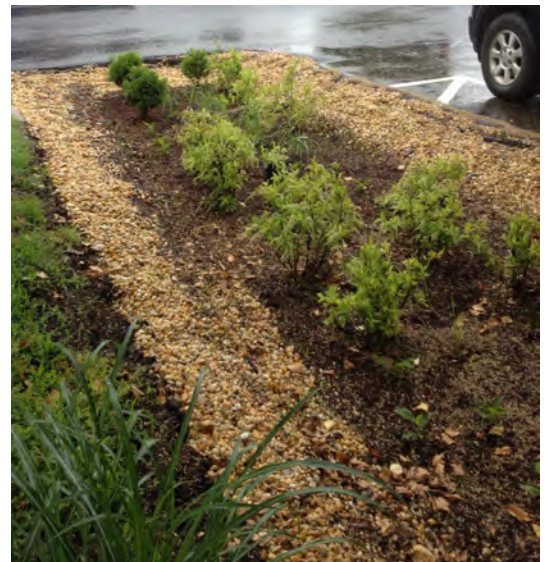




Community-Supported Flooding and Stormwater Management in St. Michaels

A Study Prepared by the Environmental Finance Center

December 2015





This project was made possible through financial support from the Chesapeake Bay Trust and the US Environmental Protection Agency completed with the teamwork of many dedicated individuals and organizations.

Cover Photo: Scenes from St. Michaels, MD, illustrative of project; Credit: UMD-EFC



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Glossary

Best Management Practice – Engineered facilities designed to treat polluted stormwater including rain gardens, rain barrels, landscape infiltration facilities, etc.

Bio-retention – The process by which contaminants and sedimentation are removed from stormwater via collection and storage in a treatment area.

Community Rating System (CRS) – A voluntary program under the National Flood Insurance Program that recognizes and encourages community actions that exceed minimum flood standards.

Duck Bill Check Valve – A technology that is placed on a stormwater outfall pipe intended to keep tidal water from back flowing into the stormwater system.

Green Infrastructure – A form of treating, conveying, and storing stormwater using natural features and processes (e.g., plants, soil, natural topography), a subset of all stormwater infrastructure.

Hard Infrastructure – A form of conveying and storing stormwater using manmade materials (e.g., concrete, PVC pipe, etc.), a subset of all stormwater infrastructure.

Nuisance Flooding – Minor, recurrent flooding that can occur as a result of precipitation or tidal events and is expected to worsen with sea level rise.

Rain Barrel – A barrel approximately 50-70 gallons in size attached to the downspout of a building intended to store and/or treatment stormwater.

Rain Garden – An area with a shallow depression planted with deep-rooted native plants that is intended to collect, store, and treat stormwater.

Shoreline Infrastructure – Engineered and natural structures interfacing with the waterfront designed to control flooding and facilitate connectivity between the water and land.

Stormwater Infrastructure (aka Stormwater System) – The entire collection and interconnection of facilities designed to convey, treat and store stormwater.

WeTable – A technology that allows a computer screen to be projected on a table enabling multiple users to interact with the projection via writing and notes.

Executive Summary

The Town of St. Michaels was developed in the 1770s as a working waterfront community. St. Michaels is bound by water to the east and west making it an ideal area for shipbuilding, fishing and other maritime commerce in the 1800s. Today, St. Michaels pays homage to its' waterfront heritage while recognizing the need to adapt to flooding and stormwater challenges, driven in large-part by climate change.

The Town's base flood elevation of 5.7 feet exposes community assets to periodic nuisance flooding from severe precipitation, tidal events, and less frequently, storm surge. St. Michaels experiences flooding on waterfront parcels, low-lying areas, and in streets and parks. From 2010 to 2012, the community experienced particularly severe flooding on Talbot Street as a result of heavy rain events, an underperforming stormwater conveyance system, and tidal backflow washing into the storm drains. The flooding resulted in road closures and property damage. St. Michaels recently invested in stormwater management projects throughout the town, works closely with property owners on stormwater best management practices, and communicates regularly with the State Highway Administration on storm drain maintenance on Talbot Street. A renewed focus on these efforts have yielded a noticeable reduction in the frequency and severity of flooding occurrences in St. Michaels in the past three years, and has likely contributed to water quality improvements in adjacent waters.



Figure ES.1. Photos emblematic of stormwater management in St. Michaels (L: Recently installed stormwater management facility on Carpenter Street; R: Talbot Street with melting snow)

The St. Michaels community is in the driver's seat and desires proactive solutions that will give the community control over a problem that has the potential to be debilitating for residents and the local economy. Looking forward, the Town of St. Michaels will need to make important investment decisions related to flooding and stormwater management. St. Michaels is in the position to continue to build on and expand the good work already done through long-term public infrastructure planning, routine maintenance, and adaptation to residential and private properties.

The purpose of this study was to capture the experiences and attitudes of the St. Michaels community on flooding and stormwater events to formulate a cohesive and implementable guide for mitigating these events in the Town.

Study Goal and Objectives

Goal: Facilitate a process of community input and fact gathering to provide the Town of St. Michaels with a clear, community-supported vision for reducing the severity and frequency of high water events and for cleaning local waterways.

Study objectives include:

- 1 Characterizing high water events including their location, magnitude of flooding, the drivers of flooding, and resident attitudes;*
- 2 Reviewing stormwater and coastal infrastructure history, budgeting, and planning;*
- 3 Evaluating potential engineering, policy, and financing solutions; and,*
- 4 Providing recommendations and implementation resources to St. Michaels.*

Background and Approach

In January 2015, the Environmental Finance Center at the University of Maryland received a grant from the Chesapeake Bay Trust to conduct a community-supported assessment of flood and stormwater problems and potential responses in the Town of St. Michaels. This study presents the findings and recommendations of the one-year project.

The project approach included the following elements:

- The St. Michaels Stormwater and Flood Management Task Force was a network of stormwater and flood management practitioners convened to ensure the project direction was guided by the Town and other project partners that could support implementation (i.e., Eastern Shore Land Conservancy, Town Engineer, staff from Maryland Critical Area Commission, and Maryland Sea Grant Extension).
- Public input was actively sought through two neighborhood stormwater meetings, a business breakfast, and interviews with Town officials, residents, and businesses. Activities including discussion, mapping exercises, and an in-person and online survey provided avenues for community engagement.
- In addition to public input, education and outreach to the St. Michaels community was a central priority. A Summer Stormwater Educational Series included a ribbon cutting ceremony for the new Carpenter Street landscape infiltration facility followed by a rain barrel workshop and two events hosted by Environmental Concern, Inc. focused on providing St. Michaels residents with tools to manage stormwater on their properties.

