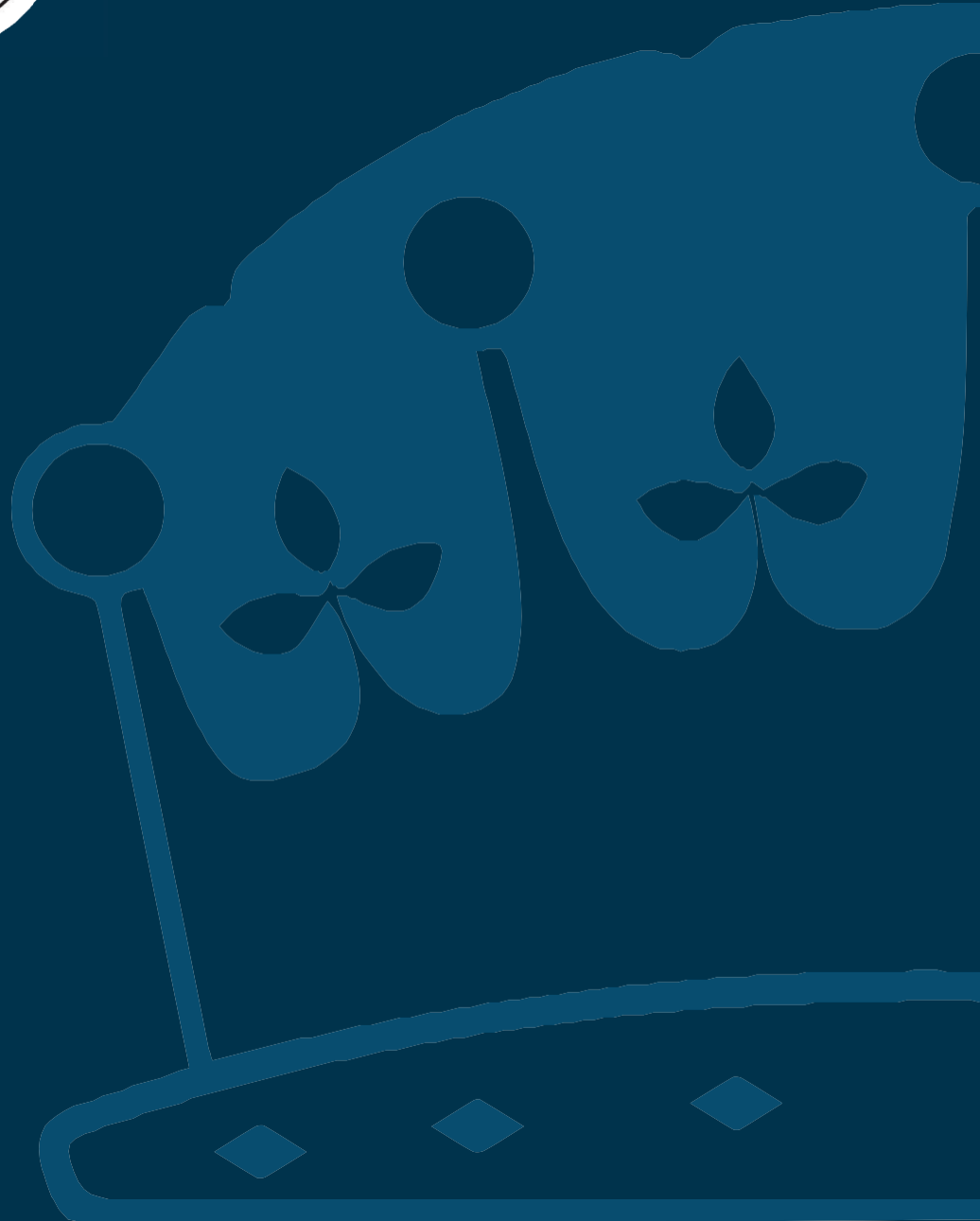




CHARLES COUNTY NUISANCE & URBAN FLOOD PLAN

10.2020



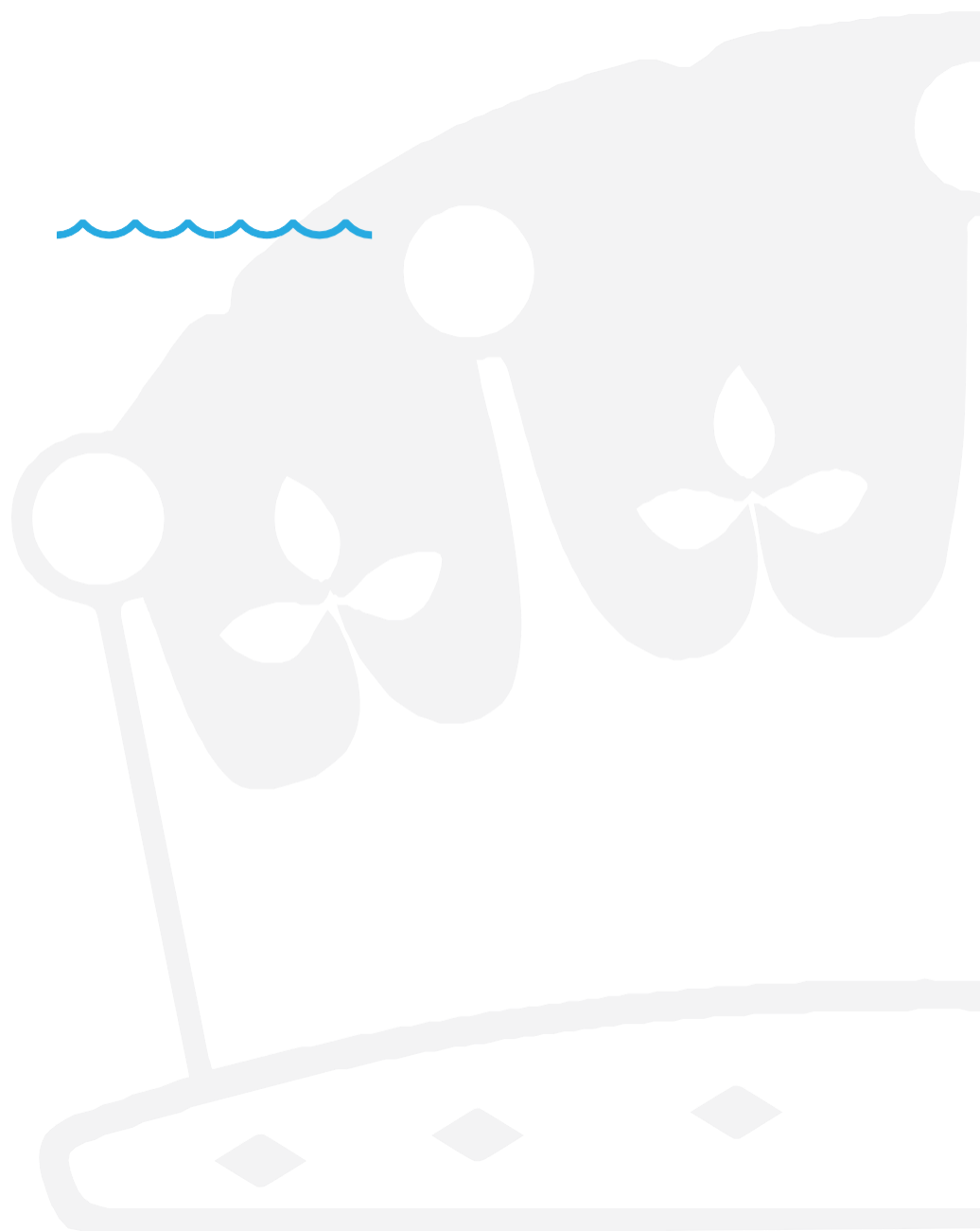


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Introduction

The purpose of the nuisance flood plan is to identify sources of nuisance and urban flooding, analyze flood hazards, and recommend actions to reduce flooding and increase community resiliency. While it was recommended that all jurisdictions within Maryland's Coastal Zone develop a Nuisance Flood Plan, Charles County recognizes both nuisance and urban flooding within this document. It is crucial to address both nuisance and urban flooding to increase resiliency, as both types of flooding affect the county.

Charles County Nuisance and Urban Flooding Problem Statement

Charles County, Maryland is experiencing flooding outside mapped floodplains with increasing frequency, including both nuisance and urban flooding. Nuisance flooding is associated with high tides that flow back through the stormwater system, increasing/raising the level of groundwater, and overtopping the banks and edge of waterways. Nuisance flooding is an indicator of rising water levels in the Chesapeake Bay and its tributaries. Areas that were previously dry now flood during high tides because the water elevation is high enough to lap over the banks of waterways and to enter stormwater systems through outfalls that were previously high enough to prevent backflow, while allowing outflow. Urban flooding is due to a variety of issues related to development: increased impervious surface, disruption of natural watershed flows and functions, undersized and aged stormwater infrastructure, and changing weather patterns which exacerbate the inadequacies of older stormwater systems and the fragmented watersheds. Urban flooding reflects decades of development that has outstripped the capacity of stormwater infrastructure and disrupted the natural flow and discharge of watersheds. Additionally, many stormwater systems are beyond their expected useful life and in need of repair and replacement. These challenges are compounded by what is becoming the new normal: an increase in the frequency and intensity of storms caused by higher global temperatures that increase evaporation in the ocean and atmosphere, creating more favorable conditions for heavier and more frequent precipitation. Increased runoff can contribute more nutrients, contaminants (e.g. oil, gasoline, antifreeze, among others) and sedimentation into the waterways and ultimately the Bay.

Nuisance Flooding Plan and Considerations

There is recognition by Maryland lawmakers, local and state governments, and citizens that tidally driven nuisance flood events are happening with more frequency. While nuisance flooding may not pose a serious threat or result in major damage, it interrupts and causes impacts to daily routines and can negatively impact commerce. Pursuant to Maryland House Bill 1427 (2019), §3-1018(b) and (c), on or before Oct. 1, 2020, a local jurisdiction that experiences nuisance flooding (NF) shall develop a plan to address nuisance flooding. In addition, a local jurisdiction shall update the plan every five years; publish the plan on the local jurisdiction's website; and shall submit a copy of the plan to the Maryland Department of Planning (Planning). This legislation is an update to Senate Bill 1006 and House Bill 1350 (2018). It is recommended that all jurisdictions, including municipalities, within Maryland's Coastal Zone develop a Nuisance Flood Plan even if they do not meet the requirements of the legislation. Charles County is located within the Maryland's Coastal Zone and is within the Chesapeake Bay Watershed Area.

Charles County, Maryland is experiencing flooding outside mapped floodplains with increasing frequency, including both **nuisance and urban flooding**.

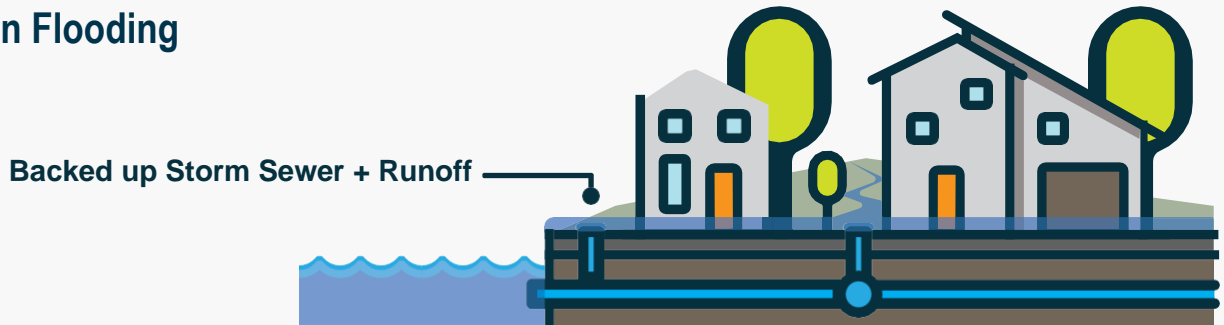
Nuisance Flooding



Nuisance flooding is associated with high tides that flow back through the stormwater system, increasing/raising the level of groundwater, and overtopping the banks and edge of waterways. Nuisance flooding is an indicator of rising water levels in the Chesapeake Bay and its tributaries. Areas that were previously dry now flood during high tides because the water elevation is high enough to lap over the banks of waterways and to enter stormwater systems through outfalls that were previously high enough to prevent backflow, while allowing outflow outside mapped floodplains with increasing frequency, including both **nuisance and urban flooding**.

Nuisance flooding is defined in **§3-1001 of the Natural Resource Article of the Maryland Annotated Code** as “high-tide flooding that causes public inconvenience.”

Urban Flooding



Urban flooding is associated with precipitation events and is due to a variety of issues related to development: increased impervious surface, disruption of natural watershed flows and functions, undersized and aged stormwater infrastructure, and changing weather patterns which exacerbate the inadequacies of older stormwater systems and the fragmented watersheds. Urban flooding reflects decades of development that has outstripped the capacity of stormwater infrastructure and disrupted the natural flow and discharge of watersheds.

Additionally, many stormwater systems are beyond their expected useful life and in need of repair and replacement.

Plan Purpose and Goals

The Plan will identify the sources and locations of nuisance and urban flooding, present an analysis of both hazards (e.g. frequency, duration, depth of flooding, and effects), and provide recommended actions to reduce flooding and increase community resiliency. Developing the Plan will help make Charles County safer and more resistant to flood damage by nuisance and urban flooding. The Plan will also fulfill the requirements set forth in Maryland House Bill 1427 (2019), §3-1018(b) and (c), which requires on or before October 1, 2020, that all local jurisdictions that experience nuisance flooding must develop a nuisance flood plan to address that flooding and update the plan every five years. To maintain the mandated update cycle, the Plan will be appended to become part of the County's 2018 Hazard Mitigation Plan Update, which must also be updated every five years.



Source:
<https://dnr.maryland.gov/ccs/Documents/NuisanceFloodPlan.pdf>

1

To develop a Nuisance and Urban Flooding Plan that will be adopted as a new Chapter into the Charles County Hazard Mitigation Plan.

2

To have the plan methods and format be a template that can be used by other jurisdictions to use create their own nuisance and urban flooding plan.

3

To integrate the plan's mitigation actions into other County plans, programs, and land-use regulation to comprehensively address and resolve the issue.

4

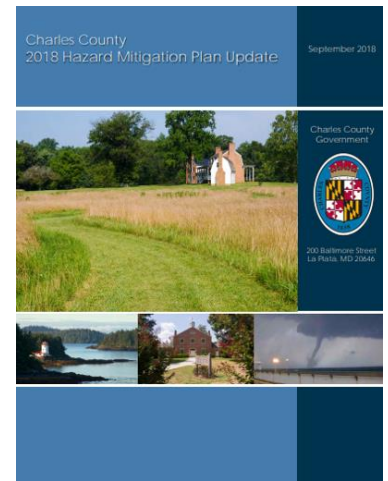
To use a of variety of mitigation actions to address issues, including, but not limited to: education and outreach, planning, stormwater improvements, watershed/stream restoration, green infrastructure solutions, best practices which may include both construction (capital) and ordinance/zoning-related (noncapital) projects.

Nuisance and Urban Flood Plan and 2018 Charles County Hazard Mitigation Plan

As part of the *2018 Charles County Hazard Mitigation Plan*, various flood mitigation action items were identified for implementation over the next five-year planning cycle. One such action item pertinent to the Nuisance Flood Plan (NFP) is as follows:

Action Item: Identify roadways/bridges that frequently flood and mitigate to ensure ingress and egress.



















Through the development of the Nuisance and Urban Flood Plan this 2018 hazard mitigation plan action item is being completed. In addition, upon completion the *Nuisance and Urban Flood Plan* that will be adopted as a new Chapter into the *Charles County Hazard Mitigation Plan*.





Source: <https://www.charlescountymd.gov/sites/default/files/es/em/Charles%20County%202018%20HMP.pdf>

Nuisance and Urban Flooding Stakeholder Group

This group included representation from various sectors of the County government, municipalities, the business community, neighborhood associations, and other stakeholders identified by the County. The Stakeholder Group guided planning efforts and assisted with community support and outreach efforts. Participants included representatives from the following:

- | | |
|--|--|
|  Department of Emergency Services; |  Port Tobacco River Conservancy |
|  Planning and Growth Management; |  College of Southern Maryland |
|  Public Works includes Transportation, Capital Services, & Utilities; |  Maryland Emergency Management (MEMA) |
|  Elected Officials; |  Maryland Department of Transportation (MDOT) |
|  County & Municipal Representatives; |  Public Schools/Board of Education |
|  Transportation; |  Soil Conservation |
|  Community Stakeholders; |  Chamber of Commerce; and, |
|  Port Tobacco Village |  Charles County Volunteer Fire. |
|  Town of La Plata | |
|  Town of Indian Head | |

The initial meeting of the Nuisance and Urban Flooding Stakeholder Group was held on 20 February 2020. Agenda items included:

-  Project Scope, Schedule, & Expectations
-  Climate Change Literature Review & Context



Work Session Coastal Flooding & Sea Level Rise Group Work & Report Out

- Site Specific Problem Statement & Description;
- Preparedness;
- Response; and,
- Mitigation.



Public Outreach Strategy

Additional information gathered during the initial stakeholder meeting, as well as modifications to previously collected data was collected. This information was then integrated into the plan document and the ArcGIS StoryMap.



Nuisance and Urban Flooding Public Outreach Efforts

Including the public is an important part of the planning process. A robust public engagement component was key to the success of this planning process. Outreach was woven throughout the planning process for developing the Charles County Nuisance and Urban Flooding Plan.

Public outreach efforts focused on the following:

1. Informed the community about the Plan and provided an opportunity to gather information from the community about nuisance and urban flooding,
2. Communicated flood risk and sought input on solutions members of the community wanted to see implemented to reduce flooding, and a final meeting
3. Communicate flood preparedness actions that individuals can take to reduce their flood hazard, the Plan mitigation strategy for carrying out the identified solutions and plan implementation.

