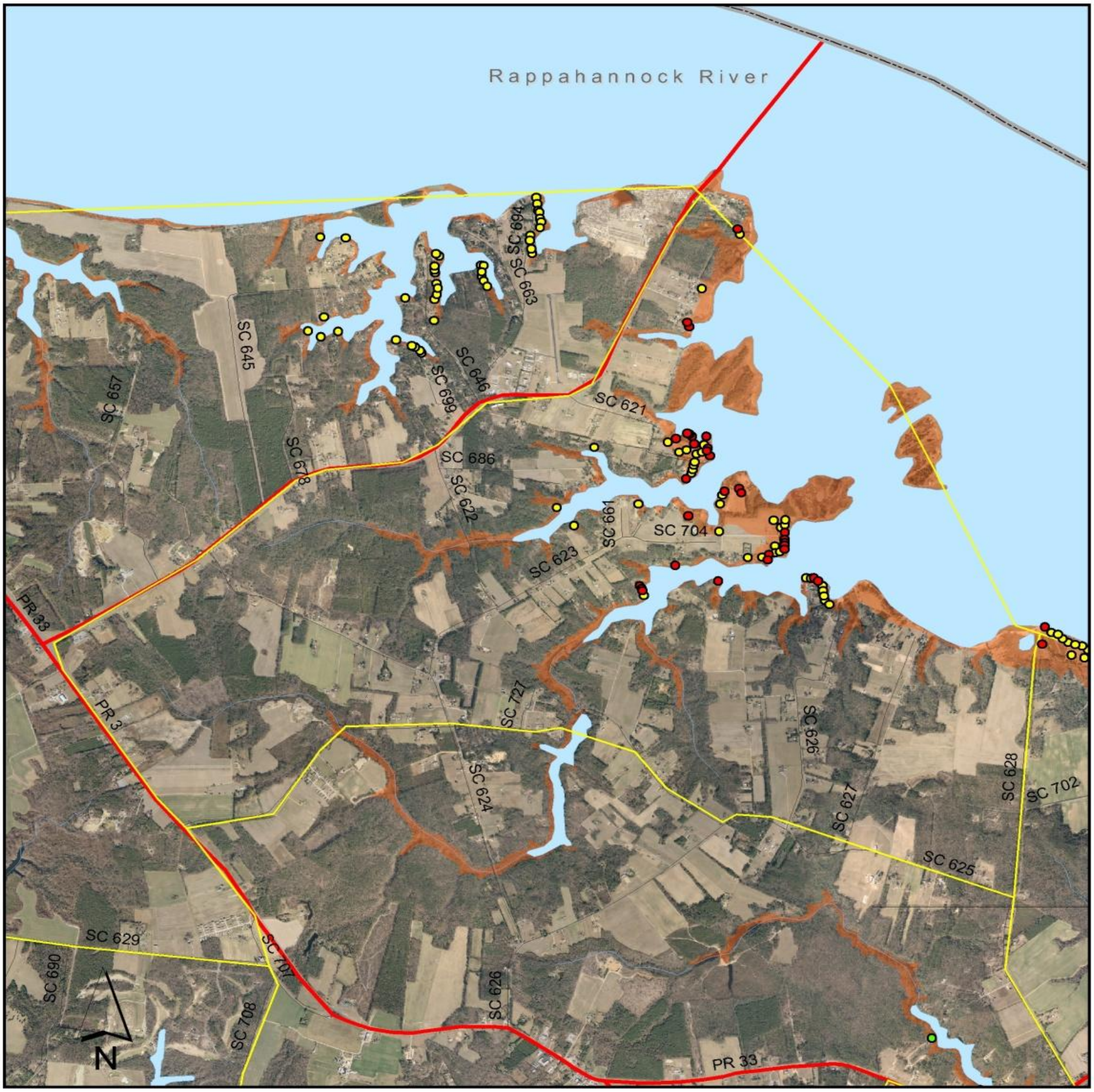
0 0.2 0.4 Miles

Affected Structures

- Zone A
- Zone AE
- Zone VE

Map 92

Middlesex County Flood Plain
Block Group 95112



Legend

100-Year Flood Plain

0 0.2 0.4 Miles

Affected Structures

Zone A

Zone AE

Zone VE

Map 93

Middlesex County Flood Plain
Block Group 95113

Legend

100-Year Flood Plain

0 0.2 0.4 Miles

Affected Structures

Zone A

Zone AE

Zone VE

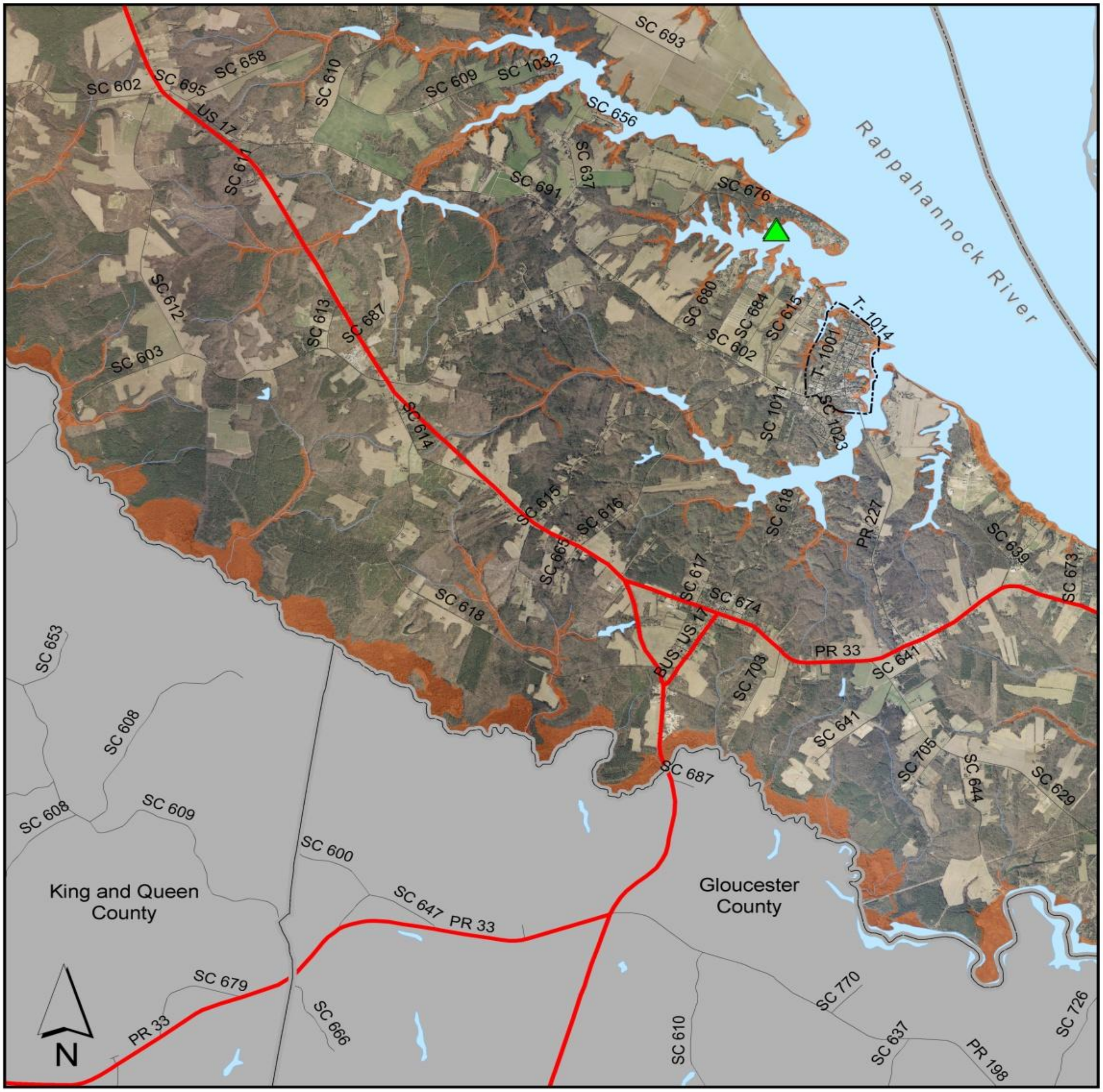
Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warranty, expressed or implied is made by the MPPDC as to the accuracy or application of the database and related materials, nor shall the fact of distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 94

Alternative On-site Sewage Disposal Systems (OSDS)

The maps below show the location of the OSDS facilities constructed in the 100-year floodplain in Middlesex County.

Middlesex County Alternative OSDS Located in Flood Plain
Block Group 95101



Legend

100-Year Flood Plain

Alternative OSDS in 100 Year Flood Plain = 2 Systems

0 0.45 0.9 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 95

Middlesex County Alternative OSDS Located in Flood Plain
Block Group 95102

Legend

100-Year Flood Plain

Alternative OSDS in 100 Year Flood Plain = 2 Systems

0 0.1 0.2 Miles

Map 96

Middlesex County Alternative OSDS Located in Flood Plain
Block Group 95112

Legend

100-Year Flood Plain

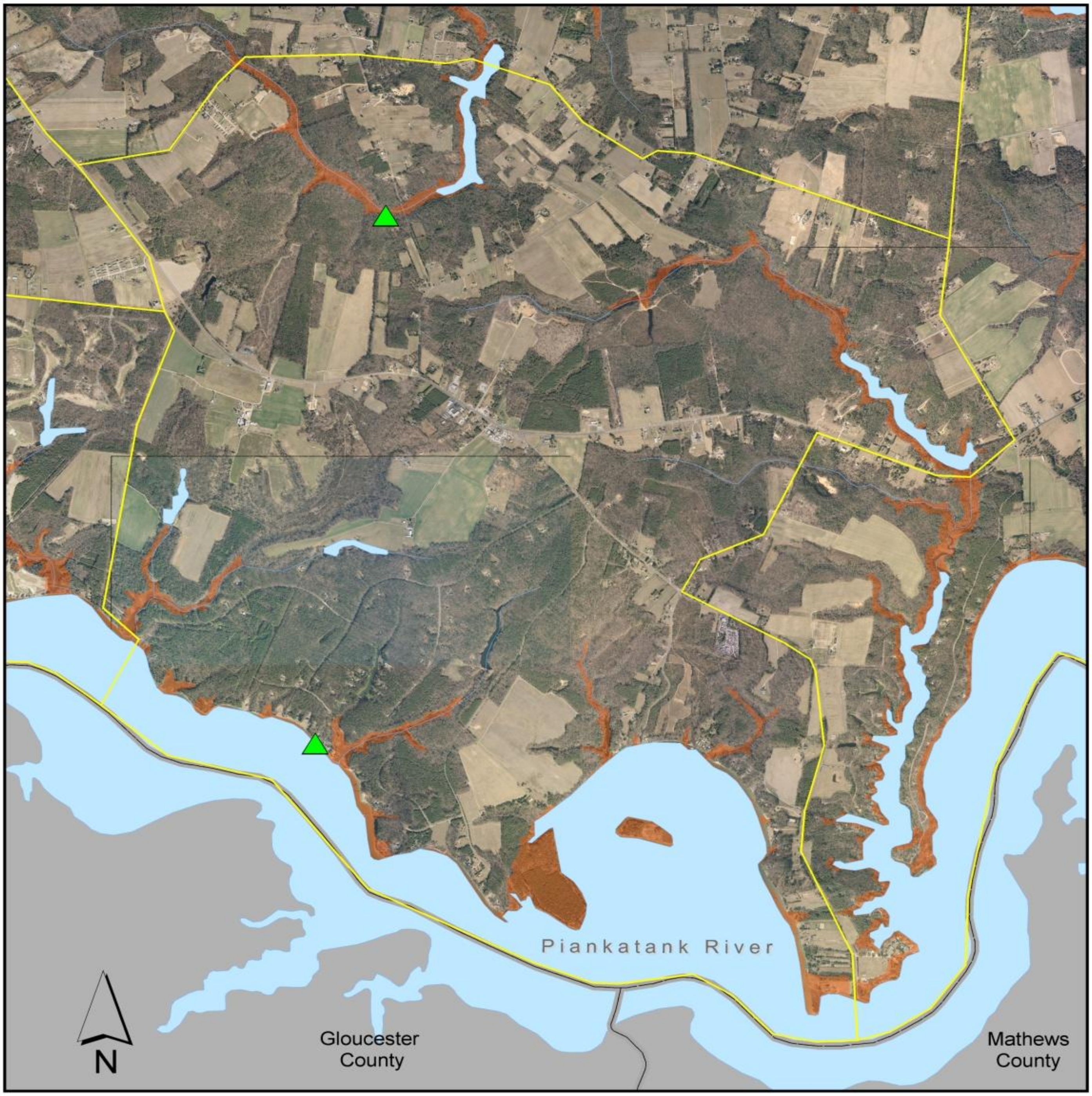
Alternative OSDS in 100 Year Flood Plain = 2 Systems

0 0.25 0.5 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 97

Middlesex County Alternative OSDS Located in Flood Plain
Block Group 95113



Legend

100-Year Flood Plain

Alternative OSDS in 100 Year Flood Plain = 2 Systems

0 0.2 0.4 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 98

Middlesex County Alternative OSDS Located in Flood Plain
Block Group 95121

Legend

100-Year Flood Plain

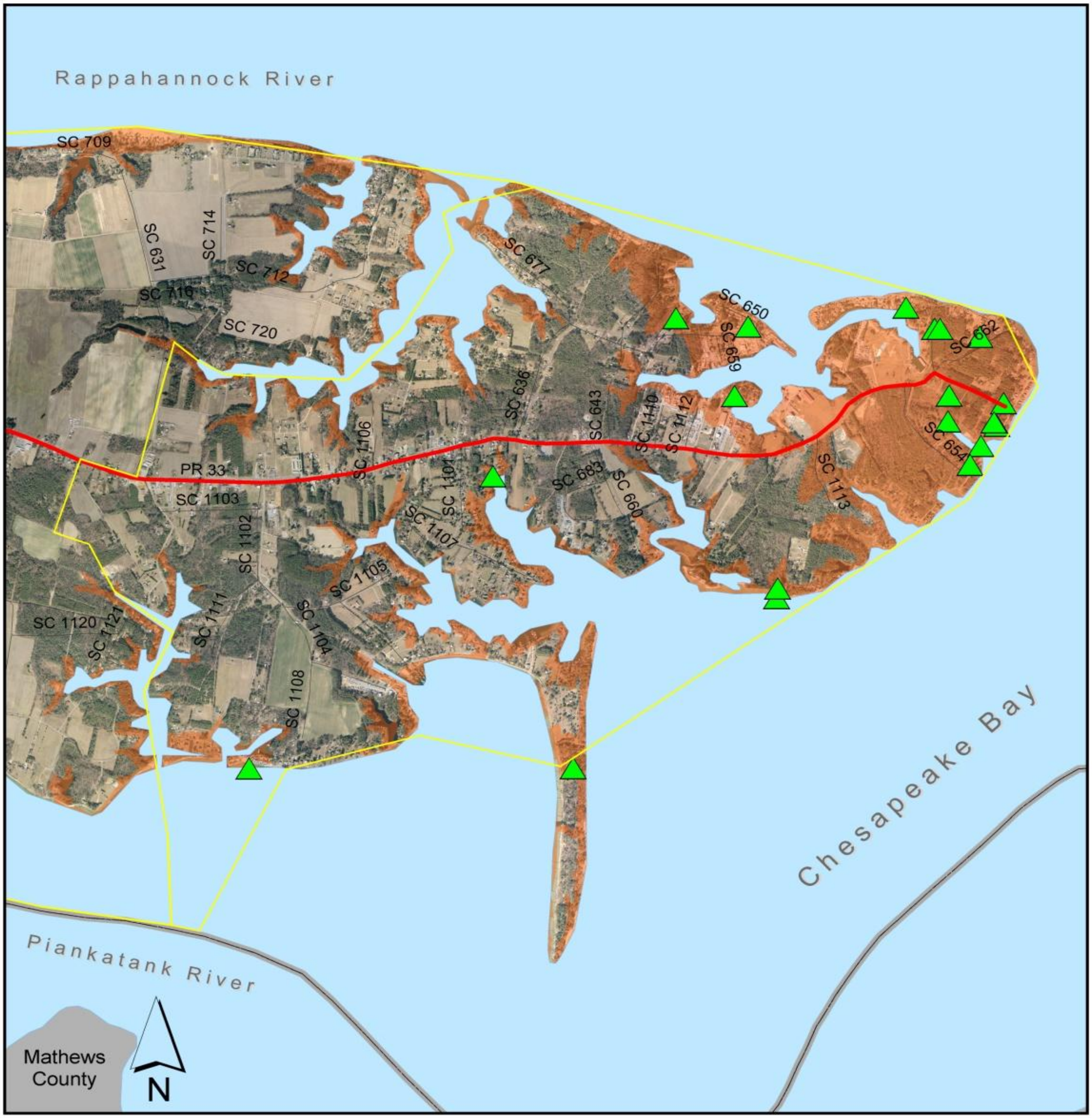
Alternative OSDS Located in 100 Year Flood Plain = 7 Systems

0 0.25 0.5 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 99

Middlesex County Alternative OSDS Located in Flood Plain
Block Group 95122



Legend

100-Year Flood Plain

Alternative OSDS in 100 Year Flood Plain = 20 Systems

0 0.150.3 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 distribution constitute any such warranty; and no responsibility is assumed by the MPPDC in connection herewith.

Map 100

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, there are 2 residential properties on the Repetitive Loss List and 0 on the Severe Repetitive Loss List as of 5/31/10. These 2 properties are listed in Appendix 9 at the end of this document.

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.

The map showing the structures in the town of Urbanna that are in the 100-year flood plain are shown in the previous set of maps covering Middlesex County.

Section 5 – Risk Assessment Analysis

The risk assessment analysis - planning process utilized to update the 2010 plan involved many community partners and extensive public involvement. Transitioning from the 2006 plan to the 2010 plan involved extensive dialog and protracted local discussion concerning the nature of risk assessment across the Middle Peninsula. The stakeholders forming the steering committee discussed risk assessment of the Middle Peninsula as it relates to the nature of critical, moderately-critical and non-critical hazards

The flood hazards affecting the Middle Peninsula will be analyzed using the following data:

1. Flood Insurance Rate Maps covering all 9 localities.
2. GIS data/maps showing all structures in the 100-year floodplain.
3. 2008 Virginia Hurricane Storm Surge Hazard Maps.
4. FEMA's List of Repetitive Loss and Severe Repetitive Loss Properties.
5. National Weather Service's Historical Data on Middle Peninsula Storms.
6. Damage Assessments from Hurricane Isabel in 2003, Tropical Storm Ernesto in 2006 and Tropical Storm Gaston in 2006.
7. Damage reports by Middle Peninsula County/Town Emergency Management Staff,
8. FEMA Flood Insurance Coverage and Claims Data, and
9. A HAZUS-MH analysis

The primary flood hazard in the Middle Peninsula results from hurricanes/tropical storms moving from the tropics in a northwesterly direction up the Chesapeake Bay and the Bay's associated water bodies. Major watersheds in the Middle Peninsula include the Rappahannock River and the York River Watersheds. Smaller watersheds include those of the Mattaponi, Pamunkey and Piankatank Rivers.

Riverine flooding is a secondary flood hazard in the Middle Peninsula due to the relatively small upland watersheds and the gently rolling topography in the Middle Peninsula.

Periodic water releases from Lake Anna in Louisa County, a Dominion/Virginia Power owned hydroelectric facility, poses a secondary flood hazard for King William County affecting the Pamunkey River Watershed.

Water flowing over the Beaverdam Reservoir spillway poses a secondary flood hazard for the Gloucester Courthouse area.

HAZUS-MH Analysis

As part of the flood mitigation planning work in 2009, a HIRA was undertaken using the FEMA-generated HAZUS-MH software. The HAZUS analysis loss assessments covered flooding from hurricane, coastal storms/nor'easters and rivers. The model also estimated high wind damages associated with these types of storm events.

The HAZUS data is included in the MPNHMP update and it will replace the loss assessment data that was estimated for the 2006 MPNHMP that was developed using another type of damage assessment methodology.

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].

Hurricane Wind

The hurricane wind analysis for the HIRA was completed using the FEMA HAZUS – MH MR4 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 Level 1 analysis only. Level 1 analysis involves using the provided data with 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 Level 2 and 3 analysis. 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 storm surge and waves have not been implemented in the present version of the Hurricane Model[2]. Storm surge risk and coastal flooding are discussed elsewhere in this plan.

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 9 displays the economic loss categories used to calculate annualized losses by HAZUS.

Table 19. 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	Rental costs per month per sq ft by occupancy	Relocation expenses (for businesses and institutions)
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	Employee wage loss as described in

1 HAZUS-MH Hurricane Event Report for Middle Peninsula PDC region, 11/10/2009

2 HAZUS Hurricane Manual

Category Name	Description of Data Input into Model	HAZUS Output
	occupancy	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 43,270 structures with an estimated exposure value of approximately $5.3 billion. Average value of buildings in the study area range from $74,100 to $234,400, with the mean value $110,357. Eighty percent of the planning district's general occupancy is categorized as residential, followed by commercial (13%). Table 10 below provides inventory information for each of the six counties that were included in the analysis. Gloucester County occupies a large percentage (39%) of the building stock exposure for the region.

Table 20. Building stock exposure for general occupancies by county.

Community	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Gloucester County	$1,667,327	$272,381	$45,396	$8,460	$37,279	$10,303	$54,226	$2,095,372
King William County	$658,933	$93,288	$31,827	$8,461	$18,455	$6,929	$7,503	$825,396
Middlesex County	$652,928	$120,077	$19,318	$3,649	$11,809	$3,765	$12,284	$823,830
Mathews County	$607,354	$50,392	$13,596	$2,563	$8,800	$2,431	$3,647	$688,783
Essex County	$450,770	$120,501	$38,173	$6,236	$12,012	$5,295	$8,963	$641,950
King & Queen County	$261,828	$18,240	$8,405	$1,743	$8,825	$1,058	$2,205	$302,304
Total	$4,299,140	$674,879	$156,715	$31,112	$97,180	$29,781	$88,828	$5,377,635
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 11.

Table 21. 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 (60%) of building types in the planning district. Masonry construction accounts for a quarter of the building type exposure. Table 12 below provides building stock exposure for the five main building types.

Table 22. Building stock exposure for general building type by county.

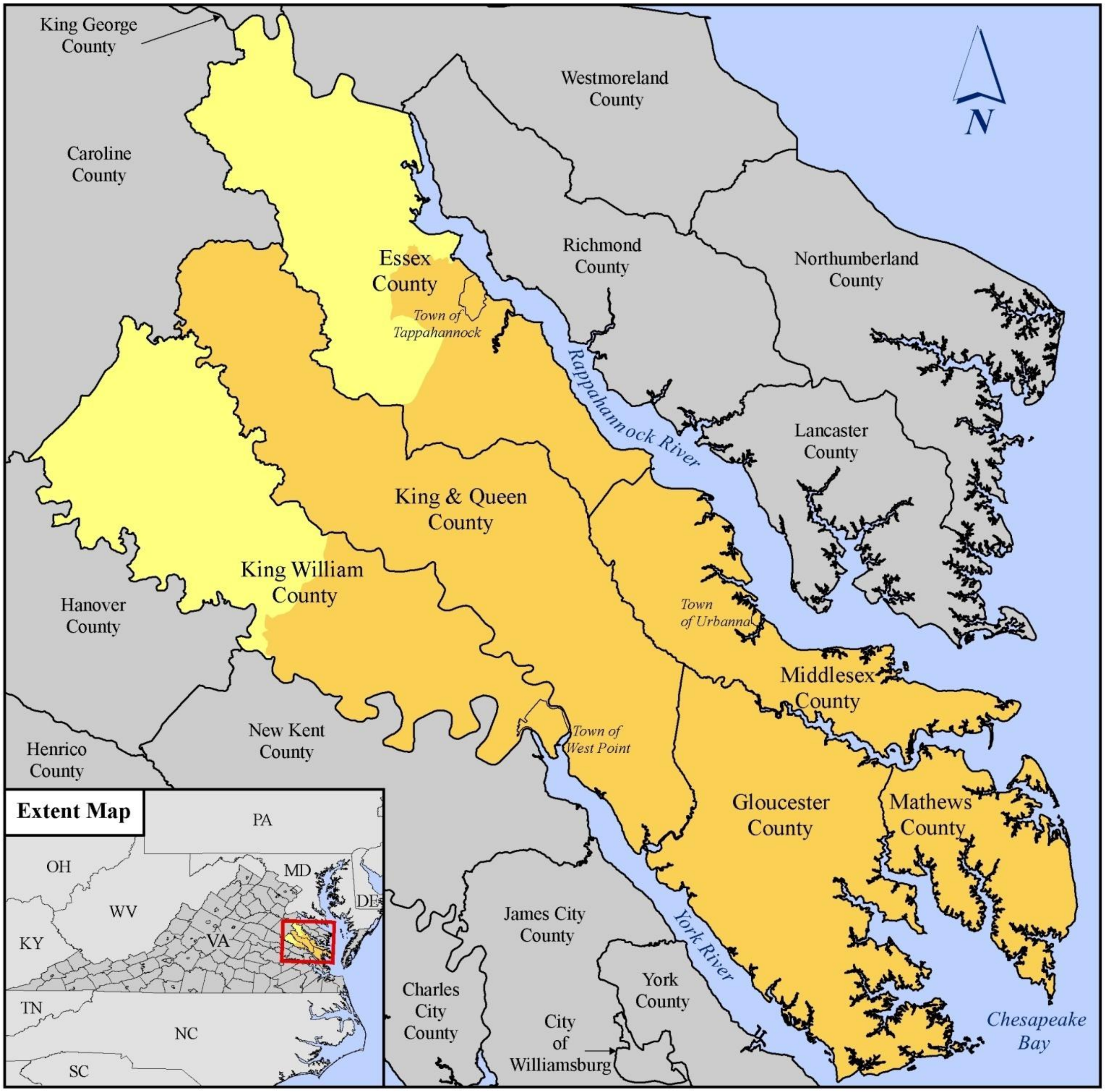
Community	Wood	Masonry	Concrete	Steel	Manufactured Home	Total
Gloucester County	$1,232,920	$528,231	$58,091	$194,459	$81,670	$2,095,371
King William County	$510,368	$211,314	$19,392	$74,547	$9,768	$825,389
Middlesex County	$485,545	$207,159	$21,215	$74,633	$35,276	$823,828
Mathews County	$450,736	$171,414	$10,356	$37,432	$18,846	$688,784
Essex County	$334,134	$158,733	$27,893	$92,957	$28,233	$641,950
King & Queen County	$186,202	$71,783	$3,661	$16,121	$24,532	$302,299
Total	$3,199,905	$1,348,634	$140,608	$490,149	$198,325	$5,377,621
All values are in thousands of dollars						

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 meter above ground at the centroid of each census track. Buildings that must be designed for a 100-year mean recurrence interval wind event include[3]:

- 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

[3] Whole Building Design Guide (WBDG) Wind Safety of the Building Envelop by Tom Smith 5/26/2008

Map 101 HAZUS 100-Year Wind Speeds



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.

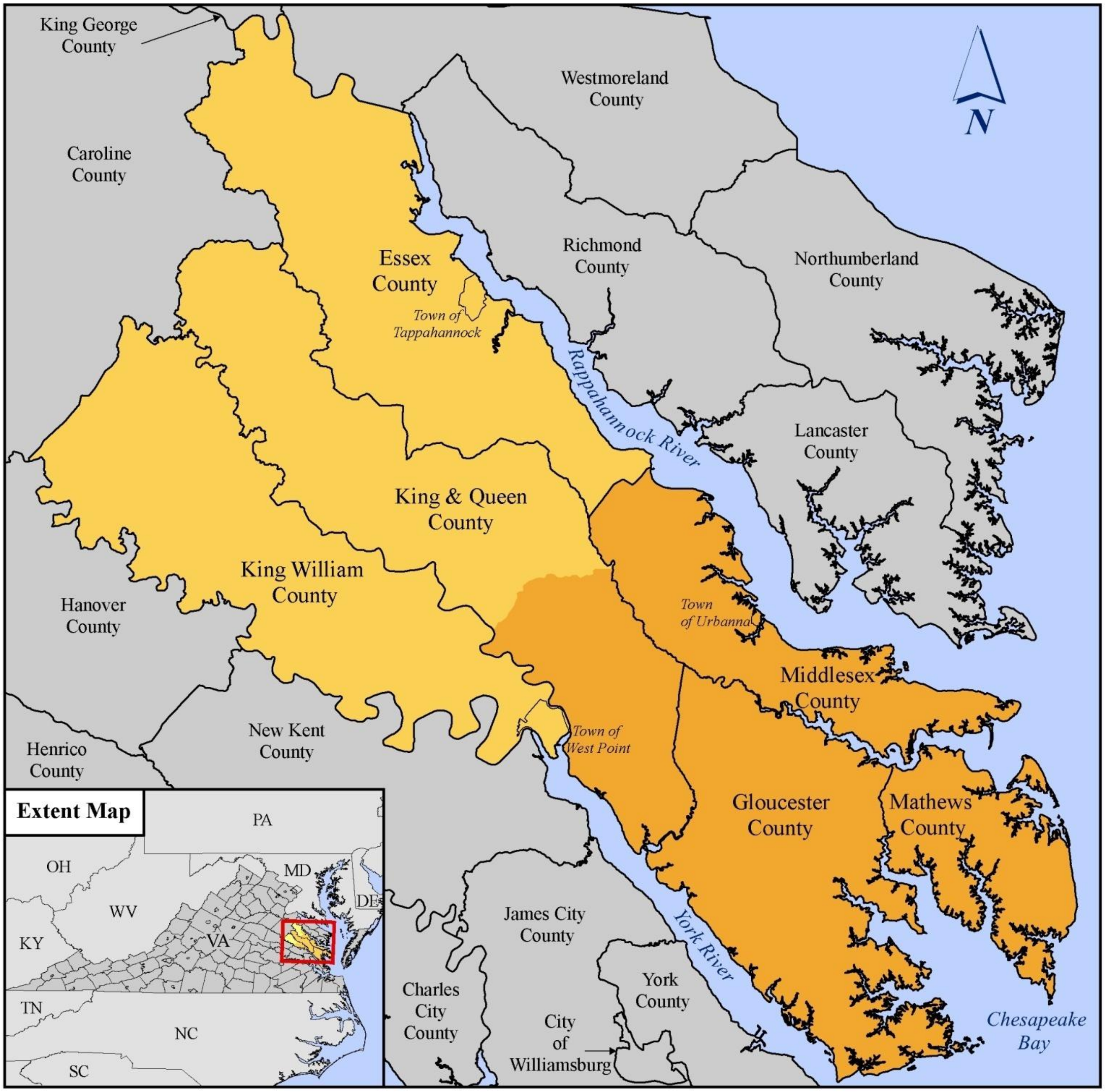
Legend:
3-Second Peak Gust Wind Speed (mph)
- 39 - 73 (Tropical Storm)
- 74 - 95 (Category 1)
- 96 - 110 (Category 2)
- 111 - 130 (Category 3)
- 131 - 155 (Category 4)

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 MR4 Wind Model *(analysis 11/2009)*
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 102. HAZUS 500-Year Wind Speeds



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

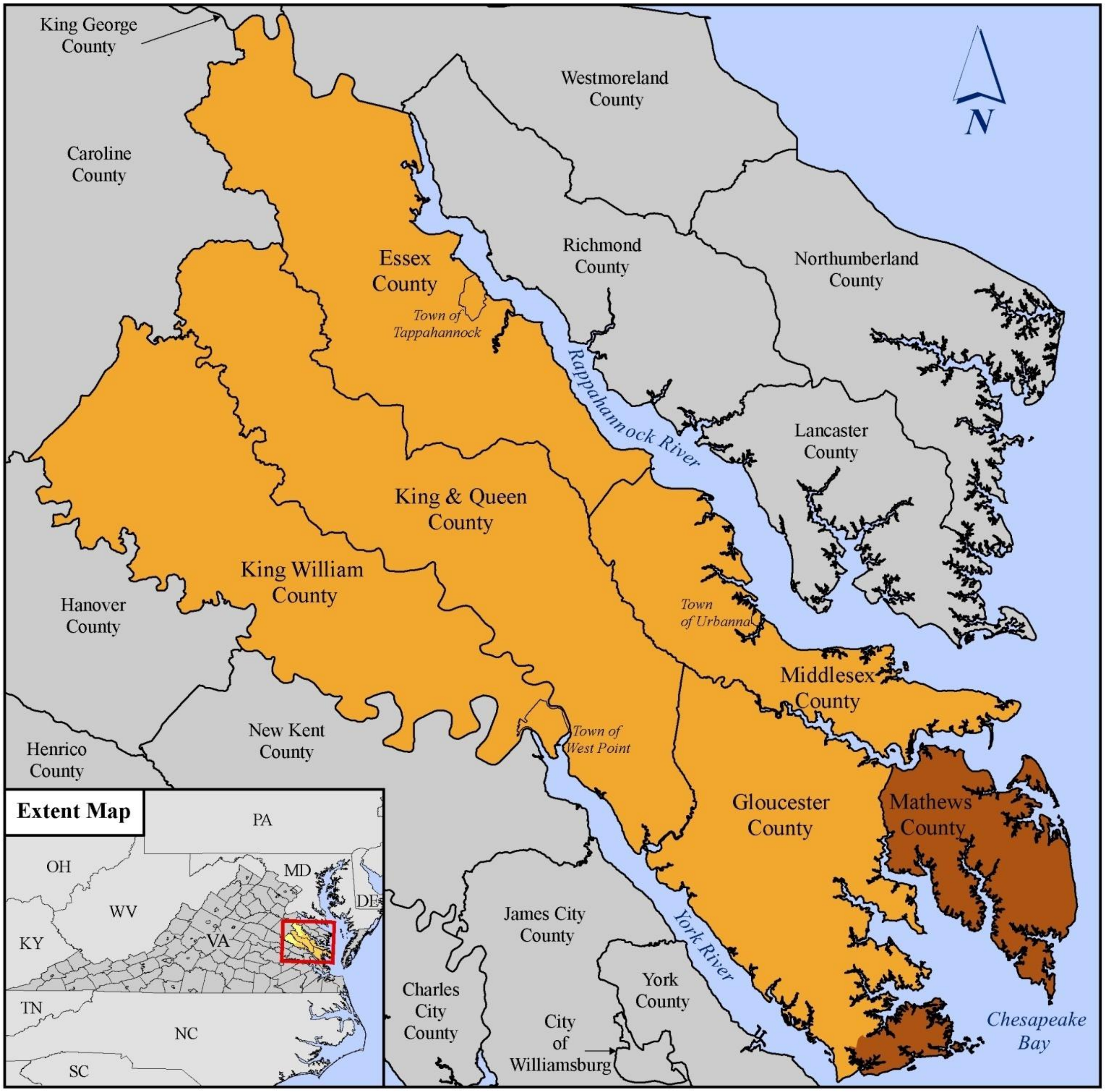
Data Information:

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 MR4 Wind Model *(analysis 11/2009)*
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 103. HAZUS 1000-Year Wind Speeds



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 MR4 Wind Model *(analysis 11/2009)*
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

General Building Stock Loss Estimation

The probabilistic HAZUS-MH hurricane analysis predicts that the Middle Peninsula can expect, annually, $959,258 in damages due to hurricane wind events. Property or "capital stock" losses make up about $836,000 of the damages. This includes the values for buildings, contents, and inventory. Business interruption accounts for nearly $122,000 of the annualized losses and includes income, rental, wage, and relocation costs.

Table 13 illustrates the expected annualized losses broken down by county. Gloucester County has the highest annualized loss, $430,964, accounting for 45% 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, $191,642, accounting for 20% of the total annualized losses for Middle Peninsula.

Building value accounts for approximately 73% of the expected annualized damages; residential occupancy makes up the vast majority of these losses. More than 65% of the buildings are categorized as wood frame and 25% masonry construction. Tables 14 and 15 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 23. County based HAZUS annualized loss by building type.

Community	Building	Content	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Gloucester County	$315,748	$61,122	$613	$34,525	$2,615	$12,051	$4,290	**$430,964**
Mathews County	$138,737	$28,349	$256	$16,727	$954	$5,369	$1,250	**$191,642**
Middlesex County	$105,061	$19,462	$204	$12,984	$1,075	$4,400	$1,570	**$144,757**
King William County	$76,999	$16,533	$579	$8,176	$629	$2,722	$1,566	**$107,204**
Essex County	$39,997	$6,642	$350	$4,550	$444	$1,570	$871	**$54,424**
King & Queen County	$23,822	$2,955	$56	$2,544	$65	$712	$112	**$30,266**

Table 24. Annualized loss by building type.