- To provide the Town of St. Michaels with tools and resources for implementing the recommendations of this study. The implementation resources are presented as a set of 9 exhibits (see Table ES.1) and include resources such as grant resources for financing green infrastructure and an on-site green infrastructure maintenance-training workshop for St. Michaels Department of Public Works staff.

Summary of Findings

1. The Town experienced severe precipitation-driven flooding on Talbot Street and adjacent areas between 2010-2012. **As a result of recent capital improvements in Muskrat Park and town-wide street rehabilitation, as well as assistance from the State Highway Administration in clearing the culverts along Talbot Street, recent flood events have been less severe and frequent on Talbot Street and adjacent streets.**
2. Among the 30 residents and businesses that participated, there were two key messages: (1) Flooding on Talbot Street and along the shoreline is a moderate to serious concern, and (2) Residents want technical and financial resources to help manage water on their property (see Exhibit A). **The amount of community feedback was limited, which is a positive result suggesting flooding and stormwater are relatively minor issues within the St. Michaels community.**
3. Managing for water *quality* is a strength of St. Michaels as demonstrated by the Town exceeding the requirements of both the Talbot County mini-WIP and Critical Area Ordinance implementation. **Where additional opportunities remain for the Town is in managing water *quantity* at the shoreline and inland. The Town is encouraged to implement green infrastructure practices to manage for both stormwater quality and quantity.**
4. St. Michaels is constrained by poorly draining soils, a high water table, small lot sizes, the historic nature of the community (e.g., many homes lack downspouts), and significant build out of the Town. Many of the best practices for managing stormwater are not suitable in St. Michaels due to the constrained environmental conditions. **Going forward, the Town will need to respond creatively with targeted, case-by-case solutions.**

High Level Recommendations and Resources

1. **Stay ahead of the curve; devote effort to the issue before it worsens.**
 - a. Preventive maintenance will always be less expensive than reactive crisis management in the face of emergency situations.
 - b. *“By the time most people think [nuisance flooding] is a problem, it is too late.”* – St. Michaels resident

2. **Invest for nuisance flooding, prepare for catastrophic flooding.**
 - a. St. Michaels can indirectly influence the frequency and severity of nuisance flooding through stormwater and shoreline infrastructure projects and regular maintenance.
 - b. To markedly reduce risk from low frequency, high-impact storm events the Town will need to navigate significant expense and likely alterations to the character of the community. The best near-term risk management approach as it relates to catastrophic storm events is to focus on emergency preparedness, communications plans, resident safety, and land use planning.
3. **Focus on green infrastructure as the key tool for managing stormwater and flooding.**
 - a. Green infrastructure uses nature-based solutions to address water management. If properly designed and sited, green infrastructure has the potential to be less expensive, smaller in scale, and more flexible than conventional stormwater infrastructure. Some benefits of a green infrastructure applicable for St. Michaels are neighborhood beautification, water quality, and water storage.
 - b. A green infrastructure approach positions the Town for more grant support and greater opportunities for leveraging volunteers, low-cost technical assistance, and other resources for stormwater management (see Exhibit D).
4. **Prioritize regular cleaning and maintenance of stormwater and shoreline infrastructure.**
 - a. Routine maintenance is generally important to accommodate regular weather events and is particularly important after severe weather, which can overflow debris and sediment into stormwater channels.
 - b. The Town of St. Michaels should prioritize training for green infrastructure maintenance, and otherwise support a process to evaluate and maintain the Town's stormwater system and green infrastructure facilities to ensure they perform as intended (see Exhibit E).
5. **Focus on the Talbot Street drainage area, shoreline infrastructure, and residential stormwater management.**
 - a. Investments in capital improvements and maintenance can further reduce nuisance flooding on Talbot Street and should be prioritized. Despite the recent investments and noticeable improvements along Talbot Street, the area still experiences standing water after during typical rain events and it is a critical commercial area with foot and vehicle traffic. It remains a top priority for residents and businesses.
 - b. Additionally, there are investments at the shoreline and on residential properties that can alleviate nuisance flooding in hotspots along waterfront properties and other inland areas of St. Michaels. For

example, living shorelines and native plants can retain tidal water and in turn reduce the risk of encroaching water and property damage.

6. **Encourage residents to accommodate stormwater with minor green infrastructure practices on private properties; facilitate by connecting them with technical and financial resources.**
 - a. There are not enough public spaces left in St. Michaels nor sufficient public funds to drastically improve water quantity management on public space alone. It is critical that the Town leverage resident interests in managing water on their private property.
 - b. Encourage green infrastructure on private property by connecting residents to experts and financial resources where possible. Clarify stormwater best management practices for residential properties by working with technical experts such as the Town’s Engineer, Critical Area Commission, Master Gardeners and Sea Grant Extension.

Table ES.1. Exhibits of implementation resources, project documents, and other related resources for the Town of St. Michaels.

Exhibit Name
<i>Exhibit A</i> – Annotated Maps with Feedback from St. Michaels Community
<i>Exhibit B</i> – Existing Green Infrastructure Facilities in St. Michaels: Map + Photos
<i>Exhibit C</i> – Prospective Green Infrastructure and Stormwater Facilities in St. Michaels: Map + Analysis + Photos
<i>Exhibit D</i> – Grant Resources for Financing Green Infrastructure and Stormwater Management Projects in St. Michaels
<i>Exhibit E</i> – Green Infrastructure Maintenance Training Workshop, a workshop from the Maryland Sea Grant Extension
<i>Exhibit F</i> – National Flood Insurance Program’s (NFIP) Community Rating System (CRS): A Checklist and Program Overview
<i>Exhibit G</i> – St. Michaels Stormwater Management Tools: A Resource for Property Owners
<i>Exhibit H</i> – Four Maps of St. Michaels Physical Environmental Attributes (i.e., depth-to-water table, drainage type, soil conditions, and water storage capacity)
<i>Exhibit I</i> – Outreach material and media coverage from the St. Michaels Community-Supported Stormwater and Flood Management Project

Study Overview

Chapter 1 presents project background and discusses the process for gathering feedback from the community, as well as education and outreach efforts. Chapter 2 presents findings including characterization of the stormwater and flooding issue in St. Michaels and discussion of stormwater infrastructure. Finally, Chapter 3 presents recommendations including both high-level guiding principles, and more specific solutions for improving stormwater and flooding issues in St. Michaels.

Chapter 1 – Background and Process

In November 2014, the University of Maryland Environmental Finance Center (EFC) approached the Town of St. Michaels about conducting a community-supported stormwater and flood management study. St. Michaels seemed a good candidate for this type of study due to the community's ongoing flooding and stormwater events, and the similar environmental conditions between St. Michaels and the Town of Oxford, where EFC had recently completed a stormwater and flood management financing study in 2013.¹ EFC staff felt they could add value to the Town of St. Michaels by initiating a process of community engagement and analysis around the Town's stormwater and flooding situation. In January 2015 with the Town's backing, EFC was awarded a \$45,000 grant from the Chesapeake Bay Trust to conduct a community-supported stormwater and flood management study in St. Michaels.