The nuisance and urban flood website was developed to communicate with the public and provide information on the planning process. In addition, social media outreach specific to the plan was conducted across all platforms. Analytics collected from the Charles County Media Services are shown below:

Facebook

- General Posts (5 Posts) > 10,718 Reach, 53 Reactions, 3 Comments, 22 Shares, 299 Post Clicks
- Aug. 14 Map Your Flood Video > People reached: 942, Reactions: 7, Shares: 8, Post Clicks: 20
- Aug. 19 Map Your Flood Video > People reached: 329, Comments: 1, Post Clicks: 4

- Aug. 20 Nuisance Vs Urban Flooding Video > People reached: 418, Share: 1, Post Clicks: 7
- Aug. 31 Nuisance Vs Urban Flooding Video > People Reached: 563, Post Clicks: 1

Twitter

- General Posts: (6 Posts) > 3681 Impressions, 57 Engagement (reactions, retweets etc.)
- Aug. 13 Map Your Flood Video > 311 Impressions, Detail expands: 11, Link Clicks: 1, Profile Clicks: 1
- Aug. 13 Nuisance Vs Urban Flooding Video > Impressions: 282, Detail expands: 3, Link Clicks: 2

NextDoor

- 2 Posts, 5738 Impressions, 5 Reactions, 2 Comments

YouTube

- Map Your Flooding (:30s) 116 views / Avg.View 0:20 (68.6%)
- Nuisance vs Urban Flooding (:40s) 34 views / Avg. View 0:21 (54.1%)

Nuisance and Urban Flooding ArcGIS StoryMap

As part of this planning initiative, an ArcGIS StoryMap was developed. An ArcGIS StoryMap is a web-based application that enables users to acquire information through stories with custom maps that inform and engage.

Information on upcoming public events related to the Plan, was posted under **What's Happening Now** on the **Get Involved** tab. In addition to public events, the public was able to show the Team where they have experienced nuisance and urban flooding using the map provided at **Map Your Flooding** (link) and adding a note describing the size, depth, duration, the weather, or any other flood characteristics that they thought were important for the Team to know.

Under the Department of Emergency Services' "Emergency Preparedness" webpage, the Nuisance and Urban Flooding ArcGIS StoryMap has been added. The public is encouraged to access the ArcGIS StoryMap to learn more about nuisance and urban flooding in Charles County. In addition, the StoryMap provides an opportunity for the public to provide feedback and the ability to map their flood issues.

Map Your Flooding

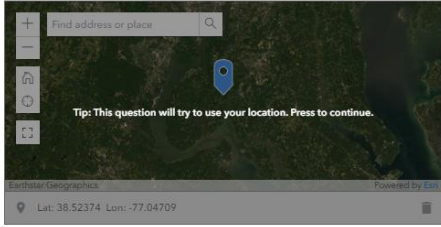
Click on the form and scroll to fill out

if you do not see a form on the right or you would like to open the form in a separate window click here:

<https://arcg.is/0CvbiT>

Charles County - public engagement flood mapping tool

Click the map to add the location of your flooding concern
If you enable location services on your device, the map will zoom to your current location. Otherwise, zoom & pan to the approximate location of a known flooding event



Please describe in detail the location of your flooding?*
This question is to help planners identify specific locations (i.e. the corner of west st & main st, water blocks the northbound lane, or the driveway of 123 ABC street)

Nuisance and Urban Flooding ArcGIS StoryMap
<https://maryland.maps.arcgis.com/apps/Cascade/index.html?appid=7bb024fa03ff46a58e07323e16bdb7f1>

Nuisance & Urban Flooding Podcast

Charles County Government has introduced a series of podcasts, “Charles County Unscripted.” Podcast subscribers can tune in and listen to county stories, news, and information at home or on the go, on any mobile device. County staff interview a variety of guests who provide an inside look at the people, places, and events that shape Charles County Government and our community. One of the podcast programs, “Inside Your County Government,” explores the range of services the government provides. During the planning process, Michele Lily, Director of Emergency Services participated in the “Nuisance/Urban Flood Podcast.”



Description of Podcast

We talk with Michelle Lilly, Director of Emergency Services, about what nuisance and urban flooding are and the department’s efforts to develop the County’s Nuisance Flood Plan.

To participate in the comments and include a location in the County you see flood, please visit the Map Your Flooding Survey website or email Flooding@CharlesCountyMD.gov

For more information on the flood plan, visit the Nuisance and Urban Flooding Storymap webpage.

Additional County Climate Action & Resiliency Efforts

Charles County Government is working to reduce greenhouse gas emissions, transition to 100 percent renewable electricity, improve sustainability in county operations, and educate the county workforce on climate change mitigation and adaptation measures.

Charles County is one of three vanguard counties in the state working with the University of Maryland Center for Global Sustainability on a project called Resiliency Planning and Financing for Maryland Counties. The goal of the project is to develop Resilience Action Plans to establish planning and financing systems in pursuit of climate change resilience. The effort includes elements such as:

- The essential role of multi-community collaboration and coordination.
- Ensuring resilience efforts address needs of the most vulnerable populations.
- Integrating resilience planning into every aspect of local government operation.
- Approaching resiliency as a community asset rather than an obligation.
- Addressing the limitation of fiscal resources and understanding how to prioritize actions among multiple departments and stakeholders.
- Aligning priorities and resources with community goals to jumpstart the resiliency process.

County government planning efforts are underway for construction projects for solar arrays on county-owned land that will offset more than 100 percent of electricity needs for county buildings and facilities. The county has worked to reduce greenhouse gas emissions by utilizing appropriate landfill covers and upgrading the current passive collection system to one that actively captures emissions. Additionally, several measures have been instituted to increase the recycling rate to 46 percent, added to a 4 percent source-reduction-credit, equals a total-waste-diversion rate of 50 percent.

Shoreline restoration along the Potomac and Wicomico Rivers has also been prioritized with the completion of a scientific assessment that identified 153 sites along 27 miles of shoreline in most need of restoration for ecological services benefits, including storm surge buffering, carbon sequestration, wetlands restoration, and habitat creation.

Three high priority actions that can be cross referenced and integrated into the County's Nuisance and Urban Flood Plan include:

1. Mitigate roads for current and future flood predictions.

Strategy: Coordinate investments to mitigation roads for future climate conditions.

Performance measure: The number of roads that have been protected against future flooding events.

Performance target: Provide mitigation for one flooded road location per fiscal year.

Possible actions include the following:

- Target coordination with the Maryland State Highways Administration to work collaboratively on a plan to harden roads to withstand flood events using the Urban & Nuisance Flooding Plan as the guide to prioritizing actions.
- Prioritize drainage (stormwater management) projects through a planned analysis of Countywide projects & prioritization.
- Add flood gauges, for safety, to areas prone to flooding.
- Post-pandemic review remote teleworking policies.

2. Maintain operation of County-owned roadways that are susceptible to sea level rise or flooding (nuisance or otherwise).

Strategy: Fortify vulnerable roadways against flooding and sea level rise by raising the roadbed; improving drainage/stormwater management in the public right-of-way; and improving drainage/stormwater management in flood-prone areas.

Performance measure: A certain percentage of flood and sea level rise prone roads hardened and mitigated; a certain number of gallons of stormwater managed by new projects.

Performance target: Set target of 10% of flood and sea level rise prone roads fortified by 2030; 50% by 2040; 100% by 2050; and 50% of all stormwater managed on-site by 2030, 100% by 2050.

- Possible actions include the following:
- Identify sea level rise and flood prone roads.
- Develop priority list for road mitigation.
- Develop priority list for stormwater management improvements. This list should be available soon from work underway with the Maryland Environmental Service.
- Construct improvements beginning with the highest priority.

3. Improve SWM features (repair, maintain, and upgrade as needed).

Strategy: Improve SWM structure resiliency by prioritizing structures in flood prone areas and taking appropriate action to include upgrades, retrofits, and repairs.

Performance measure: Percent of SWM structures improved.

Performance target: 10% of prioritized SWM structures improved by 2030, 25% by 2040, 50% by 2050.

Possible actions include the following:

- Identify stormwater structures that require retrofit (per 2010 regulations) and develop a priority list.
- Research known areas of flooding and add to priority list for retrofit/upgrade/repair.
- Develop a public outreach plan to educate Homeowner Associations (HOAs) and stormwater structures owners about maintenance and repair procedures.
- Determine which stormwater feature projects could utilize watershed funding and benefit County's MS4 goals.

Identification of Nuisance and Urban Flood Areas

As an initial step in the data gathering process, flood event data was obtained from the National Center for Environmental Information (NCEI) and is included in Appendix 1. This data was reviewed to aid in the determination of nuisance and urban flood locations. Additional information gathered by the Department of Emergency Services of known flood areas resulted in a listing of roadways and intersections. This listing was used to develop a flood location map. Staff from Department of Emergency Services and Department of Planning and Growth Management along with consultants working on the planning project conducted a tour of identified nuisance and urban flood areas on January 23, 2020. Twenty-seven nuisance and urban flood locations were identified. Additional information gathered during the flood identification site visits included a description per site and a site photograph.

The initial meeting of the Nuisance and Urban Flooding Stakeholder Group was held on February 20, 2020. During the meeting, stakeholders reviewed preliminary information gathered by the core planning team, which included nuisance and urban flood locations sites 1 thru 27. In addition to reviewing and updating of the initial identified flood locations, the stakeholders in attendance identified twenty new flood locations, sites 28 thru 48, which have been added to Table 1 and depicted on Map 1. Furthermore, distinction was made between those sites identified as nuisance or tidally influenced flood and urban flooding. Nine of the forty-eight sites were considered nuisance flooding and are depicted on Map 2.

Site Example



Site #1: Fenwick Road in the area of New Place is a nuisance flood location and is impacted by the Pomonkey Creek.

TABLE 1. NUISANCE AND URBAN FLOOD LOCATIONS

MAPS 1 & 2



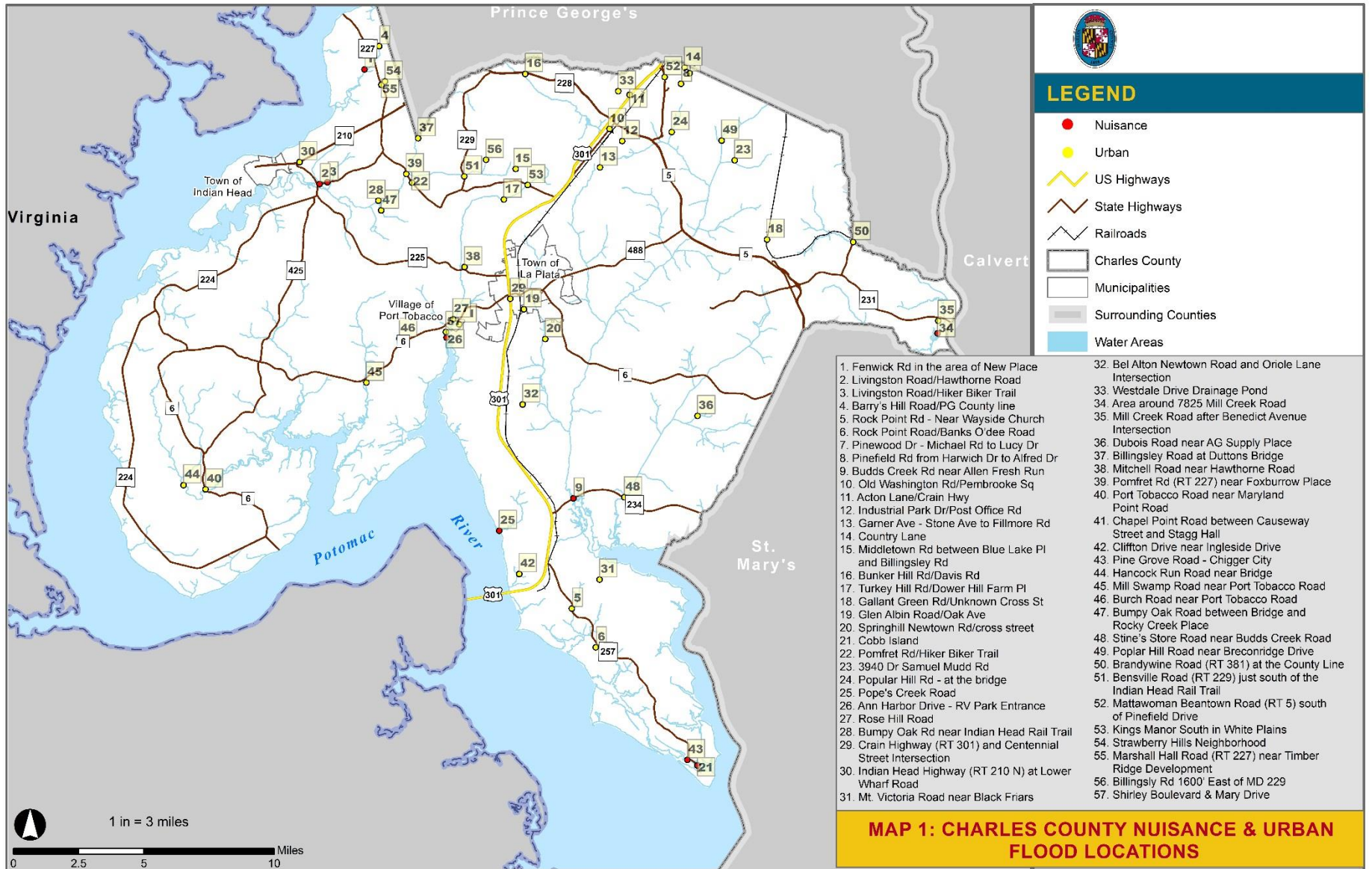










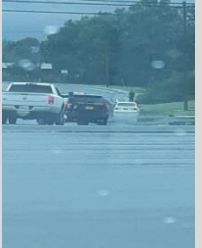

















TABLE 1: NUISANCE AND URBAN FLOOD LOCATIONS

Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
1	Fenwick Road in the area of New Place	Nuisance - Pomonkey Creek	2 feet	County
	<p>Description: Located in the northwestern portion of the county, Fenwick Road is in close proximity to Pomonkey Creek and Mill Swamp is also adjacent to Fenwick Road. Several low points along the roadway allows water to overtop the roadway. Also, the road is at the same level as the creek. High tides heavy rains and flooding can render the road impassable. This area of the road that floods is in a “bowl” and the excessive water is partly is due to upstream developments and a limited outfall Flooding occurs along Fenwick Road between New Place and Ward Place.</p>			
2	Livingston Road (RT 224) at Hawthorne Road (RT 225)	Nuisance - Tributary #1 to Mattawoman Creek; storm surge, high tide and heavy rain events	1-2 feet	State
	<p>Description: Due to a very low spot on Livingston Road (RT 224), water overtops the roadway frequently. A tributary to the Mattawoman Creek intersects at this site. A wetland is located along the road. Also, a culvert is located at the intersection of Livingston and Hawthorne Roads, which may be blocked by overgrown vegetation. Beaver dam issues are also exacerbating the flood issue. In the past, flooding has caused the entire roadway to close for 2 days.</p>			
3	Livingston Road (RT 224) at Indian Head Rail Trail	Nuisance - Tributary #2 to Mattawoman Creek	1-2 feet	State
	<p>Description: The low area on Livingston Road floods during high tide. This low area is at the Indian Head Rail Trail. The trail floods causing water to flow across Livingston Road. A tributary to the Mattawoman Creek is near this area. Flooding in this area is also contributed to by the wetland that floods mentioned in Site #2.</p>			
4	Barry's Hill Road near Old Marshall Hall Road	Urban - Mill Swamp	1-2 feet	County
	<p>Description: Barry Hill Road is adjacent to Mill Swamp. The road elevation is nearly level with the water elevation on both sides of the road. Drainage north from Mill Swamp to the Potomac River may be limited by blocked culverts or poor conveyance. There are two access points into the area and signage indicating “Flood Area” is located along the side of the road. Flooding at this site is also contributed to by beavers located downstream on a private property.</p>			
5	Rock Point Road (RT 257) in the area of Wayside Church	Nuisance & Urban - Flash Flood; Piccowaxen Creek & Wicomico Creek	Less than 1 foot	State
	<p>Description: Low section of the road allows overtopping during a heavy rain event. Ditchley Prong in close proximity to the area. Route 257 is located within the floodplain. During severe weather events, all of the road and structures are underwater. Complete destruction after an event.</p>			






Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
6	Rock Point Road (RT 257) near Banks O'dee Road	Nuisance & Urban - Flash Flood	2 - 2.5 feet	State
	<p>Description: This poorly constructed, low-lying road that floods during heavy rain events resulting in road closure. Flooding occurs up to 500 yards north of the intersection on Route 257. There is poor drainage and agriculture runoff at this site exacerbating the flood conditions. Tide levels also affect this area. This site is one of the top 5 road issues in the county.</p>			
7	Pinewood Drive from Michael Road to Lucy Drive	Urban	3 feet	County
	<p>Description: This site is in a large housing development, Pinefield Neighborhood, that experiences stormwater issues during heavy rain events. Flood elevations increase closer to Pinewood Drive; up to 5 feet.</p>			
8	Pinefield Road from Harwich Drive to Alfred Drive	Urban	1-2 feet average	County
	<p>Description: Pinefield Road is in a large housing development and has been identified as a priority area for urban flooding. Stormwater issues causes flooding in this area during heavy rain events. Storm system collections denoted by catch basins are located on corners only resulting in a limited conveyance network. Flood depths are between 3-5 feet during a major storm event.</p>			
9	Budds Creek Road (Rt 234) near Allens Fresh Run	Nuisance - Allens Fresh Run - Tributary to Wicomico River	--	State
	<p>Description: The Allen's Fresh Bridge on Budds Creek Road experiences tidal flooding. The Allens Fresh Run drains into the Wicomico River, which is in close proximity.</p> <p>After Hurricane Lee, mitigation projects included improvements to the bridge. Only an issue during a major tropical storm or hurricane event.</p>			
10	Old Washington Road and Pembroke Square	Urban - Tributary #1 to Piney Branch	Less than 1 foot	State
	<p>Description: Old Washington Road and Pembroke Square flood due to stormwater issues and impervious surface. A tributary to the Piney Branch may also be a possible flood source. Conveyance is poor across MD 925 Old Washington Rd and downstream that leads to backups and topping of swale. (Wetland-Piney Branch)</p>			






Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
11	Acton Lane near Crain Hwy	Urban - Flash Flood Events	2 feet	County
	<p>Description: Stormwater issues and a low section on Acton Lane results in flooding during a heavy rain event. Only the right lane next to the credit union floods with up to 2 feet of water. One lane road.</p>			
Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
12	Industrial Park Drive and Post Office Rd Intersection	Urban	1-2 feet	County
	<p>Description: Unnamed tributary enters a culvert north of Post Office Road and exits into channel north of the Southern MD Workforce Services property. Dense urban area associated with MD 301 up-stream leads to high volumes of runoff during rain events. Excessive flows will typically top the culvert on the north side of Post Office Drive and flood the intersection and then discharge into the channel on the south side. Also, a large controlled SWMP is located upstream. Note: This may be related to site #10, Piney Branch Wetland.</p>			
13	Garner Avenue between Stone Avenue to Fillmore Road	Urban	Less than 1 foot	County
	<p>Description: Garner Avenue is in the St. Charles Neighborhood. Stormwater issues cause flooding in the Carrington subdivision. All roads drain to channel located in residents' back yards. Box culverts are located along streets and at intersections that drain under the residential properties (front to back) to a drainage channel. Kerrick Swamp next to Fillmore Road. Drainage improvements were completed recently.</p>			
14	Country Lane near Terri Drive Intersection	Urban - Tributary of Mattawoman Creek; Stream Flooding	3-4 feet	County
	<p>Description: Country Lane is in the Pinefield Neighborhood and floods due to stormwater issues. System can't manage rainfall and gets overwhelmed due to lots of impervious surface. The bridge into the Pinefield neighborhood is stormwater issue as well. Pinefield Road and Orleans Lane to Alfred Lane had 3-4 feet of standing water from a rain event in July 2019. Stormwater or Sewer repairs currently in process. Drainage improvement projects have been developed.</p>			
15	Middletown Road between Blue Lake Place and Billingsley Road	Urban	Less than 1 foot	County
	<p>Description: Stormwater issues results in flooding along Middletown Road. There is a drainage ditch along the road, which overflows during heavy rain events. Most of Middletown Road and Turkey Hill Road are flooded routinely. It is common to have water on the road daily. Flooding occurs frequently near roundabout. Drainage improvements in process with installation of a roundabout. Issue near roundabout, SWM structures dead end and have nowhere to go. May need to partner with landowner to mitigate.</p>			






Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
16	Bunker Hill Road near Davis Road	Urban - Piney Branch	Less than 1 foot	County
	<p>Description: Davis Road is bridged over Piney Branch and then runs along Bunker Hill Road where a small stormwater management pond controls some of the road run off from the intersection of Bunkers Hill Road and Berry Road. Piney Branch crosses Berry Road, draining into the Mattawoman Creek. Combined drainage from roads and adjacent developments have led to an increase in flooding in this area. Minor improvements made with the addition of a small stormwater management pond. Mainly floods during a major storm event. During major storm events, bridge has been under 2 to 3 feet of water.</p>			
17	Turkey Hill Road	Urban - Port Tobacco Creek	1-2 feet	County
	<p>Description: Multiple areas along Turkey Hill Road are affected by flooding. A culvert is located right next to road; however, the road washes out during heavy rain events.</p> <p>Improvements have been completed and no new reports of flooding.</p>			
18	Gallant Green Road near Truman Manor Lane	Urban - Swanson Creek	1 foot	County
	<p>Description: Flooding occurs near Truman Manor Lane. One side of the road is impacted by flooding; however, water recedes quickly. Old pipes are rotting and decaying.</p>			
19	Glen Albin Road intersection with Oak Avenue	Urban	1-2 feet	County
	<p>Description: Water flows from Glen Oak Court and Oak Avenue into the intersection with Glen Albin Road. Stormwater issues cause flooding during heavy rain event. Issues began after new housing development was began.</p>			
20	Springhill Newtown Road intersection with Glen Albin	Urban - Clark Run Tributary	3 feet	County
	<p>Description: Flooding occurred near Ashely Ridge Place. An improvement project was completed 5 years ago. However, this area is still an issue. Road elevation is too low, and the bridge is not adequate. Newtown to Glen Albin -rushing water, major run-off and silt issues</p>			







Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
21	Cobb Island (MD 254) at Bridge Approach	Nuisance - Neale Sound	2 or more feet at approach to bridge	State
	<p>Description: Flooding occurs at the approach to bridge. The Crab Houses located on both sides of the road are Repetitive Loss Properties. Flood events prevents residents from evacuating the Island. Island topography has many low-lying areas characterized with dips in roadway and drainage patterns leading to Potomac River through culverts.</p>			
22	Pomfret Road (RT 227) at Indian Head Rail Trail	Urban	2 feet/4-5 feet	State
	<p>Description: Stormwater issues at the intersection of Pomfret Road and the Indian Head Rail Trail cause flooding during heavy rain events. Flood water depths on the road are at 2 feet. However, flood depths on the shoulder are 4 to 5 feet due to a major drop off between the road and shoulder. This area is a low spot that all water drains to. Flood water comes from various directions to this area and water backs up to the Mattawoman Creek. Guardrail recommended. Erosion issues at this site.</p>			
23	3940 Dr. Samuel Mudd Road	Urban	1 foot	County
	<p>Description: Drainage ditch alongside of Dr. Samuel Mudd Road and flows through a culvert at the driveway. Devils Nest crosses under a small bridge south location. Flooding is the result of stormwater issues.</p> <p>Over 200 feet of drainage pipe was recently replaced. Issue should be resolved.</p>			
24	Poplar Hill Road between St. Peters Church Road and Mattawoman Beantown Road (at the bridge)	Urban - Tributary #1 to Jordan Swamp	1-2 feet	County
	<p>Description: Low section in the road with a culvert running under roadway. Stormwater issues cause roadway flooding.</p>			
25	Pope's Creek Road	Nuisance - Potomac River	Less than 1 foot	County
	<p>Description: Flooding occurs at the Pope's Creek Road bridge abutments. This area is not restricted when flooded, there are 2 access points into the area. Crab House is a Repetitive Loss Property. Signs of high tide and debris can be seen on the shoulder of the road.</p>			






Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
26	Ann Harbor Drive at RV Park Entrance	Nuisance - Port Tobacco River	1-2 feet	Private
	<p>Description: Properties are in violation of floodplain ordinance. Entire resort is under water during flood event with no evacuation plan (trailers are not relocated prior to event). Flooding occurs at the entrance of the RV Park. The canal area that drains to the Potomac River overtops the road during a high tide.</p>			
27	Rose Hill Road	Urban - Wetland	1-2 feet	County
	<p>Description: Rose Hill Road floods at intersection with Port Tobacco Road with 1-2 ft of water across road. Abandoned blocked culvert on West side of road that allows flow under Rose Hill Road into Port Tobacco Creek. Also, low sections of road are impacted by the adjacent wetland. Area is improving since the beavers have been removed.</p>			
28	Bumpy Oak Road near Indian Head Rail Trail	Urban - Pond/Mattawoman Creek	1-2 feet	County
	<p>A pond is located in the northeast corner of the Bumpy Oak Road and Indian Head Rail Trail intersection. Mattowoman Creek is in close proximity. The road elevation is only a few feet higher than the water surface elevation of the pond. Heavy rain events cause the pond to rise and overtop the road.</p>			
29	Crain Highway (RT 301) and Centennial Street Intersection	Urban	Less than 1 foot	State/Town
	<p>Located in the Town of LaPlata, this area experiences flooding due to stormwater issues.</p>			
30	Indian Head Highway (RT 210 N) at Lower Wharf Road	Urban - Major Storm Events	1-2 feet	State/County
	<p>Limited access school buses when flooded. Stormwater issues cause flooding in this area.</p>			



Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
31	Mt. Victoria Road near Black Friars	Urban	Less than 1 foot	County
	Limited access school buses when flooded. Wide area affected, approximately 10 to 15 feet.			
32	Bel Alton Newtown Road and Oriole Lane Intersection	Urban	1-2 feet	County
	Limited access for school buses when flooded. Drainage pond located in the field along Bel Alton Newtown Road and across from Oriole Lane.			
33	Westdale Drive Townhomes	Urban	Out of Banks: 4 feet	County
	A stream channel and drainage area behind the townhomes on Westdale Drive. Flooding of this channel is causing damage to the townhomes.			
34	Area around 7825 Mill Creek Road	Nuisance - Patuxent River	2 foot	County
	Tidal flooding from the Patuxent River affects this area. This area of Benedict is surrounded by a cove of the east side and Patuxent River on the west.			
35	Mill Creek Road after Benedict Avenue Intersection	Urban	2 foot	County
	Flooding in 2 locations; before and after the firehouse.			

Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
36	Dubois Road near AG Supply Place	Urban - Denton Run	2 feet	County
	Denton Run intersects with Dubois Road. During heavy rain events, flood waters overflow onto the roadway.			
37	Billingsley Road at Duttons Bridge	Urban - Mattawoman Creek	3-5 feet	County
	Flood waters from the Mattawoman Creek overflow onto the roadway near the bidge.			
38	Mitchell Road near Hawthorne Road (RT 225)	Urban	Less than 1 foot	County
	Only one side of the road is inundated.			
39	Pomfret Road (RT 227) near Foxburrow Place	Urban - Mattawoman Creek	Less than 1 foot	State
	Flooding occurs near the bridge during storm events. The Mattawoman Creek traverses Pomfret Road at this site location.			
40	Port Tobacco Road (MD 6) near Maryland Point Road	Urban - Nanjemoy Creek	2-2.5 feet	State
	Roadway flooding occurs near the bridge that crosses Nanjemoy Creek.			

Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
41	Chapel Point Road between Causeway Street and Stagg Hall	Urban - Heavy Rain Events	Less than 1 foot	County
	Runoff issues cause roadway flooding during heavy rain events.			
42	Clifton Drive near Ingleside Drive	Urban - Clifton Creek	Less than 1 foot	County
	The floodplain to Clifton Creek is adjacent to Clifton Drive on one side of the road, while a wetland is located on the other.			
43	Pine Grove Road - Chigger City	Nuisance - Neale Sound	Less than 1 foot	County
	Flooding in this area is a common nuisance since the road is within close proximity to the Neale Sound.			
44	Hancock Run Road near Bridge	Urban - Beaverdam Creek	Less than 1 foot	County
	A beaver issue is causing Beaverdam Creek to flood the roadway during heavy rain events.			
45	Mill Swamp Road near Port Tobacco Road (RT 6)	Urban - Mill Run & Burgess Creek	Less than 1 foot	County
	A large wetland is located adjacent to Mill Swamp Road. Burgess Creek traverses the road as well. Low road elevation allows water to overflow from the wetland during storm events.			

Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
46	Burch Road near Port Tobacco Road (RT 6)	Urban - Wetland	Less than 1 foot	County
	A large wetland is located along both sides of Burch Road.			
47	Bumpy Oak Road between Bridge and Rocky Creek Place	Urban - Tributary No. 5 to Mattawoman Creek	Less than 1 foot	County
	Tributary Number 5 to Mattawoman Creek runs parallel with this section of road.			
48	Stine's Store Road near Budds Creek Road (RT 234)	Urban - Gilbert Swamp Run	Less than 1 foot	County
	Gilbert Swamp Run traverse Stine's Store Road and flows into Newport Run after the bridge.			
49	Poplar Hill Road near Breconridge Drive	Urban - Zekiah Swamp	Over 3 feet	County
	<p>Description: Zekiah Swamp flows under the bridge located along Popular Hill Road. This site experienced extremely fast-moving water overtopping the roadway during a July 2020 heavy rain event. First time swift water has been seen at this location.</p> <p>Popular Hill bridge is currently under design for a rebuilt by the State.</p>			
50	Brandywine Road (RT 381) at the County Line	Urban - Swanson Creek	Over 3 feet	State
	<p>Description: During the July 2020 heavy rain event, flooding occurred on Brandywine Road near the county line. Extremely fast-moving water from both the County Line Creek and Swanson Creek overtopped the bridge. Measurements taken after the event determined the total flood water length, encompassing the bridge, was approximately 540'. First time swift water has been seen at this location and swift water rescues were necessary for past 2 events.</p>			 

Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
51	Bensville Road (RT 229) just south of the Indian Head Rail Trail	Urban - Heavy Rain Events	1-2 feet	State
	<p>Description: This section of road is a steep hill, with a blind curve, leading to the Indian Head Rail Trail crossing. Due to the lack of a drainage system, the roadway floods during heavy rain events. Numerous wrecks with fatalities have occurred at this location due to the roadway conditions. Old Womans Run flows under the roadway just north of the trail crossing.</p> 			
52	Mattawoman Beantown Road (RT 5) south of Pinefield Drive	Urban - Heavy Rain Events	1-2 feet	State
	<p>Description: Amongst these addresses: 2290, 2270, 2262, 2254, and 2246 Mattawoman Beantown Road, a deep ponding develops in the right lane of the road during heavy rains. This is partially due to the storm drainage collection boxes along Mattawoman Beantown Road, which are blocked with growth, debris, and trash. Public Works flushed the drainage system; however, system should be monitored.</p> 			
53	Kings Manor South in White Plains	Urban	Less than 1 foot	State/County
	<p>Description: The neighborhood in Kings Manor South has dealt with flooding due to drainage issues reported by the public as “design flaws” that occurred in the development of the neighborhood. Some minor work has been completed to address the drainage problem, such as remodeling and modernizing the current drainage system. However, the issues with the drainage system persists resulting in flooding. Port Tobacco Creek and a tributary surround the neighborhood.</p> 			
54	Strawberry Hills Neighborhood	Urban	1-2 feet	County
	<p>Description: Several locations within the Strawberry Hills Neighborhood have been impacted by flooding. These locations are as follows: 6808 Lantana Drive, 6908 Arbor Lane, 6858 Arbor Lane, and the intersection of Woodbury Drive and Heather Drive. The beginning section of Arbor Lane also experiences flooding during heavy rain events. Flooding at these locations is due to drainage system issues. In addition, flooding has occurred at the intersection of Woodbury Drive and Heather Drive and is due to drainage system maintenance issues.</p> 			
55	Marshall Hall Road (RT 227) near Timber Ridge Development	Urban - Heavy Rain Events	Less than 1 foot	State
	<p>Description: The riprap and geotextile washed away along Marshall Hall Road during a heavy rain event, blocking culvert pipes causing the roadway to flood. The storm drain discharge at the Timber Ridge new construction site and Strawberry Hill subdivision is causing severe flooding, erosion and damage. Note, this is the first time this event has been reported, therefore should be monitored.</p> 			

Identifier	Location Name	Source of Flooding	Water Level Mark	State/County/Municipal
56	Billingsley Rd 1600' East of MD 229	Urban	Less than 1 foot	County
	Description: Stream crossing flooding due to undersized pipe and need of road fill. A tributary to Pole Branch traverses the roadway at this site.			
57	Shirley Boulevard & Mary Drive			County
	Description: Culvert under Shirley Boulevard. Canal located between Shirley Boulevard and Mary Drive. Tidal issues - Storm surge rises causing flooding			

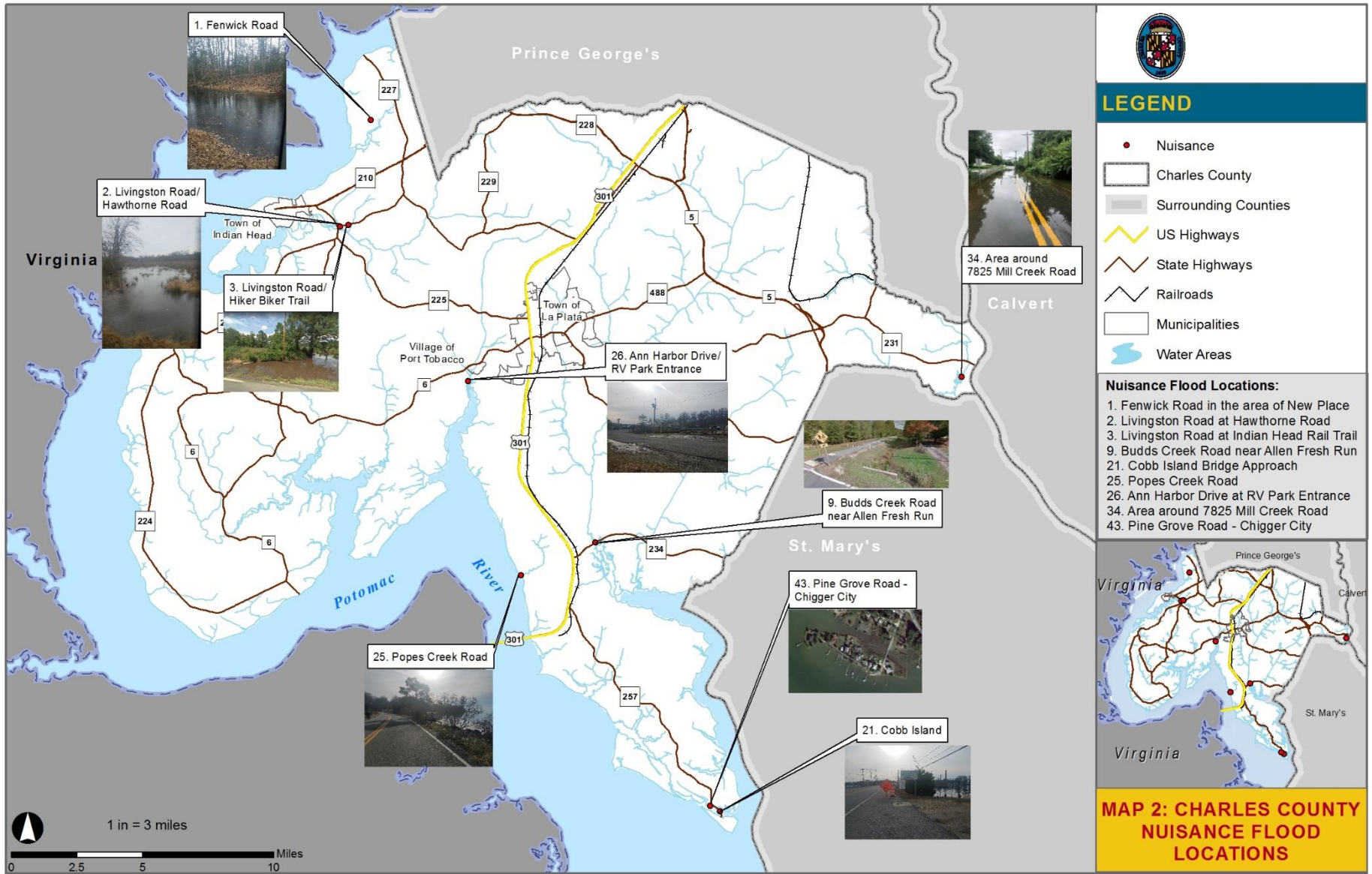
Nuisance Flood Areas

Analysis of the forty-eight identified flood locations depicted and listed on Map 1 indicates that nine of these flood locations are tidally influenced and categorized as nuisance flood areas.