Building Type	Building	Contents	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Wood	$458,251	$81,181	$205	$49,844	$1,259	$16,399	$1,861	**$609,001**
Masonry	$173,667	$35,650	$411	$19,358	$1,666	$6,909	$2,900	**$240,562**
MH	$40,946	$6,009	$0	$4,593	$0	$699	$0	**$52,247**
Steel	$22,738	$10,184	$1,183	$4,551	$2,365	$2,118	$3,871	**$47,010**
Concrete	$4,762	$2,039	$258	$1,160	$493	$698	$1,027	**$10,439**
Annualized Loss	**$700,364**	**$135,063**	**$2,057**	**$79,506**	**$5,783**	**$26,825**	**$9,659**	**$959,258**
% of Ann. Loss	73.01%	14.08%	0.21%	8.29%	0.60%	2.80%	1.01%	*HAZUS-MH (MR4) results*

Table 25. Annualized loss by occupancy type.

Occupancy Type	Building	Contents	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Residential	$642,154	$109,908	$0	$68,996	$68	$22,441	$160	**$843,726**
Commercial	$35,209	$13,278	$405	$7,209	$4,701	$4,028	$5,431	**$70,261**
Industrial	$9,600	$6,432	$1,512	$677	$173	$118	$287	**$18,799**
Non-Profit	$5,116	$1,608	$0	$888	$527	$79	$1,239	**$9,457**
Education	$4,383	$2,007	$0	$1,017	$281	$64	$661	**$8,414**
Government	$1,322	$635	$0	$353	$16	$81	$1,875	**$4,283**
Agricultural	$1,863	$881	$140	$365	$17	$14	$7	**$3,288**
Annualized Loss	**$699,647**	**$134,750**	**$2,057**	**$79,506**	**$5,783**	**$26,825**	**$9,659**	**$958,228**
% of Ann. Loss	73.01%	14.06%	0.21%	8.30%	0.60%	2.80%	1.01%	*HAZUS-MH (MR4) results*

Approximately one-fifth of the region's total exposure is at risk to hurricane wind damages. Residential occupancy accounts for the majority of the damages. Tables 16 and 17 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. Manufactured homes only account for 5.45% of the total annualized damages, but have 26.34% of the building stock at risk to yearly damages.

Table 26. County based HAZUS annualized loss by building type.

Community	Total Exposure	Concrete	Masonry	Manufactured Homes	Steel	Wood	Annualized Loss
Gloucester County	$2,095,371,000	$4,740	$107,643	$25,441	$21,250	$271,890	**$430,964**
Mathews County	$688,784,000	$1,287	$47,215	$8,288	$6,538	$128,313	**$191,642**
Middlesex County	$823,828,000	$1,454	$35,103	$10,418	$6,957	$90,825	**$144,757**
King William County	$825,389,000	$1,779	$28,820	$1,092	$7,147	$68,367	**$107,204**
Essex County	$641,950,000	$1,054	$14,851	$3,641	$4,434	$30,444	**$54,424**
King & Queen County	$302,299,000	$125	$6,929	$3,367	$684	$19,161	**$30,266**
Annualized Loss		**$10,439**	**$240,562**	**$52,247**	**$47,010**	**$609,001**	**$959,258**
% of Annualized Loss		1.09%	25.08%	5.45%	4.90%	63.49%	*HAZUS-MH (MR4) results*
% of Total Exposure		7.42%	17.84%	26.34%	9.59%	19.03%	

Table 27. County based HAZUS annualized loss by occupancy.

Community	Total Exposure	Residential	Commercial	Industrial	Non-Profit	Education	Government	Agriculture	Annualized Loss
Gloucester County	$2,095,372,000	$378,458	$33,140	$5,331	$4,472	$5,738	$1,450	$1,275	**$429,864**
Mathews County	$688,783,000	$176,086	$9,517	$2,556	$1,510	$614	$410	$623	**$191,315**
Middlesex County	$823,830,000	$126,764	$12,489	$1,999	$1,120	$977	$545	$413	**$144,308**
King William County	$825,396,000	$90,069	$8,378	$5,133	$1,489	$654	$1,364	$512	**$107,600**
Essex County	$641,950,000	$43,846	$5,905	$3,236	$494	$381	$462	$359	**$54,683**
King & Queen County	$302,304,000	$28,503	$832	$544	$372	$50	$50	$107	**$30,459**
Annualized Loss		**$843,726**	**$70,261**	**$18,799**	**$9,457**	**$8,414**	**$4,283**	**$3,288**	**$958,228**
% of Annualized Loss		88.05%	7.33%	1.96%	0.99%	0.88%	0.45%	0.34%	*HAZUS-MH (MR4) results*
% of Exposure		19.63%	10.41%	12.00%	9.73%	9.47%	14.38%	10.57%	

Maps 101 to 107 show the total annualized loss for the planning district and individual counties. Gloucester County accounts for almost 45% of the planning district's annualized losses. The census blocks bordering the York River and Chesapeake Bay have higher loss values as compared to the larger census blocks in the northwest portions of the county.

Losses in Mathews County are spread throughout the county with pockets of higher loss bordering the Chesapeake Bay. Two census blocks in the county have over $8K in annualized losses. Mathews County accounts for 20% of the total annualized losses in the planning district.

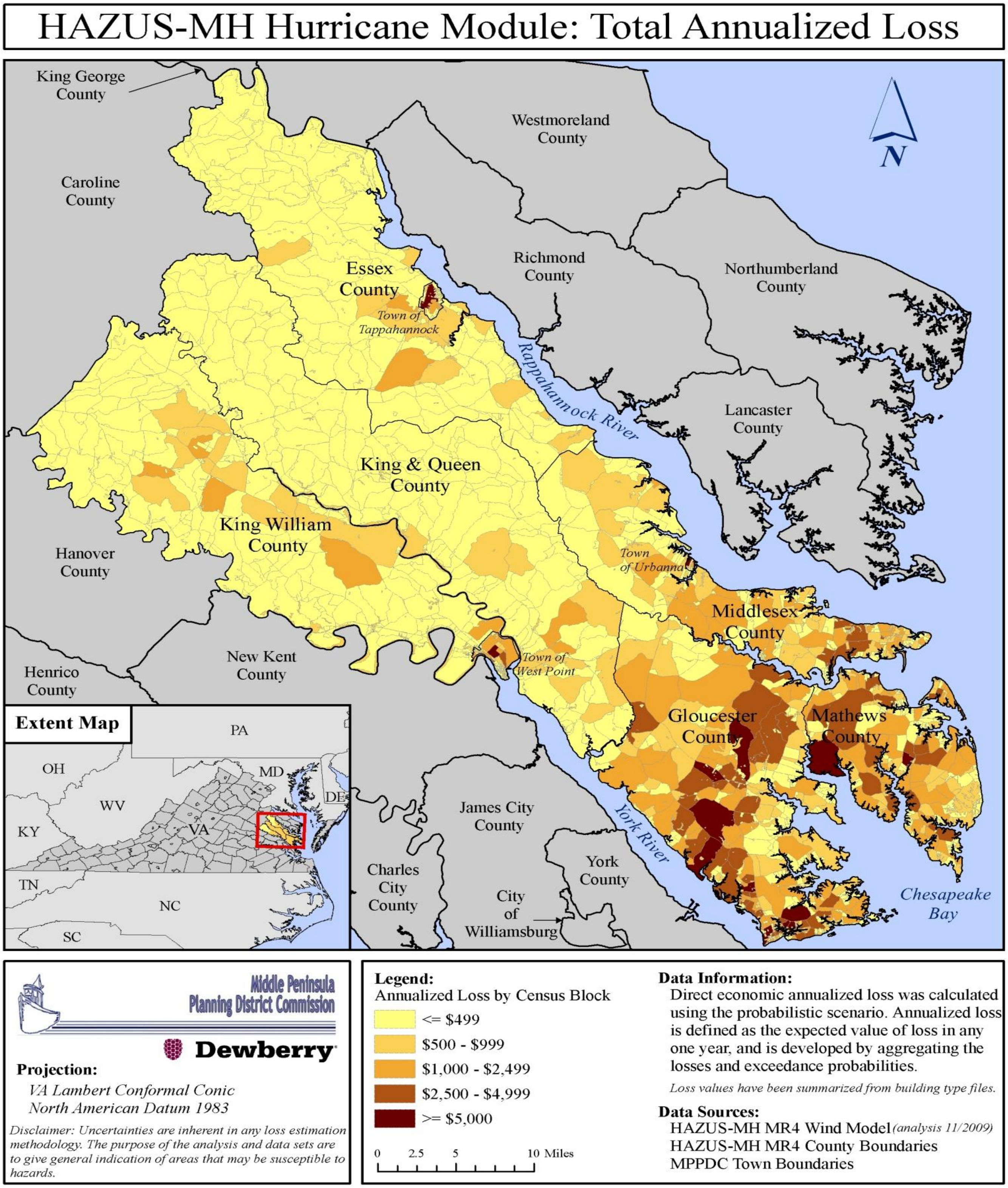
Middlesex County has the second highest annualized income losses ($1,075) for the region and account for 15% of the total losses. The eastern peninsula has small census blocks that make up most of the damages for the county. The Town of Urbanna has several high loss census blocks, one of which is estimated to have $5,066 in annualized damages.

Eleven percent of the total annualized damages ($107,204) for the region are attributed to King William County. Almost all of the estimated damages are in the Town of West Point, located on the York River.

The Town of Tappahannock and surrounding census blocks contain most of the damages for Essex County. The county and town losses attribute a little more than 5% to the annualized damages for this area.

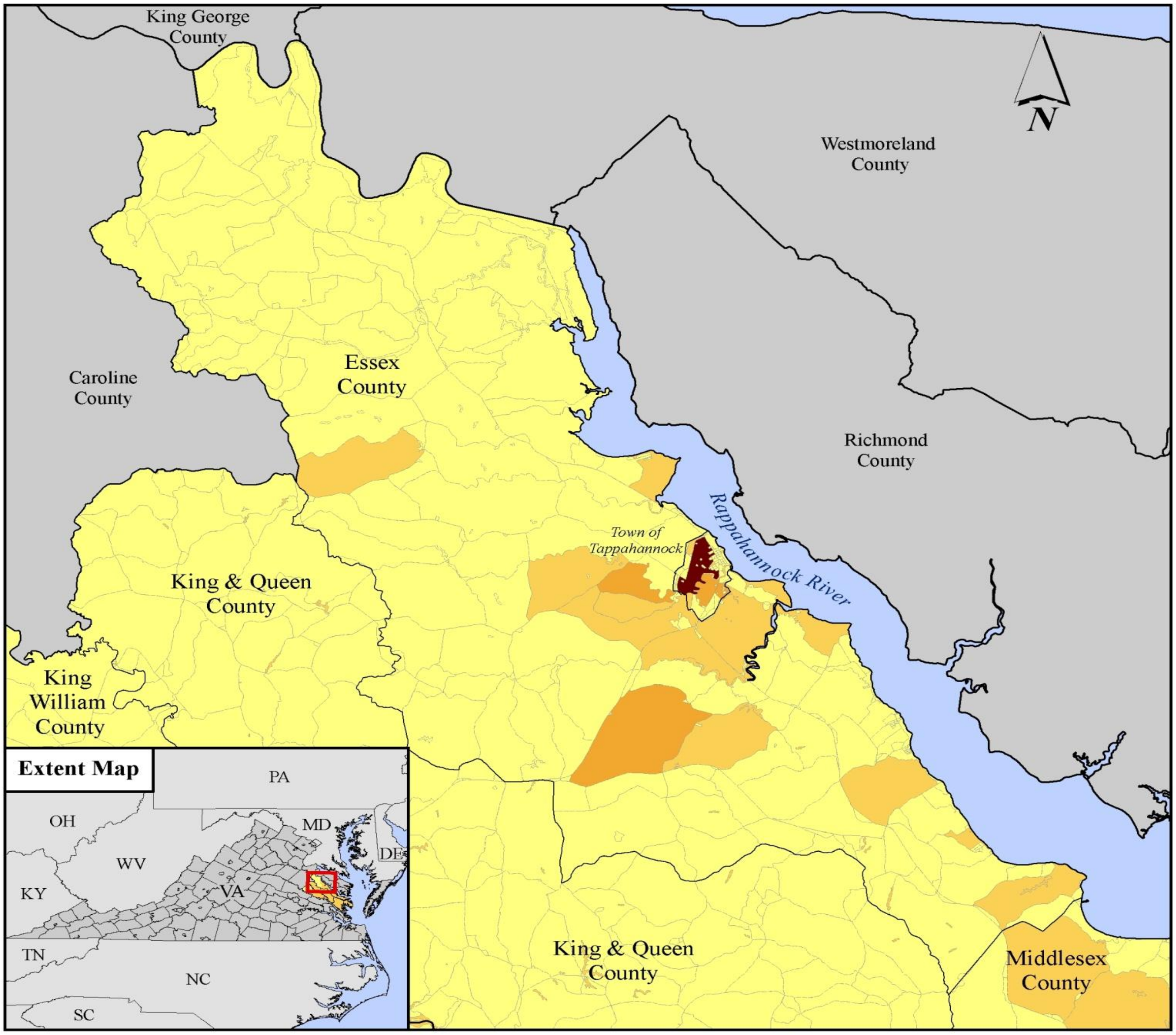
King and Queen County has the lowest annualized loss values for the region, accounting for 3% of the total damages. Residential occupancy makes up the majority of the losses in the county. The southern portion of the county, near the York River, has several census blocks with annualized losses in the thousands of dollars.

Map 104



HAZUS-MH Hurricane Module: Total Annualized Loss
King George County
Westmoreland County
Caroline County
Essex County
Town of Tappahannock
Richmond County
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
Extent Map
PA
OH
MD
DE
WV
VA
KY
TN
NC
SC
James City County
York River
York County
Charles City County
City of Williamsburg
Chesapeake Bay
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
<= $499
$500 - $999
$1,000 - $2,499
$2,500 - $4,999
>= $5,000
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 MR4 Wind Model (analysis 11/2009)
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

HAZUS-MH Hurricane Module: Total Annualized Loss



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

- <= $499
- $500 - $999
- $1,000 - $2,499
- $2,500 - $4,999
- >= $5,000

0 1.25 2.5 5 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.

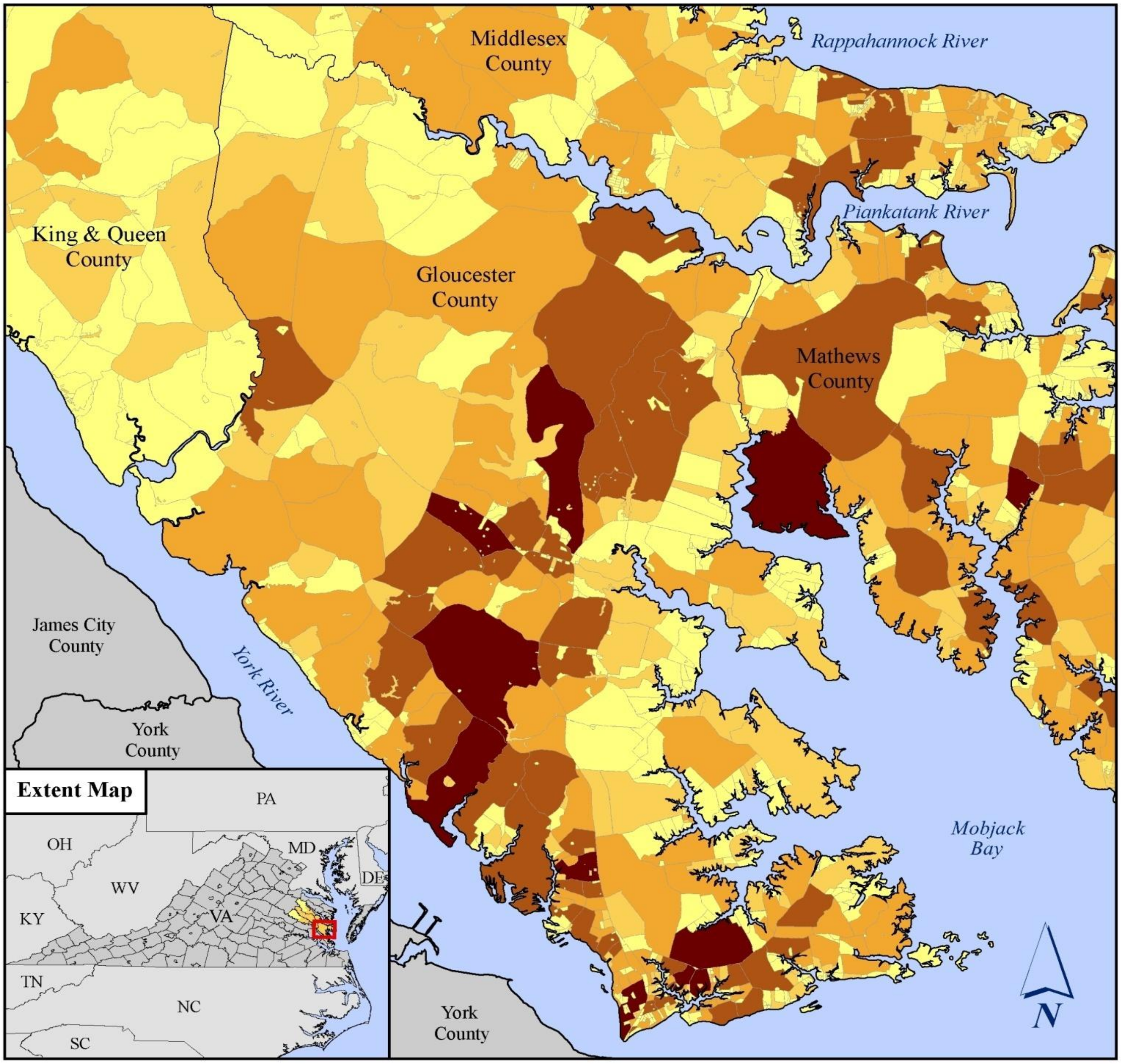
Loss values have been summarized from building type files.

Data Sources:

HAZUS-MH MR4 Wind Model *(analysis 11/2009)*
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 105

HAZUS-MH Hurricane Module: Total Annualized Loss



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
- <= $499
- $500 - $999
- $1,000 - $2,499
- $2,500 - $4,999
- >= $5,000

0 1.25 2.5 5 Miles

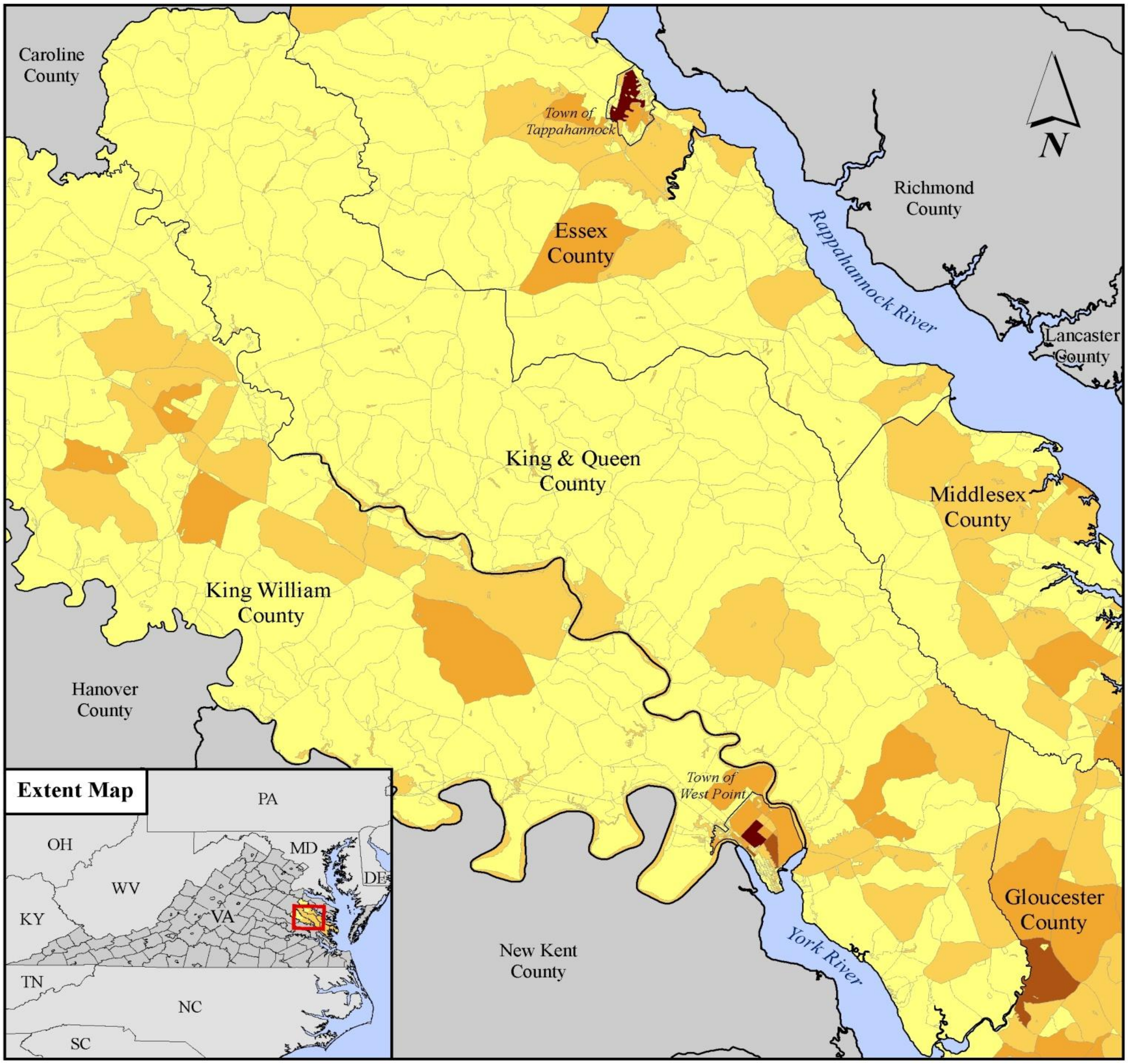
Data Information:
Direct economic annualized loss was calculated using the probabilistic scenario. Annualized loss is defined as the expected value of loss in any one year, and is developed by aggregating the losses and exceedance probabilities.

Loss values have been summarized from building type files.

Data Sources:
HAZUS-MH MR4 Wind Model *(analysis 11/2009)*
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 106

HAZUS-MH Hurricane Module: Total Annualized Loss



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

- <= $499
- $500 - $999
- $1,000 - $2,499
- $2,500 - $4,999
- >= $5,000

0 1.25 2.5 5 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.

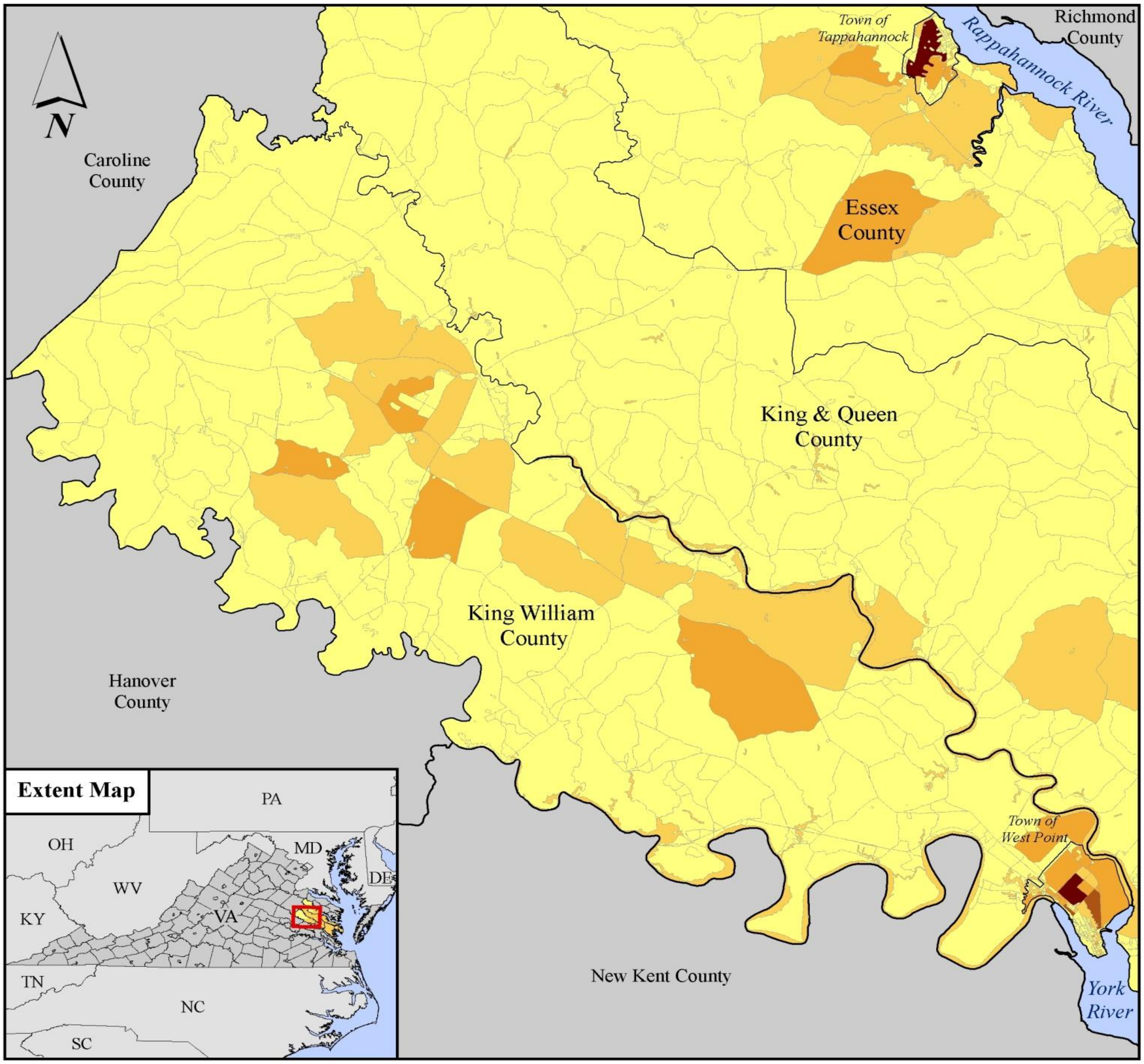
Loss values have been summarized from building type files.

Data Sources:

HAZUS-MH MR4 Wind Model *(analysis 11/2009)*
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 107

HAZUS-MH Hurricane Module: Total Annualized Loss



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
- <= $499
- $500 - $999
- $1,000 - $2,499
- $2,500 - $4,999
- >= $5,000

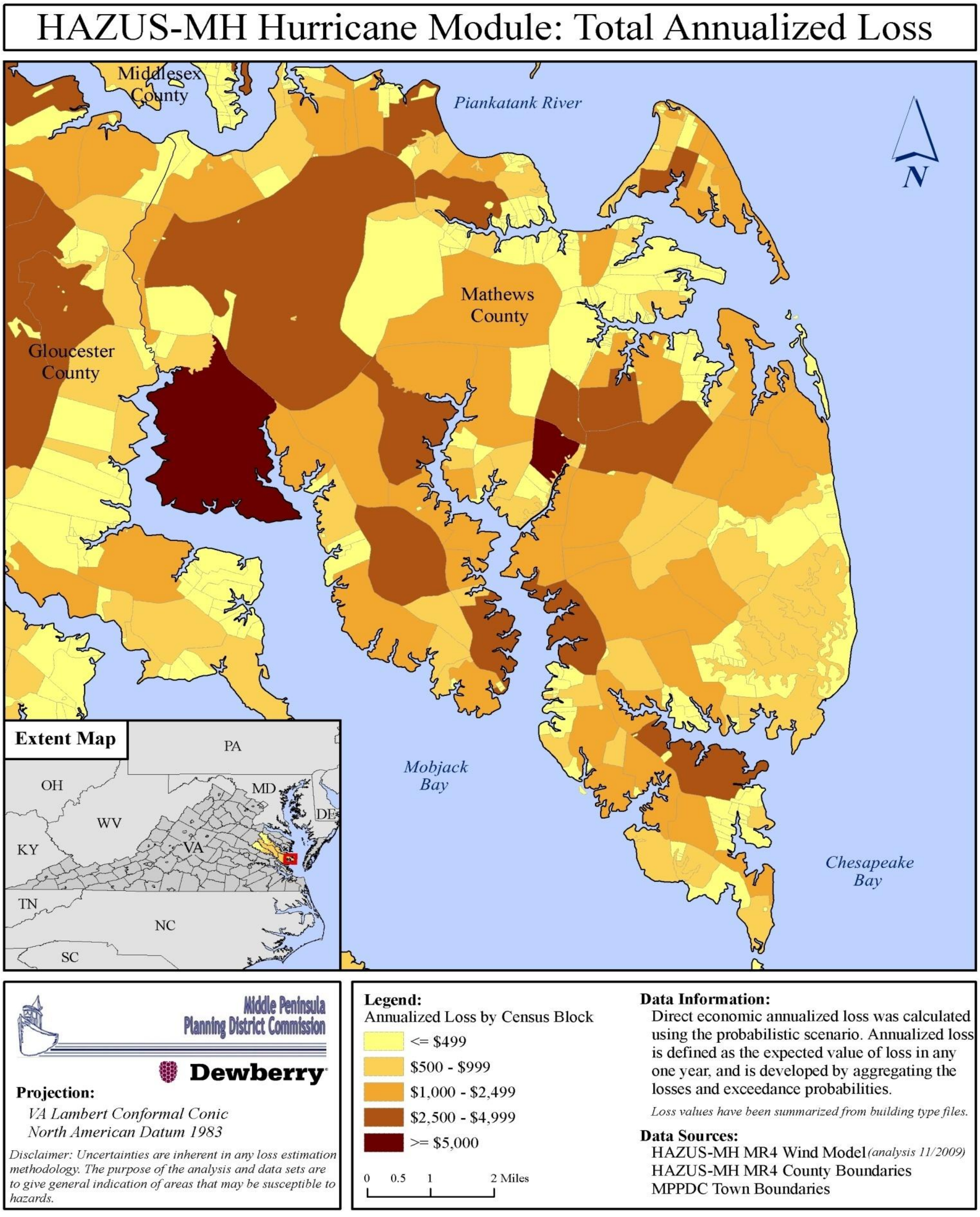
0 1.25 2.5 5 Miles

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.

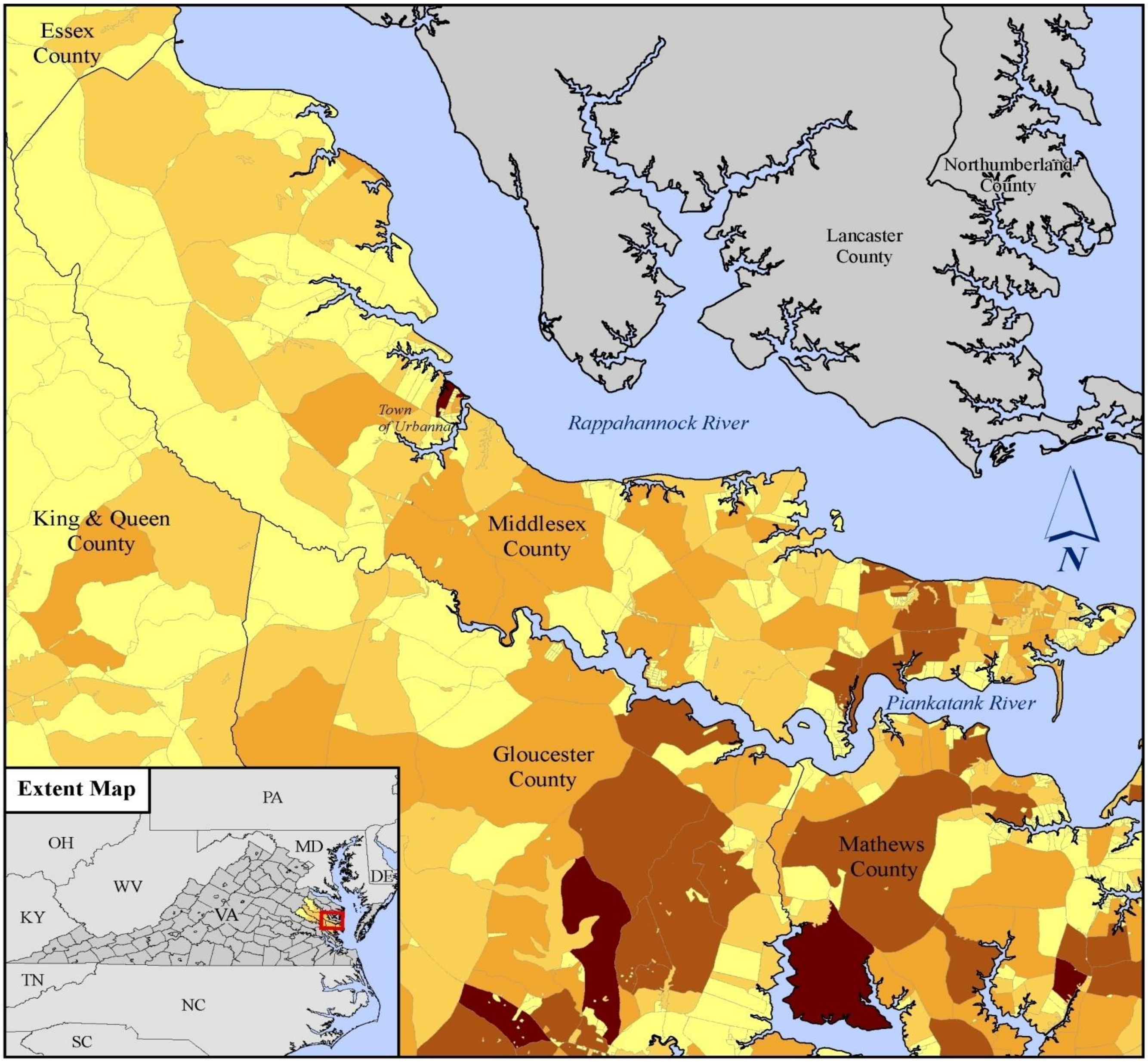
Data Sources:
HAZUS-MH MR4 Wind Model *(analysis 11/2009)*
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 108


HAZUS-MH Hurricane Module: Total Annualized Loss
Middlesex County
Piankatank River
Mathews County
Gloucester County
Mobjack Bay
Chesapeake Bay
N
Extent Map
PA
OH
MD
WV
DE
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
<= $499
$500 - $999
$1,000 - $2,499
$2,500 - $4,999
>= $5,000
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 MR4 Wind Model (analysis 11/2009)
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 109

HAZUS-MH Hurricane Module: Total Annualized Loss



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

- <= $499
- $500 - $999
- $1,000 - $2,499
- $2,500 - $4,999
- >= $5,000

0 1.25 2.5 5 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 MR4 Wind Model *(analysis 11/2009)*
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 110

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 18.

Table 28. HAZUS-MH damage state thresholds.

Damage State	Qualitative Damage Description
None	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	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	Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water.
Severe	Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.
Destruction	Complete roof failure and/or, failure of wall frame. Loss of more than 50% of roof sheathing.

HAZUS-MH MR4 Technical Manual

HAZUS analysis for the 100-year event, or 1% annual chance, results in 33 buildings being uninhabitable, the 200-year event, or 0.5% annual chance, results in 180 buildings being uninhabitable, the 500-year event, or 0.2% annual chance, results in 919 buildings being uninhabitable and the 1000-year event, 0.1% annual chance, results in 2,093 buildings being uninhabitable. Table 19 and Appendix 4 provide detailed information on the damage state percentages and number of buildings damaged for each of the probabilistic return periods.

Damage state significantly increases at the 1000-year event. King William County is estimated to have 10.93% of the building square footage uninhabitable from a 1000-yr event; only 0.58% of which is a total loss. Essex County is estimated to have 7.36% of the building square footage uninhabitable from a 1000-yr event; only 0.28% of which is a total loss.

The default data and parameters that HAZUS utilizes are capable of producing crude estimates of losses (Table 19). 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 19 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 with increase monotonically with return period.

Table 29. Building Damage by County.