Study Goal and Objectives

The goal of the study was to *facilitate a process of community input and fact gathering to provide the Town of St. Michaels with a clear, community-supported vision for reducing the severity and frequency of high water events and for cleaning local waterways.* The study focused on public perceptions of flooding and stormwater management in the community, infrastructure performance, and investment strategies capable of ensuring the Town's infrastructure is meeting the level of service expected by residents. This study should be viewed as an important prerequisite to guide future implementation practices and the prioritization of capital improvement projects designed to manage stormwater and flooding.

Important notes about what this study is not:

1. **This is not an engineering study.** EFC specializes in program and policy analysis, community infrastructure financing, and community engagement and outreach. EFC is not an engineering firm. EFC intends to offer an independent assessment of need as it relates to current planning and financing.
2. **This does not provide a set of solutions for individual properties.** While EFC is interested in the experience of private property owners, which we have documented in this study, we are unable to diagnose problems and prescribe solutions on individual properties. EFC's focus is on stormwater solutions that improve public spaces and clarifying the role of the Town as it relates to assisting private property owners.
3. **The study recommendations were not pre-determined.** EFC takes the community feedback process seriously and strives to ensure this feedback drives the outcomes and recommendations. EFC does not recommend particular solutions (e.g., stormwater utilities) unless we perceive them as necessary and appropriate for a community based on the facts gathered during the study period.

¹ Available online at: <http://efc.umd.edu/oxford>.

It was the intent of EFC to provide the Town of St. Michaels with a menu of solutions and guiding principles for how it should allocate resources to better manage stormwater and flooding. The Town of St. Michaels and its residents are the central audience for this study. The recommendations are grounded in feedback from the community in the best judgment of EFC.

The study looks exclusively at the incorporated Town of St. Michaels. State and County entities with an important role in the Town are discussed (i.e., State Highway Administration and Talbot County), but the findings and recommendations are targeted at the Town of St. Michaels and its residents. Finally, the recommendations of the study are not overly technical in an engineering sense, but address programmatic, policy, and financing dimensions to better managing stormwater and flooding in the community.

Within the framework outlined above, the study included four specific objectives:

- 1 Characterize high water events including their location, magnitude of flooding, the drivers of flooding, and resident attitudes;*
- 2 Review stormwater and coastal infrastructure history, budgeting, and planning; and,*
- 3 Evaluate potential engineering, policy, and financing solutions.*
- 4 Provide recommendations and implementation resources to the Town of St. Michaels.*

The study looks exclusively at the incorporated Town of St. Michaels. Important outside actors including the State Highway Administration and Talbot County are discussed, but the findings and recommendations are targeted at the Town of St. Michaels and its residents. Finally, the recommendations of the study are not overly technical in an engineering sense, but address programmatic, policy, and financing dimensions to better managing stormwater and flooding in the community.

Within the framework outlined above, the study included four specific objectives:

- 5 Characterize high water events including their location, magnitude of flooding, the drivers of flooding, and resident attitudes;*
- 6 Review stormwater and coastal infrastructure history, budgeting, and planning;*
- 7 Evaluate potential engineering, policy, and financing solutions; and,*
- 8 Provide recommendations and implementation resources to the Town of St. Michaels.*

Project Approach

EFC's approach to the project emphasized the following elements:

- Engage St. Michaels' officials, the Town's engineer, and other technical experts working in the region via the St. Michaels Stormwater and Flood Management Task Force (see Table 1). The role of the Task Force was to: (1) Guide the project direction to ensure it was adding value for the community,

- and (2) Establish a network of technical experts that can coordinate efforts and are vested in the St. Michaels community beyond the life of the study.
- Foster community input through neighborhood meetings, mapping exercises, surveys, and one-on-one interviews with stakeholders.
 - Generate actionable recommendations for the Town of St. Michaels based on community feedback, input from the Task Force, and judgment of EFC, and support recommendations with implementation resources as appropriate (see list of exhibits).
 - Give back to the community by connecting the Town of St. Michaels and its residents to technical, financial and educational resources.

Table 1. St. Michaels Stormwater and Flood Management Task Force Members

Organization	Representatives	Responsibilities
University of Maryland Environmental Finance Center	Sean Williamson (Program Manager); Jennifer Cotting (Research Associate)	Project management, coordination, and analysis.
Town of St. Michael's	Debbie Renshaw and Sarah Abel (Planning and Zoning Officer); Jean Weisman (Town Manager); Jeff Richardson (Public Works Director); Roy Myers (Commissioner, Town of St. Michaels)	Provide data on past and future stormwater plans, connect EFC to Town Officials and residents, share reports/plans/project information as appropriate.
Eastern Shore Land Conservancy	Brian Ambrette (Coastal Resilience Specialist)	Provide assistance with designing community engagement process, help facilitate community meetings, and compose/review final products as appropriate.
State of Maryland – Critical Area Commission	Alexandra DeWeese, Jennifer Anderson, and Kate Charbonneau (Critical Area Commission Staff)	Provide assistance with designing community engagement processes, participate in task force and community meetings, answer questions related to the Critical Area Commission regulations.
Town Engineer	Ben Taylor (Stormwater Engineer with Davis, Bowen, Friedel)	Technical guidance and infrastructure expertise.
University of Maryland Sea Grant Extension	Eric Buehl (Regional Watershed Restoration Specialist)	Technical guidance and education and outreach.

In February 2015, EFC convened the kickoff meeting of the St. Michaels Stormwater and Flood Management Task Force (see Table 1 above). The Task Force reviewed the project work plan, helped EFC to establish important connections in the community, and discussed flooding and infrastructure history in St. Michaels. The Task Force assisted EFC in setting up community meetings in the early spring. Recognizing there were vocal property owners and businesses at the onset of the study, the Task Force directed EFC to specific residents and businesses for one-on-one interviews, which were conducted throughout the duration of the project.

Community Feedback

Neighborhood stormwater and flooding meetings were held at the St. Michaels branch of the Talbot County Public Library on March 30 and April 13, 2015. The target audience was the St. Michaels community including residents businesses and visitors. The goal of the meetings was to generate discussion about experiences, concerns, and attitudes towards stormwater and flooding in St. Michaels. Both meetings were advertised on the Town website, via Task Force members, and via printed flyers distributed throughout Town. The April 13 meeting was advertised in the Star Democrat and reported in a subsequent print.²



Figure 1. Photos from the St. Michaels Neighborhood Stormwater and Flooding Meetings

In-depth Feedback

For a comprehensive look at the feedback from the community see Exhibit A – Annotated Maps with Feedback from the St. Michaels Community.