These locations include:

- Fenwick Road in the area of New Place;
- Livingston Road at Hawthorn Road;
- Livingston Road low area near the Indian Head Rail Trail;
- Allen's Fresh Bridge on Budds Creek Road;
- Cobb Island/MD 254 bridge approach;
- Pope's Creek Road bridge area; and,
- Ann Harbor Drive - RV Park Entrance;
- Area around 7825 Mill Creek Road; and,
- Pine Grove Road-Chigger City.

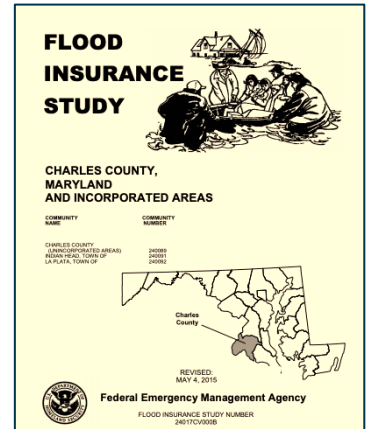
All nine-nuisance flood location are listed in Table 1 and depicted on Map 2.



Identification of Flood Thresholds, Water Levels, & Conditions

Flood Insurance Study (FIS)

According to the *Charles County Flood Insurance Study (FIS)* revised May 4, 2015, the principal flood problems of Charles County are coastal areas that are vulnerable to tidal flooding due to major storms such as hurricanes and nor'easters. Both of these storm types generate strong winds that can push large volumes of water inland. The severity of tidal flood damage depends on various factors, such as topography, the rate floodwater rises, depth and duration, wave action exposure, and quantity and type of structures or infrastructure within the floodplain. As such, the Potomac River, Patuxent River, and the Wicomico River are the primary sources of flooding in Charles County.

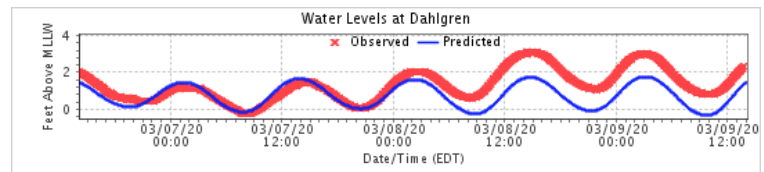


Source: FEMA MAP Service Center

The timing of the maximum storm surge in conjunction with the normal tidal cycle can play an important role in the extent of tidal flooding. Mean tidal ranges within the Potomac and Patuxent Rivers are generally in the 1.5 feet range. Prolonged easterly or southeasterly winds typically increase tidal elevations while northwest winds typically lower tidal elevations. The storm surge in the Patuxent, Potomac, and Wicomico Rivers affects approximately 6, 115, and 21 miles respectively, of Charles County coastline. As previously mentioned, storm surges in combination with mean high or mean higher-high tides can result in more severe and extensive tidal flooding.

Tidal Gauge Data

The National Oceanic and Atmospheric Administration (NOAA) maintains and operates tidal gauge and meteorological stations throughout the region. The closest NOAA gage to Charles County is located at the Naval Surface Warfare Center (NSWC) at Dahlgren, Virginia. These gauges record a plethora of information such as tides/water levels, tide predictions, sea level trends, extreme water levels, and various other meteorological observations.



Tidal gauges can be useful to compare tidal fluctuations and peak events with the still-water floodwater elevations for calculated storm events as reported in the FIS. For example, according to the FIS, the Potomac River at the U.S. Route 301 Bridge has a 100-year (1% annual chance) flood elevation of 5.8 feet (NAVD88). Tide gauges use reference values called datums. In general, a datum is a base elevation used as a reference from which to determine heights or depths. A tidal datum is a standard elevation defined by a certain phase of the tide. The NAVD88 datum value at the Dahlgren gage is 1.02. This allows a comparison between the FIS and gauge data, given that the tidal gage is sufficiently close to flooding source location.

Tidal Gauge Data vs Flood Insurance Study Discussion

The maximum recorded tide at the Dahlgren gauge was 5.01 on September 18, 2018. Therefore, converting the gage datum to the flood elevation during that September flood would result in an elevation of 3.99 feet (NAVD88). According to the FIS, a 10-year (10% annual chance) tidal flood event at the U.S. 301 Bridge would be at an elevation of 4.1 feet. It would be reasonable to state that the September 18 tidal gauge measurement was approximately a 10-year flood event. Additionally, the table below illustrates the top ten highest and lowest recorded tidal events for the Dahlgren gauge provided in the NAVD88 datum over the last 5 years. Note that the top ten highest recorded gauge measurements are all within a span of 0.7 feet.

TABLE 3: HIGHEST AND LOWEST VALUES - DAHLGREN, VA - STATION ID: 8635027

Station:	8635027	Begin Date:	19800218
Name:	Dahlgren	End Date:	20200218
Product:	High/Low	Units:	Feet
Datum:	NAVD	Quality:	Verified

Rank	Highest	Highest Date	Zone	Lowest	Lowest Date	Zone
1	3.99	20180910 07:30	GMT	-4.42	20180105 04:36	GMT
2	3.84	20180909 19:18	GMT	-4.12	20180303 01:54	GMT
3	3.62	20191012 18:42	GMT	-3.74	20180302 16:06	GMT
4	3.47	20191012 06:24	GMT	-3.57	20180303 15:00	GMT
5	3.46	20180307 11:06	GMT	-3.45	20180303 15:00	GMT
6	3.44	20151004 00:06	GMT	-3.23	20170315 04:06	GMT
7	3.41	20151005 00:36	GMT	-3.22	20180104 17:54	GMT
8	3.36	20151004 12:18	GMT	-3.15	20180106 18:48	GMT
9	3.32	20180910 20:00	GMT	-3.10	20180107 18:36	GMT
10	3.29	20180911 08:30	GMT	-3.09	20190121 15:06	GMT

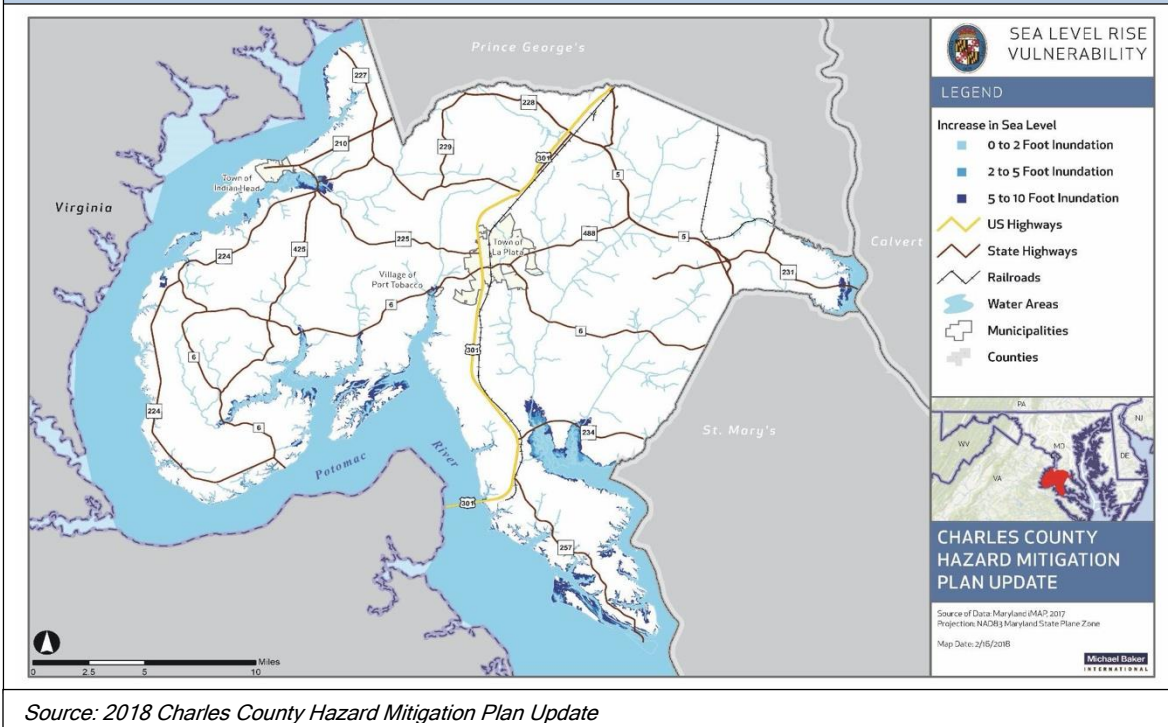
Source: <https://tidesandcurrents.noaa.gov/stationhome.html?id=8635027> NOAA Tides & Currents-Dahlgren, VA - Station ID: 8635027

This exercise can be utilized to approximately correlate recorded tidal gauge data to known flood elevations for 10-, 50-, 100-, and 500-year storms as calculated within an FIS. However, the limitations of this technique must be taken into consideration. Specifically, the proximity of the tide gauge, or gauges, to the flood location is critical as mean ranges of tides vary from location to location even along the same river.

Sea Level Rise and Shoreline Erosion

Figure 3.3.5.8 from the 2018 Charles County Hazard Mitigation Plan Update, depicts the potential sea level rise impacts on Charles County, and shows that some areas have the potential to experience 5 to 10 foot inundation. Sea level rise impacts are projected to have the greatest impacts to areas surrounding the Mattawoman Creek, the Nanjemoy Creek, the Potomac River, and the Wicomico River.

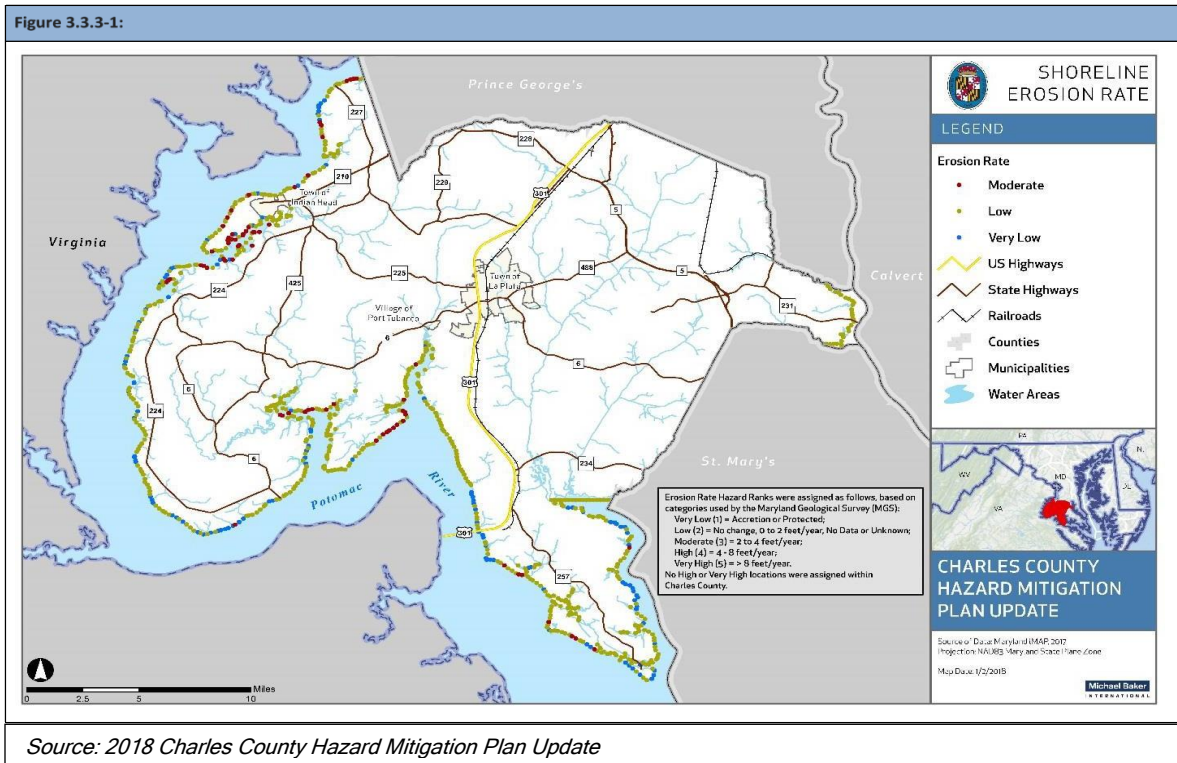
Figure 3.3.5-8:



Source: 2018 Charles County Hazard Mitigation Plan Update

Additionally, tide gauge measurements in the Chesapeake Bay and Mid-Atlantic region show that sea level along Maryland's coastline has risen at an average rate of 3-4 mm per year, or approximately one foot per century. This rate is nearly double the global average, and reflects both global sea level rise and local land subsidence. Research indicates that land subsidence in southern Maryland is the result of postglacial crustal movement, sediment loading, tectonic activity, and possibly groundwater withdrawals (Maryland DNR, 2001; MGS, 2016). Future rates of sea level rise along Maryland's coastline are also expected to exceed the global average, resulting in a rise of 2-4.2 feet by 2100, if greenhouse emission continue to increase (*2018 Sea Level Rise Projections for Maryland*). The potential of sea level rise to exacerbate erosion rates requires careful consideration of this factor in any shoreline erosion control plan.

Shoreline erosion is a continuous process that is highly spatially variable and temporally episodic. The basic progression of erosion from wave action includes: A) attack by waves, B) erosion of a bank and beach causing undercutting, C) slumping of the bank, and D) removal, transportation, and deposition of bank sediments along shorelines. The natural drivers of this process include weather, soil composition, topography, bathymetry (water depth), and fetch (the distance traveled by wind or waves across open water). Shoreline erosion tends to be greatest when storms amplify wind and wave action, and where soils are loose, slopes are steep, near-shore waters are deep, and fetch is large. In Charles County, the shoreline is highly vulnerable to nor'easters, tropical storms and hurricanes, particularly when these storms last 24 to 48 hours and are accompanied by high winds and storm surges. Storms of this type can amplify several high tide cycles, inundating protective beaches and marshes and subjecting upland areas to the brunt of the destructive wave energy. The results can include damage to shoreline stabilization projects and severe erosion of land masses.



The U.S. Army Corps of Engineers (USACE) found that 31 percent of tidal shorelines in Charles County are experiencing some erosion, with 7 percent experiencing significant erosion rates of two feet per year or more (USACE, 1990). Subsequent studies by the Maryland Geological Survey (MGS) estimated shoreline erosion by comparing recently mapped shorelines (1988-1995) to historical maps. These studies divided Maryland's shoreline into segments of 80 meters or more, generalized erosion rates into four categories, and assigned each shoreline segment to the most representative category. According to data made available through the Maryland Coastal Resiliency Assessment, the MGS found approximately 9% of the County's coastline to be subject to significant erosion rates of two feet per year or more (The Nature Conservancy, 2016). As shown in Figure 3.3.3-1, the areas subject to significant erosion are concentrated near the Indian Head peninsula, the mouth of Nanjemoy Creek, and the mouth of Port Tobacco River.

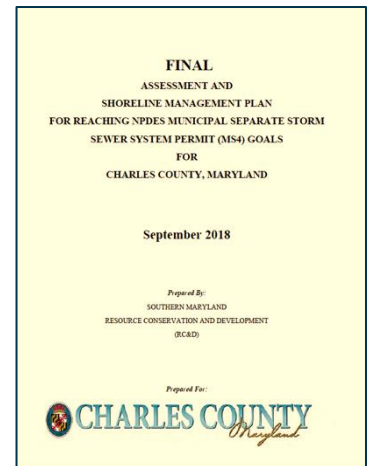
The man-made drivers of shoreline erosion include land use and erosion control projects. Shoreline erosion tends to be greatest where upland areas generate significant runoff, and where adjacent shorelines are hardened with erosion control measures (such as revetments and bulkheads). Poorly designed erosion control measures accelerate shoreline erosion by reducing the supply of sediment to adjacent beaches, removing natural features that dampen wave action, or otherwise interrupting natural shoreline processes.

High shoreline erosion rates pose a significant threat to property owners, the public, and the County's natural resources - placing valuable land and assets at greater risk of storm damage. These assets include homes, businesses, historic and cultural sites, archaeological sites, recreational beaches, productive farmland, utilities, bridges, and roads. Shoreline erosion also contributes to the degradation of water quality and habitat. The nitrogen and phosphorus

carried with eroded sediments can exacerbate summertime dead zones in the Chesapeake Bay and tidal Potomac, and the sediment itself can smother important aquatic resources and fill navigational channels used for commerce and recreation.

Finally, the risk of shoreline erosion is expected to increase in the future due to more intense weather events and rising sea levels driven by climate change. Both factors contribute to erosion by amplifying natural coastal processes. For example, as sea level rises, storm surges will extend further into the coastal zone, exposing upland areas to destructive wave energy with greater frequency.

In September of 2018, the Final Assessment and Shoreline Management Plan for Reaching NPDES Municipal Separate Storm Sewer System Permit (MS4) Goals for Charles County, Maryland was completed. The plan reported that generally, the County's shorelines on the open Potomac River are subject to winddriven wave forces that caused shoreline erosion ranging from low to severe. Shorelines along the lateral waterbodies are somewhat less exposed to wave action, except shore reaches near their mouth. This Plan put the natural process of shoreline erosion into perspective as to potential long-term impacts to upland banks, land loss, and the consequent input of sediments and nutrients into the Chesapeake Bay. Priority was given to eroding shorelines with high erosion rates and those with potential infrastructure impacts. Eroding upland banks and shoreline morphology were addressed holistically in the context of the overall shoreline management plan.



This study yielded management strategy recommendations that addressed shoreline erosion on a reach basis. The impacts of "no action" at the shoreline were also considered. This plan employed the strategy of living shorelines as a best management practice for shore stabilization. Living shorelines are shore protection strategies that are relatively non-intrusive to natural surroundings yet effective within the context of long-term shoreline erosion control. They consist of a combination of stone structures, particularly sills and/or breakwaters along with sand nourishment which create a stable substrate for establishing wetland vegetation. This living shoreline approach utilizes stable marshes and beaches for shore protection, which are the preferred alternatives for shore protection, and can provide a platform for long-term coastal resiliency in the face of sea level rise.

Stormwater & Drainage Ordinances & Improvements Projects

Charles County adopted both the Stormwater Management Ordinance and the Storm Drainage Ordinance on August 1, 2010. In addition, to ordinances to control the adverse impacts associated with increased stormwater runoff, drainage improvement projects are undertaken each year by the County to mitigate existing stormwater related issues.