Essex County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	100%	-	-	-	-
20-year Event	99.86%	0.14%	-	-	-
50-year Event	100%	-	-	-	-
100-year Event	99.16%	0.81%	0.03%	-	-
200-year Event	96.63%	3.08%	0.28%	0.01%	-
500-year Event	96.68%	3.08%	0.28%	0.01%	-
1000-year Event	76.69%	15.96%	6.33%	0.75%	0.28%

King William County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	100%	-	-	-	-
20-year Event	99.87%	0.13%	-	-	-
50-year Event	99.94%	0.06%	-	-	-
100-year Event	98.06%	1.78%	0.16%	0.01%	-
200-year Event	97.50%	2.26%	0.23%	0.01%	-
500-year Event	95.34%	3.93%	0.67%	0.04%	0.01%
1000-year Event	72.26%	16.80%	8.41%	1.94%	0.58%

Gloucester County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	100%	-	-	-	-
20-year Event	99.90%	0.10%	-	-	-
50-year Event	98.88%	1.07%	0.05%	-	-
100-year Event	98.55%	1.38%	0.07%	-	-
200-year Event	96.44%	3.28%	0.26%	0.01%	-
500-year Event	85.94%	10.95%	2.71%	0.29%	0.11%
1000-year Event	89.44%	8.84%	1.57%	0.11%	0.04%

Mathews County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	100%	-	-	-	-
20-year Event	100%	0.09%	-	-	-
50-year Event	99.15%	0.83%	0.02%	-	-
100-year Event	99.00%	0.97%	0.03%	-	-
200-year Event	93.55%	5.82%	0.60%	0.01%	-
500-year Event	81.88%	14.05%	3.64%	0.29%	0.15%
1000-year Event	92.81%	6.42%	0.73%	0.02%	0.01%

King & Queen County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	100%	-	-	-	-
20-year Event	99.94%	0.05%	-	-	-
50-year Event	99.98%	0.02%	-	-	-
100-year Event	99.02%	0.95%	0.03%	-	-
200-year Event	98.29%	1.65%	0.07%	-	-
500-year Event	97.14%	2.69%	0.17%	0.01%	-
1000-year Event	84.23%	12.24%	3.09%	0.29%	0.16%

Middlesex County	Average Damage State (%)				
Return Period	None	Minor	Moderate	Severe	Destruction
10-year Event	100%	-	-	-	-
20-year Event	99.93%	0.07%	-	-	-
50-year Event	99.87%	0.13%	-	-	-
100-year Event	98.75%	1.21%	0.04%	-	-
200-year Event	95.35%	4.23%	0.40%	0.01%	-
500-year Event	91.45%	7.26%	1.18%	0.07%	0.03%
1000-year Event	91.31%	7.47%	1.13%	0.06%	0.03%

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 1% of the total tonnage for the 50-, 100-, and 200-year return periods and 2% of the 500- and 1000-year return periods. Table 20 summarizes, by return period, the total generated debris.

Table 30. Hurricane debris generation.

Return Period	Total Debris (tons)
10-year Event	-
20-year Event	40,877
50-year Event	47,765
100-year Event	248,612
200-year Event	421,242
500-year Event	552,605
1000-year Event	1,233,315

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[4].

The HAZUS essential facilities database includes default data for Medical Care Facilities, Emergency Response Facilities (fire stations, polices stations, EOCs) and schools. Table 21 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.

[4] Multi-hazard Loss Estimation Methodology Hurricane Model User Manual, HAZUS-MH MR4, Chapter 1: Introduction, 1-6

Table 31. 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%

HAZUS-MH MR4 Analysis – Riverine and Coastal Flood

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 a methodology and software application to develop multi-hazard losses on 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[5].

Potential loss estimates analyzed in HAZUS-MH MR4 include:

- Physical damage to residential and commercial buildings, schools, essential facilities, and infrastructure, and
- 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. Probabilistic events were mainly modeled in this revision to be able to determine annualized loss for each of the counties in the Middle Peninsula. Probabilistic events are modeled by looking at the damage caused by an event that is likely to occur over a given period of time, known as a return period or recurrence interval. Hazard analysis of the 100-year return interval was performed in order to assess risk to essential facilities.

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 due to flood velocity to the general building stock (GBS). 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].

[5] HAZUS-MH MR4 Flood User Manual

Flood Analysis

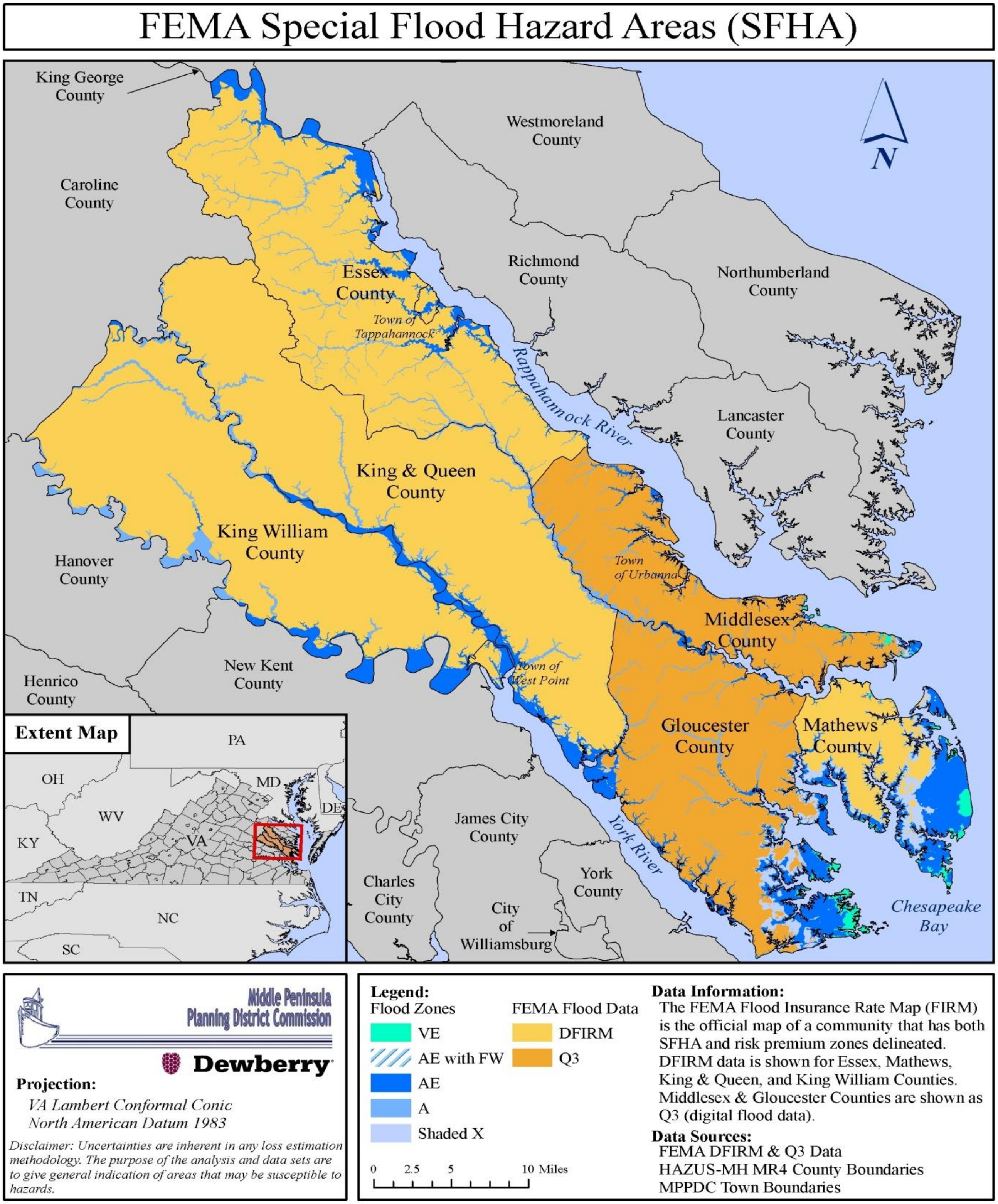
The flood analysis for the HIRA was completed using the FEMA HAZUS – MH MR4 software for riverine and coastal flood hazards. Flood hazard is defined by a relationship between depth of flooding and the annual chance of inundation to that depth. This assessment has been completed for Level 1 analysis with user-provided depth grids that were generated from the FEMA Digital Flood Insurance Rate Maps (DFIRM) and Q3 data. Map 108 illustrates the extent of flooding, as defined by FEMA.

In most cases, the FEMA flood maps have been developed for streams with contributing drainage area of 1 square mile. An attempt was made to complete the HAZUS flood analysis for this level of detail; at this time, complete county-wide analysis was not feasible for contributing drainage areas of 1 square mile. Mathews County depth-grid creation was achievable, taking more than three days for HAZUS to run the annualized loss calculations. The remaining counties in the Middle Peninsula have been completed for contributing drainage areas of 10 square miles (30 meter cell size). This is the default drainage for HAZUS flood analysis and the results are reasonable for mitigation planning purposes.

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 22 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 32. 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	Rental costs per month per sq ft by occupancy	Relocation expenses (for businesses and institutions)
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


FEMA Special Flood Hazard Areas (SFHA)
King George County
Westmoreland County
Caroline County
Essex County
Town of Tappahannock
Richmond County
Northumberland County
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
York County
Charles City County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
WV
DE
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:
Flood Zones
VE
AE with FW
AE
A
Shaded X
FEMA Flood Data
DFIRM
Q3
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. DFIRM data is shown for Essex, Mathews, King & Queen, and King William Counties. Middlesex & Gloucester Counties are shown as Q3 (digital flood data).
Data Sources:
FEMA DFIRM & Q3 Data
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 111

Building Stock

Middle Peninsula currently has approximately 43,270 structures with an estimated exposure value of approximately $5.3 billion. Average value of buildings in the study area range from $74,100 to $234,400, with the mean value at $110,357. Eighty percent of the planning district's general occupancy is categorized as residential, followed by commercial (13%).

Table 33 below provides inventory information for each of the six counties that were included in the analysis. Gloucester County occupies a large percentage (39%) of the building stock exposure for the region.

Table 33. Building stock exposure for general occupancies by county.

Community	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Gloucester County	$1,667,327	$272,381	$45,396	$8,460	$37,279	$10,303	$54,226	$2,095,372
King William County	$658,933	$93,288	$31,827	$8,461	$18,455	$6,929	$7,503	$825,396
Middlesex County	$652,928	$120,077	$19,318	$3,649	$11,809	$3,765	$12,284	$823,830
Mathews County	$607,354	$50,392	$13,596	$2,563	$8,800	$2,431	$3,647	$688,783
Essex County	$450,770	$120,501	$38,173	$6,236	$12,012	$5,295	$8,963	$641,950
King & Queen County	$261,828	$18,240	$8,405	$1,743	$8,825	$1,058	$2,205	$302,304
Total	$4,299,140	$674,879	$156,715	$31,112	$97,180	$29,781	$88,828	$5,377,635
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 24. The HAZUS inventory serves as the default when a user does not have better data available.

Table 34. 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 (60%) of building types in the planning district. Masonry construction accounts for a quarter of the building type exposure. Table 35 below provides building stock exposure for the five main building types.

Table 35. Building stock exposure for general building type by county.

Community	Wood	Masonry	Concrete	Steel	Manufactured Home	Total
Gloucester County	$1,232,920	$528,231	$58,091	$194,459	$81,670	$2,095,371
King William County	$510,368	$211,314	$19,392	$74,547	$9,768	$825,389
Middlesex County	$485,545	$207,159	$21,215	$74,633	$35,276	$823,828
Mathews County	$450,736	$171,414	$10,356	$37,432	$18,846	$688,784
Essex County	$334,134	$158,733	$27,893	$92,957	$28,233	$641,950
King & Queen County	$186,202	$71,783	$3,661	$16,121	$24,532	$302,299
Total	$3,199,905	$1,348,634	$140,608	$490,149	$198,325	$5,377,621
All values are in thousands of dollars						

Annualized loss is one way to determine the maximum potential annual loss. This is useful for creating a common denominator by which different types of hazards can be compared. Annualized losses are the summation of losses over all return periods multiplied by the probability of occurrence. Table 36 below shows the return periods used and the chance occurrence associated with the period in any given year.

Table 36. Annual probability base on flood recurrence intervals.

Flood Recurrence Interval	Annual Chance of Occurrence
10 year	10.0%
50 year	2.0%
100 year	1.0%
500 year	0.2%

General Building Stock Loss Estimation

The probabilistic HAZUS-MH flood analysis predicts that the Middle Peninsula can expect, annually, $41,109,000 in damages due to flood events. Property or "capital stock" losses make up about $41,055,000 of the damages or 99.87%. This includes the values for building, content, and inventory. Business interruption accounts for $54,000 (0.13%) of the annualized losses and includes income, rental, wage, and relocation 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 the Pre- and Post-FIRM census blocks.

Table 37 illustrates the expected annualized losses broken down by county. Gloucester County has the highest annualized loss, $18,698,000, accounting for 45.5% of the total losses for the Middle Peninsula and 0.89% of the county's building stock. The majority of the expected damages can be attributed to building and content value.

Mathews County has the second highest loss, $11,255,000, accounting for 27.4% of the total annualized losses for the Middle Peninsula and 1.4% of the county's building stock.

Building value loss accounts for approximately 54% of the expected annualized damages and 45% is attributed to content value loss. Tables 38 and 39 summarize the annualized loss by building type and occupancy type.

Table 37. County based HAZUS annualized loss for Pre- and Post-FIRM by building type.

Community	Building	Content	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Gloucester County	$9,839	$8,675	$150	$2	$1	$0	$31	$18,698
Mathews County	$6,440	$4,741	$65	$2	$0	$0	$7	$11,255
King William County	$2,588	$2,178	$43	$1	$0	$0	$5	$4,815
Middlesex County	$2,150	$1,752	$17	$0	$0	$0	$4	$3,923
King & Queen County	$784	$530	$10	$0	$0	$0	$1	$1,325
Essex County	$443	$623	$27	$0	$0	$0	$0	$1,093

All values in Thousands of Dollars

Less than 0.76% of the region's total exposure is at risk to flood damages, annually. Residential occupancy accounts for the majority of the damages, followed closely by content damages. Wood buildings account for $24,204,000, or 58.9% of the annualized damages of which the majority (43.2%) are in Gloucester County. Occupancy results indicate that agricultural, non-profit and industrial have the largest percent of exposure at risk. 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 40 and 41 summarize the annualized loss by county by building type and occupancy type. The slight differences in the annualized losses for building type and occupancy can be attributed to the HAZUS classification methodology.

Table 38. Annualized loss by building type.

Building Type	Building	Contents	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Wood	$14,311	$9,855	$30	$5	$0	$0	$3	$24,204
Masonry	$5,291	$4,748	$57	$0	$0	$0	$10	$10,106
Steel	$962	$2,701	$203	$0	$1	$0	$30	$3,897
Manufactured Housing	$1,475	$599	$0	$0	$0	$0	$0	$2,074
Concrete	$205	$596	$22	$0	$0	$0	$5	$828
Annualized Loss	**$22,244**	**$18,499**	**$312**	**$5**	**$1**	**$0**	**$48**	**$41,109**
% of Ann. Loss	54.11%	45.00%	0.76%	0.01%	0.00%	0.00%	0.12%	*HAZUS-MH (MR4) results*

Values In Thousands of Dollars

Table 39. Annualized loss by occupancy type.

Occupancy Type	Building	Contents	Inventory	Relocation	Income	Rental	Wage	Annualized Loss
Residential	$19,838	$12,036	$0	$5	$1	$0	$3	$31,883
Commercial	$1,338	$3,823	$97	$0	$3	$0	$5	$5,266
Industrial	$485	$938	$198	$0	$0	$0	$0	$1,621
Non-Profit	$115	$842	$0	$0	$0	$0	$0	$957
Agricultural	$97	$237	$40	$0	$0	$0	$0	$374
Education	$39	$242	$0	$0	$2	$0	$5	$288
Government	$12	$98	$0	$0	$0	$0	$46	$156
Annualized Loss	**$21,924**	**$18,216**	**$335**	**$5**	**$6**	**$0**	**$59**	**$40,545**
% of Ann. Loss	54.07%	44.93%	0.83%	0.01%	0.01%	0.00%	0.15%	*HAZUS-MH (MR4) results*

Values in Thousands of Dollars

Table 40. County based HAZUS annualized loss by building type.

Community	Total Exposure	Concrete	Masonry	Manufactured Homes	Steel	Wood	Annualized Loss
Gloucester County	$2,095,371	$444	$4,658	$961	$2,174	$10,461	$18,698
Mathews County	$688,784	$126	$2,730	$561	$625	$7,213	$11,255
King William County	$823,828	$99	$1,206	$136	$422	$2,952	$4,815
Middlesex County	$825,389	$60	$960	$205	$330	$2,368	$3,923
King & Queen County	$641,950	$11	$290	$173	$54	$797	$1,325
Essex County	$302,299	$88	$262	$38	$292	$413	$1,093
Annualized Loss		**$828**	**$10,106**	**$2,074**	**$3,897**	**$24,204**	**$41,109**
% of Annualized Loss		2.01%	24.58%	5.05%	9.48%	58.88%	*HAZUS-MH (MR4) results*
% of Total Exposure		0.59%	0.75%	1.05%	0.80%	0.76%	

Values in Thousands of Dollars

Table 41. County based HAZUS annualized loss by occupancy type.

Community	Total Exposure	Residen-tial	Comm-ercial	Indust-Rial	Non-Profit	Educa-tion	Govern-Ment	Agricul-ture	Annualized Loss
Gloucester County	$2,095,372	$13,642	$3,234	$747	$548	$241	$70	$84	$18,566
Mathews County	$688,783	$9,634	$700	$420	$187	$19	$32	$67	$11,059
King William County	$825,396	$3,885	$429	$146	$97	$1	$25	$210	$4,793
Middlesex County	$823,830	$3,037	$521	$124	$69	$23	$26	$3	$3,803
King & Queen County	$302,304	$1,169	$0	$37	$32	$0	$1	$4	$1,243
Essex County	$641,950	$516	$382	$147	$24	$4	$2	$6	$1,081
Annualized Loss		**$31,883**	**$5,266**	**$1,621**	**$957**	**$288**	**$156**	**$374**	**$40,545**
% of Annualized Loss		78.64%	12.99%	4.00%	2.36%	0.71%	0.38%	0.92%	*HAZUS-MH (MR4)*
% of Exposure		0.74%	0.78%	1.03%	0.98%	0.32%	0.52%	1.20%	

								results	

Maps 112 to 119 show the total annualized loss for the planning district and individual counties. Gloucester County accounts for almost 45.5% 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.

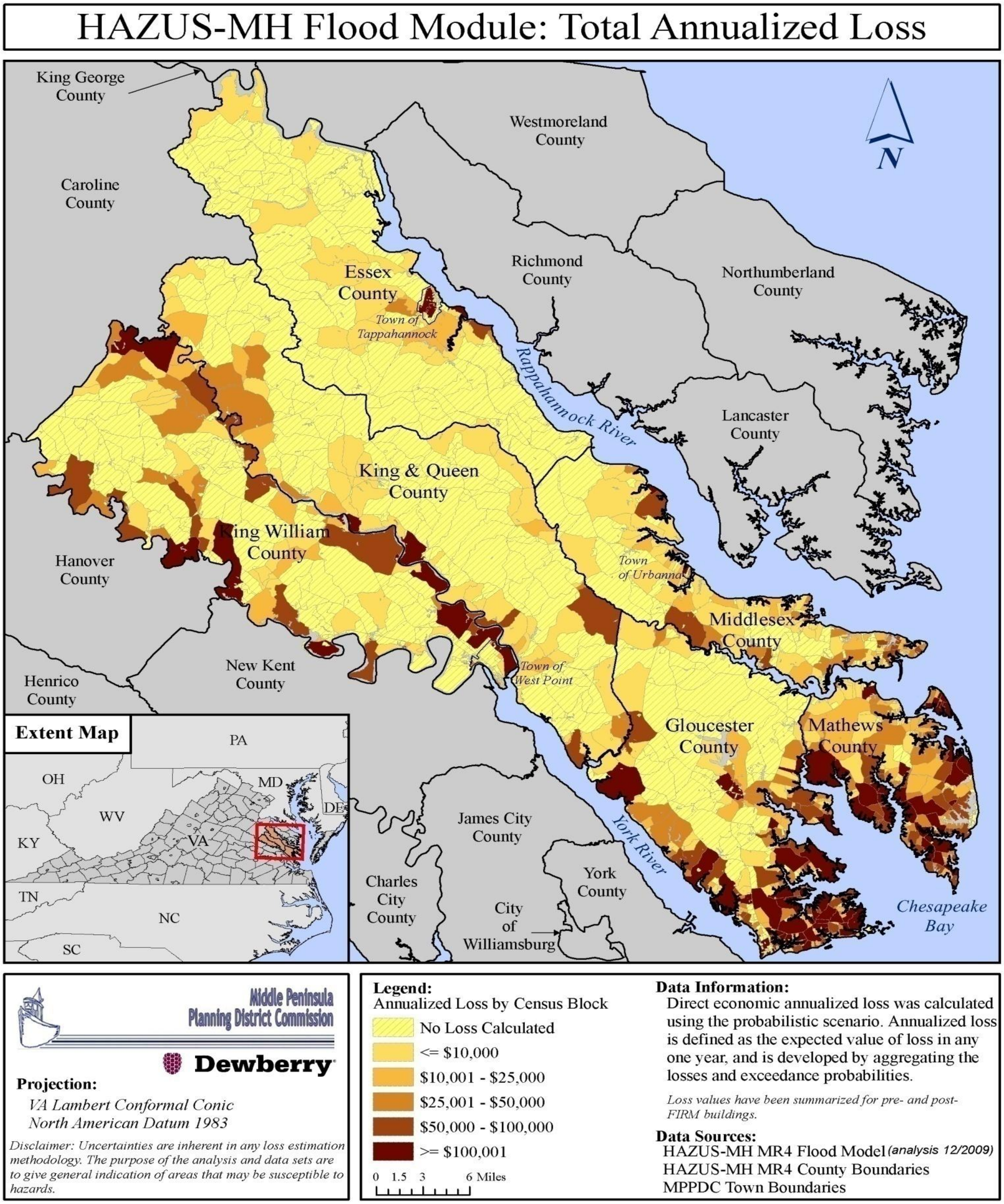
Losses in Mathews County are spread throughout the county with high frequency of census blocks having damages greater than $50,000 along the Mobjack Bay. Two neighboring census blocks on the Piankatank River have a combined annualized loss of $660,000. Mathews County accounts for 27.4% of the total annualized losses in the planning district.

The census blocks bordering the Pamunkey and Mattaponi Rivers contain almost all of the annualized damages for King William County. Wood framed structures make up 61.3% of the losses.

Middlesex County's annualized losses account for 9.5% of the total risk. The Piankatank River and Dragon Swamp contain most of the annualized losses for the county. Wood framed structures account for 60.4% of the losses. The Town of Urbanna has the largest loss per census block in the county, estimated to have $254,000 in annualized damages. The second highest census block loss ($101,000) is located in the northeastern portion of the county on the Rappahannock River.

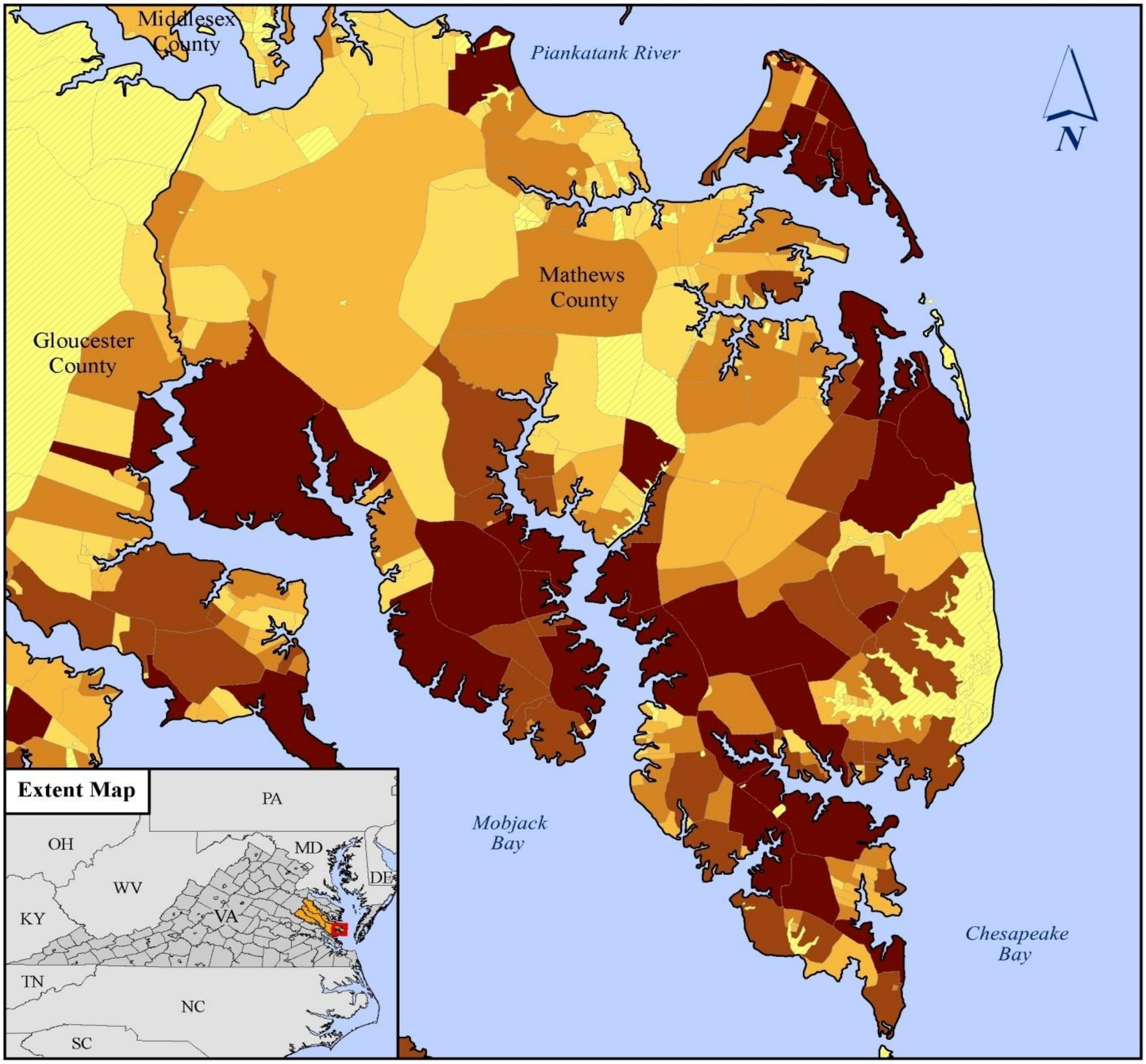
King and Queen County has the second lowest annualized loss values for the region, accounting for 9.4% of the total damages. Residential occupancy makes up the majority of the losses in the county. A few large census blocks on the Mattaponi River attribute to most of the damages.

The Town of Tappahannock and surrounding census blocks contain most of the damages for Essex County, accounting for $962,000 of the $1,093,000 damages along the Rappahannock River. The county and town losses attribute a little more than 2.7% to the annualized damages for the region.


HAZUS-MH Flood Module: Total Annualized Loss
King George County
Westmoreland County
Caroline County
Essex County
Town of Tappahannock
Richmond County
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
York County
Charles City County
City of Williamsburg
Chesapeake Bay
N
Extent Map
PA
OH
MD
WV
DE
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
<= $10,000
$10,001 - $25,000
$25,001 - $50,000
$50,000 - $100,000
>= $100,001
0 1.5 3 6 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 for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH MR4 Flood Model (analysis 12/2009)
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 112

HAZUS-MH Flood Module: Total Annualized Loss



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
- <= $10,000
- $10,001 - $25,000
- $25,001 - $50,000
- $50,000 - $100,000
- >= $100,001

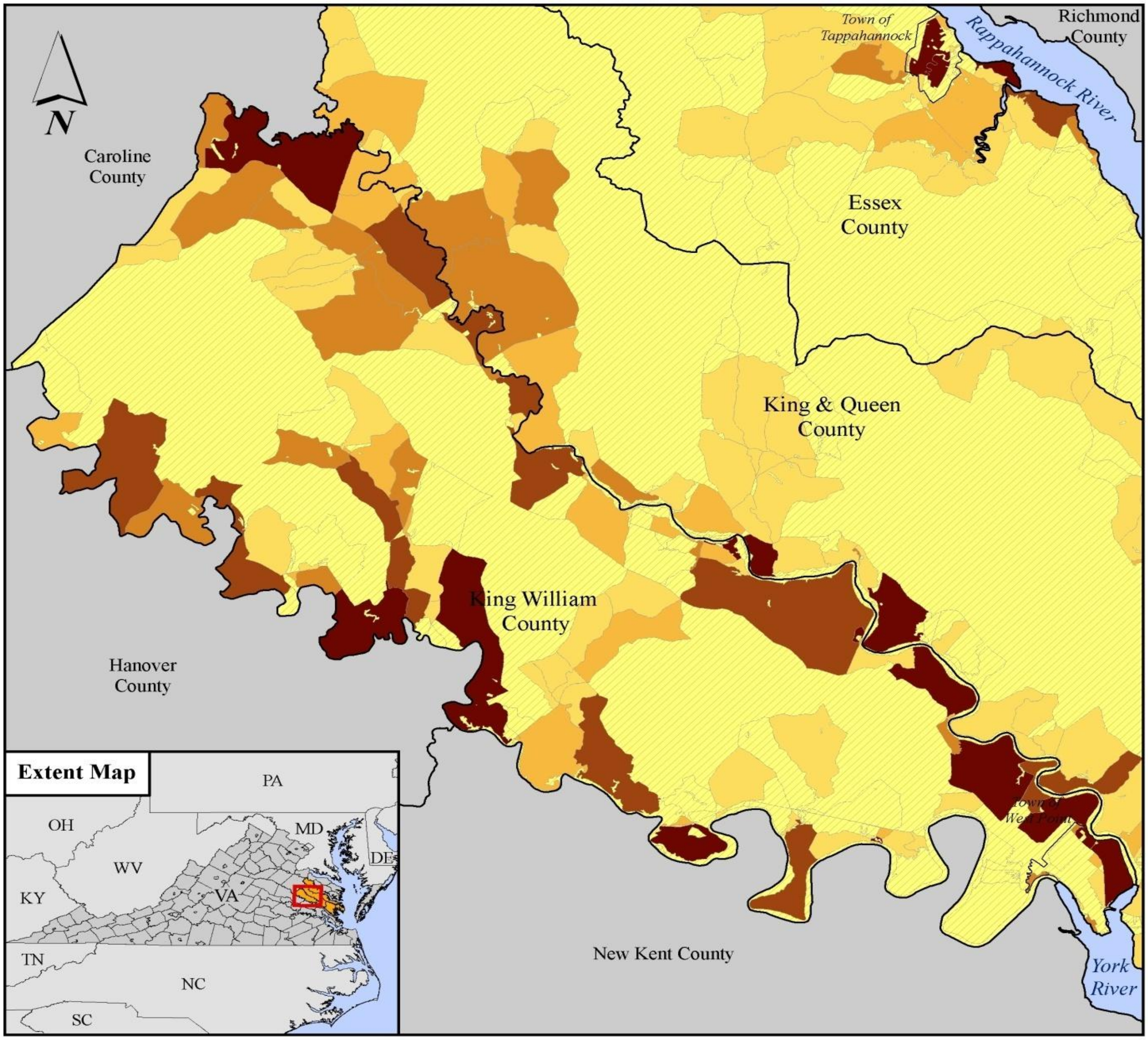
0 0.5 1 2 Miles

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 for pre- and post-FIRM buildings.

Data Sources:
HAZUS-MH MR4 Flood Model *(analysis 12/2009)*
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 113

HAZUS-MH Flood Module: Total Annualized Loss



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
- <= $10,000
- $10,001 - $25,000
- $25,001 - $50,000
- $50,000 - $100,000
- >= $100,001

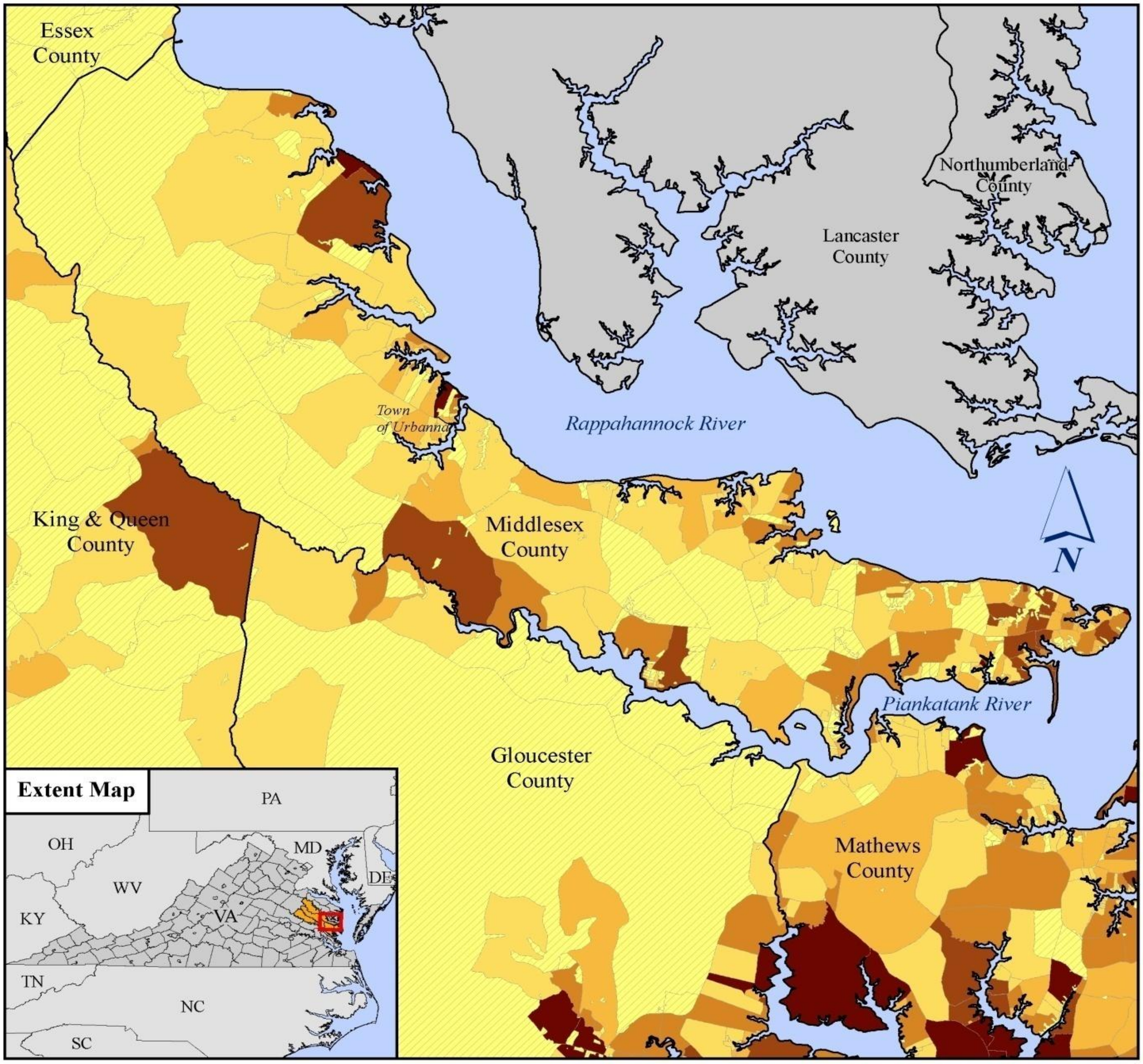
0 1.25 2.5 5 Miles

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 for pre- and post-FIRM buildings.

Data Sources:
HAZUS-MH MR4 Flood Model *(analysis 12/2009)*
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 114

HAZUS-MH Flood Module: Total Annualized Loss



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
- <= $10,000
- $10,001 - $25,000
- $25,001 - $50,000
- $50,000 - $100,000
- >= $100,001

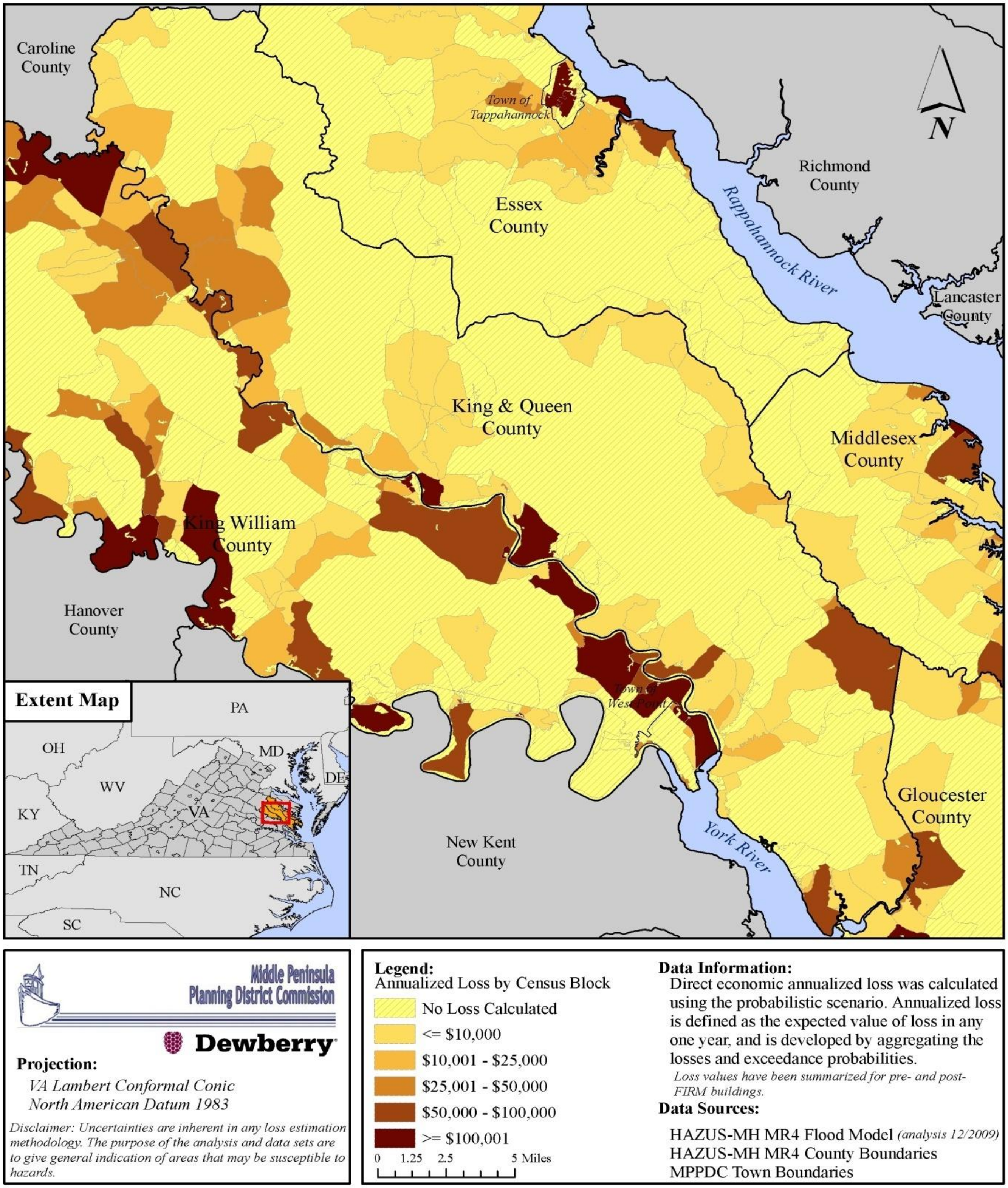
0 1.25 2.5 5 Miles

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 for pre- and post-FIRM buildings.