² Bollinger, J. 2015. *St. Michaels seeks flooding solutions*. April 13, 2015. The Star Democrat. Available online at: http://www.stardem.com/news/environment/article_bb5ca855-cf81-5bac-8ae4-15132b6ede44.html.

Each meeting had about 15 attendees (30 total) including business owners, residents, Town of St. Michaels officials, and others not directly affiliated with the Town of St. Michaels. EFC engaged attendees by various means including discussion, written responses, and flagging flooding and stormwater issues on printed and digital maps. The meeting agendas included:

- Introduction to EFC and the Stormwater Task Force;
- Background on the community-supported stormwater and flood management study;
- A facilitated discussion with attendees about their experiences and observations around stormwater management and flooding;
- A brief survey (see Table 2 and Exhibit I);
- A mapping exercise whereby attendees were invited to place dots on maps describing where flooding and stormwater problems occur (see Exhibit A);
- A solution exercise where attendees responded and reacted to potential engineering, policy, and financing solutions (see Table 2);

Interaction with a digital mapping/drawing tool coordinated by Maryland Sea Grant where attendees could zoom in to specific properties in Town on Google Earth to describe site specific flooding and stormwater issues (see Figure 2 below).

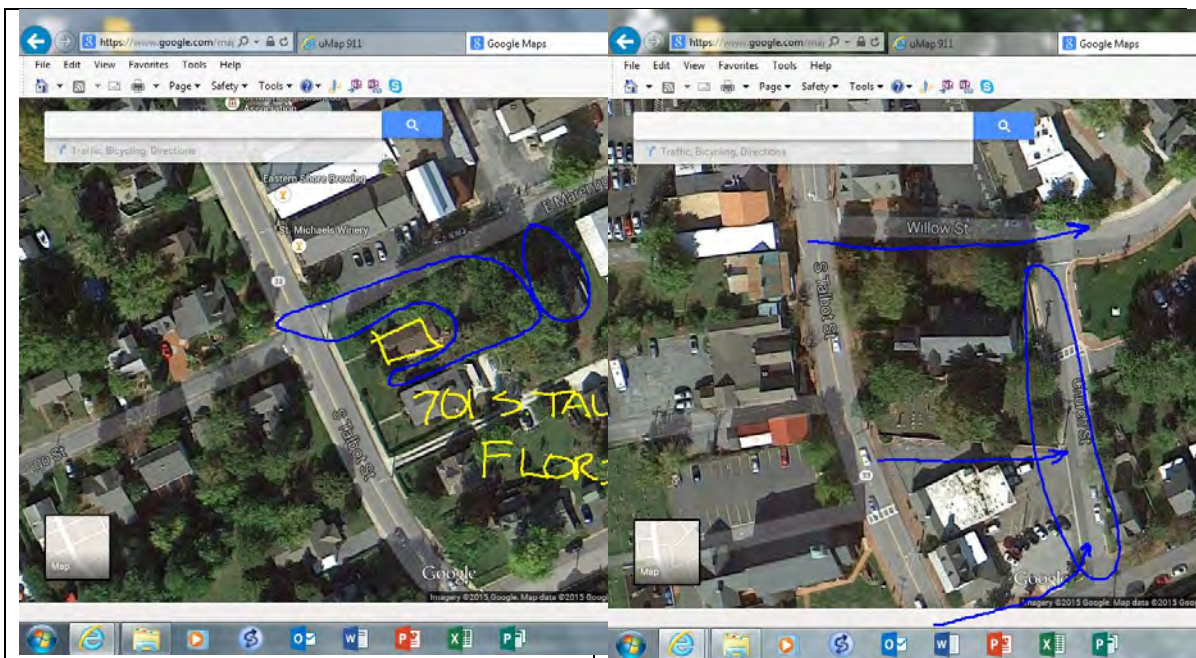


Figure 2. Sample Google Earth responses via "WeTable" tool captured during the Neighborhood Meetings (L: Property at Talbot and Marengo describing standing water; R: Description of stormwater flow and flooding towards Church Street from Talbot St).

In addition to the community meetings, special attention was placed on St. Michaels businesses because of the history of stormwater and nuisance flooding on the Town's commercial thoroughfare – Talbot Street. EFC held a June 5 business breakfast to discuss stormwater and flooding with business owners and tenants. The event, held on a Friday morning at the library, was poorly attended with just

one business owner represented. Two weeks prior, EFC and a project partner from the Eastern Shore Land Conservancy walked Talbot Street door-to-door and handed out event notifications to businesses. The St. Michaels Business Association was also invited to participate and represent business owners' flood and stormwater concerns. Notwithstanding the poor turn out at the June 5 event, EFC was able to get valuable feedback from business owners via interviews.

What was the level of participation at these community events?

Despite sincere attempts at recruiting the St. Michaels community to participate in this study, attendance was limited. Meeting attendance, especially the business breakfast, was low and the amount of feedback limited. The minimal attendance could be attributed to the timing of the events (i.e., Monday evenings in the spring). An online survey was developed to further engage St. Michaels' part-time residents, but yielded only four responses. A possible explanation for the limited participation is that stormwater and flooding is simply not perceived to be a major issue in the community or flooding is isolated to just a handful of properties at the present time. Although the amount of feedback was limited, the community participation process was integral; those who were able to participate provided important insights.

The St. Michaels stormwater and flooding survey and the solution exercise during the open community meetings yielded good community feedback from those that attended (see Table 2 below). However, it is important to acknowledge the limited number of responses from the community (detailed in text box above), as well as the fact that results may be biased by those who elected to participate. As a result, EFC has exercised caution in how it applied community feedback to the final recommendations for the Town of St. Michaels.