Stormwater Management Ordinance

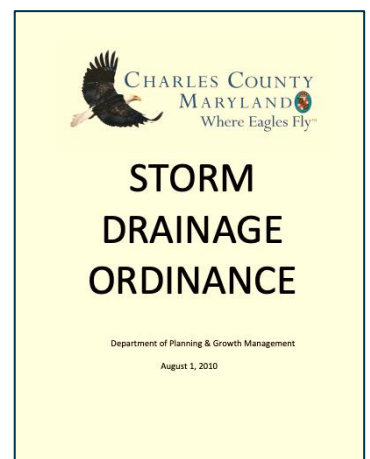
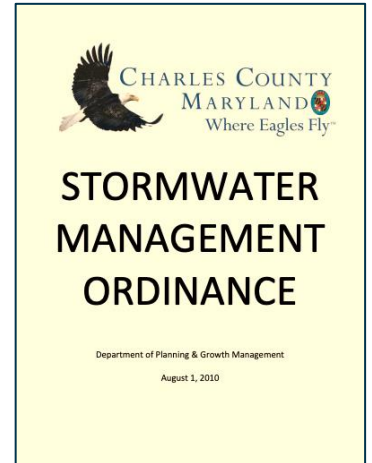
The purpose of the Charles County Stormwater Management Ordinance is to protect, maintain, and enhance the public health, safety, and general welfare by establishing minimum requirements and procedures to control the adverse impacts associated with increased stormwater runoff.

The primary goals of the Charles County Stormwater Management Program are to maintain after development, as nearly as possible, the predevelopment runoff characteristics, and to reduce stream channel erosion, pollution, siltation and sedimentation, and local flooding by implementing Environmental Site Design (ESD) to the Maximum Extent Practicable (MEP) and, for water quality purposes only when necessary, using appropriate structural best management practices (BMPs).

The provisions of this Ordinance are adopted pursuant to the authority of the Environment Article, Title 4, Subtitle 2 of the Annotated Code of Maryland, 2009 Replacement Volume and Article 25 §3 of the Annotated Code of Maryland and apply to all new development or redevelopment of land, including but not limited to, residential, commercial, industrial, or institutional use. The application of this Ordinance and the provisions expressed herein shall be the minimum stormwater management requirements and shall not be deemed a limitation or repeal of any other powers granted by State law. The Department of Planning & Growth Management shall be responsible for the coordination and enforcement of the provisions of this Ordinance.

Storm Drainage Ordinance

This purpose of this ordinance is to protect the public health, safety and welfare on all existing properties by establishing minimum requirements and standards for adequate stormwater conveyance and drainage and providing for administration, enforcement, and penalties. Unless the particular activity is exempted by this regulation, a person may not construct a stormwater conveyance system consisting of pipes, inlets, gutters, ditches, swales, manholes, junction boxes, or perform any grading which would change the runoff characteristics from a property without first obtaining a permit from the Department of Planning & Growth Management. Prior to issuance of any permit, the County Engineer shall review and approve all information related to storm drainage as may be required of a developer under the terms of this ordinance.



Stormwater Management and Impervious Surface

Charles County's commitment to environmental stewardship is especially evident as related to stormwater management restoration. In 2014, the County was issued a five-year stormwater management discharge permit by the state with a due date of December 2019. The permit requires stormwater management restoration for 20-percent of the county's unmanaged impervious surface.

To begin the five-year permit period, all impervious surface in the County was mapped, and more than 7,000 acres were identified as needing stormwater management. Watershed assessments were completed for all 10 of the County's watersheds. These assessments measured water quality, evaluated stream valleys for erosion, surveyed hotspots for pollution, and identified stormwater restoration projects.

Staffing under the Watershed Restoration and Protection Program increased from 3.5 to 10.4 full-time equivalents during this five-year period and three consultant engineering firms were hired to assist in design and permitting of restoration projects.

Several permanent restoration projects have been completed. They include three step pool conveyances, three submerged gravel wetlands, five wet pond-constructed wetlands, 25 swales, a bioretention facility, a large underground storm filtering and storage facility, an outfall stabilization and two shoreline stabilizations. Several additional projects are currently under construction and in the design and permitting phases.

Drainage Improvement Projects

The County Drainage System Improvements Program provides a source of funding to design and construct drainage improvement projects. These projects provide retrofits and repairs drainage systems in various locations of the County that are experiencing serious drainage and flooding problems.

Projects completed and/or underway include:

Dogwood Drive Drainage Improvements;

- Installed headwall at the end of an existing 48" round concrete pipe (RCP) with attached debris cage. Uncovered existing manhole to provide access to manhole and piping. Removed and reinstalled 72" corrugated metal pipe (CMP) pipe in areas of failed piping. Cleared debris from piping network and 72" CMP pipe outfall. Finally, lined entire length of 72" CMP with either heat cured-in-place pipe (CIPP) or infrared CIPP. Work on this project is **complete**.

Halley Estates Drainage;

- Numerous areas within the Haley Estates Subdivision experience substantial flooding during moderate to heavy rain events. To address these issues the Department of Public Works (DPW) installed a drainage along Hickory Court from Cul-de-Sac to Dogwood Drive. DPW also replaced approximately 200 linear feet of 24" storm drainpipe at Dogwood Drive and clean the existing inlet at corner of Dogwood Drive

and Hickory Court.

- Work has been **completed** by the County's Department of Public Works (DPW).

Hamilton Road Culvert Drainage Improvements;

- This project is to replace and upgrade culvert under Hamilton Road to address flooding issues in Lynnbrook Subdivision along Timberbrook Drive. This project was in conjunction with Western Parkway Phase 1B Road Improvement Project. Work on this project is **complete**.










Holly Tree Lane Drainage; and,

- Project has not yet started.

Valley Drive Drainage Improvements.

- Valley Drive is located in the Laurel Branch Sub-division off Bensville Road (MD Route 229) in Waldorf, Maryland. In early 2010 the County's Department of Public Works (DPW) – Roads Division repaired several sinkholes resulting from the deterioration of the existing 36" corrugated metal pipe (CMP). To avoid future sinkholes DPW repaired several sections of storm drain line. This project will correct the entire line along Valley Drive by installing a pipe liner eliminating future sinkholes at driveways culverts and adjacent to the road shoulder.

In fiscal 2019, Charles County received record rainfall totals. The County Roads Division was responsible for repairing dozens of failing stormwater management pipes and sinkholes. The Roads Division staff, contract inspectors, and maintenance contractors:

-  Inspected 4,376 stormwater basins/inlets
-  Repaired 58 stormwater basins
-  Vacuum cleaned 51 stormwater basins/pipes
-  Removed 115 tons of trash and debris from stormwater basins
-  Swept 403 miles of roadway
-  Removed 174 tons of trash and debris with mechanical sweeper
-  Relined 1,020 feet of deteriorating stormwater pipe to extend life expectancy
-  Applied 792 stormwater management basin marker on storm drain inlets in 10 neighborhoods (Basin markers state, "No Dumping" and "Only Rain in the Drain")
-  Cleaned and repaired 335 stormwater management ponds.

Nuisance & Urban Flood Response, Preparedness, & Mitigation

Following the identification of nuisance and flood locations, stakeholders discussed each site and provided ideas on initiatives and projects for the following phases of Emergency Management: Preparedness, Response, and Mitigation.

Preparedness refers to measures taken to prepare **before** an emergency occurs and ensure that communities and services are capable of coping with disasters.

Examples: Community Awareness and Education; Proper Warning System; Mutual Aid; and, Mock Drill, Training Practice.


Response is defined as the actions taken to save lives and prevent further property damage **during** an emergency situation.

Examples: Evacuation; Sheltering; Road Barricades; and, Emergency Rescue.

Mitigation is the effort to reduce loss of life and property by minimizing or eliminating the impact of disasters. Mitigation activities take place **before** and **after** emergencies.

Examples: Flood Insurance; Stormwater Conveyance (culverts); Stormwater Upgrades (retention pond); and, Property Acquisition.

Each of the identified fifty-seven nuisance and urban flood location along with ideas on initiatives and projects have been included on Table 2. Finally, sites were reviewed and assigned a risk ranking of “**High**”, “**Medium**”, or “**Low**”. Risk ranking criteria was based on the level of water observed and reported at each identified site and captured on Table 1.

 Water Level reported as less than 1 foot of water or no information provided was assigned a risk ranking of “Low”;

 Water Level reported as 1-2 feet of water was assigned a risk ranking of “Medium”; and,

 Water Level reported as 3 feet or more of water was assigned a risk ranking of “**High**”.

Using this assessment criteria six sites were labeled as “**High**” risk sites.

TABLE 2. NUISANCE AND URBAN FLOODING PREPAREDNESS, RESPONSE, & MITIGATION



HI
MD
LO

PREPAREDNESS

RESPONSE

MITIGATION

1
Fenwick Road in the area of New Place

NUISANCE - Pomonkey Creek

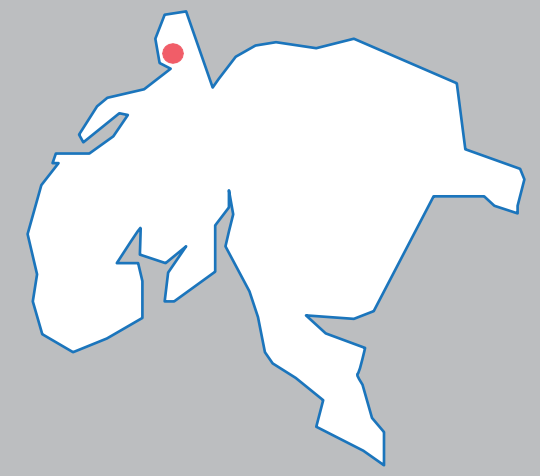
ADD SIGNAGE SIGN TYPE: Warning and Mass Notification

Use CAD and Notification EAS and IPAWS Use During Major Incidents

Current response is reactive barricade following notification Of water on roadway

Note: Evacuation Resistant Community

Assessment of Location
Existing Programs
Prioritization



2
Livingston Rd (RT 224) at Hawthorne Rd (RT 225)

NUISANCE - Tributary #1 to Mattawoman Creek

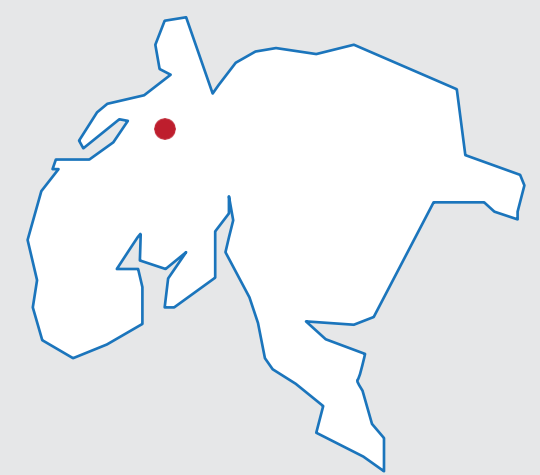
ADD SIGNAGE SIGN TYPE: Measuring

Quarterly Meeting Topic

Barricade Sign Priority

Protected property; possibly consider discussion with SHA & MDE

Needs further evaluation



3
Livingston Rd (RT 224) at Indian Head Rail Trail

NUISANCE - Tributary #2 to Mattawoman Creek

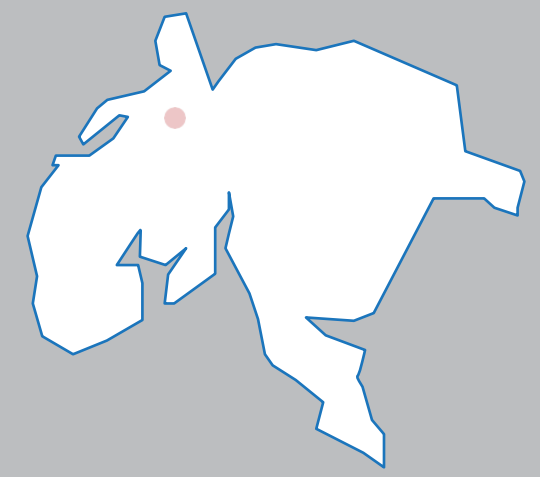
ADD SIGNAGE SIGN TYPE: Measuring

Quarterly Meeting Topic

Barricade Sign Priority

Protected property; possibly consider discussion with SHA & MDE

Needs further evaluation



HI
MD
LO

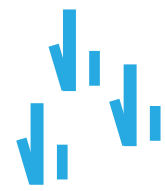
PREPAREDNESS

RESPONSE

MITIGATION

4

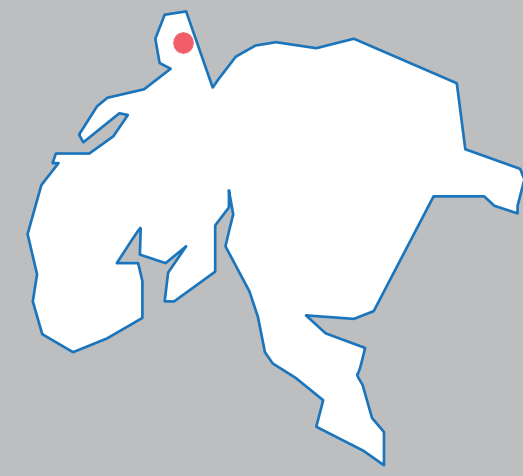
Barry's Hill Rd
near Old Marshall
Hall Rd



URBAN -
Mill Swamp

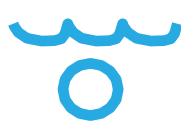
High Water Sign
already installed at
this location

Clear Culverts



5

Rock Point Rd (RT 257)
in the area of
Wayside Church

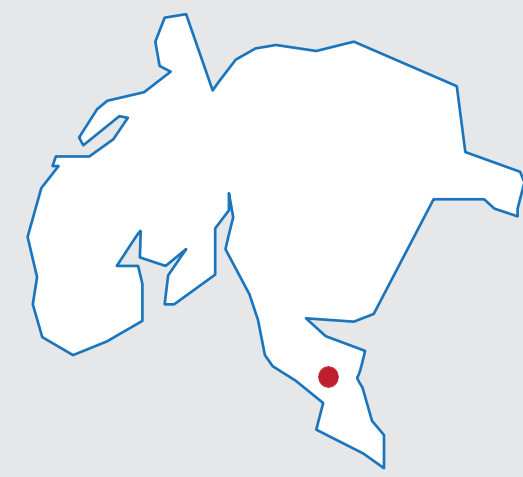


NUISANCE & URBAN -
Flash Flood; Piccowaxen
Creek & Wicomico Creek

ADD SIGNAGE
SIGN TYPE:
Measuring

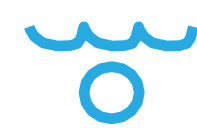
As
Needed

Alternative Route,
perhaps. Example: Improve
Mt. Victoria



6

Rock Point Rd (RT 257)
near Banks O'dee Rd



NUISANCE & URBAN -
Flash Flood

ADD SIGNAGE
SIGN TYPE: Flash Flood
Sign

As Needed

Drainage correction
Roadside ditches re-
graded
Culvert under roadway



HI

MD

LO

PREPAREDNESS

RESPONSE

MITIGATION



Pinewood Dr from Michael Rd to Lucy Dr

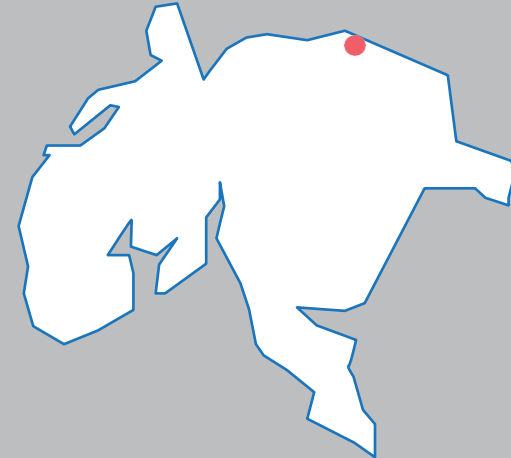


URBAN

ADD SIGNAGE
SIGN TYPE: Measuring signs placed strategically

Barricades have been used in the past.

Drainage improvements needed
Some existing projects
Private property issues



Pinefield Rd from Harwich Dr to Alfred Dr

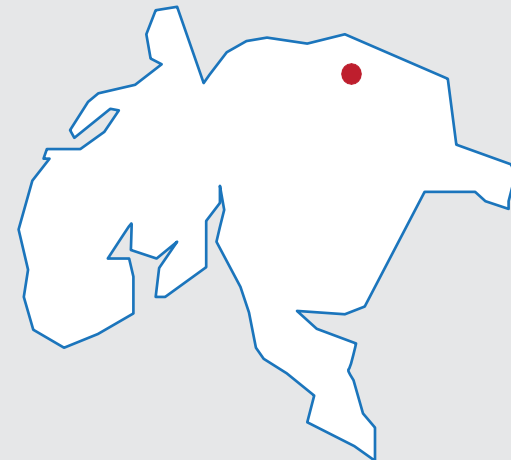


URBAN

ADD SIGNAGE
SIGN TYPE: Measuring

As Needed

Maybe a USDA Grant similar to Potomac Heights or Woodland Village

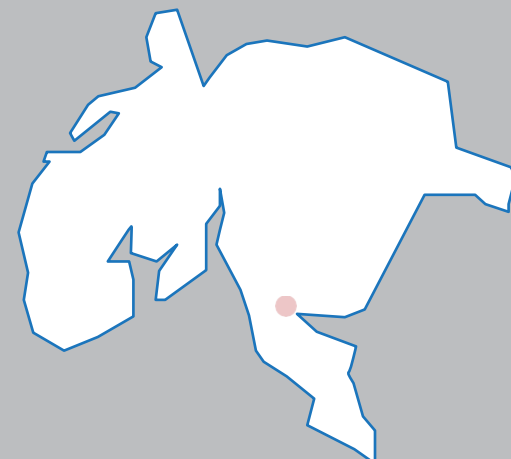


BuddsCreekRd (Rt 234) near Allens Fresh Run



NUISANCE - Allens Fresh Run - Tributary to Wicomico River

Bridge replacement project elevated the roadway.