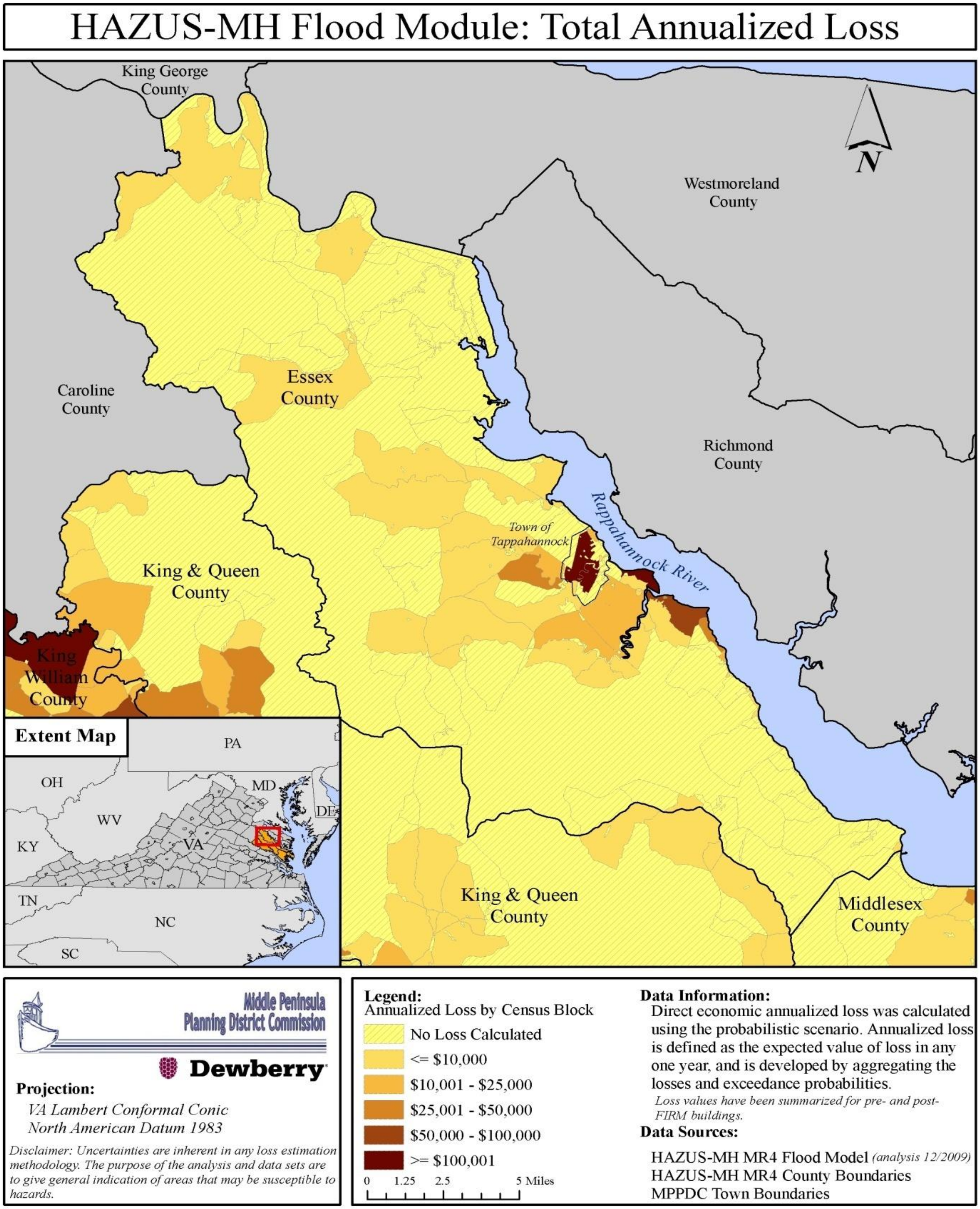
Data Sources:
HAZUS-MH MR4 Flood Model *(analysis 12/2009)*
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 115

HAZUS-MH Flood Module: Total Annualized Loss



Map 116


HAZUS-MH Flood Module: Total Annualized Loss
King George County
Westmoreland County
Caroline County
Essex County
Richmond County
Town of Tappahannock
Rappahannock River
King & Queen County
King William County
King & Queen County
Middlesex County
N
Extent Map
PA
OH
MD
WV
DE
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
<= $10,000
$10,001 - $25,000
$25,001 - $50,000
$50,000 - $100,000
>= $100,001
0 1.25 2.5 5 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 for pre- and post-FIRM buildings.
Data Sources:
HAZUS-MH MR4 Flood Model (analysis 12/2009)
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 117

Essential Facilities

Level 1 analysis involves using data that comes with the HAZUS software, which does not have local inputs - aside from the depth-grids. Therefore, some of the physical locations of the facilities, as shown on Map 114, are not accurate. Future versions of this plan can be enhanced/corrected, as stated in the Mitigation Actions section below, with Level 2 and 3 HAZUS analysis so that the spatial location of the mapped essential facilities has a higher degree of accuracy.

Essential facilities, including medical care facilities, emergency response facilities and schools, are those vital to emergency response and recovery efforts following a disaster. School buildings are included in this category because of the key role that 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 these structures, even through the uncertainty in each such estimate is large[6].

Probabilistic scenarios for the 100-year flood event were completed to be able to assess the risk to essential facilities in each county. The 100-year flood recurrence interval results in no expected damage to essential facilities in Essex, King William and Middlesex Counties.

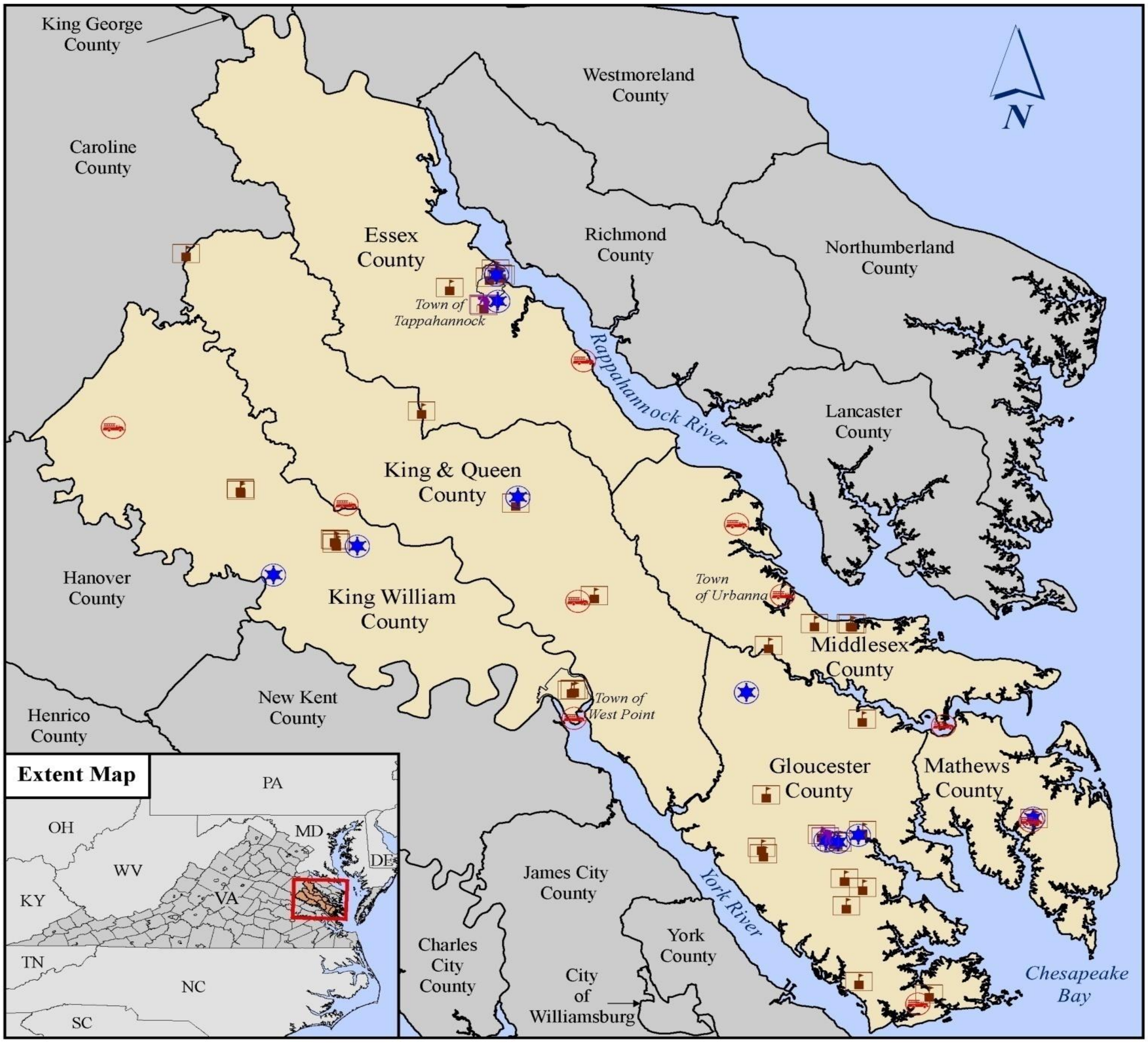
Achilles Elementary School in Gloucester County is expected to have 2.94% building and 15.87% content damage from a 100-year event.

Lawson-Marriott Elementary School in King & Queen County is expected to have at least moderate damage; 14.95% building and 74.92% content damage from a 100-year event.

Mathews Volunteer Fire Department Inc, Mathews County, is expected to have 7.59% building and 10.36% content damage from a 100-year event.

[6] Multi-hazard Loss Estimation Methodology HAZUS-MH MR4, Chapter 1: Introduction, 1-6

HAZUS Essential Facilities



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 MR4 Essential Facilties
HAZUS-MH MR4 County Boundaries
MPPDC Town Boundaries

Map 118

Mitigation Actions

1. 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.
2. Refine and update data sets for GBS and essential facilities.
3. Re-run HAZUS for plan update to reflect 2010 census data.

Risk Assessment - Flood Insurance Coverage and Claims Data

According to published information from FEMA as of June 2, 2008, there were:

1. A total of 4,021 flood insurance policies in effect in the Middle Peninsula and they cover over $856 million worth of property.
2. 76% (3,056) of these policies cover properties that are within the 100-year floodplain and the remaining 24% (965) cover properties outside of the 100-year floodplain.
3. 65% (2,614) of all policy holders have made 1 or more insurance claims in the last 30 years - between 1978 and 2008.
4. The average insurance claim was $21,864.
5. The loss ratio of claims to premiums was 19 to 1.

In summary, these insurance figures and other evidence show that:

1. The Federally backed flood insurance claim payments exceed insurance premiums by 19 times in the Middle Peninsula Region.
2. It is likely to expect that 2/3 of the flood policy holders in the Middle Peninsula will be once again be vulnerable to flood damage over the next 30 year period.
3. Global warming and greater development in the highly sought-after waterfront communities in the Middle Peninsula will continue to create a high degree of susceptibility/vulnerability of properties to severe hazards from future storm events.
4. An increasing number of insurance companies are no longer offering flood insurance coverage in coastal areas, especially in the wake of astronomical flood claims nationwide over the last 2 decades. This increases the need for stepped-up implementation of mitigation programs and policies by Middle Peninsula localities.
5. Excessive amounts of high-end development along beachfront properties have helped to create an unsustainable flood insurance program – with flood mitigation the key to reducing financial losses by the Flood Insurance Program.

Possible Financial Impacts of Flooding in Flood Insurance Rate Map (FIRM) Areas

One of the most significant hazards with the potential to impact localities within the Middle Peninsula is coastal flooding. The majority of flooding that affects the region is tidal flooding, which occurs primarily in conjunction with coastal storms such as hurricanes or nor'easters. Flooding can have a devastating effect on residential structures located within the Special Flood Hazard Areas (SFHAs).

The following tables analyze the estimated monetary value of pre-firm structures in Flood Zones A, AE, and VE. This information is analyzed and estimated on the U.S. Census Block Group level, which is the smallest unit of comprehensive housing data that local jurisdictions use in their planning and community development work.

Critical Facilities

In order to maintain public safety throughout the duration of a severe flooding event, there are critical facilities located throughout the Middle Peninsula region that will compromise public safety if disruption or inoperability occurs.

These include the following facilities:

Roads

U.S. Route 17 has been designated as a Hurricane Evacuation Route by the Commonwealth of Virginia for residents evacuating portions of the Tidewater area. Route 17, on the north side of the Town of Tappahannock at the June Parker Marina, is highly vulnerable to flooding from moderate rain events as well as more severe storm events such as hurricanes and nor'easters.

When this section of Route 17 floods and the Governor of Virginia has invoked a mandatory evacuation of the Tidewater Region due to the anticipated landfall of a Category 2, 3 or 4 Hurricane, Essex County/Tappahannock is at a high risk for having many thousands of vehicles stranded as they try to evacuate the coastal area. This traffic congestion/gridlock due to this submerged section of Route 17 will quickly create the need for local public safety officials to secure a local "Refuge of Last Resort" before the full impact of the approaching storm.

Numerous low–lying VDOT Secondary Roads flood throughout the Middle Peninsula Region. VDOT staff and county officials have produced a list of those road in their specific locality that have a chronic flooding problem – usually along road sections where it is crossed by streams/creeks. These problematic roads are listed by locality in Section 4 of this plan.

Although damage to the road surface and drainage pipes vary from storm to storm depending on its intensity and duration, residents living along these sections of roads that flood could become at risk of entrapment by rising waters if they do not evacuate the coastal side of these roads after flood waters start to rise.

Proper drainage pipe maintenance and debris removal at these low-lying sections of roads that traditional flood would lessen the risk and/or duration of entrapment for coastal side residents.

Power Grid

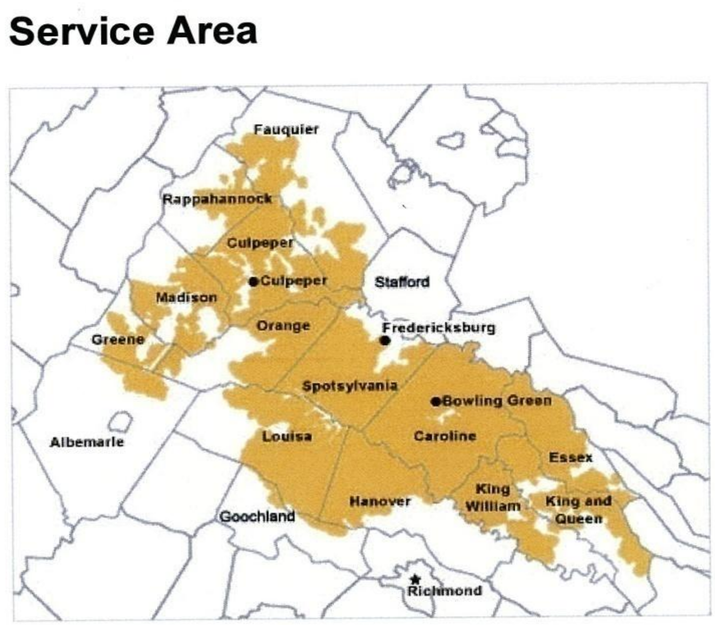
Due to the rural land development patterns throughout most of the Middle Peninsula, the majority of households are served by individual wells and septic systems. During severe flooding and wind storm events, power outages are extensive - oftentimes with serious damage to the electric system infrastructure.

Area residents, especially those with special physical and psychological needs, can be at health risks that increase in intensity during prolonged electric outages due to lack of power to run necessary medical equipment, water service and adequate septic system usage.

The Middle Peninsula Region is served by both by Dominion/Virginia Power and Rappahannock Electric Cooperative power companies. Dominion/Virginia Power serves all of Middlesex, Gloucester and Mathews Counties and portions of King and Queen, Essex and King William Counties. Rappahannock Electric Cooperative covers substantial geographic areas of King and Queen, Essex and King William Counties, as shown on the map below in brown.

Map 119

Rappahannock Electric Cooperative
A Touchstone Energy Cooperative



Reduction of potentially damaging trees and other vegetation, by both electric company right-of-way maintenance crews as well as private landowners, could lessen the extent of electric system infrastructure damage during severe storm events and therefore lower residents' vulnerability to adverse health risks due to prolonged periods of inadequate household sanitary services.

Sewer Pump Stations – 1 in Tappahannock, 1 in West Point and 2 in Gloucester

Almost by definition, sewerage pump stations are located at lower elevations with gravity flow systems. With the public systems in the Middle Peninsula, there are pump stations at 4 locations that make portions of 3 public sewerage systems at risk of malfunctioning during times of severe flooding and therefore, run the risk of posing public health concerns for residents living near the dysfunctional systems.

The **Newbill Drive Pump Station** is located in the town of Tappahannock and chronically becomes inundated with flood waters from nor'easters and hurricanes traveling up the Rappahannock River. In addition, the road surface near this sewerage pump station is vulnerable to soil erosion that damages the road surface as well as undermines the pump station structure.

In West Point, the **2nd Street Pump Station** floods on a regular basis as it is very close to the southern point of town where the Pamunky and Mattaponi Rivers join to form the York River. This station serves the lower end of town and is located near the fully developed residential and downtown business community.

During Hurricane Floyd in 1999, the Beaverdam Reservoir, located upstream from the courthouse area, overtopped its dam and floodwaters flowed over the spillway and into the Gloucester Courthouse area. **Pump Stations 11 and 13** are located in the Gloucester Courthouse area – the location of county government services, residential structures and the downtown business community.

New Point Comfort Lighthouse – Mathews County

This facility is located at the southeastern tip of Mathews County where the Chesapeake Bay meets the Mobjack Bay. The lighthouse stills serves to guide commercial and recreational waterman safely up and down these waterways. Therefore, it is an essential public safety installation in the southern area of the Middle Peninsula Region.

Over many years, coastal storms have eroded the land base at this facility whereby the lighthouse now sits approximately 900 feet from the southern end of the marshy Mathews County mainland. The base of the lighthouse has been stabilized with large rip-rap stone, but continues to be vulnerable to storm surges and flooding damage from coastal storms.

The **Urbanna Town Marina and Park** serves as a focal point for recreational boaters who reside in town as well as for tourists cruising up and down the Rappahannock River with Urbanna as one of their destinations.

The marina is a vital financial generator for the town of Urbanna since it is within easy walking distance to retail establishments along the waterfront as well as to the higher-lying downtown Urbanna business community. In addition, the marina, with its numerous boat slips, provides an essential personal property tax generator for Middlesex County.

Future Development in the 100-year Floodplain and Storm Surge Zones

Each of the Middle Peninsula localities has adopted FEMA's standard floodplain ordinance/regulations and all of the jurisdictions are in full compliance with the enforcement of them. In addition, Gloucester County has completed (May 2009) a Floodplain Management Plan that specifies additional protection measures to help mitigate future flood damages.

In an effort to provide greater protection to future development in the 100-year floodplain, the counties of Essex, Gloucester and Middlesex proposed a mitigation strategy in the adopted 2005 Natural Hazards Mitigation Plan to require that new buildings be elevated an additional 1' above the Base Flood Elevation (BFE). As of June 1, 2009, all 3 of these localities have amended their local regulations and adopted this added measure of protection.

Local adoption and enforcement of regulations that are more strict than the BFE + 1′ requirement in areas prone to flood surges would not be cost effective due to the unpredictable nature of damaging storm surges as well as the excessive heights which the new structures would need to be built. However, localities can use their GIS data base to map the storm surge information and provide property owners with flood depth levels in those areas that may be outside of the 100-year floodplain, but adversely affected by storm surges during severe hurricanes and nor'easters. Middlesex County has mapped the 2008 Hurricane Surge Data into their GIS system and can run various storm scenarios that will show inundated areas. This new application can be used to better inform and guide residents as they make building related decisions outside of the 100-year floodplains, but within hurricane storm surge zones.

Local zoning designations that prohibit or limit the number of future buildings in flood prone areas will continue to be an affective land use tool utilized by Middle Peninsula counties to mitigate future damages. The Middle Peninsula localities have implemented conservation, agricultural, rural residential or a similar zoning designations to limit or eliminate development due to natural hazards in these low-lying wetland areas due to flooding or other resource protection goals of the localities.

The construction of public infrastructure will be limited in the future in these sensitive land areas with the zoning designations noted above, with the exception of the public road network. For the most part, these flood-prone county land areas along low-lying water bodies are away from the government and commercial center, which are more centrally located on higher ground. However, there are flood prone area in the towns of West Point and Urbanna where water based commercial and residential developments are impacted.

Low-lying sections of VDOT owned/maintained roads vulnerable to flood damage are listed elsewhere in this plan. With limited VDOT funds to maintain or re-construct low-lying road sections, keeping the existing roadway passable during severe storm events will be a challenge for VDOT and county workers.

Due to the rural nature of the Middle Peninsula, locality owned public infrastructure is limited in scope and includes a handful of sewerage pump stations in Tappahannock, West Point and Gloucester Courthouse. This plan includes proposed mitigation strategies to lessen/eliminate future flooding impacts to these public sewerage facilities.

The low-lying Mathews County Courthouse building will undergo retrofitting procedures in the future to lessen future flooding damage on the lower level.

Repetitive Loss Properties

As the FEMA Repetitive Loss and Severe Repetitive Loss Lists show, there are more numerous and costly flood insurance claims mainly in the 3 southern-most counties of the Middle Peninsula – Mathews, Gloucester and Middlesex Counties. Essex County has a smaller number of insurance claims.

Some of these damaged waterfront properties are located in Flood Zone VE - where strong winds, excessive rain amounts and strong storm surges combine to create severe damage to the residences and those water dependent businesses located along water bodies.

There are a total of 329 properties on FEMA's Repetitive Loss List and 4 on FEMA's Severe Repetitive Loss List in the Middle Peninsula. Due to the confidentiality nature of some of the information contained on these lists, these listings will not be included in copies of this mitigation plan that is made available for public review. However, these property listings are available to locality officials in order for them to develop and implement mitigation activities to lesson flood damage to these homes. The majority of the 329 properties are used for residential purposes with a very small number of them being used for commercial purposes.

Their presence on the 2 FEMA lists noted above indicates their likelihood for continued high risk of damages from future flooding events.

Variable Vulnerability Rates Based on Geographic Factors of Middle Peninsula

Coastal Flooding

Coastal flooding from hurricanes and nor'easters with high storm surges will be most intense in the southeastern-most localities in the Middle Peninsula – Gloucester, Mathews, Middlesex Counties and the waterfront towns of West Point and Urbanna. The Middle Peninsula localities located towards the northwest – King and Queen, King William and Essex Counties – are generally at a lower risk for flooding damages due to less intense storm surge impacts.

FEMA's Repetitive and Severe Repetitive Loss Property Lists give empirical evidence to these sub-regional variations of the adverse impacts from flooding due to severe weather events in the Middle Peninsula region. There are significant numbers of insurance claims in Mathews, Gloucester and Middlesex Counties with fewer claims in the remaining 3 counties.

Riverine Flooding

The upper land areas in the Middle Peninsula region can be more adversely impacted by riverine flooding from severe rain events than the lower portions of the region. The rolling topography in the upper portions of the region result in more-narrow drainage channels can create a higher "flash flooding" risk, which adversely affects mainly the public road network system where the storm water crosses the roadway at low points where the drainage pipes are too small to carry the amount of water runoff.

Water releases from Lake Anna, located in Louisa County, have had adverse impacts in the upper portions of the region along the Pamunkey River in King William County. In the lower area of the Middle Peninsula region, a breach of the Beaverdam Reservoir Dam would have an immediate adverse affect on residential development located directly below the dam in the Gloucester County Courthouse area.

In August of 2004, Tropical Storm Gaston stalled over King William County causing upland, riverine flooding. As a result, three pond/lake dams in the county were destroyed, but downstream property damage was minimal. However, as of June 2009, these dams have not been replaced and the 3 dry fire hydrants that were operating in these ponds/lakes are no longer available to assist with community fire protection.

Future Vulnerability of Severe Storm Events

After reviewing the history of severe storms hitting the Middle Peninsula region since 1851, this low-lying Mid-Atlantic area will continue to have a high probability of being vulnerable to severe flooding and wind damage from tropical storm events. Due to the unpredictability of severe storms, it is not possible to calculate with any degree of certainty for any given period of time when a severe storm will affect the Middle Peninsula, but local government officials in the region are poised to proactively mitigate against anticipated adverse impacts of future events.

New U.S. Corp of Engineer storm surge data, as incorporated into the 2008 Middle Peninsula Storm Surge Hazard Maps as shown on pages 20 to 23 in a graphically bold manner, show vast amounts of land area in the lower 3 counties that will continue to be subject to severe storm damage from wind driven storm surges coming up the Chesapeake Bay and its many tributaries.

If the current global warming trend continues, the Middle Peninsula region will see a sea level rise of 1-foot by the year 2050. Since the 2008 Storm Surge Hazard Maps noted above did not take into account this anticipated sea level rise of 1-foot over current conditions, future severe storm surges will further increase the vulnerability of low-lying Middle Peninsula land masses and it man-made improvements.

These adverse impacts will continue for the 329 homes/businesses that are now included in FEMA's Repetitive Loss List and Severe Repetitive Loss List – as well as for other Middle Peninsula properties that are not covered under FEMA's Insurance Program and therefore, do not show up on these lists of adversely impacted properties.

Natural Hazard Risk Assessments

Regional Summary

Although the risk assessments were fairly consistent between the 9 Middle Peninsula jurisdictions, flooding and high wind damage from hurricanes and other coastal storms poses a higher risk for the more southeastern areas of the region with their greater exposure to the effects of storm surge from surrounding water bodies as well as their low-lying topography. This would include Mathews, Gloucester and Middlesex Counties as well as the Town of Urbanna.

The more northwesterly Middle Peninsula jurisdictions have a somewhat lower risk due to being further away from large coastal water bodies and having higher topographic elevations. This would include Essex, King & Queen and King William Counties as well as the Town of West Point and the Town of Tappahannock.

Non-flood related natural hazards occur randomly throughout the Middle Peninsula and do not have a direct connection to geographic proximity to the coast or topographic considerations.

The following are a list of natural hazards that affect the Middle Peninsula region as a whole in descending order from high risk to moderate risk:

1. Hurricanes,
2. Coastal Flooding,
3. Winter Ice Storms,
4. Coastal Shoreline Erosion,
5. Sea Level Rise (a new hazard identified in the 2010 regional assessment),
6. Lightning,
7. Winter Snow Storms,
8. Tornados,
9. Riverine Flooding,
10. High Wind Storms,

11. Wildfire,
12. Drought, and
13. Dam Failure.

Gloucester County Risk Assessment

The following are a list of natural hazards that affect Gloucester County in descending order from high risk to moderate risk:

1. Hurricanes,
2. Coastal Flooding,
3. Winter Ice Storms,
4. Coastal Shoreline Erosion,
5. Sea Level Rise (a new hazard identified in the 2010 regional assessment),
6. Lightning,
7. Winter Snow Storms,
8. Tornados,
9. Riverine Flooding,
10. High Wind Storms,
11. Wildfire,
12. Drought, and
13. Dam Failure.

Gloucester County continues to see personal property and natural resource damages from severe coastal storms. Although there hasn't been a hurricane to hit the Middle Peninsula since Hurricane Isabel in 2003, coastal storms such as nor'easters over the last couple of years with prolonged duration times of 3 to 4 days have continued to inundate low-lying roads and structures.

Numerous low-lying roads remain submerged for longer periods of time during a coastal as opposed to a hurricane, but most do not sustain the structural damage that they do when a major hurricane slams into the lower Middle Peninsula.

Also, coastal erosion continues to damage shorelines with consecutive high tides associated with these high amounts of rain and gale force winds throughout the 3 to 4 day storm event.

A sea level rise modeling project undertaken by the Coastal Planners at the Middle Peninsula Planning District Commission indicates that there will be long term detrimental effects on Gloucester's road infrastructure and private property in the lower sections of the county. The acknowledgment and concerns by county officials and emergency management staff is now reflected in the list of natural hazard threats that affect Gloucester County.

Scattered and sporadic natural events, such as tornados, wildfires and lighting strikes, continue to pose moderate levels of risk to county residents and county officials/emergency managers seek mitigation measures to insure quick and adequate response to these storm events that occur with little or no advanced notice.

Mathews County Risk Assessment

The following are a list of natural hazards that affect Mathews County in descending order from high risk to moderate risk:

1. Hurricanes,
2. Coastal Flooding,
3. Winter Ice Storms,
4. Coastal Shoreline Erosion,
5. Sea Level Rise (a new hazard identified in the 2010 regional assessment),
6. Lightning,
7. Winter Snow Storms,
8. Tornados,
9. Riverine Flooding,
10. High Wind Storms,
11. Wildfire,
12. Drought, and
13. Dam Failure.

Mathews County residents share similarities to neighboring Gloucester County, but with even greater exposure to the Chesapeake Bay and with even lower elevations above sea level. Therefore, the county is highly vulnerable to the risks and damages from hurricanes and other coastal storms.

County officials and emergency managers are highly concerned about flood water inundations and the limitations that these conditions put on emergency response and recovery efforts since they are more exposed and can be very quickly cut-off from their neighboring jurisdictions to the east (Gloucester County) and northeast (Middlesex County). These are the 2 most-likely jurisdictions that would be able to lend mutual aid assistance during and after severe weather events.

In a fashion similar to that of Gloucester County, sea level rise poses long term risks for residential and commercial development along their 217 miles of shoreline as well as to its low-lying roadway network.

Middlesex County Summary

The following are a list of natural hazards that affect Middlesex County in descending order from high risk to moderate risk:

1. Hurricanes
2. Winter Ice Storms,
3. Coastal Flooding,
4. Coastal Shoreline Erosion,
5. Winter Snow Storms,
6. Wildfire,
7. Tornados,
8. Lightning,
9. High Wind Storms,
10. Dam Failure,

11. Sea Level Rise (a new hazard identified in the 2010 regional assessment),
12. Riverine Flooding, and
13. Drought.

Coastal storms, hurricanes and low-lying residential developments in lower Middlesex County – especially in the Deltaville/Stingray Point corridor - continue to be exposed to the greatest risk in this jurisdiction.

The upper portions of Middlesex County are slightly more protected from the open water of the Chesapeake Bay and it higher in elevation than lower-lying Gloucester and Mathews Counties, which results in a slightly reduced level of vulnerability to destruction from hurricanes and other coastal storms.

Middlesex officials continue to rate winter ice and snow storms at a moderate level of vulnerability due to concerns about widespread loss of electric service which would adversely affect heat, water and sanitary services for the county's 10,412 residents.

Town of Urbanna Summary

The following are a list of natural hazards that affect the Town of Urbanna in descending order from high risk to moderate risk:

1. Hurricanes
2. Winter Ice Storms,
3. Coastal Flooding,
4. Coastal Shoreline Erosion,
5. Winter Snow Storms,
6. Wildfire,
7. Tornados,
8. Lightning,
9. High Wind Storms,
10. Dam Failure,
11. Sea Level Rise (a new hazard identified in the 2010 regional assessment),
12. Riverine Flooding, and
13. Drought.

The high storm surge and winds made the town's marina and associated shoreline buildings highly vulnerable to flooding damage during Hurricane Isabel in 2003. After Hurricane Isabel, these municipal facilities were re-built and elevated to prevent future damages from severe coastal storms during this $800,000 restoration project.

The majority of the town's residential and business structures as well as its infrastructure – mainly water and sewer systems - are located on higher ground nearby and they are less vulnerable to storm surge damage from the Rappahannock River.

However, the downtown area can be moderately vulnerable to damage from high winds associated with hurricanes/coastal storms that have dropped trees on power lines and structures in the past.

Once again, winter ice and snow storms pose a high to moderate vulnerability level to town residents, but the town has recently implemented a mitigation project by installing a generator at the town's well site to insure a safe supply of clean water during power-grid interruptions.

King and Queen County Summary

The following are a list of natural hazards that affect King and Queen County in descending order from high risk to moderate risk:

1. Hurricanes,
2. Winter Snow Storms,
3. Tornados,
4. Riverine Flooding,
5. High Wind Storms,
6. Drought,
7. Lightning,
8. Winter Ice Storms,
9. Wildfire,
10. Coastal Flooding,
11. Coastal Shoreline Erosion,
12. Dam Failure, and
13. Sea Level Rise (a new hazard identified in the 2010 regional assessment).

Due to its more upland position and its nearly 70-mile long configuration, winter snow storms and riverine flooding are rated by local emergency managers as putting county residents at a moderate level of vulnerability.

Severe thunderstorms, with their potential for high winds, lightning strikes and tornados, is a set of natural hazard events that occur sporadically with little or no notice and pose moderate levels of risk for county residents and the emergency responders. However, damage in the past has adversely affected a limited number of households/individuals when they did occur.

Hurricanes continue to put county residents at a high level of risk with the potential for structural and power line damage mainly from falling vegetative debris.

Since almost all of the residents are served by individual wells and septic systems, long term impacts from prolonged power outages could adversely affect the physical health of residents without access to clean drinking water and inadequate sanitary facilities. Similar impacts would result from winter storm events with tan additional adverse impact for residents that heat their homes using electricity.

Essex County Summary

The following are a list of natural hazards that affect Essex County in descending order from high risk to moderate risk:

1. Hurricanes,
2. Tornados,

3. Coastal Flooding,
4. Winter Snow Storms,
5. Riverine Flooding,
6. Dam Failure,
7. High Wind Storms,
8. Winter Ice Storms,
9. Lightning,
10. Wildfire,
11. Coastal Shoreline Erosion,
12. Drought, and
13. Sea Level Rise (a new hazard identified in the 2010 regional assessment).

Hurricanes continue to put county residents at a high level of vulnerability with the potential for structural and power line damage from falling vegetative debris.

Severe thunderstorms, with their potential for high winds, lightning strikes and tornados, is a set of natural hazard events that occur sporadically with little notice and poses moderate levels of risk for the county residents. Damage during past storm events adversely affects a limited number of households/individuals, but these type of storm events do remain a concern by the county's emergency response personnel due to the unpredictable nature of the storms.

With significant frontage along the Rappahannock River, County residents continue can be highly vulnerable to coastal erosion and structural damage from hurricanes and nor'easters – especially with storm surges and high winds travelling up the river in a northwesterly direction.

Due to its more northerly location in the Middle Peninsula, winter snow storms pose moderate levels of vulnerability for county residents if they result in extended periods without electric service to power essential services such as heat, water and sanitary systems.

Town of Tappahannock Summary

The following are a list of natural hazards that face the Town of Tappahannock in descending order from high risk to moderate risk:

1. Coastal Shoreline Erosion,
2. Coastal Flooding,
3. Lightning,
4. High Wind Storms,
5. Riverine Flooding,
6. Hurricanes,
7. Winter Ice Storms,
8. Tornados,
9. Winter Snow Storms,
10. Drought,
11. Sea Level Rise (a new hazard identified in the 2010 regional assessment),
12. Wildfire, and
13. Dam Failure.

Shoreline flooding and erosion along the lower portions of the town that front the Rappahannock River poses moderate levels of risks to residential and business property owners. Mariners and other boat launching facilities are especially vulnerable during severe river flooding weather events. In addition, there are a few sewer pump stations that are built along the river that pose concerns for town officials for continuity of sewer service after severe flooding along the Rappahannock River.

However, the majority of the town's residential and business structures as well as most of its infrastructure – mainly water and sewer systems - are located on higher ground nearby and they are far less vulnerable to storm surge damages from a flooding Rappahannock River.