Table 2. Summary of survey and solution mapping results (not inclusive of all results)

Survey Results	Solution Mapping Results*
<ul style="list-style-type: none"> • Number of responses = 26 total (22 in-person and 4 online); • 19 residential, 3 commercial, 4 not indicated; • 18 respondents said stormwater and flooding on their <u>personal property</u> is a serious to moderate concern; • 26 respondents said stormwater and flooding on <u>public property</u> is a serious to moderate concern; • 19 respondents said Talbot Street is the road most impacted by stormwater; • 8 respondents said neither flood frequency nor volume have increased in the past few years, 5 said both flood frequency and volume has increased in the past 5 years; • Among investment options for managing flooding, 15 respondents said the Town should invest in stormwater control measures to reduce road flooding. • 13 respondents said they were neutral towards contributing financially towards stormwater mitigation measures in the Town and would need more information. 	<ul style="list-style-type: none"> • We need educational and financial resources to help private property owners = 7 votes; - <i>“Absolutely!”</i> • We can raise funds with grants and donations = 3 votes; • It is not a critical situation, current spending on infrastructure is fine = 2 votes; - <i>“By the time most people think its critical, its too late”</i> • We need to focus on public stormwater infrastructure = 2 votes; • We need to focus on coastal infrastructure + tidal storm surge flooding = 2 votes; - <i>“High tides are higher than ever”</i> • We should invest in soft infrastructure like living shorelines and bioswales = 1 vote; - <i>“Not sure that works”</i> • We should invest in hard infrastructure like bulkheads and stormwater pumps = 1 vote; • We need a fee in place to pay for public projects = 0 votes

* The solution mapping exercise presented eight potential solutions or responses to the nuisance flooding in St. Michaels. Participants were invited to react or respond to these eight proposals with comments of their own mapped from the original comment on a large piece of butcher-block paper, and/or placement of dots, which serve as votes of agreement with the solution.

Outreach and Education

Responding to one of the major points of feedback from the St. Michaels community, EFC coordinated a summer education series on the topic of stormwater management for residential solutions. The goal of the education series was to connect residents and property owners with content experts through local workshops and materials (see Figure 3). The series included three events, advertised via printouts distributed in the community and online via the Town website, the Talbot Spy, and the Star Democrat. The three events were advertised as follows (see also Exhibit I):

- Saturday, June 27, 2015 – Stormwater Awareness Day
Carpenter Street Bio-Retention Ribbon Cutting and Rain Barrel Workshop**

Join your neighbors in helping the Town of St. Michaels usher in a recently completed bio-retention facility in the Town parking lot behind the Carpenter Street Saloon. Following the ribbon cutting ceremony, experts from Maryland Sea Grant Extension conducted a workshop on buying, installing, and maintaining rain barrels. Two residents are eligible to win a free barrel! *This event is brought to you by the Town of St Michaels and the Watershed Restoration Specialists of Maryland Sea Grant Extension.*
- Tuesday, July 21, 2015 – Rain Garden Landscaping for Stormwater Storage**

Learn how rain gardens can be used to address issues with flooding from stormwater. This event will introduce rain gardens with a focus on their benefits to the environment and private property. Participants will leave with the basic knowledge of how rain gardens are designed, created and maintained. *This event is brought to you by Environmental Concern Inc.*
- Saturday, September 12, 2015 – Native Plants for Cleaner Water**

Discover the basics of native plant selection to “bayscape” your lawn and clean the bay. Participants will learn how to plant and maintain native plants in their landscape. Recommendations will be made for native plants that are best suited for stormwater management and for attracting songbirds and butterflies to your garden. Plants will be available for sale at the Fall Native Plant Sale. *This event is brought to you by Environmental Concern Inc.*



Rain barrel workshop on June 27, 2015 –
Credit: Bruce Cotting



Native plants for cleaner water on
September 12, 2105 – *Credit: Sarah Abel*

Figure 3. Photos from the St. Michaels Summer Education Series on Stormwater Management

The June 27 stormwater awareness event was not well attended, likely due to the rain. More residents were interested in the rain garden and native plant workshops, with approximately 10-15 participants in attendance at each workshop. The series would not have been possible without assistance from Eric Buehl, the Maryland Sea

Grant Watershed Restoration Specialist serving the upper shore, and staff from Environmental Concern, Inc.

In addition to providing educational opportunities to residents, the Task Force and EFC determined it would be worthwhile to assist the Town of St. Michaels with supplies and training related to stormwater management best practices. Specifically, in the spring of 2016, the Town will install rain barrels on public buildings at the Town office, two public restroom facilities in Town and the St. Michaels Community Garden. These rain barrels have been purchased using project grant funds. The Town will also hold a green infrastructure maintenance training for public works staff in the spring of 2016 to improve the performance of existing facilities. To that end, a portion of the project grant award went towards supplies to conduct the training. Installation of stormwater management best practices and training will be coordinated by the Town and University of Maryland Sea Grant Extension staff in the spring of 2016 (see Exhibit E).

Project Outputs

EFC produced the following outputs under the St. Michaels community-supported stormwater and flood management project:

- **Developed and distributed outreach material for engaging residents and businesses in stormwater and flood management.** Event flyers, advertisements (printed and online), educational workshops, giveaways, an online survey, in-person recruiting, and other steps were taken to boost community engagement on the issue. These efforts are discussed further below and sample documents can be found in Exhibit I.
- **Held a series of community meetings to generate discussions on stormwater and flooding issues.** Three meetings were held in the spring of 2015 to collect input and data from the public.
- **Organized the St. Michaels Summer Stormwater Education Series.** Three educational events were held to create public awareness around flooding and stormwater management solutions for private properties in St. Michaels.
- **Completed a report with findings and recommendations intended to improve stormwater and flood management in St. Michaels.** To be presented to the Commissioners of St. Michaels in the early Spring of 2016 for possible adoption as a guiding document for flooding and stormwater solutions in St. Michaels.
- **Provided a set of resources to help St. Michaels kick-start implementation of the recommendations.** See Exhibits A-I including information on summer stormwater educational series and a green infrastructure maintenance training.
- **Presented findings and recommendations to the Town of St. Michaels.** Presentation to the Commissioners of St. Michaels on October 14, 2015.

Chapter 2 – Findings and Discussion

The Town of St. Michaels sits adjacent to the Chesapeake Bay between the Miles River and San Domingo Creek. Compared to neighboring Tilghman Island and Oxford, St. Michaels is relatively sheltered from the Bay due to its mid location on the Bay Hundred peninsula. Nonetheless, much of the Town is situated on low-lying land with a longstanding history of high water events including both severe flooding during emergency conditions and moderate flooding due to heavy precipitation and high tides. Precipitation happens year round in St. Michaels, and is most concerning due to standing water on the roads and ditches in Town. The most common time of year for tidal flooding is in the fall season in St. Michaels. The average elevation in the Town is 10 feet above mean high water with the high point in Town running along Talbot Street at 12 feet above mean high water.³ Understanding the different types of high water events and what causes them is critical to informing decision-making as it relates to capital improvement investments, planning, and disaster preparedness.

In the case of low-probability, high-consequence severe flooding from a major hurricane, there is little St. Michaels can do to reduce the impact to public and private property without significant expense and alterations to the community character, and the priority should be to focus on emergency preparedness and evacuation. It is not prudent for the St. Michaels community to seek out capital improvement investments that will eliminate the risk of flooding and protect *all* property. On the other hand, medium-probability, medium-impact nuisance flood events may be managed through cost-effective and proactive capital improvement investments, which is the focus of this study.