HI
MD
LO

PREPAREDNESS

RESPONSE

MITIGATION

10

Old Washington Rd and Pembroke Square

○

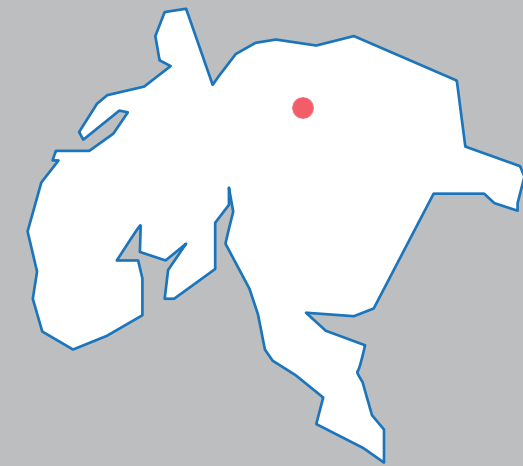
URBAN - Tributary #1 to Piney Branch

ADD SIGNAGE
SIGN TYPE: Flood

As Needed

Environmental restrictions are limited factors in this area in terms of projects

Possibility of using stormwater as grey water and pumping to power plant



Quarterly Meeting Topic

11

Acton Lane near Crain Hwy

○

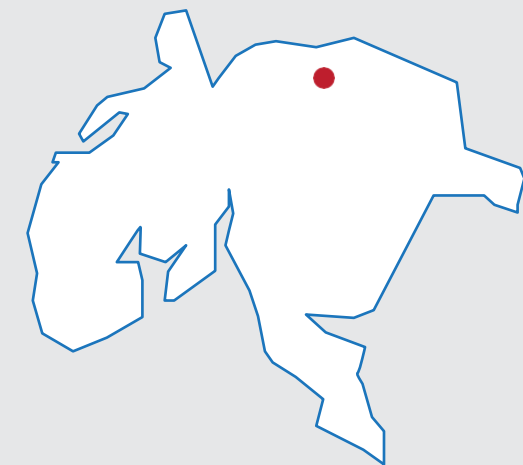
URBAN - Flash Flood Events

Existing Drainage Issues

As Needed

Evaluate Drain System

Drainage Improvement Plan



12

Industrial Park Dr and Post Office Rd Intersection

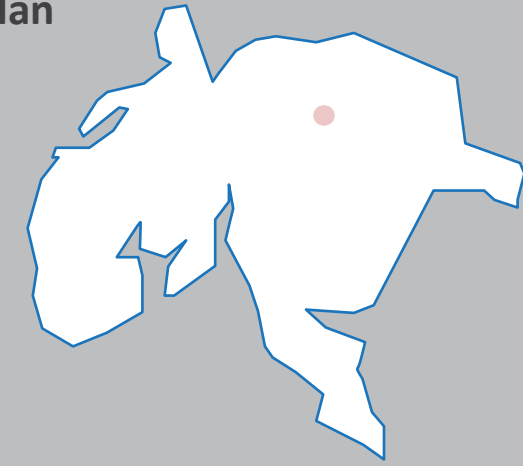
○

URBAN

ADD SIGNAGE
SIGN TYPE: Flood

Add to Drainage Improvement Plan

Possibly enlarge culvert



HI
MD
LO

PREPAREDNESS

RESPONSE

MITIGATION

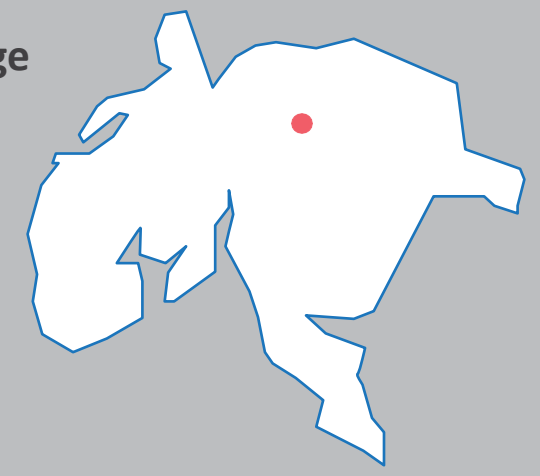
13

Garner Ave between Stone Ave to Fillmore Rd



URBAN

*Recent construction may have corrected issues. Waiting for large rain even. So far, no problems have been observed.



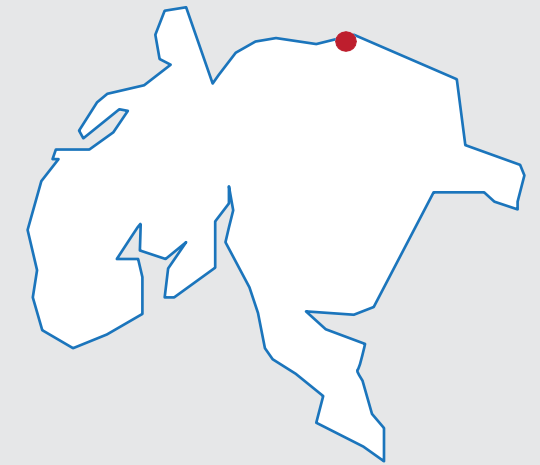
14

Country Lane near Temi Dr Intersection



URBAN - Tributary of Mattawoman Creek; Stream Flooding

*Drainage improvement project completed



15

Middletown Rd between Blue Lake Pl and Billingsley Rd

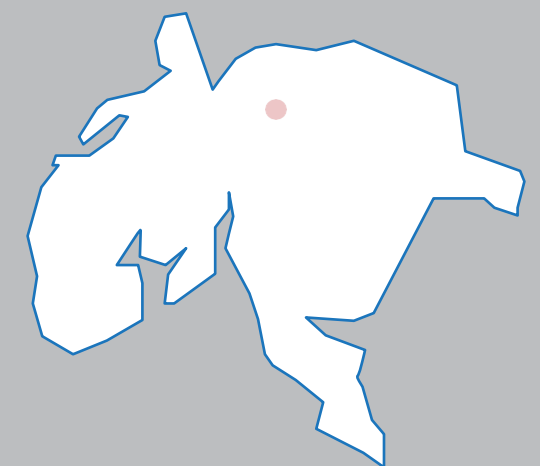


URBAN

ADD SIGNAGE
SIGN TYPE:
Permanent Sign
(High Water)

Temporary Signage Road Closures during event

Stormwater Study / Stormwater Management Structure



HI
MD
LO

PREPAREDNESS

RESPONSE

MITIGATION

16

Bunker Hill Rd near Davis Rd

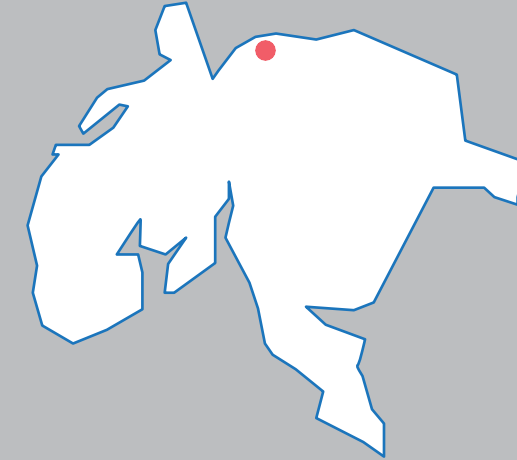


URBAN - Piney Branch

Community outreach to HOA- discuss rain barrels, and rain gardens, etc.

Road Closure Signage

Advocate for developer to retrofit stormwater management for Scotland Heights



17

Turkey Hill Rd

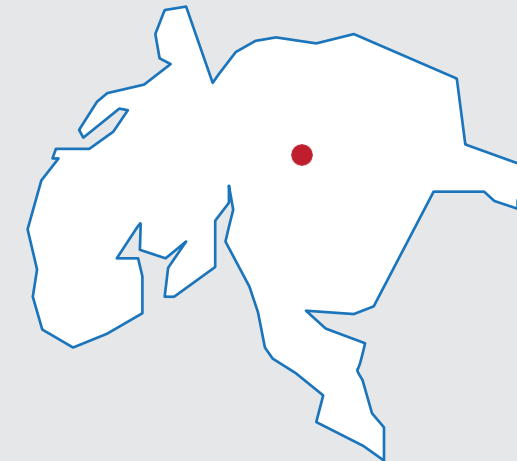


URBAN - Port Tobacco Creek

ADD SIGNAGE
SIGN TYPE:
Permanent Sign (High Water - with lights)

As Needed

Series of culverts pipes have recently been replaced in this area.



18

Gallant Green Rd near Truman Manor Lane



URBAN - Swanson Creek

ADD SIGNAGE
SIGN TYPE: Permanent Sign

Swift Water Rescue Training and Equipment

Emergency Notification Systems - public outreach initiatives

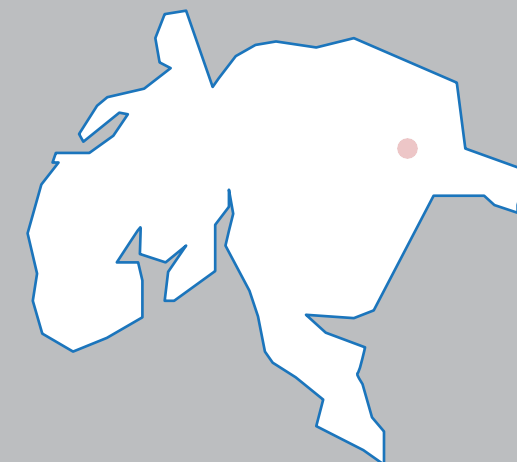
Add Vehicles with higher clearance to County vehicle fleet

Reverse 9-1-1 / Code Red System

County Stormwater engineers should review site

Replace pipes

Elevate Roadway



HI
MD
LO

PREPAREDNESS

RESPONSE

MITIGATION

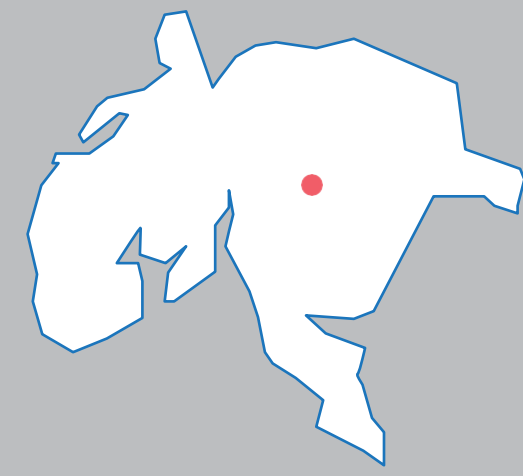
19

Glen Albin Rd intersection with Oak Avenue



URBAN

Town of La Plate to research any issues at this site.



20

Springhill Newtown Rd intersection with Glen Albin

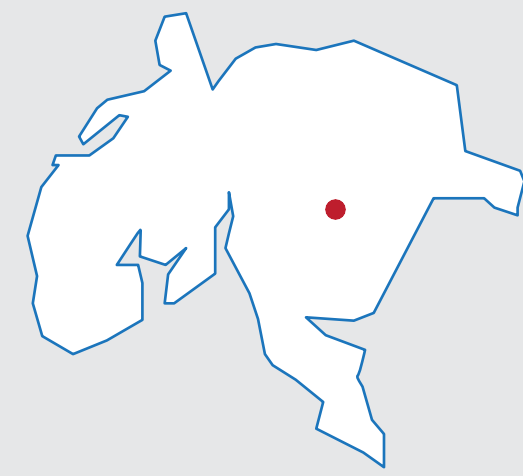


URBAN - Clark Run Tributary

ADD SIGNAGE
SIGN TYPE: Permanent Sign (Turn Around - Don't Down) & High-Level Mark Sign
Community Outreach including meetings

Road closure
Barricades
Emergency Rescue

Silt Fencing to hold back run-off
Elevate the road and install drainage ditches



21

Cobb Island (MD 254) at Bridge Approach

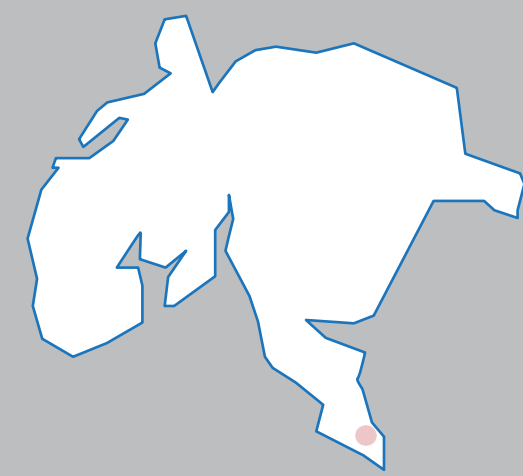


NUISANCE - Neale Sound

ADD SIGNAGE
SIGN TYPE: Permanent Sign High- Water Sign with lights; allow for remote operation and solar power
Community outreach and prepare residents
Meet with residents to discuss evacuation

As needed

Replace collapsed culvert pipe
Explore flood buy-outs and the option to elevate structures



HI
MD
LO

PREPAREDNESS

RESPONSE

MITIGATION

22

Pomfret Rd (RT227)
at Indian Head Rail
Trail

○

URBAN

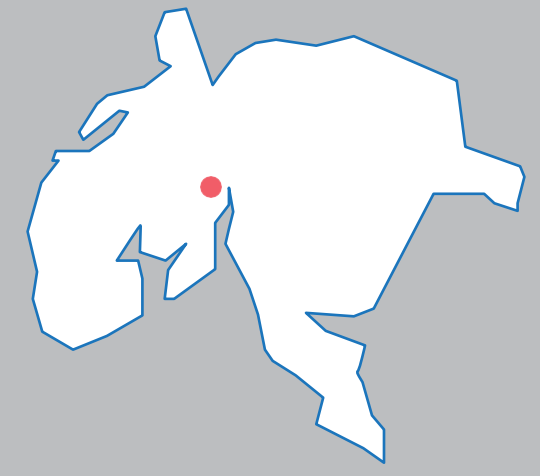
ADD SIGNAGE
SIGNTYPE: Permanent
Sign with Lights

As Needed

Stormwater improvement &
protect roadway edges /
harden

Increase vegetation along
trail and roadway

Watershed improvement at
top or bottom of hill



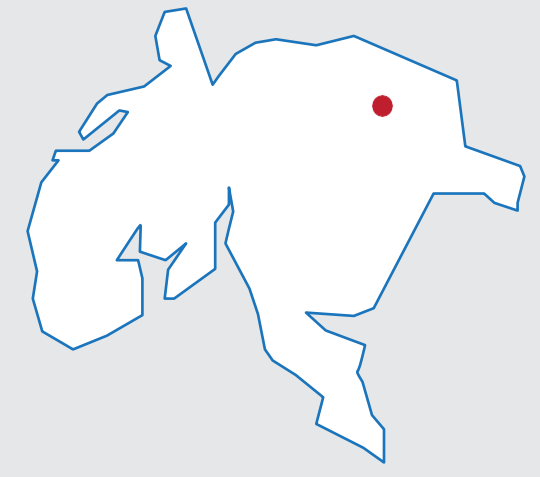
23

3940 Samuel Mudd Rd

○

URBAN

* Drainage pipe has recently been
replaced. Public Works indicated
that this should fix the issue;
they will continue to monitor



24

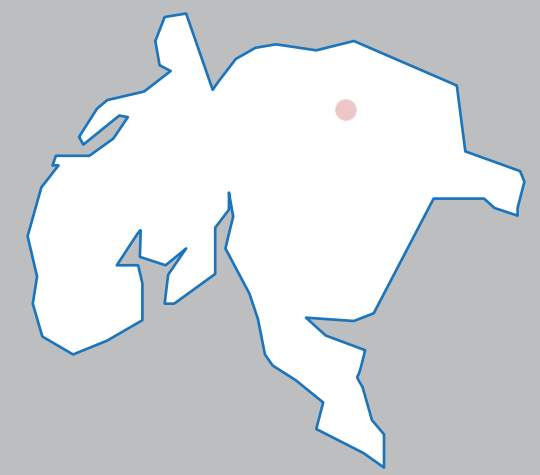
Poplar Hill Rd between
St. Peters Church Rd and
Mattawoman Beantown
Rd (at the bridge)

○

URBAN-
Tributary #1 to
Jordan Swamp

Culvert replacement project

Have County SWM
engineer review to see if
larger pipe is necessary



HI

MD

LO

PREPAREDNESS

RESPONSE

MITIGATION

25

Pope's Creek Rd

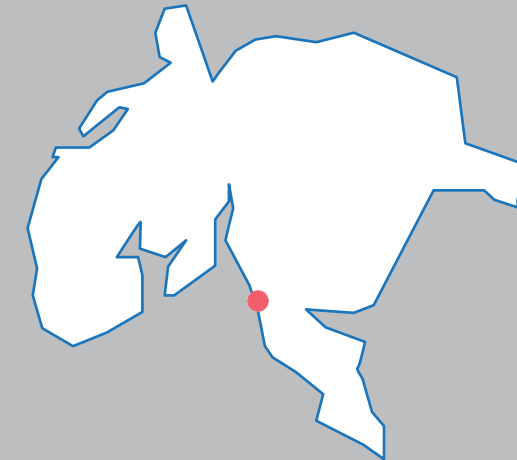


NUISANCE - Potomac River

ADD SIGNAGE
SIGN TYPE: Permanent Sign (High Water - with lights); Powered remotely and by solar energy

Armor shoreline - revetment

Elevate the road and parking lots, consider permeable pavement



26

Ann Harbor Dr at RV Park Entrance



NUISANCE - Port Tobacco River

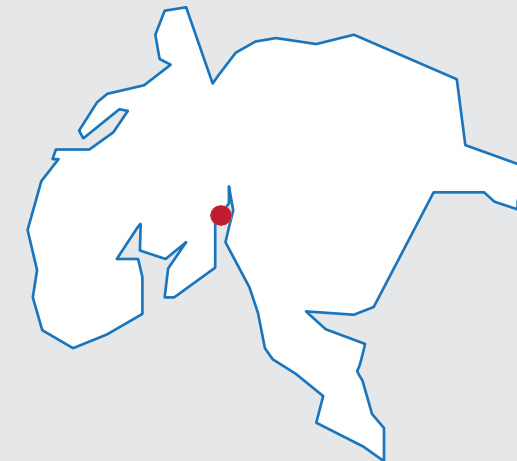
ADD SIGNAGE
SIGN TYPE: Permanent Sign (High Water)

Implement Evacuation Plan

Series of culvert pipes have recently been replaced in this area

Community outreach and education

Assist community in developing an evacuation plan



27

Rose Hill Rd



URBAN - Wetland

ADD SIGNAGE
SIGN TYPE: Permanent Sign

County stormwater engineers should review site in order to determine if larger pipe is needed to drain pond to Port Tobacco River Stream