King William County Summary

The following are a list of natural hazards that affect King William County in descending order from high risk to moderate risk:

1. Hurricanes,
2. Coastal Flooding,
3. Winter Ice Storms,
4. Coastal Shoreline Erosion,
5. Sea Level Rise (a new hazard identified in the 2010 regional assessment),
6. Lightning,
7. Winter Snow Storms,
8. Tornados,
9. Riverine Flooding,
10. High Wind Storms,
11. Wildfire,
12. Drought, and
13. Dam Failure.

Hurricanes continue to put county residents at a high level of vulnerability with the potential for structural and power line damage from vegetative debris. Riverine flooding with the addition of upstream water releases from Lake Anna during periods of severe rain associated with hurricanes and coastal storms places a moderate level of vulnerability for some residences as well as agricultural properties along the Pamunkey River.

Winter ice storms are rated by local emergency managers as putting county residents at moderate levels of risk. Since almost all of the residents are served by individual wells and septic systems, long term impacts from prolonged power outages could adversely affect the physical health of residents without access to clean drinking water, inadequate sanitary facilities and lack of heat.

Severe thunderstorms, with their potential for high winds, lightning strikes and tornados, is a set of natural hazard events that occur sporadically with little notice and poses a moderate levels of risk for the county. However, damage in the past has adversely affected a limited number of households/individuals at any one time when they do occur.

Coastal flooding in the Town of West Point, located at the southern end of King William County, is of concern for King William County Emergency Managers since they must coordinate their response and recovery efforts with officials from West Point. Severe flooding from coastal storms with high surges and high winds moving north up the York River are a major concern for the densely developed southern end of the town.

Town of West Point

The following are a list of natural hazards that affect the Town of West Point in descending order from high risk to moderate risk:

1. Hurricanes
2. Coastal Flooding
3. Winter Ice Storms,
4. Coastal Shoreline Erosion
5. Sea Level Rise (a new hazard identified in the 2010 regional assessment),
6. Lightning
7. Winter Snow Storms,
8. Tornados,
9. Riverine Flooding,
10. High Wind Storms,
11. Wildfire
12. Drought, and
13. Dam Failure

West Point is highly vulnerable to severe flooding from coastal storms when associated with high tidal surges and high winds moving north up the York River.

The downtown area is the most highly vulnerable to damages flood waters and high winds which can affect a large number of residential and business structures in the southern end of town. Portions of the town's sewerage collection and treatment facilities are moderately vulnerable to flood water damage which has implications for the health of the town's residents.

Section 6 - Capability Assessment

The capability assessment- planning process utilized to update the 2010 plan involved many community partners and extensive public involvement. Transitioning from the 2006 plan to the 2010 plan involved extensive dialog and protracted local discussion concerning the capability assessment across the Middle Peninsula. The stakeholders forming the steering committee discussed capability assessment of the Middle Peninsula as it relates to the nature of critical, moderately-critical and non-critical hazards.

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.

The County has hired the Richmond-based planning firm, K.W. Poore and Associates (now known as Community Planning Partners, Inc.), to write grant applications and to manage these projects once funded.

The County has applied for and received a number of grants under the FEMA Hazard Mitigation Grant Program (HMGP). As of May 2010, Gloucester County has been awarded $6,000,000 in grant funds, which has been used on 65 properties. This residential mitigation work has benefited around 110 people in the low-lying southeastern sections of the county.

The county has applied for additional $4,000,000 in grant funds to assist 41 homes.

In addition to the county's residential mitigation projects, some homeowners that have filed repeated flood loss insurance claims have participated in FEMA's ICC program, which can contribute up to $25,000 towards residential mitigation projects.

Named storms that have adversely affected the Gloucester area included the following:

- Hurricane Isabel,
- Tropical Storm Gaston
- Tropical Storm Ernesto, and
- Tropical Storm/Nor'ester Ida.

The county has written an Open Space Plan for the 60 acres that have been purchased through this program. The Plan was adopted by the Gloucester County Board of Supervisors in March 2009.

Before and after photographs of one residential elevation project in Gloucester County follows.

Photograph 2. Gloucester County Mitigation Project – Rowe House before Mitigation

Photograph 3. Gloucester County Mitigation Project – Rowe House after Mitigation

Gloucester County - Local Programs and Policies

Gloucester County is the most populous locality in the Middle Peninsula and the county has implemented a Community Rating System in accordance with FEMA guidelines. This mitigation policy is enforced by the Gloucester County Building Department. Gloucester recently received notification that their CRS rating went from a 9 to a 7, which has a direct beneficial effect on insurance rates for Gloucester County homeowners.

In addition, Gloucester County has developed A Coastal Floodplain Management Plan, once again in accordance with FEMA regulations following the 10-step recommended process. This plan was completed in the fall of 2007 and subsequently adopted by the Gloucester County Board of Supervisors in 2009.

In summary, Gloucester County has and continues to show its commitment and ability to enact local policies in an effort to further protect its residents from flood damage.

Mathew County's Hurricane Recovery Project

The county is currently undertaking a Post Disaster Mitigation Project that includes the elevation of 4 residential structures. The county has been awarded approximately $430,000 in FEMA/VDEM Post Mitigation Disaster Grant Funds to undertake this project. The County will be assisted with this project by the housing division of the local area agency on aging, Bay Aging. Bay Aging is based in the Middle Peninsula in Urbanna and works on housing projects in the Middle Peninsula as well as in the neighboring Northern Neck regions.

The county has allied for additional hazard mitigation funds to elevate 9 more homes and acquire 1 other property.

In addition to the county's residential mitigation projects, some homeowners that have filed repeated flood loss insurance claims have participated in FEMA's ICC program, which can contribute up to $25,000 towards residential mitigation projects.

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 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 a local agency that has a housing division to undertake their mitigation project, which will involve elevating 4 houses.

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)

All of the 9 Middle Peninsula jurisdictions participate in the NFIP as administered by FEMA.

All 9 Middle Peninsula jurisdictions have 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 can be seen in Section 7 of this plan update that reports on mitigation strategies that have been implemented since 2006, 5 of the 9 Middle Peninsula jurisdictions have implemented Base Floor Elevation (BFE) regulations that require structures to be an additional 1′ over BFE. The 5 Middle Peninsula jurisdictions that require this more restrictive regulation are Middlesex, Urbanna, West Point, Essex 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.

Stormwater Management Ordinances

All of the jurisdictions in the Middle Peninsula have adopted a local Erosion and Sediment Control Ordinance as part of their county code. With this ordinance, the locality adopts a set of erosion control design standards/specifications that controls stormwater runoff. However, the ordinance stormwater provisions tend to look at each construction project more on an individual basis rather than on an entire watershed basis.

None of the Middle Peninsula localities have adopted a local Stormwater Management Ordinance. This type of ordinance would look at the stormwater and flooding impacts on a watershed or sub-watershed basis and have a greater ability to mitigate some flooding impacts – especially from severe upland flooding to rivers and streams caused by severe storms.

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 2006 Middle Peninsula Natural Hazards Mitigation Plan (MPNHMP)

The planning process utilized to update the 2010 plan involved many community partners and extensive public involvement. Transitioning from the 2006 plan to the 2010 plan involved extensive dialog and protracted local discussion concerning the transition from 2006 strategies to new 2010 strategies across the Middle Peninsula. The stakeholders forming the steering committee discussed 2006 strategies of the Middle Peninsula as it relates to the nature of critical, moderately-critical and non-critical hazards

The following table summarizes the status of all mitigation strategies listed in the 2006 MPNHMP:

Table 42. Status of 2006 MPNHMP Mitigation Strategies*

As Middle Peninsula localities transition from the 2006 natural hazard plan strategies into the 2010 plan strategies, under certain circumstances, some strategies may still be a priority to Middle Peninsula localities. Knowing this, staff asked each locality the following question: If funding or technical expertise were to become available for any or all of the 2006 strategies indentified in table 42 below which have not been completed , would your locality seek such funding or technical expertise to implement any or all of these strategies. If no response was received from the locality, the strategy was deemed no longer applicable.

The following responses were received. Specific status and comments concerning 2010 are reflected within the table.

Mathews: if funding was provided, Mathews would certainly update aerial maps

Middlesex: if funding was provided, Middlesex would install R911

King William: if funding was provided, King William would create hurricane surge maps; Repair Dry Hydrants for the dam that has been repaired; Repair Tropical Storm Gaston pond damage, Strategy 1.1.6 – dams are owned by private individual and the County is prohibited by law from making improvements to private property

Town of West Point- Yes, Town would seek funding for any 2006 items not completed

FEMA ID #	Locality Name	Strategy	Strategy ID #	Priority	2010 Status	2010 Comments	Cost
510304	King William	Create hurricane surge maps	3.3.1	High	Not started	2010 Comment: It was requested that King William County be included when the hurricane surge maps were updated in 2009, but only the coastal counties were included. The county does not have the funds or the expertise to have the maps updated	
510304	King William	Install reverse 911 system	2.1.4	High	completed		$32,000
510304	King William	Repair TS Gaston pond damage	1.1.6	High	Partially Completed	2010 Comment: The dams that create the ponds that were destroyed during TS Gaston are privately owned and must be repaired by the owners of the property that surrounds the pond. One dam was completed in 2010. The rest of the dams are not being repaired due to lack of funds. Under the Code of Virginia, the County is prohibited to do work on private property except for public safety reasons. None of the dam damage created a public safety issue that requires the county to step in and make repairs.	

510304	King William	Repair dry hydrants	1.1.5	High	Not started	2010 Comment The dams that create the ponds that were destroyed during TS Gaston are privately owned and must be repaired by the community that surrounds the pond. One dam was completed in 2010 and the pond is being evaluated for placement of a dry hydrant. The rest of the dams are not being repaired due to lack of funds so there is no place for a dry hydrant.	

FEMA ID #	Locality Name	Strategy	Strategy ID #	Priority	2010 Status	2010 Comments	Cost
510096	Mathews	Relocate sewage treatment plant	1.2.2	High	in progress	(2011 start)	$15 m.
510096	Mathews	Install reverse 911 system	2.1.6	High	completed		$32,000
510096	Mathews	Update aerial maps	2.1.6A	High	Not started	Lack of funds	

FEMA ID #	Locality Name	Strategy	Strategy ID #	Priority	2010 Status	2010 Comments	Cost
510098	Middlesex	Increase BFE by 1 foot	1.1.3	High	completed		minimal
510098	Middlesex	Install reverse 911 system	2.1.7	High	not started	Lack of funds	
510098	Middlesex	Update storm surge maps	3.3.2	High	completed		minimal
510098	Middlesex	Update aerial maps	3.2.5	High	completed		minimal

FEMA ID #	Locality Name	Strategy	Strategy ID #	Priority	2010 Status	2010 Comments	Cost
510049	Tappahannock	Elevate sewage pump station	1.2.1	High	not started	Lack of funds	
510049	Tappahannock	Install reverse 911 system	2.1.1	High	not started	Lack of funds	
510049	Tappahannock	Update aerial maps	3.2.1	High	not started	Lack of funds	
510049	Tappahannock	Install pump station backup pr.	1.2.3	High	not started	Lack of funds	

FEMA ID #	Locality Name	Strategy	Strategy ID #	Priority	2010 Status	2010 Comments	Cost
510292	Urbanna	Increase backup power-water	1.2.4	High	completed		$50,000
510292	Urbanna	Install reverse 911 system	2.1.8	High	completed		$2,000 per yr.
510292	Urbanna	Update aerial maps	3.2.6	High	completed		minimal

FEMA ID #	Locality Name	Strategy	Strategy ID #	Priority	2010 Status	2010 Comments	Cost
510071	Gloucester	Update aerial maps	3.2.3	High	completed		minimal

2010 2010

FEMA ID #	Locality Name	Strategy	Strategy ID #	Priority	Status	Comments	Cost
510082	King and Queen	Install reverse 911 system	2.1.3	High	not started	Lack of funds	
510082	King and Queen	Update aerial maps	3.2.2	High	completed		

FEMA ID #	Locality Name	Strategy	Strategy ID #	Priority	2010 Status	2010 Comments	Cost
510048	Essex	Increase BFE by 1 foot	1.1.2	High	completed		minimal
510048	Essex	Form emergency services comm.	3.1.1	High	completed		minimal
510048	Essex	Install reverse 911 system	2.1.1	High	January 2011 start		
510048	Essex	Increase development restrictions	1.1.1	Medium	not completed	Lack of funds	
510048	Essex	Update aerial maps	3.2.1	High	not completed	Lack of funds	

FEMA ID #	Locality Name	Strategy	Strategy ID #	Priority	2010 Status	2010 Comments	Cost
510083	West Point	Increase BFE by 1 foot	1.1.4	High	completed		minimal
510083	West Point	Establish emer. plan. area	2.2.1	High	under eval.		
510083	West Point	Install reverse 911 system	2.1.5	High	completed		KWC paid
510083	West Point	Create surge maps	3.3.1	High	not completed	lack of funds	
510083	West Point	Update aerial maps	3.2.4	High	completed		minimal
510083	West Point	Increase backup power-water	1.2.6	High	completed		
510083	West Point	Install backup power-shelter	1.2.5	High	not completed	lack of funds	

* A copy of a more expanded version of the MPNHMP Annual Report is shown in Appendix 10 of this plan.

The following is a more descriptive version of the mitigation strategies noted above that have been implemented by the Middle Peninsula jurisdictions:

Strategies that have been completed since 2006 by the local governments under **Goal 1: Prevent Future Hazard Related Losses** include the following:

1. Amended local floodplain and building regulations that increase the height that new structures would need to be built to in the 100-year floodplain in the Town of West Point and in the Counties of Middlesex, Gloucester and Essex (2007 and 2008).
2. Residential flood mitigation projects in both Gloucester and Mathews Counties (2007 to present).
3. 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 (construction started in 2009 with completion anticipated in 2010).

4. Relocated the Mathews County Sheriff's Office/Dispatch Center out of the flood-prone basement of the courthouse to another nearby building that does not flood (2008).
5. Provided backup power to the Town of Urbanna's Water System and to the Town of West Point's Water System (2007 and 2008).

Strategies that have been completed by the local governments under **Goal 2: Improve Community Emergency Management Capability** include the following:

1. Installed Emergency Notification Systems in Mathews County as well as in King William County, which also covers the Town of West Point, to notify residents of emergency conditions (2008).
2. Created high-resolution orthophotographic aerial maps (1″=200′) in Gloucester County and Middlesex County (2007).
3. Formed an All Hazards Emergency Planning Board in King William County to make emergency management recommendations to the County's Board of Supervisors (2008).

A strategy that has been completed under **Goal 3: Increase Public Awareness of Vulnerability to Hazards** includes the following:

1. Formed an Emergency Preparedness Committee in Essex County to educate the public about natural hazards and the impacts that they will have on residents (2006).

Strategies Implemented in Addition to Those Specified in the 2006 MPNHMP

In addition to those specified in the 2006 MPNHMP, there are additional flood mitigation strategies that have been developed and completed by some of the Middle Peninsula localities since then. These strategies include the following:

1. Construction of new, multi-million dollar radio communications systems in Gloucester County (2008), Essex County (2009) and King & Queen County (2010).
2. Reviewing proposals for new, multi-million dollar radio communication systems in King William and West Point (2010).
3. Adoption of a Floodplain Management Plan in Gloucester County (2009).

Evaluation of Mitigation Strategies included in the 2006 MPNHMP

As noted above, the Middle Peninsula localities have implemented a number of mitigation projects/strategies since the adoption of its first regional natural hazards mitigation plan in 2006.

Some projects, like the new radio systems, have the potential to mitigate adverse affects for all residents in these localities with better communication capabilities during a severe storm. These radio system upgrades have cost the 3 Middle Peninsula localities over $23,000,000 in local funds to complete.

Other projects, such as the residential mitigation projects in Gloucester and Mathews Counties, have had a direct mitigation impact by eliminating or lowering flooding hazards for family members living in these houses.

Due to cost/benefit considerations, the Middle Peninsula localities chose not to contract with VGIN to provide higher resolution aerial maps when they re-flew the state in 2007. However, VGIN did provide higher resolution maps for portions of Gloucester and Middlesex Counties at no additional costs to the localities. Although higher resolution maps in the remaining localities would indirectly benefit emergency management capabilities, the localities expended their limited financial resources on needed capital improvements projects, such as radio system projects, that directly benefit residents – especially by providing better coverage in the more remote areas of the Middle Peninsula localities as well as increasing interoperability capabilities between Middle Peninsula jurisdictions and other surrounding localities.

Due to limited local government financial resources as well as the lack of direct benefits to improve emergency management capabilities, upgrades to higher resolution aerial maps that would cost local governments is therefore deleted as a realistic mitigation strategy.

In summary, the Middle Peninsula localities have made significant progress by completing hazard mitigation strategies that were specified in the 2006 MPNHMP as well as additional locally funded communication enhancement projects that benefit all in their residents.

The MPNHMP update will build upon the 3 mitigation goals listed in the 2006 MPNHMP as well as developing a wider range of goals and strategies to address an expanded set of natural hazards affecting the Middle Peninsula.

Section 8 - Mitigation Goals, Objectives and Strategies

The 2010 mitigation goals, objective and strategies process utilized to update the 2010 plan involved many community partners and extensive public involvement. Transitioning from the 2006 plan to the 2010 plan involved extensive dialog and protracted local discussion. The stakeholders forming the steering committee discussed 2006 goals, objective and strategies and developed a new list of 2010 goals, objective and strategies for the Middle Peninsula as each relates to the nature of critical, moderately-critical and non-critical hazards

Criteria Used to Develop and Prioritize Goals, Objectives and Strategies

A review of the mitigation strategies that have been completed since the adoption of the MPNHMP in 2006 indicate that the localities are willing and able to undertake mitigation projects that:

1. Directly decrease or eliminate future flooding hazards for people living in houses that are on FEMA's Repetitive Loss or Severe Repetitive Loss list of properties,
2. Require grant funding support from the state and/or federal government, but require little or no direct funding from the local jurisdiction,
3. Can be accomplished by amending/implementing local building and land development regulations, and
4. Improve public safety, especially by updating emergency communication systems, which will lessen adverse impacts from all hazards for all residents.

In an effort to expand the types of mitigation activities that can be undertaken to reduce the adverse impacts from natural hazards, the Steering Committee members are proposing mitigation strategies that:

1. Educate the general public about specific flood hazards where they live, and
2. Encourage residents to undertake self-help projects that will decrease their vulnerability to natural hazards.

Mitigation Strategy Evaluation Criteria

The Steering Committee members developed a list of criteria to assist them select and prioritize the most appropriate mitigation strategy alternatives for their localities with this update.

The evaluation criteria considered when developing the mitigation strategies included the following issues/questions:

Social Considerations

1. Will the proposed strategy be considered acceptable to the residents?
2. Will the proposed strategy treat all members of the locality equally?
3. Will the proposed strategy cause 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 mast a symptom?
4. Is the proposed action in line with other community 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 legally challenged if implemented?

Economic Concerns

2. What are the costs and the benefits of implementing the proposed strategy?
3. 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.
4. Are the capital, maintenance and administrative costs accounted for with the proposed strategy?
5. Has the funding been secured for this project?
6. What burden will this strategy place on the locality's tax base or local economy?
7. 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? From whom and does this cause any concern about the feasibility of the proposed action?

Essential Information with Strategies

The strategies need to be:

1. clearly and simply written,
2. proposed with a cost estimate whenever possible,
3. assigned to a specific locality or agency staff person, and
4. implemented within a realistic time frame based on the locality's human and financial resources.

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. **Town of West Point,**
6. **Town of Urbanna, and**
7. **Town of Tappahannock**

On behalf of their residents, the 7 Middle Peninsula localities listed above will apply for FEMA grant funds that lessen/eliminate flood damages to those structures that appear on the FEMA-generated Repetitive Loss and Severe Repetitive Loss Lists, if requested by the residents living in these structures.

Project costs, including both construction and administrative costs, will need to be covered by the 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 records as of mid-2008, the following is a summary of the number and locations of these flood prone properties:

Table 43

Locality	Repetitive Loss Properties	Severe Repetitive Loss Properties
Essex County	25	2
Gloucester County	146	3
Mathews County	90	3
Middlesex County	30	2
Tappahannock	2	0
Urbanna	2	0
West Point	7	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.

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/Town of Urbanna,**
3. **Gloucester County,**
4. **Mathews County, and**
5. **Town of West Point.**

The Building Official in each of the localities listed above will work with the owners of these properties to communicate the full range of flood proofing techniques available to them to decrease their vulnerability to flood losses. Properties in the Town of Urbanna are handled by the Middlesex County Building Official. The Town of West Point has its own Building Official.

The Building Official 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.

Strategy 1.1.3: Protect public buildings and public infrastructure from flood waters resulting from a 100-year flood storm event.

Strategy 1.1.3 will be undertaken by the following Middle Peninsula localities:

1. **Town of Tappahannock,**
2. **Gloucester County,**
3. **Mathews County, 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 such as 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 includes the following:

- Flood proof and/or elevate the following public sewerage pump stations:

Locality	Pump Station Name
Tappahannock	Newbill Drive Pump Station including nearby road surface
Gloucester	Pump Station #11 and Pump Station #13
West Point	Second Street Pump Station

- 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.

Strategy 1.1.4: When elevating or flood proofing is not feasible for existing buildings on the Severe Repetitive Lost List or Repetitive Lost List of Properties, 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. **Gloucester County, and**
2. **Mathews 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. Costs for FEMA through expenditure of Hazard Mitigation Funds for land use conversion program.

Strategy 1.1.5: Improve/maintain main evacuation routes used by Middle Peninsula residents as well as Tidewater residents evacuating severe coastal weather events.

Strategy 1.1.5 will be undertaken in the following Middle Peninsula localities using VDOT funds:

1. **Essex County**
2. **Town of Tappahannock, and**
3. **King William County**

Table 44. 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

Cost/Benefit Implications of Implementing Strategy 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. Substantial costs in federal and state transportation construction funds to elevate Route 17 and Route 30.

Strategy 1.1.6: Improve/maintain/reconstruct public roads that hinder the evacuation of Middle Peninsula and Tidewater residents fleeing flood waters from severe hurricanes.

Strategy 1.1.6 will be undertaken in the following Middle Peninsula localities using VDOT funds:

1. **Essex County**
2. **Middlesex County**
3. **Gloucester County**
4. **Mathews County**
5. **King William County, and**
6. **King and Queen County**

Table 45. 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 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
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 K&Q/ Gloucester County line

Table 46. 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 47. 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 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 Street
n/a	1st to 7th Streets	Between Kirby St. and Pamunkey R.
n/a	2nd to 5th Streets	Between Lee St. and Mattaponi R.

Table 48. 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 Rte. 618
618	Chappahosic Road	from Rte. 662 to Rt. 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 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

Table 49. VDOT Maintained Collector Roads in Mathews County

Route	Road Name	Location
610	Marsh Hawk Road	from Rte. 614 to Rte. 611
600	Circle Drive	from Rte. 14 to Rte. 14
600	LightHouse Road	from Rte. 14 to ESM
611	Tabernacle Road	from Rte. 613 to Rte. 610
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. 663 to Gwynn's Island Bridge
608	Potato Neck Road	from Rte. 649 to ESM
644	Bandy Ridge Road	from Rte. 611 to Rte. 614

Table 50. VDOT Maintained Collector Roads in Middlesex County

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 643 to Rte. 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
688 662 654 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.

Strategy 1.1.7: Improve public roads that adversely affect critical public infrastructure in the flood plain .

Strategy 1.1.7 will be undertaken in the following Middle Peninsula locality:

<u>Locality</u>	<u>Road Name/Location</u>
Tappahannock	Newbill Drive

Significant storm water runoff from the downtown Tappahannock Business District combined with storm surge activity from the adjacent Rappahannock River cause undermining of Newbill Drive as well as the sewer pump station located along this public road.

Cost/Benefit Implications of Implementing Strategy 1.1.7

This strategy will have direct:

1. Benefits to local residents in this portion of the Town of Tappahannock with a fully functional sewer system during and after severe flooding events.
2. Capital costs to improve storm water drainage in order to avoid future damage to roadway and pump station.

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/Town of Tappahannock**
2. **Middlesex County/Town of Urbanna**
3. **Gloucester County**
4. **Mathews County**
5. **Town of West Point**
6. **King William County**
7. **King and Queen County**

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 incorporate any floodplain ordinance, policy or procedural changes into their Floodplain Management Plan and their Community Rating System Program.

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 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/Town of Tappahannock**
2. **Middlesex County/Town of Urbanna**
3. **Mathews County**
4. **Town of West Point**
5. **King William County**
6. **King and Queen County**

With the exception of Gloucester County which is already involved in the CRS Program, the local floodplain managerial staff in the remaining Middle Peninsula localities will determine the steps and resources that will be needed to become a certified CRS Program Community.

The local floodplain managerial staff will take their findings to the County Administrator with a recommendation of whether or not to enter into the CRS Program 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 for 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 in the local Zoning and Building Departments to develop, implement and manage the CRS Program.

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. **Town of Tappahannock**
3. **Town of Urbanna**
4. **Mathews County**
5. **King William County**

6. **Town of West Point**
7. **King and Queen County**

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.

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. **Town of Tappahannock**
3. **Middlesex County**
4. **Town of Urbanna**
5. **Gloucester County**
6. **Mathews County**
7. **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.

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 include the following:

Locality	**Facility**
King William County	Lake Anna – 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 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.

Strategy 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.

Strategy 1.1.13 will be undertaken in the following Middle Peninsula localities by the aforementioned agencies:

1. **Essex County**
2. **Middlesex County**

3. **Gloucester County**
4. **Mathews County**
5. **King William County**
6. **King and Queen County**

There is no organized data base 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 data base be developed by each locality to ensure emergency response actions and mitigation activities are undertaken.

The 2 agencies listed above have a working knowledge in their 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.

King and Queen, King William and Essex Counties are served by these agencies located in Tappahannock. Middlesex, Gloucester and Mathews Counties are served by these agencies located in Gloucester County.

A written request from the County Administrator/Emergency Services Coordinator in each of the 6 Middle Peninsula counties should be made to these 2 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.

Strategy 1.1.14: Develop Storm Water Management Plans and Policies for Urban Development Areas in both King William and Gloucester Counties.

Strategy 1.1.14 will be undertaken in the following Middle Peninsula localities:

1. **Gloucester County**
2. **King William County**

Both of the localities listed above have been designated 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 Conservation and Recreation.

Planning and Administrative Staff will develop a strategy to incorporate the Storm Water Management Plan into the locality's next update of their Comprehensive Plan.

Cost/Benefit Implications of Implementing Strategy 1.1.14

This strategy will have direct:

1. Benefits local planning/zoning officials by guiding development away from areas that may be needed in the future for storm water facilities identified in the plan.
2. Benefits to both the locality and development community when discussing proffered conditions applicable to storm water issues during proposed rezoning requests.
3. Costs to the locality for developing and implementing Storm Water Management Plan, which may be in form of consulting fees to write the plan and locality staff time to implement/enforce the plan.

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. **Town of Tappahannock**
3. **Middlesex County**
4. **Town of Urbanna**
5. **Gloucester County**
6. **Mathews County**
7. **King William County**
8. **Town of West Point**
9. **King and Queen County**

Local Building Officials and local Wetlands Board 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.

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.

Strategy 1.1.16: Add evacuation route insignia to public streets that are part of the hurricane evacuation route.

Strategy 1.1.16 will be undertaken in the following Middle Peninsula locality:

1. **King William County**

Cost/Benefit Implications of Implementing Strategy 1.1.16

This strategy will have direct:

1. Benefits local residents to better visualize route as well as seasonal visitors who may not be aware that the route exists.
2. Costs of producing and erecting the signs.

Strategy 1.1.17: Install flood gauges and create erosion monitoring locations to inspect at regular intervals.

Strategy 1.1.17 will be undertaken in the following Middle Peninsula locality:

1. **King William County**

Cost/Benefit Implications of Implementing Strategy 1.1.17

This strategy will have direct:

1. Benefits to locality officials/staff by creating historical data to aid in planning to be able to forecast changing environment/conditions.
2. Costs of purchasing/installing flood gauges as well as of staff time to monitor and evaluating data.

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. **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.

Objective 1.2: Provide protection for critical public facilities and essential services.

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 1.2.1 will be undertaken in the following Middle Peninsula localities:

1. **Essex County**
2. **Town of Tappahannock**
3. **Middlesex County**
4. **Town of Urbanna**
5. **Gloucester County**
6. **Mathews County**
7. **King and Queen County**
8. **King William County**
9. **Town of West Point**

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.

Cost/Benefit Implications of Implementing Strategy 1.2.1

This strategy will have direct:

1. Benefits for local residents since enactment of conservation measures are more likely to help them and their communities maintain sufficient water supplies until drought conditions subside.
2. Cost in staff time to monitor and enact the response measures to protect and prolong the safe use of existing water resources could be time consuming for administrative and emergency management staff during the drought emergency stage if this were to occur.

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. **Town of Tappahannock**
3. **Gloucester County**
4. **Mathews County**
5. **Middlesex County**

6. **King and Queen County**
7. **King William County**
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.

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.

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. **Town of Tappahannock**
3. **Gloucester County**
4. **Mathews County**
5. **Middlesex County**
6. **King and Queen County**
7. **King William County**
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.

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.

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 3.1.1: Enhance/implement the use of rapid notification systems to warn residents of approaching flood waters and mandatory evacuation notices.

Strategy 3.1.1 will be undertaken in the following Middle Peninsula localities:

1. **Essex County/Town of Tappahannock**
2. **Town of Urbanna**
3. **Gloucester County**
4. **Mathews County**
5. **Middlesex County**
6. **King William County**
7. **Town of West Point**
8. **King and Queen County**

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.

Cost/Benefit Implications of Implementing Strategy 3.1.1

This strategy will have direct:

1. Benefits for residents living in flood prone areas that will allow for direct and instant messaging about evacuation, sheltering and other emergency notifications.
2. Costs for system hardware, system upgrades and maintaining phone record data bases to ensure a comprehensive and an effective notification system.

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. **Town of Tappahannock**
3. **Middlesex County**
4. **Town of Urbanna**

5. **Gloucester County**
6. **Mathews County**
7. **King William County**
8. **Town of West Point**
9. **King and Queen County**

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 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.

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 sever weather.

Strategy 3.1.3 will be undertaken in the following Middle Peninsula localities:

1. **Essex County**
2. **Town of Tappahannock**
3. **Middlesex County**
4. **Town of Urbanna**
5. **Gloucester County**
6. **Mathews County**
7. **King William County**
8. **Town of West Point**
9. **King and Queen County**

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.

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. **Town of Tappahannock**
3. **Middlesex County**
4. **Town of Urbanna**
5. **Gloucester County**
6. **Mathews County**
7. **King William County**
8. **Town of West Point**
9. **King and Queen County**

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.

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. **Town of Tappahannock**
3. **Middlesex County**
4. **Town of Urbanna**
5. **Gloucester County**
6. **Mathews County**
7. **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.

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. **Town of Tappahannock**
3. **Middlesex County**
4. **Town of Urbanna**
5. **Gloucester County**
6. **Mathews County**
7. **King and Queen County**
8. **King William County**
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.

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.

Strategy 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.

Strategy 3.1.7 will be undertaken in the following Middle Peninsula localities:

1. **Middlesex County**
2. **Town of Urbanna**
3. **Gloucester County**
4. **Mathews County**
5. **Town of West Point**

The local governments noted above will develop and post 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.

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. **Middlesex County**
3. **Gloucester County**
4. **Mathews County**
5. **King and Queen County**
6. **King William 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.

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.

Strategy 3.2.1 will be undertaken in the following Middle Peninsula localities:

1. **Essex County/Town of Tappahannock**
2. **Middlesex County/Town of Urbanna**
3. **Gloucester County**
4. **Mathews County**
5. **King William County**
6. **Town of West Point**
7. **King and Queen County**

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.
3. 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. **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.**

Strategy 3.2.2 will be undertaken in the following Middle Peninsula localities:

1. **Essex County**
2. **Town of Tappahannock**
3. **Middlesex County**
4. **Town of Urbanna**
5. **Gloucester County**
6. **Mathews County**
7. **King William County**
8. **Town of West Point**
9. **King and Queen County**

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.

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. Consider adopting a Floodplain Overlay District as a component of the County's Zoning Ordinance.
8. Submit capital projects to the Planning Commission/Board of Supervisors for their consideration when they review the locality's Capital Improvement Program (CIP).
9. 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. **Town of Tappahannock**
3. **Middlesex County**
4. **Town of Urbanna**
5. **Gloucester County**
6. **Mathews County**
7. **King William County**
8. **Town of West Point**
9. **King and Queen County**

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.