What capacity does the Town of St. Michaels have to influence nuisance flooding? Residents are quick to point out physical constraints including the Town's low elevation, poorly draining soils, and high water table. In addition, there are many cultural constraints – part-time residents, narrow streets, historic homes, and low-to-moderate income housing. These physical and cultural features of the St. Michaels community exacerbate management of water quantity and should not be discounted.

The Town's low elevation is particularly important because (1) it determines the community's risk to wind-driven events and tidal flooding, and (2) it influences stormwater storage and conveyance via a gravity-fed stormwater system. St. Michaels cannot control its local topography and soil conditions nor the occurrence of tidal events, storm surge, and severe precipitation. However, the Town can work to ensure its stormwater and coastal infrastructure are properly designed and maintained in a way that accommodates and does not compound natural events

³ Commissioners of St. Michaels. St. Michaels Comprehensive Plan 2015. Available online at: http://issuu.com/kimberlyweller/docs/2015_comprehensive_plan_for_st_mic.

(e.g., clogged storm drains result in water back-ups on roadways) and complements the community's physical and cultural features.

Chapter 2 focuses specifically on characterizing flooding in St. Michaels including feedback from residents and businesses, the impact of recent stormwater, and coastal infrastructure investments on flooding. This chapter also describes critical area regulations and sea level rise projections as it relates to flooding and stormwater issues in St. Michaels.

Characterizing Flooding and Stormwater Issues in St. Michaels

The history of flooding from major storms and hurricanes in St. Michaels is briefly documented in the Talbot County Flood Insurance Study (Section 2.2 and 2.3), most recently updated in August 2013 by the Federal Emergency Management Agency (FEMA).⁴ The Talbot County Flood Insurance Study notes that the west side of Talbot Street is the highest existing elevation in Town (at 12 feet) and major storms have routinely caused flooding in the areas of Mill Street, Green Street, Mulberry Street and Harbor Road. The Town of St. Michaels has no flood protection measures in place and none are proposed by FEMA at the time of this report, although the Town has adopted a 7.5' minimum first floor height requirement in the flood zone. The Town's floodplain management requirements and statement of purpose can be found in Chapter 173 of the St. Michaels Town Code. Per feedback from the St. Michaels community, the areas most prone to tidal flooding have historically included the Navy Point area (i.e., Mill Street including the Crab Claw Restaurant and the Chesapeake Bay Maritime Museum) and the south harbor area (i.e., West Harbor Road and Chew Ave).

During tropical storm Isabel in 2003, the Chesapeake Bay Maritime Museum saw approximately 2.5 feet of flooding in the administration building. In 2004, the Maritime Museum administration buildings, all historic structures on Navy Point, were raised six feet by a combination of grade fill and building foundations.⁵ Aside from major storm-driven flooding, regular flooding events at the Maritime Museum occur two to four times per year coinciding with peak tides and result in about two inches of water above the docks.⁶ The Crab Claw Restaurant, adjacent to the Maritime Museum is also susceptible to the same tidal flooding, and often times has to close the lower portion of the restaurant due to flooding. Likewise, West Harbor Road floods a few times each year, usually when water ascends the public boat ramp and stormwater outfalls during peak tides. During these events people often need to move their vehicles away from West Harbor Road to higher ground.

⁴ FEMA, 2013. Flood Insurance Study: Talbot County, MD and Incorporated Areas. Available online at: <http://www.talbotcountymd.gov/uploads/File/P&Z/flood%2013.pdf>

⁵ Personal telephone call between Sean Williamson and Bill Gilmore on July 24, 2015.

⁶ Shaum, J. & Bollinger, J., 2014. *Motorist rescued from flooding*. May 1, 2014. The Star Democrat. Available online at: http://www.stardem.com/news/local_news/article_8ad11d07-d214-598b-ae99-4f3281f7fca4.html.

<http://ecode360.com/7036871>

Historically, flooding from precipitation events, particularly high-intensity precipitation events that coincide with high tide have been the most common and problematic type of flooding for St. Michaels. It is important to note that severe precipitation events can come from widely anticipated tropical storms or nor'easters, but they can also come from less predictable summer rainstorms.

On July 11, 2010, St. Michaels experienced nearly eight inches of rain in a 24-hour time span, resulting in significant flooding as west as Talbot Street, with numerous road closures and reported property damage.⁷ Among survey respondents, 10 out of 26 individuals said the most common cause of flooding in St. Michaels is stormwater including rainfall and snowmelt, followed by tidal/riverine events (6 out of 26), and wind-driven events (4 out of 26).

Stormwater drainage in St. Michaels is roughly divided along Talbot Street with precipitation that falls to the east of Talbot Street going to Miles River and precipitation that falls to the west of Talbot Street going to San Domingo Creek. Prior to this conveyance, a significant share of the Town's stormwater runoff is often captured at the north end of Talbot Street and conveyed south towards outfalls.⁸

Between 2010 and 2012, the Town of St. Michaels experienced approximately two to three flood events per year cause by a combination of both severe precipitation and high tide in an underperforming stormwater conveyance system.⁹ Heavy precipitation flooding typically occurs along Talbot Street, the Town's high-traffic, commercial core, and also hinders Willow, Green, Church, Chestnut, and Marengo Streets.

Among survey respondents, 21 people said stormwater flooding on public property including roads, sidewalks, and parks is a serious problem in St. Michaels, compared to 5 respondents who said it was a moderate problem. Conversations with Town officials, residents, and businesses point to Talbot Street being the primary area of concern in the community due to ongoing issues with standing water after a rain event. Among survey respondents, 19 out of 26 people identified Talbot Street as the road most impacted by stormwater and flood events in St. Michaels.

⁷ Newell, B. 2010. *St. Michaels floods, traffic at standstill*. July 11, 2010. The Star Democrat. Available online at: http://www.stardem.com/news/local_news/article_9e575906-8cd8-11df-9e1d-001cc4c03286.html

⁸ Commissioners of St. Michaels. *St. Michaels Comprehensive Plan 2015*. Available online at: http://issuu.com/kimberlyweller/docs/2015_comprehensive_plan_for_st_mic.

⁹ Personal communication between Sean Williamson and Jeff Richardson and Jean Weisman, February 18, 2015.