Maintenance

Dam Removal



HI

MD

LO

PREPAREDNESS

RESPONSE

MITIGATION

28

Bumpy Oak Rd near Indian Head Rail Trail

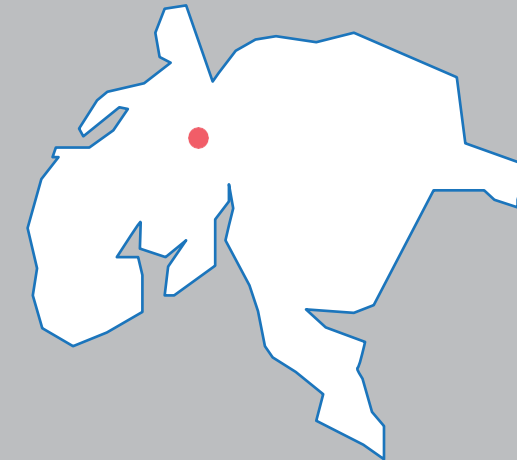


URBAN - POND - Mattawoman Creek

Sign with Barricade

As Needed

Marsh / Wetland Issues



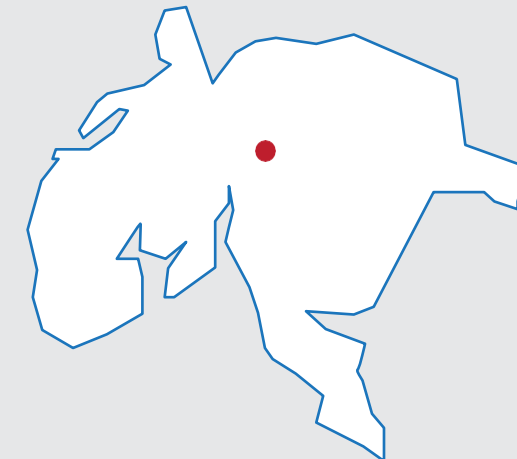
29

Crain Highway (RT 301) and Centennial St Intersection



URBAN

Stormwater Improvement



30

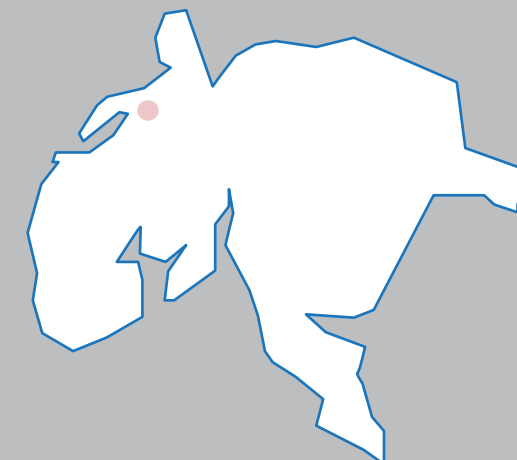
Indian Head Highway (RT 210N) at Lower Wharf Rd



URBAN – Major Storm Event

Beaver Removal

Included in current Drainage Improvement Plan



HI
MD
LO

PREPAREDNESS

RESPONSE

MITIGATION

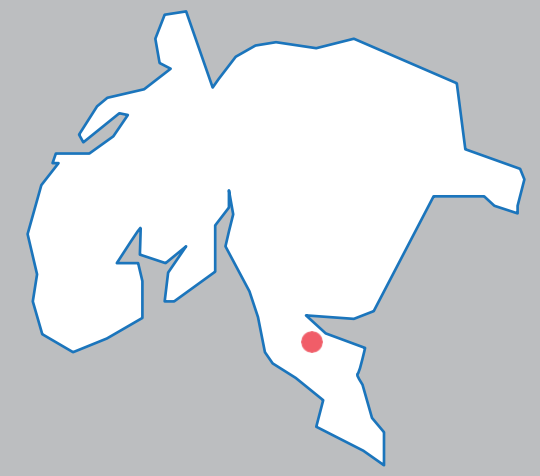
31

Mt. Victoria Rd
near Black Friars

URBAN

ADD SIGNAGE
SIGN TYPE: Flood Area
Sign

Stormwater evaluation
Culvert may help
Drainage Improvement plan



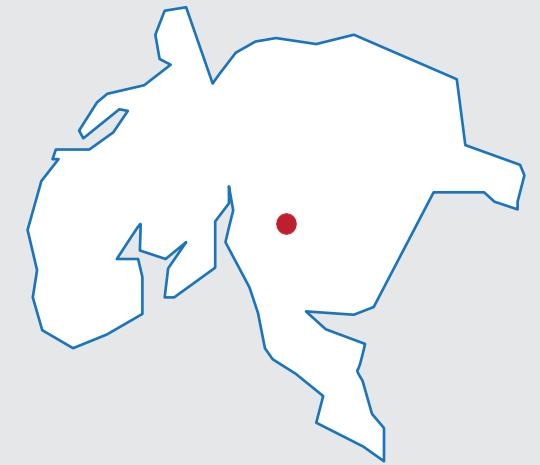
32

Bel Alton Newtown
Rd and Oriole Lane
Intersection

URBAN

ADD SIGNAGE
SIGN TYPE: Permanent Sign
with Lights

Stormwater evaluation
Culvert may help
Consider site for inclusion
in the Drainage Improvement
Plan



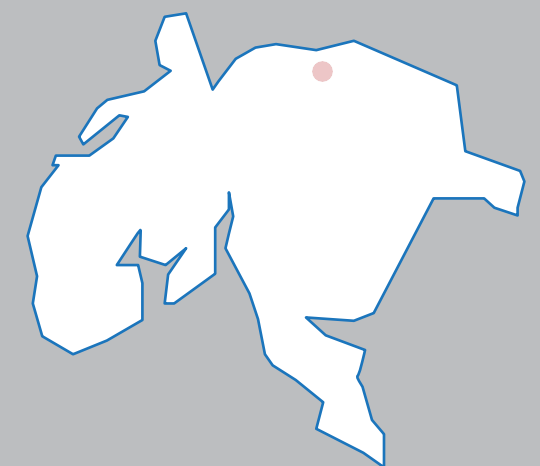
33

Westdale Dr
Townhomes

URBAN

Educate
Homeowners/HOA

Drainage Pond Needed
Idea: Use as a template for
additional drainage ponds
that do not affect a road but
impacts homes.



HI
MD
LO

PREPAREDNESS

RESPONSE

MITIGATION

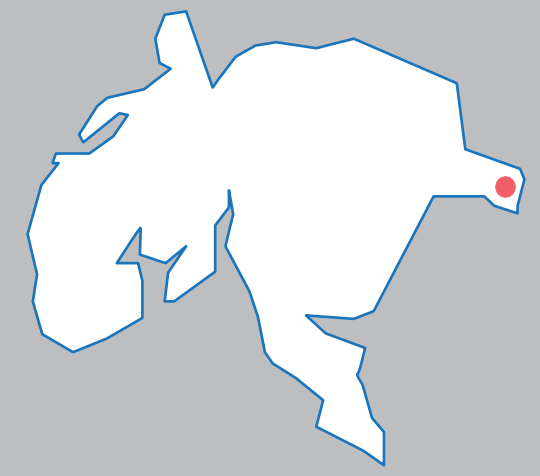
34

Area around 7825 Mill Creek Rd



NUISANCE - Patuxent River

ADD SIGNAGE
SIGN TYPE: Flood Area Sign with gauge and flashers



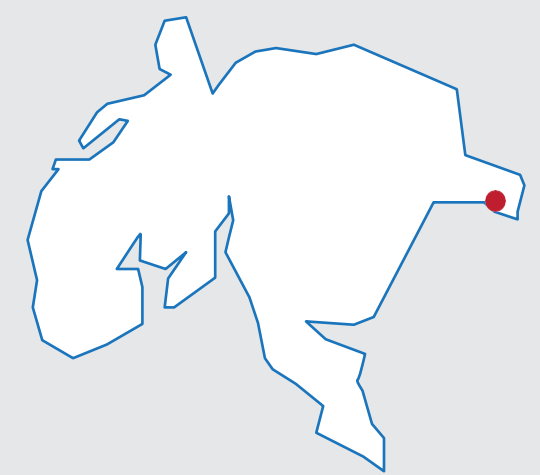
35

Mill Creek Rd after Benedict Ave Intersection



URBAN

ADD SIGNAGE
SIGN TYPE: Flood area sign with gauge and flashers



36

Dubois Rd near AG Supply Place

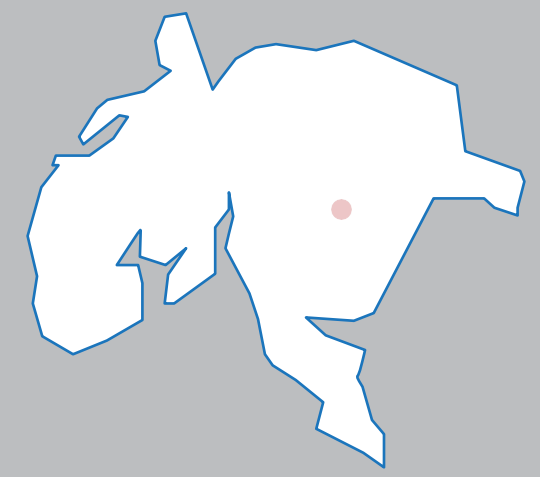


URBAN – Denton Run

ADD SIGNAGE
SIGN TYPE: Measuring Sign

Response
Barricades - fast moving water

Repairs may have been completed at this site, need to evaluate and confirm if work has been completed since 2015



HI

MD

LO

PREPAREDNESS

RESPONSE

MITIGATION

37

Billingsley Rd at
Duttons Bridge

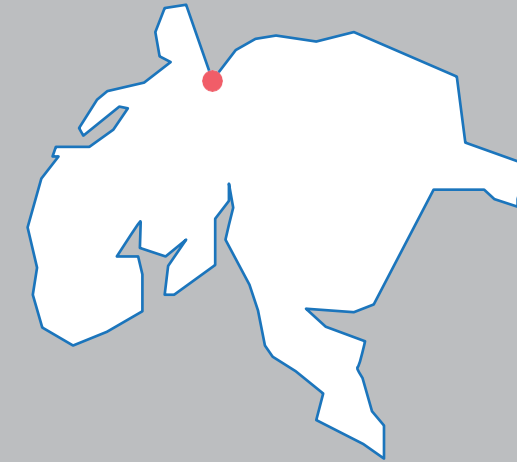


URBAN -
Mattawoman Creek

ADD SIGNAGE
SIGN TYPE: Flood area
sign with barricades

Rescue as Needed

Currently Being
Evaluated Road and
Drainage



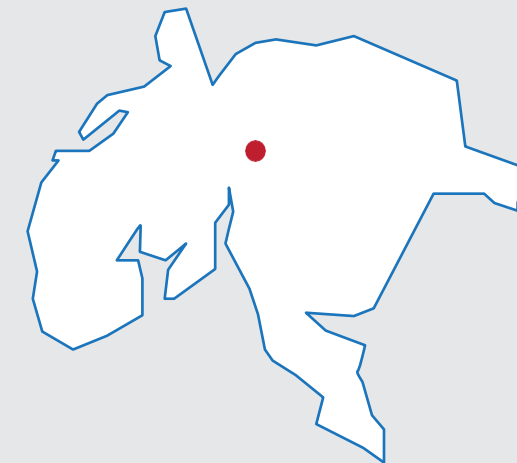
38

Mitchell Rd near
Hawthorne Rd (RT
225)



URBAN

Installation of a culvert should
fix this issue.



39

Pomfret Rd (RT
227) near
Foxburrow PI



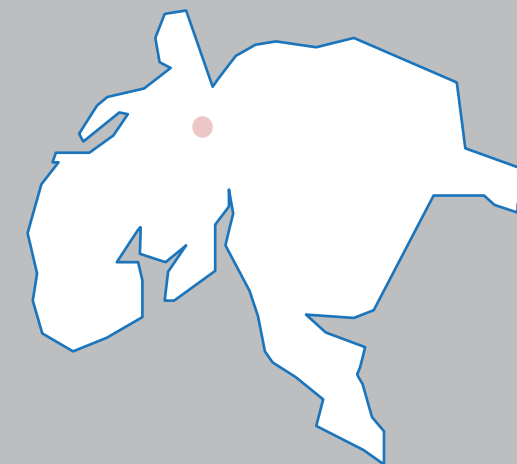
URBAN -
Mattawoman Creek

ADD SIGNAGE
SIGN TYPE: Permanent
Sign with lights

Road Closure

Community outreach
through social media

Flyers to get community
to sign-up for
emergency notifications



HI

MD

LO

PREPAREDNESS

RESPONSE

MITIGATION

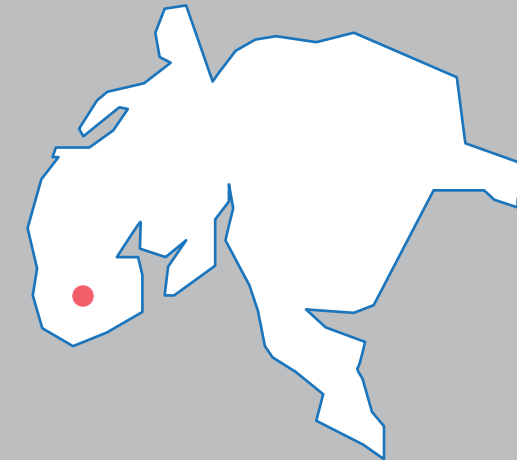
40

Port Tobacco Rd (MD 6) near Maryland Point Rd



URBAN - Nanjemoy Creek

ADD SIGNAGE
SIGN TYPE: Flood Area Sign
Mailing to Property Owners



41

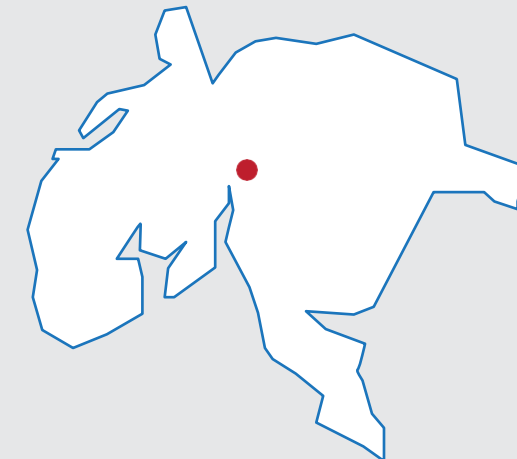
Chapel Point Rd between Causeway St and Stagg Hall



URBAN - Heavy Rain Events

Property owner outreach

Silt Fencing



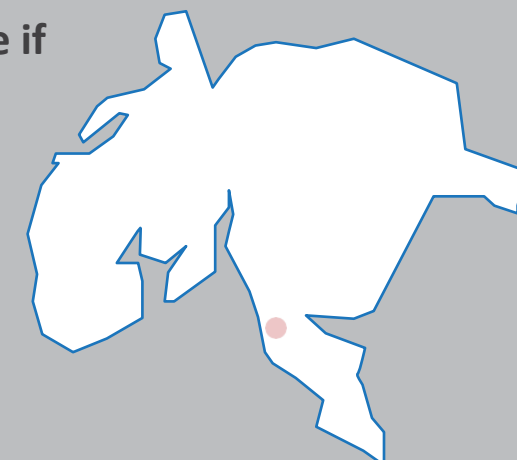
42

Clifton Dr near Ingleside Dr



URBAN - Clifton Creek

Review Clifton on the Potomac stormwater system to determine if retrofit project is needed.



HI
MD
LO

PREPAREDNESS

RESPONSE

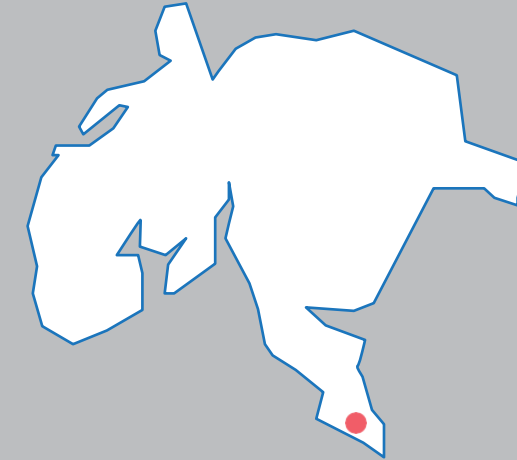
MITIGATION

43

Pine Grove Rd
- Chigger City



NUISANCE -
Neale Sound



44

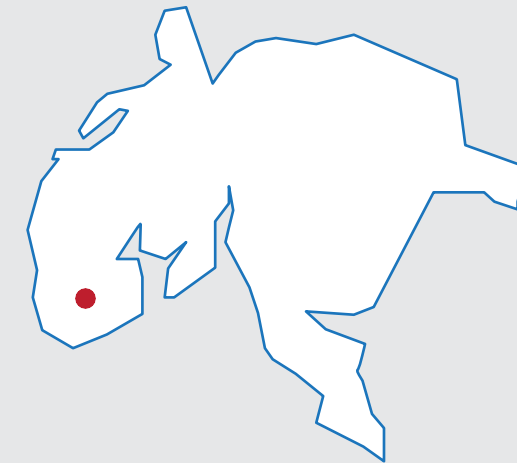
Hancock Run
Rd near Bridge



URBAN /
BEAVER
Beaverdam
Creek

Road Closure

Beaver Issue
Elevate Low Spots in Roadway



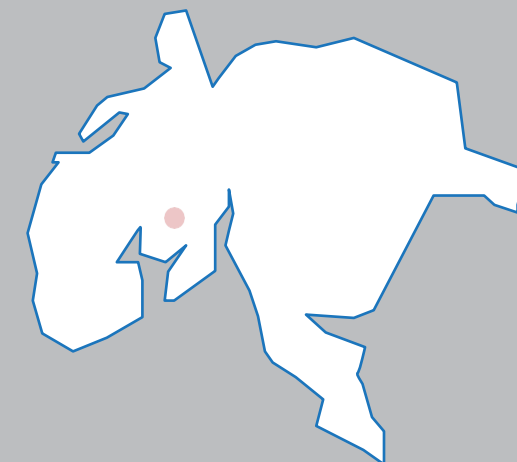
45

Mill Swamp Rd
near Port Tobacco
Rd (RT 6)