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 MPNHMP 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 51. Locality Specific Plan of Action – Essex County

Strategy	Priority	Responsible Party	Funding Source	Schedule	Cost	Beneficiary

1.1.1	Low	Zoning	FEMA/landowners	by request	variable	homeowners
1.1.2	Low	Building	local	yearly	low	businesses
1.1.5	High	BOS/VDOT	VDOT	ASAP	$4 million	general public
1.1.6	Mod	BOS/VDOT	VDOT	on-going	unknown	general public
1.1.8	Mod	Zoning	local	every 2 yrs	low	general public
1.1.9	Low	Bldg/Zoning	local	w/in 2 yrs	low	general public
1.1.10	Low	Building	local	w/in 2 yrs	low	general public
1.1.11	High	Zoning	local	on-going	low	general public
1.1.13	Mod	ESC/Planning	local	w/in 2 yrs	low	general public
1.1.15	Low	Building/Wetlands	local	w/in 2 yrs	low	general public
1.2.1	Low	ESC/CAO	local	on-going	low	general public
2.2.1	High	ESC	n/a	w/in 1 yr	low	general public
2.2.2	High	ESC	n/a	w/in 1 yr	none	general public
3.1.1	High	ESC	FEMA/local	w/in 1 yr	$30,000	general public
3.1.2	Mod	ESC	n/a	on-going	low	homeowners
3.1.3	Mod	ESC/power co.	n/a	w/in 1 yr	low	homeowners
3.1.4	High	ESC	n/a	w/in 1 yr	low	general public
3.1.5	High	ESC	n/a	w/in 1 yr	low	homeowners
3.1.6	Mod	ESC	n/a	w/in 2 yrs	low	general public
3.1.7	High	ESC	FEMA/local	w/in 2 yrs	$30,000	general public
3.1.8	Mod	ESC	n/a	on-going	low	homeowners
3.2.1	Mod	Planning	n/a	w/in 2 yrs	low	general public
3.2.2	Low	ESC	n/a	w/in 5 yrs	low	general public
4.1.1	High	ESC	local	on-going	low	general public

Table 52. Locality Specific Plan of Action – Tappahannock

Strategy	Priority	Responsible Party	Funding Source	Schedule	Cost	Beneficiary

1.1.1	Low	Zoning	FEMA/landowners	by request	variable	homeowners
1.1.3	High	Public Works	local	ASAP	unknown	general public
1.1.5	High	Town/County	VDOT	ASAP	$4 million	general public
1.1.7	High	Town	VDOT	ASAP	unknown	town residents
1.1.8	Mod	Zoning	local	every 2 yrs	low	general public
1.1.9	Low	Bldg/Zoning	local	w/in 2 yrs	low	general public
1.1.10	Low	Building	local	w/in 2 yrs	low	general public
1.1.11	High	Zoning	local	on-going	low	general public
1.1.15	Low	Building/Wetlands	local	w/in 2 yrs	low	general public
1.2.1	Low	ESC/CAO	local	on-going	low	general public
2.2.1	High	ESC	n/a	w/in 1 yr	low	general public
2.2.2	High	ESC	n/a	w/in 1 yr	none	general public
3.1.1	High	ESC	FEMA/local	w/in 1 yr	$30,000	general public
3.1.2	Mod	ESC	n/a	on-going	low	homeowners
3.1.3	Mod	ESC/power co.	n/a	w/in 1 yr	low	homeowners
3.1.4	High	ESC	n/a	w/in 1 yr	low	general public
3.1.5	High	ESC	n/a	w/in 1 yr	low	homeowners
3.1.6	Mod	ESC	n/a	w/in 2 yrs	low	general public
3.2.1	Mod	Planning	n/a	w/in 2 yrs	low	general public
3.2.2	Low	ESC	n/a	w/in 5 yrs	low	general public
4.1.1	High	ESC	local	on-going	low	general public

Table 53. Locality Specific Plan of Action – Middlesex County

Strategy	Priority	Responsible Party	Funding Source	Schedule	Cost	Beneficiary

1.1.1	Low	Zoning	FEMA/landowners	by request	variable	homeowners
1.1.2	Low	Building	local	yearly	low	businesses
1.1.6	Mod	BOS/VDOT	VDOT	on-going	unknown	general public
1.1.8	Mod	Zoning	local	every 2 yrs	low	general public
1.1.9	Low	Bldg/Zoning	local	w/in 2 yrs	low	general public
1.1.10	Low	Building	local	w/in 2 yrs	low	general public
1.1.11	High	Zoning	local	on-going	low	general public
1.1.13	Mod	ESC/Planning	local	w/in 2 yrs	low	general public
1.1.15	Low	Building/Wetlands	local	w/in 2 yrs	low	general public
1.2.1	Low	ESC/CAO	local	on-going	low	general public
2.2.1	High	ESC	n/a	w/in 1 yr	low	general public
2.2.2	High	ESC	n/a	w/in 1 yr	none	general public
3.1.1	High	ESC	FEMA/local	w/in 1 yr	$30,000	general public
3.1.2	Mod	ESC	n/a	on-going	low	homeowners
3.1.3	Mod	ESC/power co.	n/a	w/in 1 yr	low	homeowners
3.1.4	High	ESC	n/a	w/in 1 yr	low	general public
3.1.5	High	ESC	n/a	w/in 1 yr	low	homeowners
3.1.6	Mod	ESC	n/a	w/in 2 yrs	low	general public
3.1.7	Mod	ESC	local	w/in 2 yrs	low	general public
3.1.8	Mod	ESC	n/a	on-going	low	homeowners
3.2.1	Mod	Planning /GIS	n/a	w/in 2 yrs	low	general public
3.2.2	Low	ESC	n/a	w/in 5 yrs	low	general public
4.1.1	High	ESC	local	on-going	low	general public

Table 54. Locality Specific Plan of Action – Mathews County

Strategy **Priority** **Responsible Party** **Funding Source** **Schedule** **Cost** **Beneficiary**

1.1.1	High	Planning	FEMA/landowners	by request	variable	homeowners
1.1.2	Mod	Building	local	yearly	low	businesses
1.1.3	Mod	BOS	federal grant	as needed	unknown	general public
1.1.4	Mod	Planning	FEMA	by request	variable	homeowners
1.1.6	Mod	BOS/VDOT	VDOT	on-going	unknown	general public
1.1.8	Mod	Zoning	local	every 2 yrs	low	general public
1.1.9	Low	Bldg/Zoning	local	w/in 2 yrs	low	general public
1.1.10	Low	Building	local	w/in 2 yrs	low	general public
1.1.11	High	Zoning	local	on-going	low	general public
1.1.13	Mod	ESC/Planning	local	w/in 2 yrs	low	general public
1.1.15	Low	Building/Wetlands	local	w/in 2 yrs	low	general public
1.2.1	Low	ESC/CAO	local	on-going	low	general public
2.2.1	High	ESC	n/a	w/in 1 yr	low	general public
2.2.2	High	ESC	n/a	w/in 1 yr	none	general public
3.1.1	High	ESC	n/a	on-going	low	general public
3.1.2	Mod	ESC	n/a	on-going	low	homeowners
3.1.3	Mod	ESC/power co.	n/a	w/in 1 yr	low	homeowners
3.1.4	High	ESC	n/a	w/in 1 yr	low	general public
3.1.5	High	ESC	n/a	w/in 1 yr	low	homeowners
3.1.6	Mod	ESC	n/a	w/in 2 yrs	low	general public
3.1.7	Mod	ESC	local	w/in 2 yrs	low	general public
3.1.8	Mod	ESC	n/a	on-going	low	homeowners
3.2.1	Mod	Planning /GIS	n/a	w/in 2 yrs	low	general public
3.2.2	Low	ESC	n/a	w/in 5 yrs	low	general public
4.1.1	High	ESC	local	on-going	low	general public

Table 55. Locality Specific Plan of Action – King and Queen County

Strategy	Priority	Responsible Party	Funding Source	Schedule	Cost	Beneficiary

1.1.6	Mod	BOS/VDOT	VDOT	on-going	unknown	general public
1.1.8	Mod	Zoning	local	every 2 yrs	low	general public
1.1.9	Low	Bldg/Zoning	local	w/in 2 yrs	low	general public
1.1.10	Low	Building	local	w/in 2 yrs	low	general public
1.1.13	Mod	ESC/Planning	local	w/in 2 yrs	low	general public
1.1.15	Low	Building/Wetlands	local	w/in 2 yrs	low	general public
1.2.1	Low	ESC/CAO	local	on-going	low	general public
2.2.1	High	ESC	n/a	w/in 1 yr	low	general public
2.2.2	High	ESC	n/a	w/in 1 yr	none	general public
3.1.1	High	ESC	FEMA/local	w/in 1 yr	$30,000	general public
3.1.2	Mod	ESC	n/a	on-going	low	homeowners
3.1.3	Mod	ESC/power co.	n/a	w/in 1 yr	low	homeowners
3.1.4	High	ESC	n/a	w/in 1 yr	low	general public
3.1.6	Mod	ESC	n/a	w/in 2 yrs	low	general public
3.1.8	Mod	ESC	n/a	on-going	low	homeowners
3.2.1	Mod	Planning/GIS	n/a	w/in 2 yrs	low	general public
3.2.2	Low	ESC	n/a	w/in 5 yrs	low	general public
4.1.1	High	ESC	local	on-going	low	general public

Table 56. Locality Specific Plan of Action – King William County

Strategy	Priority	Responsible Party	Funding Source	Schedule	Cost	Beneficiary

1.1.5	High	BOS/VDOT	VDOT	ASAP	unknown	general public
1.1.6	Mod	BOS/VDOT	VDOT	on-going	unknown	general public
1.1.8	Mod	Zoning	local	every 2 yrs	low	general public
1.1.9	Low	Bldg/Zoning	local	w/in 2 yrs	low	general public
1.1.10	Low	Building	local	w/in 2 yrs	low	general public
1.1.12	Mod	Planning	local	w/in 2 yrs	low	general public
1.1.13	Mod	ESC/Planning	local	w/in 2 yrs	low	general public
1.1.14	Mod	Planning	local	w/in 2 yrs	low	general public
1.1.15	Low	Building/Wetlands	local	w/in 2 yrs	low	general public
1.1.16	Mod	Comm Devel	local	w/in 1 yr	low	general public
1.1.17	Mod	Comm Devel	grant	w/in 1 yr	low	general public
1.1.18	Mod	GIS/Comm Devel	local	w/in 2 yrs	low	general public
1.2.1	Low	ESC/CAO	local	on-going	low	general public
2.2.1	High	ESC	n/a	w/in 1 yr	low	general public
2.2.2	High	ESC	n/a	w/in 1 yr	none	general public
3.1.1	High	ESC	FEMA/local	w/in 1 yr	$30,000	general public
3.1.2	Mod	ESC	n/a	on-going	low	homeowners
3.1.3	Mod	ESC/power co.	n/a	w/in 1 yr	low	homeowners
3.1.4	High	ESC	n/a	w/in 1 yr	low	general public
3.1.6	Mod	ESC	n/a	w/in 2 yrs	low	general public
3.1.8	Mod	ESC	n/a	on-going	low	homeowners
3.2.1	Mod	Planning/GIS	n/a	w/in 2 yrs	low	general public
3.2.2	Low	ESC	n/a	w/in 5 yrs	low	general public
4.1.1	High	ESC	local	on-going	low	general public

Table 57. Locality Specific Plan of Action – Gloucester County

Strategy	Priority	Responsible Party	Funding Source	Schedule	Cost	Beneficiary

1.1.1	High	Haz Mit	FEMA/landowners	by request	variable	homeowners
1.1.2	Mod	Codes Comp.	FEMA	by request	variable	businesses
1.1.3	Mod	Public Util.	federal grant	as needed	unknown	general public
1.1.4	High	Haz Mit	FEMA	by request	variable	homeowners
1.1.6	Low	BOS/VDOT	VDOT	on-going	unknown	general public
1.1.8	Low	Codes Comp.	local	every 2 yrs	low	general public
1.1.11	High	Codes Comp.	local	on-going	low	general public
1.1.13	Low	Public Util.	local	w/in 5 yrs	low	general public
1.1.14	Mod	Planning	local	w/in 2 yrs	low	general public
1.1.15	Low	Codes C./Wetlands	local	w/in 5 yrs	low	general public
1.2.1	Low	BOS	local	on-going	low	general public
2.2.1	High	Vol. F & R	n/a	w/in 1 yr	low	general public
2.2.2	High	Vol. F & R	n/a	w/in 1 yr	none	general public
3.1.1	High	EMC	local	on-going	$20-$36k	general public
3.1.2	Mod	Codes Comp.	n/a	on-going	low	homeowners
3.1.3	Mod	EMC/power co.	n/a	on-going	low	homeowners
3.1.4	High	Codes/EM	n/a	w/in 1 yr	low	general public
3.1.5	High	Codes/EM	n/a	w/in 1 yr	low	homeowners
3.1.6	Mod	power co.	n/a	on-going	low	general public
3.1.7	Low	Flood Committee	n/a	w/in 5 yrs.	low	general public
3.1.8	Mod	Vol. F/R/Forestry	n/a	on-going	low	homeowners
3.2.1	Mod	Planning /GIS	n/a	w/in 2 yrs	low	general public
3.2.2	Low	EMC	n/a	w/in 5 yrs	low	general public
4.1.1	High	EMC	local	on-going	low	general public

Table 58. Locality Specific Plan of Action – Town of West Point

Strategy **Priority** **Responsible Party** **Funding Source** **Schedule** **Cost** **Beneficiary**

1.1.1	Low	Planning	FEMA/landowners	by request	variable	homeowners
1.1.2	Mod	Building	local	yearly	low	businesses
1.1.3	High	HRSD	HRSD/local	ASAP	unknown	general public
1.1.8	Mod	Zoning	local	every 2 yrs	low	general public
1.1.9	Low	Bldg/Zoning	local	w/in 2 yrs	low	general public
1.1.10	Low	Building	local	w/in 2 yrs	low	general public
1.1.11	High	Zoning	local	on-going	low	general public
1.1.15	Low	Building/Wetlands	local	w/in 2 yrs	low	general public
1.2.1	Low	ESC/CEO	local	on-going	low	general public
2.2.1	High	ESC	n/a	w/in 1 yr	low	general public
2.2.2	High	ESC	n/a	w/in 1 yr	none	general public
3.1.1	High	ESC	King Wm County	w/in 1 yr	none	general public
3.1.2	Mod	ESC	n/a	on-going	low	homeowners
3.1.3	Mod	ESC/power co.	n/a	w/in 1 yr	low	homeowners
3.1.4	High	ESC	n/a	w/in 1 yr	low	general public
3.1.5	High	ESC	n/a	w/in 1 yr	low	homeowners
3.1.6	Mod	ESC	n/a	w/in 2 yrs	low	general public
3.1.7	Mod	ESC	local	w/in 2 yrs	low	general public
3.2.1	Mod	Planning	n/a	w/in 2 yrs	low	general public
3.2.2	Low	ESC	n/a	w/in 5 yrs	low	general public
4.1.1	High	ESC	local	on-going	low	general public

Table 59. Locality Specific Plan of Action – Town of Urbanna

Strategy	Priority	Responsible Party	Funding Source	Schedule	Cost	Beneficiary

1.1.1	Low	Zoning	FEMA/landowners	by request	variable	homeowners
1.1.2	Mod	Building	local	yearly	low	businesses
1.1.8	Mod	Zoning	local	every 2 yrs	low	general public
1.1.9	Low	Bldg/Zoning	local	w/in 2 yrs	low	general public
1.1.10	Low	Building	local	w/in 2 yrs	low	general public
1.1.11	High	Zoning	local	on-going	low	general public
1.1.15	Low	Building/Wetlands	local	w/in 2 yrs	low	general public
1.2.1	Low	ESC/CEO	local	on-going	low	general public
2.2.1	High	ESC	n/a	w/in 1 yr	low	general public
2.2.2	High	ESC	n/a	w/in 1 yr	none	general public
3.1.1	High	ESC	local	w/in 1 yr	none	general public
3.1.2	Mod	ESC	n/a	on-going	low	homeowners
3.1.3	Mod	ESC/power co.	n/a	w/in 1 yr	low	homeowners
3.1.4	High	ESC	n/a	w/in 1 yr	low	general public
3.1.5	High	ESC	n/a	w/in 1 yr	low	homeowners
3.1.6	Mod	ESC	n/a	w/in 2 yrs	low	general public
3.1.7	Mod	ESC	local	w/in 2 yrs	low	general public
3.2.1	Mod	Zoning/GIS	n/a	w/in 2 yrs	low	general public
3.2.2	Low	ESC	n/a	w/in 5 yrs	low	general public
4.1.1	High	ESC	local	on-going	low	general public

Section 10 - Plan Adoption

Each of the 9 localities participating in the MPNHMP 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	xx/xx/20xx
Town of Tappahannock	xx/xx/20xx
Middlesex County	xx/xx/20xx
Town of Urbanna	xx/xx/20xx
Gloucester County	xx/xx/20xx
Mathews County	xx/xx/20xx
King and Queen County	xx/xx/20xx
King William County	xx/xx/20xx
Town of West Point	xx/xx/20xx

Copies of relevant sections from the minutes of the board/council meetings noted above are included in Appendix 11. Copies of resolutions adopting the MPNHMP Update from each of the localities are also contained in Appendix 11.

Section 11 - Plan Maintenance

The monitoring, evaluating and updating of this plan shall be done on a yearly basis and shall be the responsibility of the locality's Emergency Services Coordinator/Emergency Manager, with the assistance of the Chief Executive Officer - the County Administrator or Town Manager. In some of the Middle Peninsula localities, these 2 positions are held by the Chief Executive Officer.

The first yearly evaluation of the MPNHMP update by the localities will be done on the 1-year anniversary date after FEMA's approval of the plan. For consistency purposes, the same evaluation 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.

A Regional Planner at the Middle Peninsula Planning District Commission (MPPDC) will be available to coordinate the yearly evaluation process of the updated MPNHMP at the request of the 9 member jurisdictions with the provision of appropriate resources. The Planner will work with the Steering Committee Members, who actively participated in the development of this plan, on the yearly evaluation since they will be the most knowledgeable in their locality about what has transpired in terms of mitigation projects. In most cases, the active Steering Committee Members are the locality's Emergency Services Coordinator/Emergency Managers and implementation of the mitigation projects are an important part of their job responsibilities.

The Regional Planner will assist the Middle Peninsula localities with the evaluation process in the following ways:

1. Distribute the Excel-based written evaluation tool to each ESC/EM approximately 1 month before the annual anniversary date of the plan. Each ESC/EM will receive the Excel spreadsheet that lists their locality-specific mitigation strategies.
2. Collate and edit the completed Excel spread-sheets that have been returned to the MPPDC after the Steering Committee Members have solicited input for the evaluation directly 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.
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 the 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.

Local Plan Coordination

It is recommended that the Middle Peninsula Natural Hazard Mitigation Plan be incorporated into local comprehensive plans, local EOP's, zoning ordinances, and flood plain management plans when appropriate. Beyond the adoption of the 2006 plan, several localities identified additional specific local planning integration steps taken:

- Gloucester - The Middle Peninsula Mitigation Plan will be given reference in the Comprehensive Plan, Coastal Floodplain Management Plan and the Emergency Operations Plan.

- Mathews- The revised Mathews County Comprehensive Plan will reference the All Hazard Plan. Expected adoption date is December 2010

- King and Queen- The 2010 Middle Peninsula Natural Hazards Mitigation Plan will be referenced in the County's Emergency Operations Plan. Copies of the Plan will be kept in the EOC and will be in the Checklists and Operations Books for the EOC

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- The County has established an All-Hazards Emergency Planning Committee to insure that the public is involved.

- Gloucester- The public will be involved with natural hazard planning through the Local Emergency Management Committee and the Floodplain Management Committee. Both of these groups are open to the public and speak to hazard mitigation.

- Tappahannock- Monthly Town Council meetings

- Mathews- County will, from time to time, include pertinent information and opportunities for input on our website www.mathewscountyva.gov.

- King and Queen- 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

The 2016 MPNHMP Update

Due to the limited jurisdictional staff and in following with the process followed with the original 2006 MPNHMP and this 2010 update, it can be anticipated that the 9 Middle Peninsula localities will once again undertake this as a regional planning project. It can be anticipated that the Middle Peninsula Planning District Commission will once again be asked by the member jurisdictions 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 1 - Jurisdictional Letters of Intent

MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

Saluda Professional Center, 125 Bowden Street, P.O. Box 286, Saluda, VA 23149-0286
Toll Free: 1-888-699-1733 Phone: (804) 758-2311 FAX: (804) 758-3221
E-mail: mppdc@mppdc.com Webpage: www.mppdc.com

NOV 4 2008

LETTER OF INTENT

October 10, 2008

To: Michael M. Cline, State Coordinator
Virginia Department of Emergency Management
10501 Trade Court
Richmond, VA 23236-3713

RE: **Middle Peninsula Natural Hazards Mitigation Plan Update**

The Middle Peninsula Planning District Commission is in the process of revising the Plan referenced above with the assistance of the FY09 Pre-Disaster Mitigation Grant Program (PDM).

Specific requirements must be met in order to receive available funding, including the intent of local jurisdictions to participate in this planning process. I understand by submitting this "Letter of Intent" I am stating that my jurisdiction will work with the Middle Peninsula Planning District Commission in the revision of the Plan.

Name	Title	Date
[illegible]	Deputy County Administrator	October 21, 2008

Address
PO Box 1079
Tappahannock
Virginia 22560

Telephone	Fax
(804) 443-4331	(804) 443-4157

MIDDLE PENINSULA PLANNING DISTRICT COMMISSION
Saluda Professional Center, 125 Bowden Street, P.O. Box 286, Saluda, VA 23149-0286
Toll Free: 1-888-699-1733 Phone: (804) 758-2311 FAX: (804) 758-3221
E-mail: mppdc@mppdc.com Webpage: www.mppdc.com

LETTER OF INTENT

October 10, 2008

To: Michael M. Cline, State Coordinator
Virginia Department of Emergency Management
10501 Trade Court
Richmond, VA 23236-3713

RE: **Middle Peninsula Natural Hazards Mitigation Plan Update**

The Middle Peninsula Planning District Commission is in the process of revising the Plan referenced above with the assistance of the FY09 Pre-Disaster Mitigation Grant Program (PDM).

Specific requirements must be met in order to receive available funding, including the intent of local jurisdictions to participate in this planning process. I understand by submitting this "Letter of Intent" I am stating that my jurisdiction will work with the Middle Peninsula Planning District Commission in the revision of the Plan.

[signature]	County Administrator	10/15/08
Name	Title	Date

Address
Gloucester County
PO Box 329
Gloucester, VA 23061

804-693-4042	804-693-6004
Telephone	Fax

MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

Saluda Professional Center, 125 Bowden Street, P.O. Box 286, Saluda, VA 23149-0286
Toll Free: 1-888-699-1733 Phone: (804) 758-2311 FAX: (804) 758-3221
E-mail: mppdc@mppdc.com Webpage: www.mppdc.com

LETTER OF INTENT

October 10, 2008

To: Michael M. Cline, State Coordinator
Virginia Department of Emergency Management
10501 Trade Court
Richmond, VA 23236-3713

RE: **Middle Peninsula Natural Hazards Mitigation Plan Update**

The Middle Peninsula Planning District Commission is in the process of revising the Plan referenced above with the assistance of the FY09 Pre-Disaster Mitigation Grant Program (PDM).

Specific requirements must be met in order to receive available funding, including the intent of local jurisdictions to participate in this planning process. I understand by submitting this "Letter of Intent" I am stating that my jurisdiction will work with the Middle Peninsula Planning District Commission in the revision of the Plan.

TRENTON L. FUNKHOUSER — Name
TOWN MANAGER, TOWN OF WEST POINT — Title
10/10/08 — Date

Address
P.O. BOX 152
WEST POINT VA 23181

804-843-3330
Telephone

804-843-4364
Fax

MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

Saluda Professional Center, 125 Bowden Street, P.O. Box 286, Saluda, VA 23149-0286
Toll Free: 1-888-699-1733 Phone: (804) 758-2311 FAX: (804) 758-3221
E-mail: mppdc@mppdc.com Webpage: www.mppdc.com

LETTER OF INTENT

October 10, 2008

To: Michael M. Cline, State Coordinator
Virginia Department of Emergency Management
10501 Trade Court
Richmond, VA 23236-3713

RE: **Middle Peninsula Natural Hazards Mitigation Plan Update**

The Middle Peninsula Planning District Commission is in the process of revising the Plan referenced above with the assistance of the FY09 Pre-Disaster Mitigation Grant Program (PDM).

Specific requirements must be met in order to receive available funding, including the intent of local jurisdictions to participate in this planning process. I understand by submitting this "Letter of Intent" I am stating that my jurisdiction will work with the Middle Peninsula Planning District Commission in the revision of the Plan.

Frank A. Pleva
Frank A. Pleva — King William Co Administrator — 10/10/08

Name — Title — Date

Address
P.O. Box 215
King William, VA.
23086

(804) 769-4927 — (804) 769-4964

Telephone — Fax

MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

Saluda Professional Center, 125 Bowden Street, P.O. Box 286, Saluda, VA 23149-0286
Toll Free: 1-888-699-1733 Phone: (804) 758-2311 FAX: (804) 758-3221
E-mail: mppdc@mppdc.com Webpage: www.mppdc.com

OCT 28 2008

Received
King & Queen
Admin. Office

LETTER OF INTENT

October 10, 2008

To: Michael M. Cline, State Coordinator
Virginia Department of Emergency Management
10501 Trade Court
Richmond, VA 23236-3713

RE: **Middle Peninsula Natural Hazards Mitigation Plan Update**

The Middle Peninsula Planning District Commission is in the process of revising the Plan referenced above with the assistance of the FY09 Pre-Disaster Mitigation Grant Program (PDM).

Specific requirements must be met in order to receive available funding, including the intent of local jurisdictions to participate in this planning process. I understand by submitting this "Letter of Intent" I am stating that my jurisdiction will work with the Middle Peninsula Planning District Commission in the revision of the Plan.

K. Diane Gaber	Interim Co. Administrator	10-27-08
Name	Title	Date

Address
King and Queen County
P.O. Box 177
King & Queen C.H., VA. 23085

(804) 785-5975	(804) 785-5999
Telephone	Fax

MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

Saluda Professional Center, 125 Bowden Street, P.O. Box 286, Saluda, VA 23149-0286
Toll Free: 1-888-699-1733 Phone: (804) 758-2311 FAX: (804) 758-3221
E-mail: mppdc@mppdc.com Webpage: www.mppdc.com

OCT 14 2008

LETTER OF INTENT

October 10, 2008

To: Michael M. Cline, State Coordinator
Virginia Department of Emergency Management
10501 Trade Court
Richmond, VA 23236-3713

RE: **Middle Peninsula Natural Hazards Mitigation Plan Update**

The Middle Peninsula Planning District Commission is in the process of revising the Plan referenced above with the assistance of the FY09 Pre-Disaster Mitigation Grant Program (PDM).

Specific requirements must be met in order to receive available funding, including the intent of local jurisdictions to participate in this planning process. I understand by submitting this "Letter of Intent" I am stating that my jurisdiction will work with the Middle Peninsula Planning District Commission in the revision of the Plan.

Name	Title	Date
[illegible signature]	County Administrator	10/10/08

Address
Middlesex County
PO Box 428
Saluda VA 23149

Telephone	Fax
804-758-4330	804-758-0061

MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

Saluda Professional Center, 125 Bowden Street, P.O. Box 286, Saluda, VA 23149-0286
Toll Free: 1-888-699-1733 Phone: (804) 758-2311 FAX: (804) 758-3221
E-mail: mppdc@mppdc.com Webpage: www.mppdc.com

LETTER OF INTENT

October 10, 2008

To: Michael M. Cline, State Coordinator
Virginia Department of Emergency Management
10501 Trade Court
Richmond, VA 23236-3713

RE: **Middle Peninsula Natural Hazards Mitigation Plan Update**

The Middle Peninsula Planning District Commission is in the process of revising the Plan referenced above with the assistance of the FY09 Pre-Disaster Mitigation Grant Program (PDM).

Specific requirements must be met in order to receive available funding, including the intent of local jurisdictions to participate in this planning process. I understand by submitting this "Letter of Intent" I am stating that my jurisdiction will work with the Middle Peninsula Planning District Commission in the revision of the Plan.

Stephen K. Whiteway	County Administrator	10-10-08
Name	Title	Date

Address
County of Mathews
PO Box 839
Mathews, VA 23109

804-725-7172	804-725-7805
Telephone	Fax

MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

Saluda Professional Center, 125 Bowden Street, P.O. Box 286, Saluda, VA 23149-0286
Toll Free: 1-888-699-1733 Phone: (804) 758-2311 FAX: (804) 758-3221
E-mail: mppdc@mppdc.com Webpage: www.mppdc.com

OCT 16 2008

LETTER OF INTENT TOWN OF URBANNA.

October 10, 2008

To: Michael M. Cline, State Coordinator
Virginia Department of Emergency Management
10501 Trade Court
Richmond, VA 23236-3713

RE: **Middle Peninsula Natural Hazards Mitigation Plan Update**

The Middle Peninsula Planning District Commission is in the process of revising the Plan referenced above with the assistance of the FY09 Pre-Disaster Mitigation Grant Program (PDM).

Specific requirements must be met in order to receive available funding, including the intent of local jurisdictions to participate in this planning process. I understand by submitting this "Letter of Intent" I am stating that my jurisdiction will work with the Middle Peninsula Planning District Commission in the revision of the Plan.

Name	Title	Date
G. LEWIS FILLING	CHIEF ADMINISTRATIVE OFFICER	10/14/2008

Address
PO BOX 179
URBANNA,
VIRGINIA, 23175

Telephone	Fax
804-758-2613	804-758-0389

MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

Saluda Professional Center, 125 Bowden Street, P.O. Box 286, Saluda, VA 23149-0286
Toll Free: 1-888-699-1733 Phone: (804) 758-2311 FAX: (804) 758-3221
E-mail: mppdc@mppdc.com Webpage: www.mppdc.com

OCT 20 2008

LETTER OF INTENT

October 10, 2008

To: Michael M. Cline, State Coordinator
Virginia Department of Emergency Management
10501 Trade Court
Richmond, VA 23236-3713

RE: **Middle Peninsula Natural Hazards Mitigation Plan Update**

The Middle Peninsula Planning District Commission is in the process of revising the Plan referenced above with the assistance of the FY09 Pre-Disaster Mitigation Grant Program (PDM).

Specific requirements must be met in order to receive available funding, including the intent of local jurisdictions to participate in this planning process. I understand by submitting this "Letter of Intent" I am stating that my jurisdiction will work with the Middle Peninsula Planning District Commission in the revision of the Plan.

Name	Title	Date
JAMES W SYDNOR	ASST. TOWN MANAGER	10-17-08

Address
P.O. BOX 266
TAPPAHANNOCK, VA

804-443-3336
Telephone

804-443-1051
Fax

Appendix 2 – List of Flood Mitigation Planning Steering Committee Members

MPPDC Flood Mitigation Plan Team Members

County Administrators/Town Managers
County Emergency Services Coordinators
County Planning/Zoning Staff
VDEM Mitigation Staff and Regional Coordinators
VDCR Floodplain Staff
VDOT – Saluda Residency Administrator
VDH – Three Rivers Emergency Planner
US Corps of Engineers
US Coast Guard

County Administrators/Town Managers

Steve Whiteway, County Administrator
Mathews County
P. O. Box 839
Mathews, VA 23109
804-725-7172

Charles Culley, County Administrator
Middlesex County
P. O. Box 428
Saluda, VA 23149
804-758-4330

Brenda Garton, County Administrator
Gloucester County
P. O. Box 329
Gloucester, VA 23061
804-693-4042

Tom Swartzwelder, County Administrator
King and Queen County
P. O. Box 177
King and Queen C.H., VA 23085
804-785-5975

Dave Whitlow, County Administrator
Essex County
P. O. Box 1079
Tappahannock, VA 22560
804-443-4331

Frank Pleva, County Administrator
King William County
P. O. Box 215
King William, VA 23086
804-769-4927

Jimmy Sydnor, Assistant Town Manager
Town of Tappahannock
P. O. Box 266
Tappahannock, VA 22560
804-443-3336

Lewis Filling, Town Manager
Town of Urbanna
P. O. Box 423
Urbanna, VA 23175
804-758-2613

Trent Funkhouser, Town Manager
Town of West Point
P. O. Box 152
West Point, VA 23181
804-843-3330

Emergency Services Coordinators (if different than County Administrator/Town Manager)

Dave Burns, Emergency Services Coordinator
Mathews County
P. O. 839
Mathews, VA 23109
804-725-9063

Tim Doss, Interim Emergency Services Coordinator
Gloucester County
7502 Justice Drive
Gloucester, VA 23061
804-693-1379

Jane Wenner, Emergency Services Planner/Trainer
Gloucester County
P.O. Box 329
Gloucester, VA 23061
804-693-1391

Grace Tressler, Emergency Services Coordinator
King and Queen County
P. O. Box 177
King and Queen C.H., VA 23085
804-785-5975

Steve Puckett, Emergency Services Coordinator
King William County
P.O. Box 215
King William, VA 23086
804-769-2654

Larry Smith, Emergency Services Coordinator
Essex County
P. O. Box 1079
Tappahannock, VA 22560
804-443-4414

County Planning/Zoning Staff

Chris Perez, Planner 1
Gloucester County Planning Department
P. O. Box 329
Gloucester, VA 23061
804-693-0271

Paul Koll, Building Official
Gloucester County
P.O. Box 604
Gloucester, VA 23061
804-693-4040

Matt Walker, Planning Director
Middlesex County
P. O. Box 428
Saluda, VA 23149
804-758-3382

David Selph, Building Official
Middlesex County
P.O. Box 423
Saluda, VA 23149
804-758-4305

John Shaw, Planning Director
Mathews County
P.O. Box 839
Mathews, VA 23109
804-725-4034

Tom Swartzwelder, Zoning Administrator
King and Queen County
P. O. Box 177
King and Queen C.H., VA 23085
804-785-5975

Scott Lucchesi, Community Development Director
King William County
P.O. Box 215
King William, VA 23086
804-769-4973

Jeff Hodges, Zoning Administrator
Essex County
P. O. Box 1079
Tappahannock, VA 22560
804-443-4951

Wyn Davis, Environmental Codes Compliance Officer
Essex County
P.O. Box 1079
Tappahannock, VA 22560

Virginia Department of Emergency Management

Robbie Coates, Mitigation Planning Coordinator
Amy Howard, Mitigation Planning Coordinator
VDEM
10501 trade Court
Richmond, VA 23236-3713
804-897-6500 x 6582 (Robbie)
804-897-6500 x 6534 (Amy)

Gene Wills, Regional Coordinator
VDEM
P.O. Box 672
Emporia, VA 23847
434-336-1015

Wallace Twigg, Regional Coordinator
VDEM
P. O. Box 1239
Mathews, VA 23109
804-725-4035

Virginia Department of Conservation and Recreation

Charley Banks, Floodplain Program Engineer
VDCR
203 Governor Street – Suite 206
Richmond, VA 23219
804-371-6135

Virginia Department of Transportation

Marcie Parker, Residency Administrator
VDOT
P. O. Box 184
Saluda, VA 23149
804-758-2321

Virginia Department of Health

Steve Rykal, Emergency Planner
Three Rivers Health District
P. O. Box 415
Saluda, VA 23149
804-758-2381 x 28

U.S. Corps of Engineers

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

Appendix 3. Steering Committee Agendas and Meeting Minutes

Middle Peninsula Regional Flood Mitigation Plan Meeting

Thursday, October 16th from 2:00 p.m. to 4:00 p.m. MPPDC Offices

Proposed Agenda

1. **Welcome and Self-Introductions**
2. **Overview of Project – Ron Hachey**
3. **Flood Mitigation Planning Process – Robbie Coates and Amy Howard – VDEM**
4. **Review of 21-month Project Work Schedule – Ron**
5. **Suggestions for Additional or Substitute Team Members – Ron**
6. **Flood Information Data Gathering – Who has what? – Team Members**
7. **Team Member Comments/Ideas**
8. **Next Meeting**
9. **Adjourn**

Middle Peninsula Regional Flood Mitigation Plan Meeting Minutes

October 16, 2008 - MPPDC Offices

This was the kick-off meeting for those invited to participate in the development of the Middle Peninsula's first Regional Flood Mitigation Plan. The Team is made up of officials from the 9 localities that make up the Middle Peninsula region as well as state and federal officials who have a stake and/or interest in flood-related matters.

Those attending this meeting included the following:

1. Charley Banks, VDCR
2. Robbie Coates, VDEM
3. Amy Howard, VDEM
4. Scott Lucchesi, King William County
5. Keith Lynch, NWS – Wakefield Office
6. Charlie Culley, Middlesex County
7. Steve Rykal, Three Rivers Health District
8. Gene Wills, VDEM
9. Paul Koll, Gloucester County
10. Steve Puckett, King William County
11. Matthew Rowe, Mathews County
12. Marcie Parker, VDOT
13. Grace Tressler, King and Queen County
14. Matt Welsh, USCG – Milford Haven Station
15. Ron Hachey – MPPDC

A sign-up sheet was passed around to gather names and e-mail addresses of those present. Ron stated that he will distribute copies of that list when he mails copies of the minutes from the meeting.

The following is a summary of the major subjects that the group covered during the meeting:

Welcome/Brief Overview of the Project

Ron welcomed those in attendance and gave a brief overview of the Flood Mitigation Plan Project. He informed the group that this is a new regional project that he will be working on over the next 21-months. He noted that the flood hazards were not assessed with the other natural hazards when the Middle Peninsula Natural Hazards Mitigation Plan was written in 2005 and approved by the localities and FEMA in 2006.

Self-Introductions

Ron asked those present to introduce themselves and to mention any kind of information/data that they might have that will help with this project. Everyone introduced themselves and those having any specific information/data that they wanted to mention included the following.

Charley Banks stated that updated digital floodplain maps have been completed for Mathews County and that preliminary updated floodplain maps have been done for Essex, King William and King and

Queen Counties. Charley noted that preliminary maps will not be available for Middlesex and Gloucester Counties until September of 2009 according to FEMA's schedule. He noted that FEMA's map update schedule sometimes gets delayed/changed.

Paul informed the group that Gloucester County is developing a Floodplain Management Plan. He also noted that the County participates in the Community Rating System (CRS) which enables residents to get a reduction on their home insurance premiums. Currently, Gloucester's CRS rating allows for a 5% reduction in their premiums.

Steve Puckett wanted to make sure that water release data from the Lake Anna Dam be included in the flood mitigation plan since it does create flooding in King William County.

Marcie noted that VDOT does have some general information about which roads flood during storm events. She stated that new roads are built to withstand storm events of a specific size, but that the old Byrd Act Roads were not built to any specific road construction standards.

Keith noted that the National Weather Service (NWS) has flooding data on Tropical Storm Ernesto and Hurricane Isabel. He went on to say that the NWS also has data from river gauges that might prove helpful in developing this plan.

Flood Mitigation Planning Process - Robbie and Amy

Robbie and Amy provided the group with a power point overview of the Flood Mitigation Assistance Program. Points made during the presentation included the following:

1. Mitigation actions will reduce or eliminate injury to citizens, damage to structures while at the same time allowing the community to continue functioning.
2. Supports and promotes the National Floodplain Insurance Program and local floodplain ordinances.
3. The 4 stages of the planning process include assessing your capabilities and risks, establishing mitigation strategies, developing the plan including plan maintenance procedures and gaining local/state/federal approvals.
4. The Planning District Commission can play a role in coordinating and organizing a team to develop the plan.
5. The public needs to be actively involved in the plan development process.
6. Each locality in the region will have different capabilities/resources/limitations with implementing flood mitigation actions.
7. Flood hazards include riverine, coastal and flash flooding events.
8. Risk assessment involves identifying location-specific flood hazards, determining the severity of the hazard and predicting the probability of future flooding events.
9. FEMA's HAZUS Software is used to evaluate the vulnerability of people and structures, with an emphasis on repetitive and severe flood insurance loss properties.
10. The goal is to develop realistic strategies to mitigate flood hazards.

There was a brief discussion about strategies that could be developed by enhancing local county ordinances.

Project Work Schedule

Ron briefly went over the proposed 21-month work schedule for the project. He noted that the schedule identifies a handful of times when the Team members will get together. These meetings are scheduled to occur at certain milestone points throughout the project. Ron will be contacting members of the Team as needed to gather data and to discuss other aspects of the plan throughout the process.

Additional Team Members

Ron asked the group to let him know if they knew of other associates who might be interested in being involved with the project.

Next Meeting

It was the consensus of the group that the next meeting should be held on February 19, 2009 from 2:00 p.m. to 4:00 p.m. at the MPPDC offices in Saluda.

The meeting ended at 3:30 p.m.

Ron Hachey, MPPDC Staff

Middle Peninsula Regional Flood Mitigation Plan Meeting

Thursday, February 19, 2009 from 2:00 p.m. to 4:00 p.m. MPPDC Offices

Proposed Agenda

1. **Welcome and Self-Introductions**

2. **Overview of Project – Ron Hachey**

3. **Review of Identified Flood Hazards in Each Locality – Ron**

4. **Identification of Additional Flood Hazards – Team Members**

5. **Discussion of Possible Hazard Mitigation Strategies – Team Members**

6. **Review of Project Work Schedule – Ron**

7. **Next Meeting**

8. **Adjournment**

Middle Peninsula Regional Flood Mitigation Plan Meeting Minutes

February 19, 2009 - MPPDC Offices

This was the second meeting for those invited to participate in the development of the Middle Peninsula's first Regional Flood Mitigation Plan. The Team is made up of officials from the 9 localities that make up the Middle Peninsula region as well as state and federal officials who have a stake and/or interest in flood-related matters.