Crab Claw Restaurant and dock on May 1, 2014 – *Credit: Kevin Smith, SMFD via the Star Democrat*



Talbot Street facing north, circa 2010 – *Credit: Roxane Doster Watts via the Star Democrat*

Figure 4. Photographs of flooding in St. Michaels including State Highway Administration employee locating stormwater drain blockage

Precipitation events are compounded by tidal events, particularly where stormwater outfalls meet the harbor and tidal backflow occurs. This has historically been an issue at Muskrat Park, which has seen road flooding along Church, Green and Willow Streets as a result of tidal backflow, as well as along West Harbor Road and points south including Marengo and Maple Streets. The Town installed a duckbill check valve in the storm drain outfall to the Harbor as part of a renovation project to Muskrat Park. In addition to tidal backflow, blockages and collapsed pipes can delay or stop the movement of stormwater to outfalls. The flooding along Talbot Street between 2010 and 2012 can largely be attributed to severe precipitation events, blockage of the stormwater system on Talbot Street, and tidal backflow at the Muskrat Park stormwater outfall.

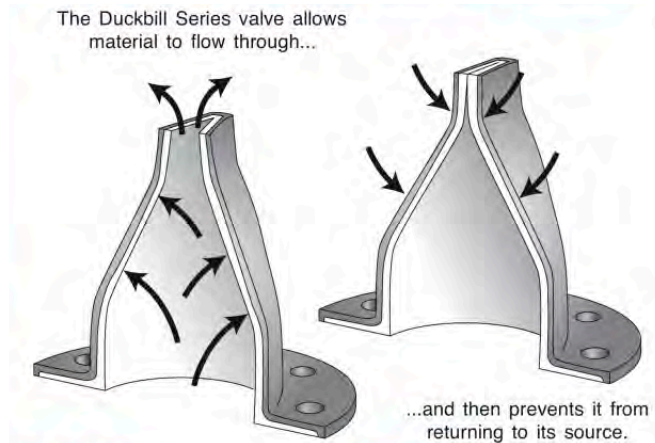


Figure 5. Example duckbill check valve that prevents tidal back flow in storm drains in St. Michaels

Areas on the east side of Town are also subject to flooding from heavy precipitation and/or tidal events along San Domingo Creek. Much of the land north of Grace Street and east of Tilden Street along the St. Michaels' Nature Trail and north Canton Street is low-lying with mixed marshy areas, residential properties, and public space. High tides are the main cause of slow dewatering of San Domingo Creek and some minor flooding. It should be noted that the San Domingo Creek area has ongoing water quality issues due to the marshy headwater conditions.

Other specific areas of concern in St. Michaels are as follows:

- **Mill Street Bottleneck.** A small drainage basin extends north and west from Mill Street towards Perry Cabin Lane, North Street and north Talbot Street. Stormwater collected in this area dewateres at the Mill Street lagoon near Honeymoon Bridge at the end of Cherry Street. However, the drainage pipes under Mill Street are undersized for the amount of stormwater that collects off the north 200 block of Talbot Street creating a bottleneck during periods of significant flow. Talbot County-owned stormwater pipes at the Mill Street area pose a barrier to simply installing a larger system. Larger diameter pipes would need to be placed deeper to accommodate their larger size, which would raise costs substantially. Water overtops Mill Street two to three times per year as a result of upstream stormwater and this particular bottleneck.¹⁰
- **Underperforming infrastructure.** In 2014, closed circuit cameras were “snaked” through the southern third of the Town’s stormwater pipes. Numerous pipes are clogged – about 50 to 60 percent of the pipes would require jet cleaning to restore normal flow. Some pipes are seriously corroded, collapsed or undersized to convey stormwater and leads to flooding issues, particularly from extreme precipitation events.¹¹
- **Compounding geographic conditions.** Poorly draining soils (most of St. Michaels consists of C&D soil types), a high water table (only 2’ below grade in some areas of Town), and lack of topography causes water to pool on properties throughout Town. Property-owners along Dodson, Mulberry, and Railroad Avenues reported stormwater management issues on their property.

A set of maps with annotated comments about stormwater and flooding from St. Michaels' residents and businesses can be found in Exhibit A.

¹⁰ Personal communication between Sean Williamson and Ben Taylor and/or Jeff Richardson, various dates in the spring of 2015.

¹¹ Ibid.

Stormwater Infrastructure Projects and Maintenance

Since 2012, St. Michaels has made stormwater capital improvements to reduce the frequency and severity of nuisance flooding particularly along the most impacted areas of Talbot Street, Green Street, Church Street, Marengo Street, and Chestnut Street. However, 15 out of 26 survey respondents indicated recent increases in flood frequency, volume, or both in the Town.

There are two important points about perceived vs. actual improvements in flood frequency and severity to consider prior to discussing how recent efforts have improved flooding. First, it is important to consider the frequency of severe precipitation events in the context of improved flooding and stormwater management conditions. It is possible that St. Michaels has been fortunate over the past two to three years in terms of the number of severe precipitation events and the co-occurrence with tidal peaks. This may in part explain the perceived reductions in flooding.

Second, there are conclusions to be made from the level of participation by St. Michaels' residents and businesses in various community meetings (see Chapter 1). Attendance was lower than expected at each of the two neighborhood stormwater meetings and the business breakfast. The lower-than-expected attendance, and the potential for widespread community engagement stemming from disruptive flood events between 2010-2012, suggests that a majority of the residents of St. Michaels do not presently perceive stormwater and flooding in the Town as a serious issue.

While there are opportunities to further improve flood and stormwater conditions in the Town, EFC believes these issues have improved markedly since 2012, and the evidence presented below supports this claim.

Investments to Date

St. Michaels has benefited greatly from recent stormwater infrastructure investments by the Town, Talbot County and State Highway Administration. In particular, high impact flood areas near Talbot Street have seen major improvements. Recent capital investments and maintenance efforts include:

- **Highway 33 cleanout.** Prompted by the flood events of 2010 to 2012, the State Highway Administration (SHA), which is responsible for maintaining the stormwater system along State Highway 33 (Talbot Street), conducted a major cleanout of catch basins and stormwater lines along Talbot Street. Sediment and debris will collect over time and block stormwater pipes if not routinely maintained. After the drain cleanout, the Town experienced increased nuisance flooding at Muskrat Park and along the south harbor area as stormwater previously held in the center of Town along Talbot

Street was now able to reach stormwater outfalls at Muskrat Park and Harbor Road.¹²

- **Muskrat Park retrofit.** In 2010, the Town installed a duckbill valve check at the outfall in Muskrat Park to prevent tidal related backflow in to the storm drains that previously caused flooding in the Green Street area. In 2013, the Town also completed a major stormwater retrofit at Muskrat Park including a bioswale along the south side of the park that can store and treat a substantial amount of stormwater. Prior to the installation of the duckbill, Green and Church Street would flood during most peak tides and became impassable by vehicle. Both infrastructure projects have noticeably improved flooding conditions around Muskrat Park.¹³
- **Street reconstruction.** In 2007, St. Michaels began a nine-year, \$5.5 million street reconstruction project intended to redesign, regrade, and resurface 27 streets in the Town. While not undertaken solely to improve stormwater management, it was a primary goal for the road reconstructions. Many streets (e.g., East Maple) had new catch basins installed and were regraded and recurbed to more efficiently move stormwater from the road surface to the stormwater system. Community feedback and discussions with Town officials suggest the street reconstruction has generally reduced stormwater issues in most of the Town. However, individual property owners have expressed the opinion that the project either (1) did not go far enough towards improving the Town's stormwater infrastructure, or (2) the project made stormwater issues worse on their property.¹⁴