URBAN / BEAVER
Mill Run & Burgess
Creek

Beaver issues
Clean out pipes



HI
MD
LO

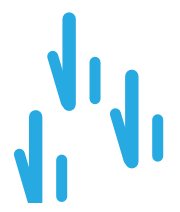
PREPAREDNESS

RESPONSE

MITIGATION

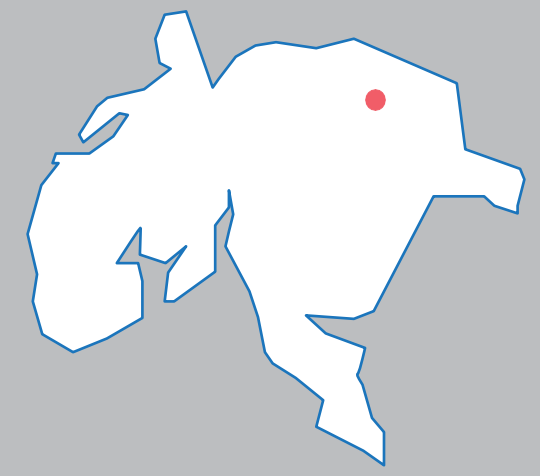
49

Popular Hill Rd near Breconridge Drive



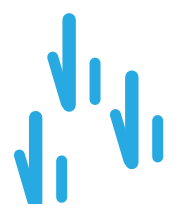
URBAN - Zekiah Swamp

Complete reconstruction of the bridge; in design phase now



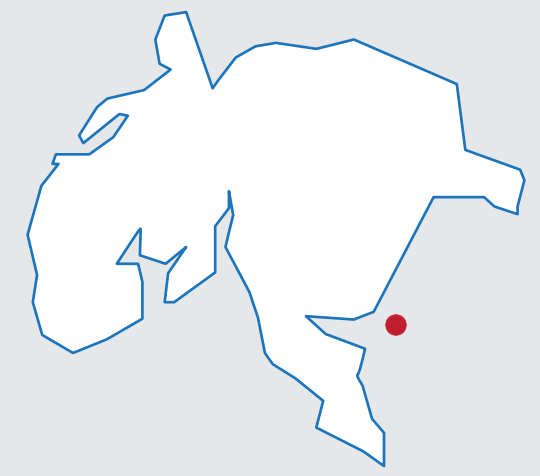
50

Brandywine Rd (RT 381) at the County Line



URBAN - Swanson Creek

ADD SIGNAGE
SIGN TYPE: Measuring



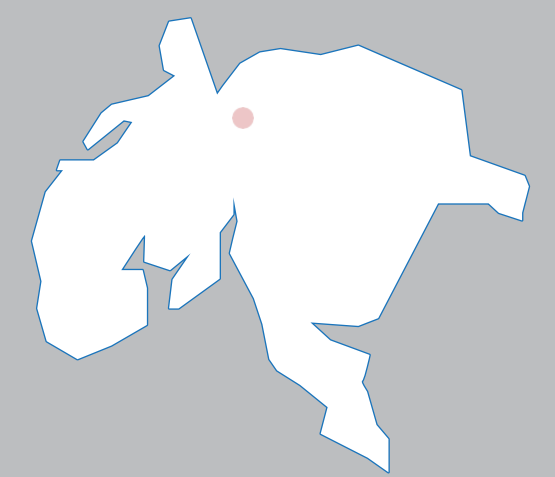
51

Bensville Rd (RT 229) just south of Indian Head Rail Trail



URBAN - Heavy Rain Events

ADD SIGNAGE
SIGN TYPE: Flash FloodSign



HI

MD

LO

PREPAREDNESS

RESPONSE

MITIGATION

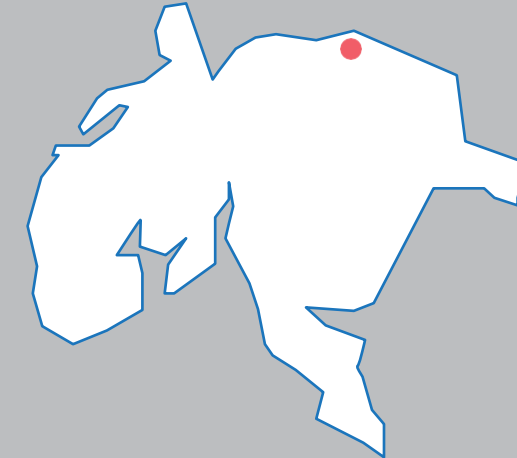
52

Mattawoman
Beantown Rd
(RT5) south
Pinefield Dr



URBAN

Stormwater Maintenance



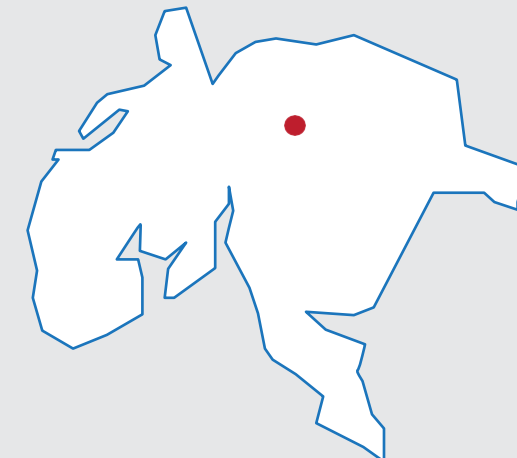
53

Kings Manor South
in White Plains



URBAN

Add to Drainage
Improvement Plan



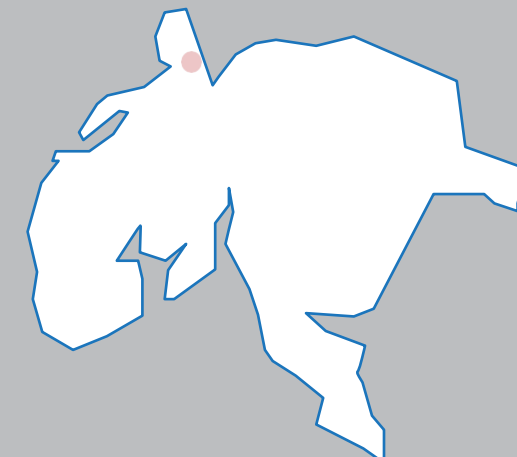
54

Strawberry Hills
Neighborhood



URBAN

Add to Drainage
Improvement Plan



HI

MD

LO

PREPAREDNESS

RESPONSE

MITIGATION

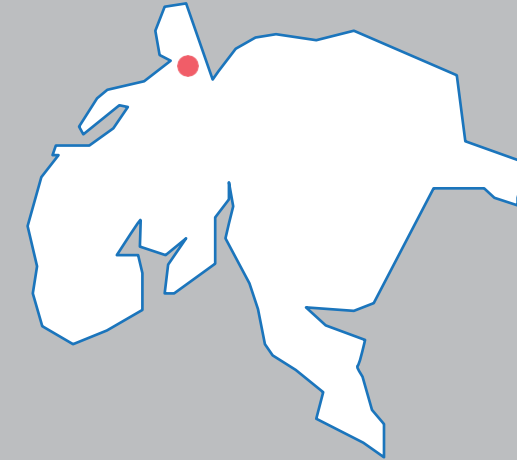
55

Marshall Hall Rd
(RT 227) near
Timber Ridge
Development



URBAN

Install Plant Material
Repair Culvert



56

Billingsley Rd
1600' east of
MD 229

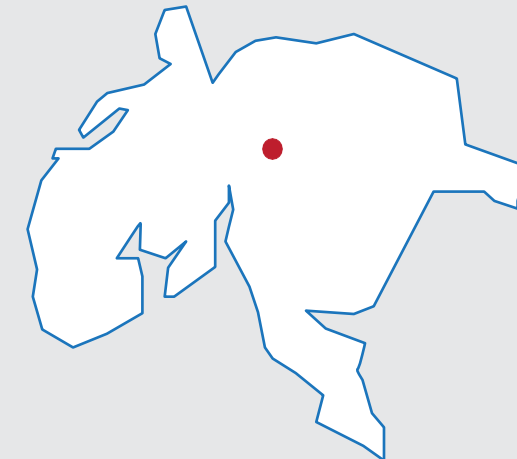


URBAN

ADD SIGNAGE
SIGN TYPE:
Warning System
Signs

Traffic Warning Signs –
Detour Signs

Investigate cause –
calculate and resize
culvert, may require
property acquisition to
clear the channel



57

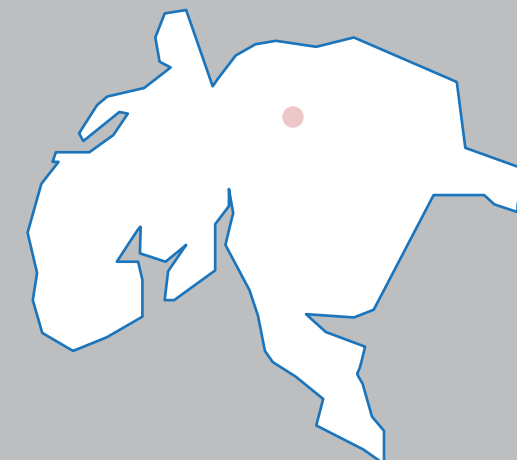
Shirley Blvd. & Mary
Drive



URBAN

ADD SIGNAGE
SIGN TYPE: Warning
System Signs

Investigate downstream
issues for the cause –
calculate and resize
culvert



Drainage Improvement Plan & Project Prioritization Criteria

Quantitative metrics were scored based on results of the preliminary design and cost estimates (e.g. impervious area treated, pollutant removal). Other metrics were scored more qualitatively based on professional judgment and assessment of each project site (e.g. access constraints, public visibility/education/outreach).

Each project was assigned a score between 1 and 5 for each metric. Projects evaluated to have the most benefit received a score of 5, and those with the least benefit were given a score of 1. Constraints were evaluated in a similar fashion such that projects with more constraints were scored a 1, and those with the least were given a score of 5. The Department Public Works will continue to work on project criteria and prioritization and will include nuisance and urban flood site identified herein within their planning framework.

Implementation & Monitoring

Nuisance and urban flood events and adaptation actions will be monitored, implemented, and documented. Table 2 within this plan will serve a guide for future actions over the course of over the next five years.

Continuous Communication with the Public

Charles County Nuisance and Urban Flooding ArcGIS StoryMap will continue to collect flood related information from the public. Additional information communicating flood hazards, ways to engage, and updates on implementation will be uploaded to the site.





In addition to the StoryMap, Maryland will be deploying the MyCoast application to document nuisance and precipitated-induced flooding, storm damage, and more. Coastal decision makers, emergency managers, and others use your reports to make better decisions. Charles County will promote the use of this application.

MyCoast

The National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS) developed the MyCoast application, which is a social media application used to document nuisance flooding and flooding after storms. NOAA and NWS partner with State agencies to tailor the app to suit the needs of the partnering agency. In Maryland, the Department of Natural Resources (DNR) is the sponsoring partner.

Once the application is downloaded onto a mobile device, users can take photographs of nuisance flooding and submit them. These submissions are called “reports.” The MyCoast application captures the time and location of the photograph, in addition to the weather and tidal conditions. This data is recorded by the application and can be downloaded. Data obtained could assist decision makers on how to address nuisance flooding.

Data collected from the application is utilized to track the occurrence of nuisance flood events and support the development of mitigation actions for areas impacted by these events. The MyCoast report data can be used to:

-  Confirm and identify new locations of nuisance flooding
-  Define the hazard (depth, duration, area covered by flooding)
-  Further refine the thresholds for when nuisance flooding will occur (in conjunction with tide data)
-  Develop mitigation strategies to reduce nuisance flooding

APPENDIX 1

NCEI STORM EVENT DATA- CHARLES COUNTY ROADWAY FLOODING EVENTS



NCEI DATA
Charles County - Roadway Flood Events

Event Type	Date	Location	Narrative/Road Name
Coastal	2/4-2/5/1998	Cobb Island	Inland flooding was less extensive in Charles and Calvert Cos, but a problem, nonetheless. In Charles Co, 25 roads were closed at the peak of the flooding. Coastal flooding forced evacuations of Cobb Island; the island was cut off from the mainland at around 0700EST on the 5th, with conditions returning to normal by 1600EST.
Flash	8/25/1999	Countywide	<ul style="list-style-type: none"> • Several portions of Action Lane near the Mattawoman Creek were closed due to high water. • The Lynnbrook subdivision in Waldorf had several homes surrounded and flooded by water, and some residents had to be rescued by firefighters. • Hamilton Drive had water flowing over it like a waterfall. • Near the intersection of Acton Lane and Highway 301 in Waldorf, water became so deep a hotel had to be evacuated.
Flood	2/2-2/23/2003	La Plata	<p>In Charles County, urban and small stream flooding was reported in La Plata and Bryans Road.</p> <ul style="list-style-type: none"> • Newton Road, • Hancock Road, • and Bumpy Oak Road were closed by high water.
Flash Flood	6/7/2006	Countywide	<ul style="list-style-type: none"> • Middletown Road, • Billingsley Road, and • Turkey Hill Road in Waldorf and White Plains. • Bryans Road and Fenwick Road experienced flash flooding. • Bumpy Oak Road and Pomfret Road in Pomfret reported flash flooding.
Flood	11/16/2006	La Plata and Waldorf	<p>Numerous roads were closed across Charles County, especially near La Plata, Port Tobacco, Bryans Road and Waldorf.</p> <ul style="list-style-type: none"> • One roadway closed due to flooding include Billingsley Road between White Plains and Bryans Roads.
Flash Flood	8/22/2009	White Plains	Turkey Hill Road was closed due to water flowing over the roadway. Spotter in the area reported rainfall total of 3.74 inches.
Coastal Flood	11/13/2009	Cobb Island	Coastal flooding was responsible for road closures in Cobb Island.
Coastal Flood	9/30-10/1/2010		<p>Several roads were closed due to tidal inundation.</p> <ul style="list-style-type: none"> • Shirley Blvd. was closed at Port Tobacco Lakes. • Saunders Marine Place was closed in Charleston Creek. • Cobb Island Road was closed on Cobb island.

NCEI DATA
Charles County - Roadway Flood Events

Event Type	Date	Location	Narrative/Road Name
Flash Flood	7/13/2011	La Plata White Plains	<ul style="list-style-type: none"> • Saint Mary's Avenue was closed due to high water. A nearby rain gage measured 1.75 inches. • Washington Avenue was closed due to flash flooding. A nearby rain gage recorded 1.50 inches.
Flash Flood & Flood	9/7/2011	Mason Springs Mattawoman & Indian Head Tompkinsville Port Tobacco La Plata Bel Alton Indian Head	<ul style="list-style-type: none"> • Route 225 was flooded and closed near Route 224. A nearby rain gauge tallied 6.13 inches. • Numerous roadways were closed due to flash flooding in Waldorf and across Charles County. A spotter in Waldorf measured 8.71 inches of rain. • Route 257 was flooded and closed at Banks O Dee Road. A nearby spotter observed 4.52 inches of rain. • Route 301 was closed at Route 6 due to flash flooding. A nearby rain gauge tallied a storm total of 7.83 inches. • Port Tobacco Road was closed between Rose Hill and Valley Roads. • Route 301 was closed at Chapel Point Road due to flash flooding. A rain gauge in the area recorded 6.91 inches. • Route 227 West was closed at Ray Drive due to flash flooding. A nearby spotter reported 5.84 inches of rain.
Flash Flood	9/8/2011	Hill Top & Ironsides	Port Tobacco Road was closed at Wards Run due to flash flooding.
Flood	12/7-12/8/2011	Grayton	Route 6 was closed at Maryland Point Road due to flooding. A trained spotter near Bryans Road observed 4.31 inches.
Flood	12/8/2011	Pomfret	Route 227 was closed between Brierwood Road and Marshalls Corner Road due to high water. A rain gauge near Waldorf totaled 4.18 inches.
Flash	8/9/2013	Dubois	Dubois Road at AG Supply Place was closed due to high water.
Flood	5/1/2014	Pomonkey	Billingsley Road was flooded and closed just east of Mattawoman Creek.
Flash Flood	8/12/2014	Mattawoman & Waldorf	There was more than six inches of water flowing over Timberbrook Drive in Waldorf.
Flash Flood	6/27/2015	Newport	Bowling Drive was closed due to high water.
Coastal	10/4/2015		MD route 257/254 at Dyer Rd was closed during consecutive high tide cycles on the 4th.
Flash Flood	7/6/2017	Newton	There was high water flowing across the roadway near the intersection of Glen Albin Road and Spring Hill-Newtown Road.
Flash Flood	8/21/2017	Dentsville	Estevez Road flooded and closed due to torrential rainfall.

NCEI DATA
Charles County - Roadway Flood Events

Event Type	Date	Location	Narrative/Road Name
Flood	2/11/2018	Indian Head	The USGS stream gauge on Mattawoman Creek near Pomonkey exceeded flood stage between 256 PM on the 11th and 1030 AM on the 12th. Several roads, including Maryland Route 227, were flooded and closed while the gauge was over flood stage.
Flood	5/18/2018	Wayside Newtown Newport	<ul style="list-style-type: none"> • Mill Run Road reported flooded and closed at Mill Run near Route 257. • Shiloh Church Road reported flooded and closed near Ditchley Prong in the Newburg area. • Springhill Newtown Road reported flooded and closed in the vicinity of Clark Run south of La Plata. • Stines Store Road and Newport Church Road are both reported flooded and closed in the area of Murphy Run and Newport Run near Wicomico.
Flood	7/22/2018	Massawoman	Pinefield Road flooded and closed near Alfred Drive.
Flood	10/11/2018	St. Charles Waldorf Ironsides	<p>Multiple vehicles were stranded in water at least knee high at the intersection of Hamlin and Garner and also at the intersection of Stone and Garner.</p> <ul style="list-style-type: none"> • MD-925 was closed due to flooding near Terrace Drive. • MD-425 Ironsides Road was closed due to flooding near MD-6 Port Tobacco Road.
Flood	10/12/2018	Patuxent Indian Head	MD-381 Brandywine Road was closed due to flooding near MD-231 Prince Frederick Road. Mattawoman Creek was out of its banks. The creek passed flood stage of 7 feet at 5:42 AM EST and crested at 7.62 feet at 9:15 AM EST. At 7 feet, Pomfret Road at Livingston Road was closed due to high water.
Flash Flood	7/8/2019	St. Charles Indian Head	<ul style="list-style-type: none"> • Wakefield circle was flooded with water up over the bottom of vehicle doors. • The water level rose to the flood stage of 7 feet along the Mattawoman Creek at Pomonkey. The water level crested at 7.43 feet at 10:00 PM EST on the 8th. At 7 feet, Pomfret Road begins to flood.

Source: National Centers for Environmental Information (1980-September 30,2019)