Those attending this meeting included the following:

- Charley Banks, VDCR
- Robbie Coates, VDEM
- Amy Howard, VDEM
- Debbie Messmer, VDEM
- Scott Lucchesi, King William County
- Steve Puckett, King William County
- Paul Koll, Gloucester County
- John Shaw, Mathews County
- Marcie Parker, VDOT
- Matt Walker, Middlesex County
- David Selph, Middlesex County
- Wyn Davis, Essex County
- Ron Hachey – MPPDC

A sign-up sheet was passed around to gather the names and contact information of those present at the meeting.

Welcome and Self-Introductions

Each of the team members introduced themselves to the group since some of them had not been in attendance at the first meeting back in October 2008.

Charley noted that draft versions of digitized floodplain maps for both Middlesex and Gloucester Counties are projected to be available in June 2009 according to FEMA's latest estimates. However, this date is subject to change by FEMA officials due to unforeseen circumstances.

Robbie stated that the State's Mitigation Plan is due to be updated/revised in the near future.

Debbie noted that both Mathews and Gloucester Counties have on-going residential mitigation projects. Some of the mitigation projects involve elevating houses and other projects involve purchasing flood prone properties then demolishing the damaged houses.

Brief Overview of the Project

Ron gave a brief overview of the Flood Mitigation Plan Project. He informed the group that this is a regional planning project that has a 21-month time line. He noted that the focus of this meeting would be to look at the flood hazard information that he has gathered for each of the Middle Peninsula localities.

Ron then handed out copies of hazard information to representatives from each of the localities at the meeting.

The locality specific information lists public facilities/buildings, public utilities, roads/boat ramps, residences /businesses that are adversely affected by flooding. Ron also referred to the FEMA generated list on the conference room table that listed detailed information on the 246 residences/businesses that have had repetitive or severe repetitive flood losses and insurance claims. He noted that there is the number of structures per locality is in the hazard information that he handed out, but that the detailed insurance claim information was considered confidential by FEMA and not for public distribution.

Ron asked members of the group to assist him by correcting any inaccuracies in the flood hazards that he had described in the draft and to please add other flood hazards in their communities that he may have overlooked. He asked that they share this information with others in their locality that might be able to better describe or expand upon this preliminary list of flood hazards. It would be especially helpful to look at the list of roads that flood to more accurately pinpoint where the problem spots are located.

Paul noted that the fire station located in Bena does not flood, but that the road leading to it floods - at times with 4′ to 5′ of water. Marcie noted that when a severe storm is predicted, VDOT stages their vehicles and/or equipment in areas that do not flood so that they have mobility to start repairing roads immediately after the storm.

Marcie noted that VDOT has facilities that are in a similar situation and that they position equipment outside of those areas before the storm strikes so that they can work on the roads immediately after the storm passes.

Ron noted that information about water releases from the Lake Anna Dam would be included in the flood mitigation plan since it does create flooding in King William County. Steve stated that most of the land that floods during release waters is farmland; however, there is some residential development in the inundation zone. Ron noted that the Beaverdam Reservoir inundation information would be included in the plan since spillway overflows have created minor flood damage in the past in the Gloucester Courthouse area.

Discussion of Possible Hazard Mitigation Strategies

Ron noted that flood mitigation strategies to be considered should include structural activities, such as they are doing in Mathews and Gloucester Counties, as well as policy/ordinance revisions that would provide further protection for those planning to build or undertake other activities in flood prone areas. For example, Ron stated that a locality could implement a policy to raise a structure proposed to be built in a flood prone area to even a higher elevation above the flood waters than is currently required by floodplain regulations.

Paul informed the group that Gloucester County is developing a Floodplain Management Plan. He also noted that the County participates in the Community Rating System (CRS) which enables residents to get a reduction on their home insurance premiums.

In reference to a comment about dam repairs, Charley noted that the VDCR does have low interest loans for dam repairs. If interested, he suggested that they contact VDCR’s Dam Safety Division to discuss the details of this loan program.

Steve noted that flood waters can have a damaging affect on the numerous private wells that serve many homes throughout the Middle Peninsula region. He stated that the local health departments test well water after severe flooding and this needs to be taken into account in the development of this plan.

Next Meeting

Ron noted that he should have a draft of the plan in 3 to 4 months that would include the hazards and mitigation strategies. He suggested that the next meeting of the group take place at that time and that he would notify them well in advance of the day and time for that meeting.

The meeting ended at 3:15 p.m.

Ron Hachey, MPPDC Staff

Middle Peninsula Regional Flood Mitigation Plan Meeting

Thursday, April 23, 2009 from 2:00 p.m. to 4:00 p.m. MPPDC Offices

Proposed Agenda

1. **Welcome**
2. **Overview of Project – Ron**
3. **Second Review of Flood Hazards in Each Locality – Team Members**
4. **First Review of Proposed Hazard Mitigation Strategies – Ron**
5. **Review of Remaining Project Work Schedule – Ron**
6. **Next Meeting**
7. **Adjournment**

Middle Peninsula Regional Flood Mitigation Plan Meeting Minutes

April 23, 2009 - MPPDC Offices – 2:00 p.m.

This was the third meeting for those invited to participate in the development of the Middle Peninsula's first Regional Flood Mitigation Plan. The Team is made up of officials from the 9 localities that make up the Middle Peninsula region as well as state and federal officials who have a stake and/or interest in flood-related matters.

Those attending this meeting included the following:

- Charley Banks, VDCR
- Amy Howard, VDEM
- Scott Lucchesi, King William County
- Paul Koll, Gloucester County
- Christopher Perez, Gloucester County
- Trent Funkhouser, West Point
- Steve Rykal, Three Rivers Health District
- Dave Burns, Mathews County
- Richard Gonzalez, U.S. Coast Guard – Milford Station
- David Selph, Middlesex County
- Ron Hachey – MPPDC

Welcome/Overview of Project

Ron welcomed everyone to the meeting and noted that Grace Tressler, King and Queen County, had just called in and would not be making the meeting today due to car trouble.

Ron noted that the purpose of this meeting was to go over the flood hazards that have been identified in each locality and then to review the strategies that have been proposed to mitigate those hazards.

Paul noted that FEMA has specified a new flood zone that is identified as the Coastal AE Flood Zone. This flood zone has wave action in the 1.5′ to 3′ range. Charley noted that the new FIRM map updates do not show this new Coastal AE Flood Zone on them. David stated that Middlesex County requires that surveyors submit elevation data with all building permit applications in the floodplain to show flood water depths in order to determine the proper building code specifications to follow.

Paul noted that FEMA Memo #50 explains the new Coastal AE Flood Zone in greater detail.

Christopher suggested that it might be helpful to know what kind/magnitude of a flooding event causes particular roads to become inundated.

Paul noted that Gloucester County has mitigated 23 properties thus far with their mitigation projects.

Amy stated that the group should review the flood related vulnerabilities and strategies specified in the Natural Hazards Mitigation Plan to determine if they were still valid and if others can be added to them.

Comments on Strategies

Ron stated that he has come up with a list of mitigation strategies and that he would like the group's input on whether or not they should be considered for inclusion in the plan and if so, by which of the localities covered in this regional plan.

Both Chris and Amy expressed the need to develop a set of goals before the group gets too far along with developing strategies. Chris noted that the strategies in the plan are grouped into sections and that the title of each section lends itself to the formulation of a goal statement.

Ron then went through each of the strategies to get team member feedback. Comments included the following:

1. Strategy 1. Since these figures only represent FEMA flood insured properties, there should be an effort to see if there is a way to identify properties that flood that are not part of the FEMA flood insured properties.
2. Strategy 2. It was noted that flood proofing workshops **should** be offered rather than **will** be offered by the local Building Officials.
3. Strategy 3. Trent noted that some of these facilities were owned by HRSD and therefore, not directly under the control of the localities. Dave thought that the New Point Comfort Lighthouse should not be listed, but that the Mathew's County Administration Building should be added to the list.
4. Strategy 5. It was determined that Newbill Drive in Tappahannock did not affect evacuation routes and should be deleted from this strategy. Dave wanted to add Main Street to this list since its flooding adversely affects evacuation from the Mathews Courthouse area.
5. Strategy 6. Dave wanted to add the Mathews Fire Department to this list since inadequate storm drains back up and adversely affects access to the fire department building.
6. Strategy 8. It was noted that towns can participate in the CRS Program. Paul noted that Gloucester County will undergo their CRS audit in October 2009. It was suggested that this strategy **should** be undertaken rather than **will** to undertaken.
7. Strategy 9. Trent asked about flood surge data for West Point and it was noted that the town wasn't part of the U.S. Corp of Engineer's latest study which dealt with more coastal localities.
8. Strategy 12. Christopher noted that Beaverdam Reservoir is certified as a Class 4 structure by the VDCR. The dam is structurally sound, but flood waters have flowed over the spillway during previous severe weather events. Ron noted that a Lake Anna inundation map should be added to the plan, if one is available.
9. Strategy 14. Trent noted that some of the schools have a student notification system in place that may be able to be used with the localities reverse 911 systems to warn residents of flooding/evacuation plans.
10. Strategy 15. Scott noted that subdivision plats/development plans in King William County require that drainage easements be shown on the plats/plan, which may help with ditch maintenance. It was noted that it may not be feasible to **require** VDOT to maintain roadway ditches to reduce some chronic flooding problems along some of their roads. One of the team members noted that it maybe illegal to fill ditches and this is something that could be researched.
11. Strategy 16. It was suggested that telephone line rights-of-way be added to electric power line rights-of-way when it comes to landscaping materials.

12. Strategy 17. It was noted that this strategy might be more applicable to a locality's Emergency Operations Plan rather than the Flood Mitigation Plan.
13. Strategy 18. This strategy is an attempt to mitigate the adverse affects of riverine flooding – especially in developing localities where multiple developments compound storm water runoff/flooding for downstream land areas.
14. Strategy 19. This strategy needs to be more fully developed with the types of coastal construction techniques that might be able to lessen flood damage.

Next Meeting

Although the group did not designate a day for the next meeting, Ron will notify team members well in advance of the day and time for that meeting.

Ron Hachey, MPPDC Staff

Middle Peninsula Regional Flood Mitigation Plan Meeting

Thursday, August 27, 2009 from 2:00 p.m. to 4:00 p.m. MPPDC Offices

Proposed Agenda

1. **Welcome**
2. **Overview of Project**
3. **Second Review of Locality Specific Proposed Hazard Mitigation Strategies**
4. **Review of Locality Specific Plans of Action to Implement Mitigation Strategies**
5. **Discussion of When to Hold Public Informational Meetings in Each Locality**
6. **Next Meeting of this Group**
7. **Adjournment**

Middle Peninsula Regional Flood Mitigation Plan Meeting Minutes

August 27, 2009 - MPPDC Offices – 2:00 p.m.

This was the fourth meeting for those invited to participate in the development of the Middle Peninsula's first Regional Flood Mitigation Plan (FMP). The Team is made up of officials from the 9 localities that make up the Middle Peninsula region as well as state and federal officials who have a stake and/or interest in flood-related matters.

Those attending this meeting included the following:

- Christopher Perez, Gloucester County
- Steve Rykal, Three Rivers Health District
- Matt Walker, Middlesex County
- Dave Whitlow, Essex County
- John Shaw, Mathews County
- Ron Hachey – MPPDC

Welcome/Overview of Project

Ron welcomed everyone to the meeting and gave a brief overview of the project. He stated that the Middle Peninsula localities adopted their first Natural Hazards Mitigation Plan (NHMP) in 2006. As stated in the plan, flooding from hurricanes was/is the greatest natural hazard likely to affect our region. The purpose of the FMP is to develop more detailed goals and strategies to mitigate the adverse affects from severe flooding events.

Review of Hazard Mitigation Strategies

Ron noted that the purpose of this meeting was:

- To review progress towards implementing strategies as specified in the 2006 NHMP,
- To go over proposed locality-specific hazard mitigation strategies, and
- To review locality-specific plans of action to implement the proposed strategies.

The group then went over Section 7 of the FMP, which outlines the mitigation strategies that have been accomplished by the localities since the adoption of the NHMP in 2006. Those projects implemented under each of the 3 goals listed in the NHMP were briefly reviewed and discussed. Ron noted that the relocation of the Mathews County Sheriff's Department to another facility that doesn't flood should be added to the list of accomplishments under "Goal 1 – Prevent Future Hazard Related Losses."

The group also discussed those projects implemented in addition to those specified in the 2006 NHMP. These projects included the construction of multi-million dollar radio communications systems in Gloucester and Essex Counties. In addition, King and Queen County and King William Counties are reviewing proposals for their new radio system upgrades.

Matt will check with the County's GIS staff person to see if the newly digitized floodplain maps have been incorporated into the County's GIS system and to see if the orthographic maps were upgraded to high resolution images in 2007. If either project was completed since the adoption of the NHMP in 2006, then it/they will be added as strategies implemented since the adoption of the NHMP.

The group then went over the proposed mitigation goals and strategies listed in Section 8 of the FMP. Those present suggested the following revisions:

1. Re-order the priority ranking criteria under Strategy 1.1 so that 2 becomes 1 and 1 becomes 2.
2. Remove the reference about the need to flood proof the Mathews County Sheriff's Office/Dispatch Center in Strategy 1.3 since this office has been relocated to another building.
3. Create a strategy for the Route 17 and Route 30 improvement projects separate from the VDOT secondary road listings since these 2 roads are critical/major hurricane evacuation routes for Middle Peninsula residents.
4. Strategy 1.4 should specify that land purchases will be voluntary and not forced upon any private property owners.
5. Re-phrase Strategy 1.5 to say: "Improve, maintain or reconstruct public roads that hinder ……………….."
6. Map as well as list the roads in Strategy 1.5 for inclusion into the FMP.
7. Clarify with town officials what needs to be done to Newbill Drive at the sewage pump location in Tappahannock.
8. Revise Strategy 2.3 to say: "Investigate increasing building elevation requirements above those in effect now for structures proposed to be built in flood zones." This strategy could be investigated by all of the Middle Peninsula localities.
9. It should be noted in Strategy 2.4 that not all of the localities have GIS systems and that the newly digitized maps can't be incorporated until they have GIS systems.
10. Revise Strategy 3.1 to say: "Continue to insure ……………"
11. Revise Strategy 3.2 to eliminate Gloucester County and check with King William County officials to see if they want to keep this strategy in the FMP to mitigate the adverse impacts from water releases from Lake Anna. The King William Reservoir should be deleted from the list since the City of Newport News does not plan to move forward with this project.
12. Revise Strategy 3.3 to say: "The USDA – Natural Resources Conservation Services Staff and the Virginia Soil and Water Conservation District Office staff will be encouraged to ensure that farm pond dams remain structurally sound."
13. Revise Strategy 4.1 to say: "Enhance/implement the use of reverse 911 ……."
14. Revise Strategy 5.2 to say: "Encourage the 2 power companies serving the Middle Peninsula Region to minimize interruptions to the electrical power grid."
15. Revise Strategy 5.3 to say: "Ensure that fire, rescue and law enforcement vehicles are deployed to non-flood prone areas during storms."
16. Revise Strategy 6.1 to say: "Develop Storm Water Management Plans in Urban Development Areas in both King William and Gloucester Counties."
17. The wording in Strategy 6.2 should clearly state that the coastal construction techniques refer to land protection measures and not to house construction methods.

Review of Locality Specific Plans of Action

Ron stated that Section 9 of the FMP has a locality-specific plan of action that lists each strategy that each locality proposes to undertake. The plan of action contains a priority, responsible party, funding source, schedule, cost and beneficiary column for each strategy.

Matt noted that local funding would be limited to finance any proposed strategies and that this should be a serious consideration when looking at this section of the plan.

Ron asked that each of those present closely review their locality's plan of action and let him know of any changes that should be made to it.

Public Informational Meetings

Ron noted that he would like to schedule a public informational meeting in each of the localities this fall. He asked those present to let him know if they wanted to have their public meeting as part of their governing body's regular meeting or if they wanted to hold it at a different time from their regular meeting.

Next Steps

The committee members would like to see a copy of the draft plan. Ron stated that he will send them one after he revises the strategies and associated plans of action.

Recording Secretary

Ron Hachey – MPPDC Staff

Appendix 4. List of MPNHMP Update Steering Committee Members

Middle Peninsula Natural Hazards Mitigation Plan Update
Steering Committee Members
February 2, 2010

County Administrators/Town Managers
County Emergency Services Coordinators
County Planning/Zoning Staff
VDEM Mitigation Staff and Regional Coordinators
VDOT – Saluda Residency Administrator
VDH – Three Rivers Emergency Planner
NWS - Wakefield
US Corps of Engineers - Norfolk
US Coast Guard – Mathews County

County Administrators/Town Managers

Steve Whiteway, County Administrator
Mathews County
P. O. Box 839
Mathews, VA 23109
804-725-7172

Charles Culley, County Administrator
Middlesex County
P. O. Box 428
Saluda, VA 23149
804-758-4330

Brenda Garton, County Administrator
Gloucester County
P. O. Box 329
Gloucester, VA 23061
804-693-4042

Tom Swartzwelder, County Administrator
King and Queen County
P. O. Box 177
King and Queen C.H., VA 23085
804-785-5975

Dave Whitlow, County Administrator
Essex County
P. O. Box 1079
Tappahannock, VA 22560
804-443-4331

Frank Pleva, County Administrator
King William County
P. O. Box 215
King William, VA 23086
804-769-4927

Jimmy Sydnor, Assistant Town Manager
Town of Tappahannock
P. O. Box 266
Tappahannock, VA 22560
804-443-3336

Lewis Filling, Town Manager
Town of Urbanna
P. O. Box 423
Urbanna, VA 23175
804-758-2613

Trent Funkhouser, Town Manager
Town of West Point
P. O. Box 152
West Point, VA 23181
804-843-3330

Emergency Services Coordinators (if different than County Administrator/Town Manager)

Dave Burns, Emergency Services Coordinator
Mathews County
P. O. 839
Mathews, VA 23109
804-725-9063

Emily Ashley, Emergency Services Coordinator
Gloucester County
P.O. Box 329
Gloucester, VA 23061
804-693-1390

Grace Tressler, Emergency Services Coordinator
King and Queen County
P. O. Box 177
King and Queen C.H., VA 23085
804-785-5975

Steve Puckett, Emergency Services Coordinator
King William County
P.O. Box 215
King William, VA 23086
804-769-2654

Larry Smith, Emergency Services Coordinator
Essex County
P. O. Box 1079
Tappahannock, VA 22560
804-443-4414

County Planning/Zoning Staff

Chris Perez, Planner 1
Gloucester County Planning Department
P. O. Box 329
Gloucester, VA 23061
804-693-0271

Paul Koll, Building Official
Gloucester County
P.O. Box 604
Gloucester, VA 23061
804-693-4040

Matt Walker, Planning Director
Middlesex County
P. O. Box 428
Saluda, VA 23149
804-758-3382

David Selph, Building Official
Middlesex County
P.O. Box 423
Saluda, VA 23149
804-758-4305

John Shaw, Planning Director
Mathews County
P.O. Box 839
Mathews, VA 23109
804-725-4034

Tom Swartzwelder, Zoning Administrator
King and Queen County
P. O. Box 177
King and Queen C.H., VA 23085
804-785-5975

Scott Lucchesi, Community Development Director
King William County
P.O. Box 215
King William, VA 23086
804-769-4973

Jeff Hodges, Zoning Administrator
Essex County
P. O. Box 1079
Tappahannock, VA 22560
804-443-4951

Holly McGowan, Community Development Director
Town of West Point
P.O. Box 152
West Point, VA 23181
804-843-3330

Virginia Department of Emergency Management

Amy Howard, Mitigation Planning Coordinator
VDEM
10501 Trade Court
Richmond, VA 23236-3713
804-897-6500 x 6534

Gene Wills, Regional Coordinator
VDEM
P.O. Box 672
Emporia, VA 23847
434-336-1015

Wallace Twigg, Regional Coordinator
VDEM
P. O. Box 1239
Mathews, VA 23109
804-725-4035

Virginia Department of Transportation

Marcie Parker, Residency Administrator
VDOT
P. O. Box 184
Saluda, VA 23149
804-758-2321

Virginia Department of Health

Steve Rykal, Emergency Planner
Three Rivers Health District
P. O. Box 415
Saluda, VA 23149
804-758-2381 x 28

U.S. Corps of Engineers

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

National Weather Service
Bill Sammler
National Weather Service
10009 General Mahone Hwy.
Wakefield, VA 23888
757-899-4200

Appendix 5. Agendas and Minutes from MPNHMP Update Meetings

Middle Peninsula Natural Hazards Mitigation Plan Update Meeting
Thursday, February 18, 2010 from 2:00 p.m. to 4:00 p.m. MPPDC Offices

Proposed Agenda

1. **Welcome and Self-Introductions**
2. **Overview of Project**
3. **MPNHMP Update Planning Process**
4. **Review of Project Work Schedule**
5. **Suggestions for Additional or Substitute Committee Members**
6. **Review of Hazard Rankings From 2006 Plan**
7. **Next Steps**
8. **Next Meeting**
9. **Adjourn**

Middle Peninsula Natural Hazards Mitigation Plan (MPNHMP) Update Meeting Minutes

February 18, 2010 - MPPDC Offices – 2:00 p.m.

This was the first meeting for those invited to participate in the update of the MPNHMP that was adopted in 2006 by all 9 of the Middle Peninsula jurisdictions. The participants are officials from the 9 localities that make up the Middle Peninsula region as well as state and federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome

Ron welcomed everyone to the meeting and then asked everyone to introduce themselves to the group. Those doing so included the following:

- Paul Koll, Gloucester County
- Emily Ashley, Gloucester County
- David Selph, Middlesex County
- Dave Whitlow, Essex County
- Larry Smith, Essex County
- Holly McGowan, Town of West Point
- Joyce McGowan, VDOT – Saluda
- Bill Sammler, NWS - Wakefield
- Scott Lucchesi, King William County
- Debbie Messmer, VDEM via phone
- Robbie Coates, VDEM via phone
- Ron Hachey – MPPDC

Overview of Project

Ron gave the group a brief overview of the project. He stated that the Middle Peninsula localities adopted the MPNHMP in 2006 and that the plan needs to be updated every 5 years in order to be in compliance with FEMA regulations.

Since its adoption in 2006, there has been one major revision to it. Revision #1 resulted in the development of the Flood Mitigation Plan, which covers mitigation strategies covering the Middle Peninsula's most critical threat, which is flooding. Therefore, the update of the MPNHMP will include reviewing and updating mitigation strategies for those natural hazards - other than flooding - that were identified in the 2006 plan.

Review of Project Work Schedule

Ron referred the group to the Project Tasks List that was included with the information that was mailed to them. He noted that the contract between FEMA/VDEM and the MPPDC runs for 2 years, but it is anticipated that the Emergency Planning Program at the MPPDC will be ending at the completion of the current fiscal year – June 30, 2010. Therefore, he stated that the MPNHMP update work will need to be compressed so that the update is substantially complete by that date.

Review of Hazard Rankings from the 2006 MPNHMP

Ron referred the group to the Prioritization Worksheet for Hazards from the 2006 MPNHMP that was also included with the information that was mailed to the attendees. It was noted that this summary of hazards and their risk ratings was completed using a Kaiser Permanente hazard vulnerability tool. Ron asked the group if they still agreed with the rankings and ratings of the impacts of these natural hazards.

Bill suggested that the following changes be made to the worksheet:

- Tornados go from a 3 to a 2 in probability.
- Coastal flooding go from a 2 to a 3 in affected structures.
- Coastal flooding go from a 2 to a 3 in primary impacts.
- Coastal/shoreline erosion go from a 0 to a 1 in primary impacts.
- Riverine flooding go from a 3 to a 2 in affected structures.
- Riverine flooding go from a 2 to a 1 in primary impacts.
- Riverine flooding go from a 2 to a 1 in secondary impacts.
- Wildfires go from a 3 to a 2 in affected structures.
- Droughts go from a 3 to a 2 in probability.
- Lightning go from a 2 to a 3 in probability.
- Lightning go from a 0 to a 1 in affected structures.
- Lightning go from a 1 to a 2 in primary impacts.
- Earthquakes go from a 2 to a 1 in probability.
- Extreme cold go from a 2 to a 1 in probability.
- Extreme heat go from a 1 to a 2 in probability.

Emily requested that the hazard of sea level rise be added to the list of hazards to be included in the rankings and update.

In response to a question from Holly about the Reverse 911 System in King William County, Ron will follow-up with Steve Puckett to confirm that the system covers households in West Point as well as see how and by whom the emergency messages are generated.

In response to a question from Scott concerning the dam failure hazard, Ron noted that this was discussed in the Flood Mitigation Plan and that a mitigation strategy to develop a data base of where these dams were located as well as an evaluation of their structural integrity is in the plan. Robbie noted that the Virginia Department of Conservation and Recreation has a data base that includes a locality-by locality listing of some of this information in their Dam Permitting Program.

Larry noted that there would be less assistance/guidance from the Virginia Department of Forestry during wildfires if the state budget cuts as proposed are implemented.

In a response to a question from Bill, Robbie stated that the state used a different methodology during the update of the State's Mitigation Plan, but that the Kaiser Permanente method could still be used if the Middle Peninsula group decided to do so.

The group asked that Ron re-calculate the prioritization worksheet figures using the suggested changes that were noted above and have the new worksheet for the group at their next meeting.

Review of Rankings

Ron referred the group to the ranking summary sheet that was included in their mailing. He stated that the hazards in the 2006 plan were grouped into high, moderate and low hazards. In the 2006 plan, there were strategies developed for the high ranking hazards. In addition, flood-related hazards were reviewed and strategies developed for them in the Flood Mitigation Plan.

Ron asked the group if they wanted to review and/or develop mitigation strategies for the remaining natural hazards in the high ranking and moderate ranking categories in this update.

Emily suggested that the group wait to make this determination after they review the revised rankings from the Kaiser Permanente worksheet at their next meeting. Emily went on to say that she may want to work with some of her co-workers and community residents to develop a list of mitigation strategies that would be tailored to more specifically address Gloucester County's natural hazards situation.

Public Review Process

Emily stressed the need to get public input on the proposed update after the HIRA was completed as well as after mitigation strategies have been developed/proposed. It was noted that public comments could be solicited at meetings held in the hazard-prone areas of the jurisdiction as well as at meetings of the local governing body.

Other Matters

In response to a question from Joyce about VDOT's involvement in the Flood Mitigation Plan, it was noted that there is a list by jurisdiction of public roads segments that are adversely affected by flooding. Ron stated that he would provide Joyce/VDOT with a copy of the proposed Flood Mitigation Plan.

Next Meeting

The next meeting of the group will be held on Wednesday, March 10, 2010 at 2:00 p.m. at the MPPDC offices in Saluda.

Recording Secretary – Ron Hachey

Middle Peninsula Natural Hazards Mitigation Plan Update Meeting

Wednesday, March 10, 2010 from 2:00 p.m. to 4:00 p.m. MPPDC Offices

Proposed Agenda

1. **Welcome**

2. **Review of HAZUS Damage Assessments from flooding and high wind hazards that were included in Flood Mitigation Plan – implications for mitigation strategies. Dewberry Consultants (who conducted the damage assessments) via conference call.**

3. **Review of Hazard Identification/Capability Assessment Worksheets by locality representatives.**

4. **Review of Regional Natural Hazards ranking results from Kaiser Permanente Assessment tool.**

5. **Review of Project Work Schedule as outlined to Steering Committee members in memo dated February 23, 2010.**

6. **Remaining meeting schedule dates – April, May and June**

7. **Public Comments**

8. **Adjournment**

Middle Peninsula Natural Hazards Mitigation Plan (MPNHMP) Update Meeting Minutes

March 10, 2010 - MPPDC Offices – 2:00 p.m.

This was the second meeting of the Steering Committee members participating in the update of the MPNHMP that was adopted in 2006 by all 9 of the Middle Peninsula jurisdictions. The participants are officials from the 9 localities that make up the Middle Peninsula region as well as state and federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome and Opening Remarks

Ron welcomed everyone to the meeting, which included the following people:

- Emily Ashley, Gloucester County
- David Selph, Middlesex County
- Larry Smith, Essex County
- Bill Sammler, NWS - Wakefield
- Scott Lucchesi, King William County
- Amy Howard, VDEM
- Grace Tressler, King and Queen County
- Steve Puckett, King William County
- John Shaw, Mathews County
- Ron Hachey – MPPDC
- Rachael Herman, Dewberry - via phone for HAZUS discussion

There was a brief discussion about the process that the group should be following for the update of the plan. Amy stated that Ron's role is to facilitate the development and writing of the plan update based on the hazard assessments and strategies that are to be generated by the Steering Committee members and residents of their localities.

Review of HAZUS Damage Assessments

Ron stated that a hazard assessment for flooding and high winds using the FEMA HAZUS software was undertaken during the development of the Flood Mitigation Plan. He stated that Rachael Herman, from the consulting firm Dewberry, conducted the assessment. Ron stated that Rachael was available via speaker phone to explain the assessment process, anticipated damage results and possible mitigation strategies.

Rachael stated that the HAZUS assessment model was run using existing data inputs from federal sources, including floodplain maps and U.S. Census figures. She noted that there were no locally generated inputs put into the model. She stated that this was a basic level of analysis, which she characterized as higher than a Level 1 assessment, but less than a Level 2 assessment. The HAZUS model analysis can be rated as a 1, 2, or 3 – based on the types and details of the data inputs used in the runs.

Rachael referred to this HAZUS run as around a "Level 1.5."

Rachael referred the committee members to the pages in the assessment showing the annualized financial losses that could be anticipated depending on the intensity of the flooding and the wind speeds from severe weather events.

In terms of mitigation strategies, Rachael noted that there were hardening and shuttering techniques that the localities could propose to protect structures. David noted that the building code that the localities in our area of the state have adopted and enforce require that buildings be designed/constructed to withstand 100 mph winds. He noted that changes would need to be made to the building code before our localities could enforce construction standards for winds in excess of 100 mph - a change that would not be easy to make.

The group discussed the Essential Facilities Map and noted that some of the locations were not accurate and that some of their facilities were not shown on the map. Both Rachael and Amy pointed out that this information should be field verified and improved upon before another HAZUS-type assessment is undertaken for the region.

Rachael briefly noted that there were some good strategies in the Flood Mitigation Plan. She went on to say that mitigation strategies such as continued strong enforcement of local floodplain regulations, conducting a Level 2 HAZUS assessment in the future using locally generated data inputs, participation in FEMA's Community Rating System Program, and providing alternative power sources for essential facilities during outages could be undertaken by the localities.

In response to a question from Rachael about storm debris, Ron noted that the Middle Peninsula localities have contracts through their solid waste authority (Virginia Peninsulas Public Service Authority) that can be activated to remove debris after a severe storm event.

Grace noted the chart in the report that showed the decreasing functionality of the area's essential facilities as the storm intensity increases.

Emily noted that mitigation plans could be adopted as an addendum to the locality's comprehensive plan.

Review of Regional Natural Hazard Assessments

Ron handed out revised copies of the regional natural hazard vulnerability assessment summary sheet on the new version of the Kaiser Permanente tool. He noted that the summary sheet that he was passing out was a result of the input from the Steering Committee members in attendance at the February 18th meeting. Ron noted that in response to his e-mail asking localities to fill out their local assessments of natural hazard vulnerabilities for compilation into a regional assessment, he only received responses back from David in Middlesex and from Jimmy Sydnor in Tappahannock.

Bill noted that the rating criteria in the new version of the Kaiser Permanente tool had changed and therefore, he suggested making additional adjustments to some of the assessments. Bill led the group discussion that resulted in a group consensus of additional adjustments to make to the regional assessments of natural hazards that affect the Middle Peninsula area.

After the additional adjustments were completed, Ron stated that he would revise the spreadsheet based on these adjustments and e-mail the revised spreadsheet to the Steering Committee members present. (Note: The revised spreadsheet is attached and considered a part of these meeting minutes)

Emily suggested that each locality rank order their natural hazards based on the regional assessment information as well as based on input from other local officials and residents.

Project Schedule

Ron referred the Steering Committee members to his mailing of February 23rd that outlined the time line and associated tasks that need to be completed by June 30th. He noted that he would e-mail the worksheets that had been included in that mailing to those present so that they could fill them out.

At Grace's suggestion, the group agreed to return the completed worksheets to Ron by March 24th - in time for him the compile the results so that the committee members can see them in advance of their next meeting.

Next Meeting

The next meeting of the Steering Committee will be held on Wednesday, April 7, 2010 at 2:00 p.m. at the MPPDC offices in Saluda. Ron noted that Michael Dodson will attend this meeting to discuss the Gloucester County and Mathews County Residential Housing Mitigation Projects.

Amy suggested that the Steering Committee members discuss any other successful mitigation activities that their localities have undertaken. Ron stated that he would put that as an item on the April agenda.

Recording Secretary

Ron Hachey, MPPDC Staff

Middle Peninsula Natural Hazards Mitigation Plan Update Meeting

Wednesday, April 7, 2010 from 2:00 p.m. to 4:00 p.m. at MPPDC Offices

Proposed Agenda

1. **Welcome**

2. **Review of Gloucester County's and Mathew County's Residential Housing Mitigation Projects – Mike Dodson and Travis Lindsey**

3. **Final Review of Regional Natural Hazards Ranking Results from Kaiser Permanente Assessment Tool.**

4. **Review Existing and Develop New Regional Mitigation Goals and Objectives for MPNHMP Update.**

5. **Review of Criteria to be Used in Developing Mitigation Strategies**

6. **Review of Remaining Deadlines with Update:**

    - **Localities Develop Mitigation Strategies based on goals and objectives finalized in item #4 above by April 21st and send them to Ron at MPPDC**
    - **Review of Locality Mitigation Strategies at May 5th Steering Committee Meeting**
    - **Attend May 5th Steering Committee Meeting**
    - **Draft of MPNHMP Update to VDEM/FEMA Staff and Steering Committee Members by May 19th**
    - **Attend June 9th Steering Committee Meeting to review and revise Draft MPNHMP**

7. **Public Comments – from those in attendance, from newspaper articles or from MPPDC website posting**

8. **Next Meeting – May 5th**

9. **Adjournment**

Middle Peninsula Natural Hazards Mitigation Plan (MPNHMP) Update Meeting Minutes

April 7, 2010 - MPPDC Offices – 2:00 p.m.

This was the third meeting of the Steering Committee members participating in the update of the MPNHMP that was adopted in 2006 by all 9 of the Middle Peninsula jurisdictions. The participants are officials from the 9 localities that make up the Middle Peninsula region as well as state and federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome

Ron welcomed everyone to the meeting. Since there were 2 quests present, each attendee introduced themselves to the others in the room. Those present included:

- Emily Ashley, Gloucester County
- Travis Lindsey, K.W. Poore & Associates
- Michael Dodson, K. W. Poore & Associates
- Debbie Messmer, VDEM
- Robbie Coates, VDEM
- Larry Smith, Essex County
- Grace Tressler, King and Queen County
- Steve Puckett, King William County
- Ron Hachey, MPPDC Staff

Review of Gloucester County's and Mathew County's Residential Housing Mitigation Projects

Michael made a power-point presentation explaining the multi-phased Gloucester Residential Housing Mitigation Project that has been underway since 2004. He also discussed the newly funded first phase of the Mathew's County Residential Housing Mitigation Project that involves 5 properties, which Travis will be working on.

Michael noted that the Gloucester project has created 65 acres of permanent open space, relocated 14 households, has or will elevate 70 homes and has applied for grant funding to acquire 9 additional properties and elevate an additional 23 homes.

Michael noted that his firm has worked in a number of jurisdictions in the state and provides a wide range of hazard mitigation services including those noted above as well as in the areas of FEMA's CRS Program, writing or assisting in the development of Floodplain Management Plans and drainage improvement projects.

In response to questions from Grace, Larry and Steve about roads in their communities that flood, Debbie and Michael stated that road improvement projects have been funded with mitigation funds, but that a rigorous cost benefit analysis that would need to be undertaken before a project could be considered as eligible for competitive FEMA grant funding.

The Emergency Managers present noted the importance of Route 17 as a state designated hurricane evaluation route for Middle Peninsula residents as well as some Tidewater residents, but once again expressed their concerns about how Route 17 frequently floods on the north side of Tappahannock (at the

June Parker Marina) during many rain events. Ron noted that the Route 17 flooding problem was identified in the recently completed Flood Mitigation Plan. He also noted that many secondary roads in the region that have a history of flooding were identified in the Flood Mitigation Plan.

Michael and Travis stated that they are available to meet with any of the Middle Peninsula jurisdictions to discuss any mitigation projects that their firm may be able to assist them with.

Debbie noted that there would be new mitigation funds as a result of the December 2009 snowstorm and that "quick- connects" for generators powering critical facilities would be eligible for funding. Debbie and Robbie stated that there would be announcements soon about webinars that are being scheduled on and around April 20th where VDEM will discuss how to apply for these funds.

Steve noted that the Richmond-based UASI Project has been looking at generator projects as part of their capabilities assessment work and thought that their work could tie-in nicely with this funding opportunity. Steve also asked about the possibility of grant funding for the construction of bulkheads to protect the lower portions of West Point.

Review of Regional Natural Hazard Ranking Results

Ron noted that he has received 3 natural hazard vulnerability assessments from localities using the new version of the Kaiser Permanente tool. Grace, Larry, Steve and Emily have completed their assessments and will now forward them to Ron for his compilation into a regional vulnerability assessment.

Grace suggested that the regional assessment could be used to develop the regional goals and objectives, but that the jurisdictional assessments could be used by the locality to develop their locality's mitigation strategies.

Review of Existing and Development of New Regional Mitigation Goals and Objectives

Emily noted that the goals and objective from the 2006 MPNHMP were pretty basic and had limited usability for Gloucester County.

Robbie noted that the region could have a regional HIRA, a regional capabilities assessment, regional goals, but locality specific mitigation strategies.

After further discussion, Debbie suggested that the 5 goals and objectives that the state used when developing the state-wide Virginia Natural Hazard Mitigation Plan could be used as a framework for the MPNHMP update. The group agreed to this approach and Robbie stated that he would e-mail this information to Ron on Thursday for his dissemination to the Steering Committee members for their use in developing their goals/objectives/strategies.

Grace noted that King and Queen County is updating their LCAR capability assessment, which will help with the formulation of their mitigation strategies.

Emily asked Ron to attend Gloucester County's Hazard Mitigation Management Team meeting on May 13th to help them develop their locality specific mitigation strategies.

Project Schedule

Ron referred the Steering Committee members to item #6 on the agenda that briefly outlines the critical milestones/deadlines for the project in order to have the update complete by the end of the current fiscal year.

Next Meeting

The group determined that the next meeting of the Steering Committee will be held on Thursday, May 6, 2010 at 2:00 p.m. at the MPPDC offices in Saluda.

Recording Secretary

Ron Hachey, MPPDC Staff

Middle Peninsula Natural Hazards Mitigation Plan (MPNHMP) Update Meeting Minutes

May 6, 2010 - MPPDC Offices – 2:00 p.m.

This was the fourth meeting of the Steering Committee members participating in the update of the MPNHMP that was adopted in 2006 by all 9 of the Middle Peninsula jurisdictions. The participants are officials from the 9 localities that make up the Middle Peninsula region as well as state and federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome

Ron welcomed everyone to the meeting, which included the following:

- Debbie Messmer, VDEM
- Amy Howard,, VDEM
- Larry Smith, Essex County
- Grace Tressler, King and Queen County
- Steve Puckett, King William County
- John Shaw, Mathews County
- Scott Lucchesi, King William County
- Ron Hachey, MPPDC Staff

Project Status Update

Ron gave the group a brief update on this project as well as the work previously completed with the Flood Mitigation Plan. He stated that the work in the Flood Mitigation plan will be incorporated into the MPNHMP update so that there is one document that includes all of the region's natural hazard mitigation activities.

He noted once again that the draft of the update will need to be completed by the end of the current fiscal year – June 30, 2010.

Develop New Regional Mitigation Goals and Objectives

The group then reviewed the goals and objectives from the 2006 MPNHMP and decided upon changes that they wanted to make to them with the 2010 update. Suggested changes included the following:

1. Develop a new goal that would ensure that the mitigation strategies are implemented – this includes the possibility of adopting the update as an addendum to the locality's comprehensive plan.
2. Develop a strategy that would improve communications during a natural hazards event as the event unfolds – phone trees and VDEM's WebEOC techniques were noted as methods to enhance communications during emergencies.
3. Incorporate the communications-related recommendations from the PENEX '09 regional training exercise into the mitigation strategies.

Steve stressed the need to increase the coordination of communications between the EOCs and has observed that there appears to be a lot of duplication of efforts with the work of the WebEOC, UASI and RPAC, for example.

It was stressed once again by the Steering Committee members that the localities could work the mitigation plan into the Comprehensive Plan, the Emergency Operations Plan and other local plans to ensure its implementation.

John stressed the need to have a clear time frame for implementation of the strategies. Scott would like to have a mitigation strategy that produces maps showing the areas anticipated to be affected by some of the natural hazards. Amy suggested that this could be done by undertaking a higher level HAZUS assessment.

In response to a comment that neither King & Queen County or Essex County have a reverse-911 system, Debbie stated that there are post-disaster funds from this past winter's snow storms that could be utilized for this type of project. She encouraged them to apply for these grant funds – which require a match of 25% from the locality.

Grace noted that a regional Web-EOC is a project that she would like to suggest that could reduce communications interoperability problems that were clearly identified as a problem at the PENEX '09 Regional Training Exercise.

Debbie noted that public education brochures or other types of informational initiatives to keep residents aware of natural hazard issues is a type of project that could be funded through the 2 recent disaster declarations. She noted that the Central Shenandoah PDC has undertaken an effective public information campaign along these lines. Debbie noted that it may be possible to provide a portion of the 25% local match requirement using in-kind goods/services.

Grace stated that she would be willing to apply for grant funds for a public education/awareness project for the region if the other localities are interested in her doing so.

It was noted that some of the NOAA radios that were given to schools to assist them with responding to tornado warnings are in need of external antennas to enable a strong enough broadcast signal. It was noted that this type of project would be eligible for post-disaster FEMA grant funds.

Development of Mitigation Strategies

Ron stated that he would revise/reword the goals and objectives and e-mail them to the Steering Committee members tomorrow – May 7th. He noted that due to the tight time-frame for completing the project, he needs to get proposed mitigation strategies back from the Steering Committee members by the end of next week – May 14th.

Review of Remaining Deadlines with Update

Ron stated that he is on a schedule to complete a draft of the MPNHMP update by May 19th - with the intent of sending it to VDEM/FEMA staff and Steering Committee members for their review and comments before the next Steering Committee meeting.

Next Meeting

The group determined that the next meeting of the Steering Committee will be held on Wednesday, June 9, 2010 at 2:00 p.m. at the MPPDC offices in Saluda.

Recording Secretary,

Ron Hachey, MPPDC Staff

Middle Peninsula Natural Hazards Mitigation Plan (MPNHMP) Update Meeting Minutes

June 9, 2010 - MPPDC Offices – 2:00 p.m.

This was the fifth meeting of the Steering Committee members participating in the update of the MPNHMP that was adopted in 2006 by all 9 of the Middle Peninsula jurisdictions. The participants are officials from the 9 localities that make up the Middle Peninsula region as well as state and federal officials who have a stake and/or interest in natural hazards mitigation planning matters.

Welcome

Ron welcomed everyone to the meeting, which included the following:

- Emily Ashley, Gloucester County
- Larry Smith, Essex County
- Matt Walker, Middlesex County
- David Selph, Middlesex County
- John Shaw, Mathews County
- Scott Lucchesi, King William County
- Debbie Messmer, VDEM
- Ron Hachey, MPPDC Staff

Ron noted that Grace Tressler called to say that she was sick. Steve Puckett called to say that he was at a hazardous material spill and would try to get to the meeting later if he could.

Brief Discussion of Remaining Project Schedule

Ron informed those present that the Emergency Preparedness Planning position at the MPPDC would be ending, but that there is enough funding to keep his position going for 2 months into the new fiscal year, which would be until the end of August 2010.

He noted that the purpose of this meeting was to:

1. get feedback on the final draft of the plan update,
2. discuss how each of the localities wanted to get any further public comments, and
3. communicate about how they envisioned the adoption process in their jurisdiction.

Ron noted that once the draft plan is finalized, it will be sent to VDEM for their review/comments/revisions before it is sent to FEMA for the same. After that, each of the Middle Peninsula governing bodies will need to adopt the plan by resolution.

Review/Revisions of Draft Update

Ron noted that he had sent the final draft to the plan update to steering committee members on May 21st after having talked with each of the 9 jurisdictional Emergency Services Coordinators/Emergency Managers.

Comments from those present at this meeting included the following:

1. Matt had a list of additional roads that flood during storms that he wanted to be incorporated into the existing list for Middlesex County.
2. David stated that he had provided comments previously, which have been included in the final draft. He noted a spelling correction that needed to be made on page 267 – "mast" should be spelled "mask".
3. Matt wanted to make sure that there were no other agencies that dealt with farm ponds in addition to the USDA-Natural Resources Conservation Services and the Virginia Soil and Water Conservation Districts. It was noted that the US Corp of Engineers sometimes gets involved with water impoundments. Ron will check to see if this agency should be added to the list in Strategy 1.1.13.
4. Larry noted that he, Grace Tressler, Steve Puckett and Assistant Tappahannock Town Manager Jimmy Sydnor had gone over the final draft and that within the next few days, Grace would be sending Ron a few minor items that needed to be corrected in the update.
5. John noted that he had requested some revisions be made to the plan update and wanted to make sure they were incorporated into the final draft since he had not seen the final draft that had been sent to Dave Burns since Dave has been out of town for a few weeks. Ron stated that he had made the changes and John said that he would get with Dave Burns when he gets back to go over the final draft of the update.
6. Emily stated that she is still reviewing the final draft and will get any additional comments to Ron by the end of the week.
7. Scott stated that he had already provided comments, which Ron said had been included into the final draft. He said that he would check to see if Steve Puckett had anything that he saw that needed to be changed.

Public Review and Adoption Schedule

The group then discussed the need to get additional public input on the proposed mitigation strategies. Additional efforts to solicit public input will include the following:

1. Scott will put a notice in the Tidewater Review and the Country Courier newspapers inviting the public to a meeting that he will hold where they can review the draft plan and offer comments on the strategies that are being proposed in King William County.
2. Matt, Dave, Emily and John will invite Middlesex, Gloucester and Mathews residents to a similar type event covering the southern portion of the Middle Peninsula. The group would like to have the meeting at RCC-Glenns in mid-July. Ron will contact RCC to see about reserving a room for the meeting.
3. Larry will post information on the Essex County website about the draft plan and will make the document available at his office as well as at the Essex County Public Library in Tappahannock.
4. Ron will check with Grace to see how King & Queen County would like to handle this matter.

Review of Remaining Deadlines with Update

Some of the group members discussed providing their governing board members with summary information from the plan update in advance of it being on their agenda for adoption by resolution.

I was noted that the review time by state and federal officials will take from 60 to 90 days; therefore, an early fall adoption time by the 9 local jurisdictions is anticipated.

Next Meeting

There were no additional meetings of the Steering Committee scheduled.

Recording Secretary,

Ron Hachey, MPPDC Staff

Appendix 6 – MPNHMP Update Press Release

To: News Editor

From: Ron Hachey, Regional Emergency Preparedness Planner

Subject: **Press Release – Natural Hazards Mitigation Plan Update**

Date: March 2, 2010

I would appreciate it if you could run the following press release in the next edition of your newspaper. If you need any additional information, I can be reached by phone at 804-758-2311 or via e-mail at rhachey@mppdc.com.

Thank you.

Natural Hazards Mitigation Plan Being Updated For the Middle Peninsula

Saluda, VA — March 2, 2010 — The Middle Peninsula Planning District Commission (MPPDC), in conjunction with local officials from the region's six counties and three towns, is updating the 2006 Middle Peninsula Natural Hazards Mitigation Plan that evaluated natural hazards affecting the region and then proposed to cost-effective mitigation strategies to lessen the adverse impacts of future hazardous events.

Since the Middle Peninsula region has a long history of severe flooding from hurricanes and nor'easters as well as moderate levels of flooding from summer thunderstorms, a regional Middle Peninsula Flood Mitigation Plan (FMP) has been developed over the last few years to look at mitigation strategies that can be implemented to combat flooding threats to private properties as well as to public properties and facilities. The FMP plan is currently under review and will be scheduled for adoption by the 9 Middle Peninsula jurisdictions by June 30th of this year.

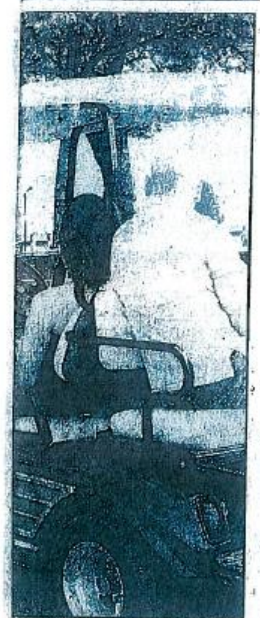
All other natural hazards – other than flooding – that were identified in the 2006 Middle Peninsula Natural Hazards Mitigation Plan are currently under review to determine if the hazard assessments that were done at that time are still accurate and if the mitigation strategies that were developed to lessen their adverse affects are still feasible. If not, amended or new mitigation strategies will be proposed with the updated plan.

The MPPDC staff is looking for any information that residents may have about problems occurring in their area that are caused by natural hazards. Residents should contact Ron Hachey, Regional Planner, at the MPPDC offices in Saluda at 804-758-2311 or via e-mail at rhachey@mppdc.com if they have information about natural hazards that affect them that should be considered during the updating of the 2006 Middle Peninsula Natural Hazards Mitigation Plan.

Appendix 7- Flood Mitigation Planning Press Release

clearly distressed bird, which by this point was sitting on Elder's dock. She was convinced the eagle needed imme-

Please Turn To Page 10



...l Day to Labor Day residents ...surrounding communities take ...services.

...rug Probe

distribution of cocaine and faces additional distribution and possession of cocaine charges, Clarke reported. He is currently being held in the Middle Peninsula Regional Security Center in Saluda without bond, the sheriff said.

Also arrested as a result of the investigation were:

* Jermaine Vaughan, 29, of Middlesex County, on six charges of distribution of co-

Please Turn To Page 5

card scam.

A longtime local, who wished to remain unidentified, received an automated phone call last week offering help with "your Visa card in Essex County."

When instructed to push a button for further assistance, the skeptical lady hung up the phone and called her bank instead. She said officials with the Northern Neck State Bank office in Tappahannock confirmed the call she received was most likely a scam to gather information for identity theft.

"It was so specific," she said. "They named the type of card and even said in Essex County. I am just afraid someone will trust them because they seem to have that information."

Phishing scams, as authorities call them, have become increasingly sophisticated in recent years according to the FBI. Scammers are now able to target specific individuals by

... legitimate because they seem to have information about the victim that only legitimate officials would have.

Some of the information they request can sometimes catch people off-guard as well. Most of us know not to give out our full Social Security number or credit card number to strangers who contact us on the phone.

But some callers seem to already have that information, and request only the three or four digit code on the back of a credit card to "confirm you are in possession of the card."

The FBI advises people to keep in mind that most companies, banks, agencies, etc., don't generally contact people via either the phone or Internet to request personal information.

If in doubt, hang up the phone and call your bank immediately.

Flood Mitigation Plan Being Developed For MP

The Middle Peninsula Planning District Commission (MPPDC), in conjunction with local officials from the region's six counties and three towns, is developing a plan that will look at flooding hazards and determine cost-effective strategies to lessen the adverse impacts of future severe storms. The area has a long history of severe flooding that has resulted mainly from hurricanes and nor'easters. However, moderate levels of flooding can also occur from summer thunderstorms.

The Flood Mitigation Plan will identify private property as well as public property and infrastructure that are at risk of sustaining flood damage. Once the properties and infrastructure are identified, they will be evaluated to determine if they pose a high, moderate or low risk of future damage from flooding events. Specific, cost effective strategies will be developed by officials from each of the nine localities in the region with the goal of lowering future flood insurance claims. There are currently 246 residential and commercial properties throughout the Middle Peninsula that have sustained repetitive or severely repetitive flood losses and subsequently submitted insurance claims through the National Flood Insurance Program, which is administered by the Federal Emergency Management Agency - commonly referred to as FEMA.

The MPPDC staff is looking for any information that residents may have about flooding problems in their area. Residents should contact Ron Hachey, regional planner, at the MPPDC offices in Saluda at 804-758-2311 or via e-mail at *rhachey@mppdc.com* if you have information about flooding problems that should be considered during the development of this plan.

Rappahannock Times ...

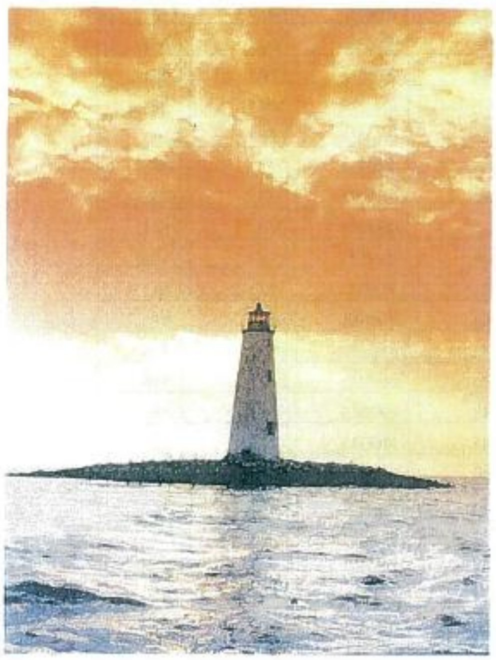
Richmond Times 6/3/09

Appendix 8 – MPPDC Website Homepage with link to MP Natural Hazard Plan Press Release

eninsula Planning District Commission http://www.mppdc.

Middle Peninsula Planning District Commission

HOME | PDC INFO | PROJECTS | GOVERNMENT | GIS/DATA



Promoting the orderly and efficient development of the physical, social, and economic elements of the Middle Peninsula of Virginia.

Our Mission

"To improve public health, safety, convenience and welfare, and to provide for the social, economic and physical development of communities and metropolitan areas of the Commonwealth on a sound and orderly basis, within a governmental framework and economic environment which fosters constructive growth and efficient administration."

IN THE NEWS

Item	Downloads	Project
Septic Pumpout Assistance	Application	Septic Pumpout
Repair Your Failing Septic System	Application	Onsite Revolving Loan Fund
MP Natural Hazards Mitigation Plan Undergoing Update	Press Release	Emergency Management
Current Legislative Assembly Members	List of VA Legislators	N/A
Organizational Meeting of the **Middle Peninsula Broadband Authority**	10:00 AM August 12, 2010	Middle Peninsula Planning District Commission Boardroom 125 Bowden Street, Saluda

Quick Links

Middle Peninsula Rideshare Program
Business Development Partnership
Middle Peninsula PDC Broadband Application
User: middlepen Password: clara2010
Middle Peninsula Regional Airport
Energy Efficiency and Conservation Block Grant (EECBG)
Near Shore Jurisdiction
York River Use Conflict Report
York River Appendix: 1 of 3
York River Appendix 2 of 3
York River Appendix 3 of 3
EECBG_PD18

Home Page | **Contact Us** | **Employment** | **Bids/RFPs** | **Newsletter** | **Economic Data**
Request Information | **Commuter Information** | **Commission Agenda** | **Historical Tour** | **Links**

Appendix 9. FEMA's List of Repetitive Loss Properties and Severe Repetitive Loss Properties *

State Name	Community Name	Comm Nbr	Prop Locatr	Mitigated?	Insured?
VIRGINIA	ESSEX COUNTY	510048	0091372	NO	NO
VIRGINIA	ESSEX COUNTY	510048	0167140	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0167714	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0088163	NO	NO
VIRGINIA	ESSEX COUNTY	510048	0094106	NO	NO
VIRGINIA	ESSEX COUNTY	510048	0008861	NO	NO
VIRGINIA	ESSEX COUNTY	510048	0167819	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0167831	NO	NO
VIRGINIA	ESSEX COUNTY	510048	0092233	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0167772	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0091409	NO	NO
VIRGINIA	ESSEX COUNTY	510048	0167916	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0124867	NO	NO
VIRGINIA	ESSEX COUNTY	510048	0167104	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0167838	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0168490	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0167315	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0167713	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0167128	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0124793	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0126609	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0167102	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0167715	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0168231	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0167798	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0125148	NO	YES
VIRGINIA	ESSEX COUNTY	510048	0091420	NO	SDF
VIRGINIA	ESSEX COUNTY	510048	0093352	NO	SDF
VIRGINIA	ESSEX COUNTY	510048	0094048	NO	NO
VIRGINIA	GLOUCESTER COUNTY	510071	0166994	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167706	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0126811	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0169474	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0169358	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167109	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0127726	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0125656	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167111	NO	YES

State Name	Community Name	Comm Nbr	Prop Locatr	Mitigated?	Insured?
VIRGINIA	GLOUCESTER COUNTY	510071	0167680	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167908	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167250	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0125288	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0033235	NO	NO
VIRGINIA	GLOUCESTER COUNTY	510071	0167994	NO	NO
VIRGINIA	GLOUCESTER COUNTY	510071	0167978	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0168461	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0166554	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0125172	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0168811	NO	NO
VIRGINIA	GLOUCESTER COUNTY	510071	0166934	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0168191	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0125961	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0168771	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0125222	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0125657	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0168275	NO	NO
VIRGINIA	GLOUCESTER COUNTY	510071	0169014	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0166548	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0168593	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167679	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0125209	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167390	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167187	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0166552	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167266	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167263	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167944	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0168824	NO	NO
VIRGINIA	GLOUCESTER COUNTY	510071	0168918	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0101760	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0168583	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167709	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0169379	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0168070	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0125197	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167990	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0166545	NO	YES

State Name	Community Name	Comm Nbr	Prop Locatr	Mitigated?	Insured?
VIRGINIA	GLOUCESTER COUNTY	510071	0168502	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0168309	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0108061	NO	SDF
VIRGINIA	GLOUCESTER COUNTY	510071	0167824	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167428	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0167710	NO	YES
VIRGINIA	GLOUCESTER COUNTY	510071	0069068	NO	NO
VIRGINIA	GLOUCESTER COUNTY	510071	0167950	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0108062	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0167814	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167214	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167116	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167496	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167264	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167289	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167815	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168510	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168770	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168194	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0126520	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168609	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168181	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167262	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168314	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167735	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0169070	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168075	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167705	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167475	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167490	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0125751	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167828	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167298	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168199	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166940	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0125454	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168508	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167727	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167310	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167830	NO	YES

State Name	Community Name	Comm Nbr	Prop Locatr	Mitigated?	Insured?
VIRGINIA	MATHEWS COUNTY	510096	0168203	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168550	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167245	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0167323	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168182	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166555	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166907	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168098	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0125752	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0167396	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166963	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168744	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166931	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167804	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168803	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0024489	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0127727	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0168237	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167314	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168494	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0172213	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167865	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0125488	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0168204	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167530	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0100935	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0168836	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0169018	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0169168	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0126663	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0167307	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166556	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0103731	NO	SDF
VIRGINIA	MATHEWS COUNTY	510096	0166971	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166518	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0010636	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0126094	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0108060	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0167168	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168006	NO	YES

State Name	Community Name	Comm Nbr	Prop Locatr	Mitigated?	Insured?
VIRGINIA	MATHEWS COUNTY	510096	0167091	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167910	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166990	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167145	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0167725	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168674	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167316	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167741	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167320	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166932	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167383	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167722	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168170	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167238	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166980	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0169311	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0124799	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166981	NO	SDF
VIRGINIA	MATHEWS COUNTY	510096	0167293	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0125099	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168198	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0126519	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0125753	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0168072	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167296	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0169262	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167309	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0093353	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0167118	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0103207	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0167531	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0126164	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0167805	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167242	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167907	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168537	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167294	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0168033	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167960	NO	YES

State Name	Community Name	Comm Nbr	Prop Locatr	Mitigated?	Insured?
VIRGINIA	MATHEWS COUNTY	510096	0124806	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0167246	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0166911	NO	YES
VIRGINIA	MATHEWS COUNTY	510096	0169036	NO	NO
VIRGINIA	MATHEWS COUNTY	510096	0168983	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0167317	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0124786	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0167775	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0168487	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0167321	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0166550	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0093354	NO	NO
VIRGINIA	MIDDLESEX COUNTY	510098	0167127	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0167045	NO	NO
VIRGINIA	MIDDLESEX COUNTY	510098	0167131	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0168225	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0167823	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0103215	NO	NO
VIRGINIA	MIDDLESEX COUNTY	510098	0167107	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0167265	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0168316	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0168753	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0172319	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0093346	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0126035	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0104783	NO	NO
VIRGINIA	MIDDLESEX COUNTY	510098	0169016	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0046236	NO	NO
VIRGINIA	MIDDLESEX COUNTY	510098	0167833	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0167919	NO	YES
VIRGINIA	MIDDLESEX COUNTY	510098	0167090	NO	YES
VIRGINIA	TAPPAHANNOCK, TOWN OF	510049	0167921	NO	YES
VIRGINIA	TAPPAHANNOCK, TOWN OF	510049	0168536	NO	YES
VIRGINIA	URBANNA, TOWN OF	510292	0168180	NO	YES
VIRGINIA	URBANNA, TOWN OF	510292	0166557	NO	YES
VIRGINIA	WEST POINT, TOWN OF	510083	0096886	NO	NO
VIRGINIA	WEST POINT, TOWN OF	510083	0168299	NO	YES
VIRGINIA	WEST POINT, TOWN OF	510083	0095454	NO	YES
VIRGINIA	WEST POINT, TOWN OF	510083	0135181	NO	YES
VIRGINIA	WEST POINT, TOWN OF	510083	0169576	NO	YES

State Name	Community Name	Comm Nbr	Prop Locatr	Mitigated?	Insured?
VIRGINIA	WEST POINT, TOWN OF	510083	0167233	NO	YES
VIRGINIA	WEST POINT, TOWN OF	510083	0125544	NO	YES

* This Repetitive Loss List of Properties had an effective date of 6/2/08 and the Severe Repetitive Loss List had an effective date of 9/4/08.

Appendix 10. Report on Status of 2006 MPNHMP Mitigation Strategies

The following spreadsheets show the status of the mitigation strategies as of the first-half of 2010 that were included in the 2006 Middle Peninsula Natural Hazards Mitigation Plan.

Each of the 9 localities in the Middle Peninsula has its own excel spreadsheet showing this FEMA-reported information.

King William County
Mitigation Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project status 1/1/10	If Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
510304	King William County	King William	MPPDC	Create Hurricane storm surge maps	3.3.1	H	Yes	No	Not started	Lack of funds									S. Puckett	County			8047692654			
510304	King William County	King William	MPPDC	Install a reverse 911 system	2.1.4	H	Yes	No	Completed		Local	$32,000	Yes	15,765					S. Puckett	County			8047692654			
510304	King William County	King William	MPPDC	Repair dams on ponds destroyed by Tropical Storm Gaston and install dry hydrants on each	1.1.6	H	Yes	No	Not started	Lack of funds									S. Puckett	County			8047692654			
510304	King William County	King William	MPPDC	Repair dry hydrants throughout the County	1.1.5	H	Yes	No	Not started	Lack of funds									S. Puckett	County			8047692654			

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project status 1/1/10	If Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
510304	King William	King William	MPPDC	Install new radio system		H	No	No	Bids under review		Local								S. Puckett	County			8047692654			

Mathews County Mitigation Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
510096	Mathews County	Mathews	MPPDC	Install a reverse 911 system	2.1.6	H	Yes	No	Completed		HMGP	$32,000	Yes	9,418					Dave Burns	County				8047259063		
510096	Mathews County	Mathews	MPPDC	Relocate the HRSD sewage treatment facility in Mathews	1.2.2	H	Yes	No	Under construc.		HRSD	$15,000,000	Yes	600					Jim Pyne	HRSD				8048432582		
510096	Mathews County	Mathews	MPPDC	Update to high-resolution aerials orthophotography for mapping data for the community	2.1.6A	H	Yes	No	Not started	Lack of Funds																

New Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
510096	Mathews Cour	Mathews	MPPDC	Residential Mitigation Project		H	No		In progress		HMGP/Local	$520,000	Yes	9	4				S. Whiteway	County				8047257172		
510096	Mathews Cour	Mathews	MPPDC	Code Red Text Messaging System		H	No		Completed		FEMA	$25,000	Yes	9,418					Dave Burns	County				8047259063		

Town of Tappahannock
Mitigation Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project Status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
510049	Tappahannock, Town of	Essex	MPPDC	Elevate the Newbill Drive Pump Station	1.2.1	M	Yes	Medium	Not started	Lack of funds									J. Sydnor	Town			8044433336			
510049	Tappahannock, Town of	Essex	MPPDC	Install a reverse 911 system	2.1.2	H	Yes	Low	Not Started	Lack of funds									J. Sydnor	Town			8044433336			
510049	Tappahannock, Town of	Essex	MPPDC	Install backup power to the following sewage pump stations: Essex Street, Cross Street, Old Creek Lake Drive, and Hoskins Street at Route 17	1.2.3	M	Yes	Low	Not started	Lack of funds									J. Sydnor	Town			8044433336			
510049	Tappahannock, Town of	Essex	MPPDC	orthophotography for mapping data for the community	3.2.1	H	Yes	Low	Not started	Lack of funds									J. Sydnor	Town			8044433336			

New Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project Status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)

Middlesex County Mitigation Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
510098	Middlesex County	Middlesex	MPPDC	Amend the local floodplain ordinance to require new construction to include a FPE requirement - BFE +1	1.1.3	H	Yes	No	Completed		Local	Minimal	Yes	10,277					D. Selph	County				8047584305		
510098	Middlesex County	Middlesex	MPPDC	Install a reverse 911 system	2.1.7	H	Yes	No	Not started	Lack of funds																
510098	Middlesex County	Middlesex	MPPDC	Update Hurricane storm surge maps	3.3.2	H	Yes	No	Completed		USCOE	Unknown	Yes	10,277												
510098	Middlesex County	Middlesex	MPPDC	orthophotography for mapping data for the community	3.2.5	H	Yes	No	Completed		VGIN	Unknown	Yes	10,277					G. Nix	County				8047583382		

New Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)

Town of Urbanna Mitigation Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
510292	Urbanna, Town of	Middlesex	MPPDC	Install a reverse 911 system	2.1.8	H	Yes	No	Completed			$2,000 per yr		543					L. Filling	Town				8047582613		
510292	Urbanna, Town of	Middlesex	MPPDC	Install backup power to the 250,000 gallon water tower that feeds the public.	1.2.4	H	Yes	No	Completed		Local	$50,000	Yes	543					L. Filling	Town				8047582613		
510292	Urbanna, Town of	Middlesex	MPPDC	Update to high-resolution aerials orthophotography for mapping data for the	3.2.6	H	Yes	No	Completed		VGIN	unknown	Yes	543					G. Nix	County				8047583382		

New Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)

Gloucester County Mitigation Strategies

FEMA Community I #	Communit	Coun	PDC/Pla n Stu Are	Mitigation Strategies	Strategy ID # (when provid)	Priority H = High M=Medi um L = Low	Project Listed in HazMit Plan? (Yes/)	Has Project Priority Changed? (High/Mediu Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpow , etc)	Funding Source (Local, HMGP, PDM etc)	Final Proje Cost?	Was the project Cost Effective ? Yes No?	# people Protec d?	# Structur es Mitig d?	Other Indicator s of Success (i.e. losses avoide ?	How many process / plans was the plan integr d into	Lesso Learn	Project Conta Nam	Project Conta Agen	Project Conta Title	Project Conta Emai	Project Contact Phone #	Project Contact Address (Street Addre)	Project Contact Address (City/ unty)	Proj Cont Addr (Zi cod
510071	Gloucester County	Gloucester	MPPDC	Update to high-resolution aerials orthophotography for mapping data for the community	3.2.3	H	Yes		Completed		VGIN	unknown		36,109					G. Bains	County GIS			8046931108			

Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medi um L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/ Low)?	Project Status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower , etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective ? Yes or No?	# people Protecte d?	# Structur es Mitigate d?	Other Indicator s of Success (i.e. losses avoided) ?	How many process / plans was the plan integrate d into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Proj Cont Addr (Zi cod
510071	Gloucester	Gloucester	MPPDC	Residential Flood Mitigation Project		H	No		On-going		HMGP/PDM	$6,000,000	Yes	110	65		2		M. Dodson	County			8048322401			
510071	Gloucester	Gloucester	MPPDC	Development/Adoption of Flood Management Plan		H	No		Completed		Local	Minimal	Yes	36,109			1		C. Perez	County			8046930271			
510071	Gloucester	Gloucester	MPPDC	Installed new radio system		H	No		Completed		Local	$15,000,000	Yes	36,109			1		G.Curry	County			8046935480			

King and Queen Mitigation Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
510082	King and Queen County	King and Queen	MPPDC	Install a reverse 911 system	2.1.3	H	Yes	No	Not Started	lack of funds									G. Tressler				8047855975			
510082	King and Queen County	King and Queen	MPPDC	Update to high-resolution aerials orthophotography for mapping data for the community	3.2.2	H	Yes	No	Not Started	lack of funds									G. Tressler				8047855975			

New Strategies

FEMA Community ID #	Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project Status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
510082	K & Q County	King and Queen	MPPDC	Install a new radio communications system		H	No		Completed		Local	$3,000,000	Yes	6,935					G. Tressler				8047855975			
510082	K & Q County	King and Queen	MPPDC	Install a generator at Central High School shelter		H	No		Received bids		Local	$75,000	Yes	6,935					G. Tressler				8047855975			

Essex County Mitigation Strategies

County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
Essex	MPPDC	Form a committee that is responsible for providing the public with information regarding disasters, Floodplain Management, and preparedness	3.1.1	H	Yes	No	Completed		Local	Minimal	Yes	10,732					L. Smith	County			8044434414			
Essex	MPPDC	Increase restrictions to residential and commercial development in flood prone areas	1.1.1	M	Yes	No	Not started	Under study									L. Smith	County			8044434414			
Essex	MPPDC	Increase the Flood Protection Elevation (FPE) requirement from 7 feet to 8 to 8.5 feet. New structures built within the Special Flood Hazard Area should be built such that the freeboard on the lowest floor of the structure is at a minimum of 8 feet in el	1.1.2	H	Yes	No	Completed		Local	Minimal	Yes						L. Smith	County			8044434414			
Essex	MPPDC	Install a reverse 911 system	2.1.1	H	Yes	No	Not Started	Lack of funds									L. Smith	County			8044434414			
Essex	MPPDC	Update to high-resolution aerials orthophotography for mapping data for the community	3.2.1	H	Yes	No	Not started	Lack of funds									L. Smith	County			8044434414			

County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed? (High/Medium/Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective? Yes or No?	# people Protected?	# Structures Mitigated?	Other Indicators of Success (i.e. losses avoided)?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
Essex	MPPDC	Installed new radio system		H	No		Complete		Local	$3,000,000	Yes	10,732					L. Smith	County			8044434414			
Essex	MPPDC	Comprehensive evaluaion of EMS and Fire Services		H	No		Contract		Local	$15,000	Yes	10,732					L. Smith	County			8044434414			

Town of West Point
Mitigation Strategies

Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed ? (High/Medium/Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective ? Yes or No?	# people Protected?	# Structures Mitigated ?	Other Indicators of Success (i.e. losses avoided) ?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)
West Point, Town of	King William	MPPDC	Amend the local floodplain ordinance to require new construction to include a FPE requirement - BFE +1	1.1.4	H	Yes	No	Completed		Local	minimal	Yes	3,113					Funkhouser	Town			8048433330			
West Point, Town of	King William	MPPDC	Create Hurricane storm surge maps	3.3.1	H	Yes	No	Not started	Lack of funds									Funkhouser	Town			8048433330			
West Point, Town of	King William	MPPDC	Establish an officially recognized independent emergency planning area	2.2.1	H	Yes	Yes	In progress	Under eval.									Funkhouser	Town			8048433330			
West Point, Town of	King William	MPPDC	Install a reverse 911 system	2.1.5	H	Yes	No	Completed		KWC paid			3,113					Funkhouser	Town			8048433330			
West Point, Town of	King William	MPPDC	Install backup power to the Town's Red Cross approved shelter	1.2.5	H	Yes	No	Not started	Lack of funds				3,113					Funkhouser	Town			8048433330			
West Point, Town of	King William	MPPDC	Install backup power to the Town's water supply: Well #2 West Point High School and Well #3 at Chelsea Road	1.2.6	H	Yes	No	Completed		Local			3,113					Funkhouser	Town			8048433330			
West Point, Town of	King William	MPPDC	Update to high-resolution aerials orthophotography for mapping data for the community	3.2.4	H	Yes	No	Completed	1" = 200'	VGIN	unknown		3,113					Funkhouser	Town			8048433330			

Community	County	PDC/Plan Study Area	Mitigation Strategies	Strategy ID # (when provided)	Priority H = High M=Medium L = Low	Project Listed in HazMit Plan? (Yes/No)	Has Project Priority Changed ? (High/Medium/Low)?	Project status 1/1/10	If Delayed / Canceled Why? (Lack of $, support, manpower, etc)	Funding Source (Local, HMGP, PDM, etc)	Final Project Cost?	Was the project Cost Effective ? Yes or No?	# people Protected?	# Structures Mitigated ?	Other Indicators of Success (i.e. losses avoided) ?	How many process / plans was the plan integrated into?	Lessons Learned	Project Contact Name	Project Contact Agency	Project Contact Title	Project Contact Email	Project Contact Phone #	Project Contact Address (Street Address)	Project Contact Address (City/County)	Project Contact Address (Zip code)

Appendix 11 – Resolutions and Minutes Adopting the MPNHMP Update