Given the age and condition of the Town's stormwater lines, it is EFC's opinion that in an ideal scenario, it may have been more cost-effective and prudent to replace as many stormwater drains as part of the street reconstruction, rather than the fraction that were replaced due to failures.¹⁵ Understandably, the Town wanted to control costs on an already expensive project. Other communities have realized efficiencies and reduced costs associated with taking on road reconstruction and stormwater infrastructure projects in tandem. The Town is encouraged to investigate the cost-effectiveness of stormwater drain replacements and/or improvements for subsequent street and sidewalk improvement projects. The Town installed a bioretention facility on Fremont Street as part of that 2014 road reconstruction with funding assistance from Eastern Shore Land Conservancy. The Town intends to explore better stormwater management

¹² Personal communication between Sean Williamson and Jeff Richardson and Jean Weisman, February 18, 2015.

¹³ Ibid.

¹⁴ Personal interviews with St. Michaels' business owners.

¹⁵ Personal communication between Sean Williamson and Ben Taylor, March 24, 2015.

improvements on the next two street reconstructions, Thompson and Grace Streets.

- **Shoreline Improvements.** In the past five years, coastal shoreline improvements have been made at various street terminals (i.e., public right-of-way at the end of streets). Namely, Mulberry, Carpenter, Mill, and Cherry Streets have all received bulkhead replacements with a two-foot top-plate elevation, and the bulkhead around the harbor at West Harbor Road and the boat ramp was recently replaced and installed at a 2.5-foot top-plate elevation. Moreover, there are multiple living shorelines in the community including a major installation at San Domingo Creek and the Chesapeake Bay Maritime Museum. These types of installations help to mitigate tidal and storm surge driven flooding and were installed by Environmental Concern – a longstanding wetland restoration nonprofit in St. Michaels.
- **Green infrastructure practices.** Over the past 5 years, many green infrastructure facilities have been installed in the Town of St. Michaels. Where traditional “hard” infrastructure is designed to quickly convey stormwater to the nearest outfall, green infrastructure is nature-based and uses natural processes to improve water treatment, flow and storage via plants and soil to manage both water quality and quantity.

Exhibit B presents a map and photographs of existing green infrastructure facilities in St. Michaels.

Some of the Town’s green infrastructure investments, including the landscape infiltration facility at the “pharmacy parking lot” between Talbot and Fremont Streets and the Police Station bioretention facility were installed to meet the Town’s Critical Area

regulations. Other green infrastructure facilities have been installed to mitigate flooding problems or to better manage stormwater runoff on a particular site, not required by Critical Area regulation (e.g., Muskrat Park or the Carpenter Street landscape infiltration facility). The Town has approximately nine different green infrastructure facilities sited on public property (Exhibit B), all of which have the capacity to treat stormwater to reduce phosphorus, and more importantly to manage high water events to help store water on-site away from roads and sidewalks.

The Potential Impact of Pending Projects

There are two major projects under development on public roads in St. Michaels, both of which will have serious implications for stormwater management. First, the Town is planning to install submerged gravel wetland facilities at West Chestnut Street and Thompson in partnership with RDC Inn at Perry Cabin LLC to help improve water quality and quantity in San Domingo Creek as part of a Critical Area growth allocation approved for the Inn at Perry Cabin by the Maryland Critical Area Commission. RDC Inn at Perry Cabin LLC is also working with the Town to retrofit

“Dorres Ditch” to improve standing water issues at the Inn at Perry Cabin Ballfield Park on North Talbot Street and also worked with Midshore Riverkeeper Conservancy to do tree plantings on their property in 2014 to help treat stormwater at Fogg Cove.

Second, the State Highway Administration is initiating a planning study for a safety and enhancement project along MD 33 (Talbot Street) from Pea Neck Road to Yacht Club Road. Though the SHA project is not funded for construction at this time, this project would include American Disabilities Act accessible sidewalk updates, stormdrain updates, and other alterations that could positively impact the stormwater patterns in the Town if designed correctly.¹⁶ St. Michaels has been working closely with the State Highway Administration on the design phase of the project. These two projects have the potential to significantly improve water quality and quantity management Town-wide.

The Importance of Operations and Maintenance

As described above, flood and stormwater management in St. Michaels has seen much improvement from major capital improvement projects over the past five years. Properly designed and functioning stormwater infrastructure is critical to mitigating flooding and the Town is making important upfront investments to reduce the impact of flooding and stormwater in St. Michaels. Moving forward, maintenance of the existing stormwater (green and conventional) infrastructure will be equally important to managing flooding and stormwater quality and quantity.

Maintenance of St. Michaels’ stormwater infrastructure is a responsibility shared by the Town, SHA, and Talbot County. For all roads other than MD 33, the Town’s Department of Public Works (DPW) is responsible for cleaning inlets and catch basins, which is done twice annually; clearing clogged pipes and ditches; and identifying and replacing degraded pipes and culverts. The MD 33 (Talbot Street) maintenance is coordinated and routinely done by the SHA District 2 office. Although the SHA is responsible for Talbot Street, DPW often does interim cleans outs of catch basins, inlets, and easily accessible pipes along the road.

The Town does not own pipe-jetting equipment, which is a tool used for more intensive storm drain cleaning. The Town has relied on an outside contractor to provide this pipe-jetting service performed approximately a dozen times over the past 20 years. The last storm drain video survey found that 50 to 60 percent of pipes are clogged with many degraded and collapsed pipes in the southern third of Town. Jetting of the stormwater system in this part of St. Michaels is an activity that will need to occur in the coming years.

¹⁶ Project description available online at:
<http://apps.roads.maryland.gov/WebProjectLifeCycle/ProjectInformation.aspx?projectno=TA28621>

In terms of replacing degraded stormwater infrastructure, the DPW Director works closely with the Town Manager and the Commissioners of St. Michaels to prioritize and budget for major projects. On average, the Town sets aside about \$5,000 per year for stormwater repairs, although this figure has been higher in recent years due to larger infrastructure improvements. For example, in 2015 the Town coordinated the replacement of a culvert estimated at \$60,000 due to a collapse at Grace Street near San Domingo Creek.

The DPW is also responsible for maintaining newly installed green infrastructure including removal and replacement of dead plant material, removal of debris, clean out of overflows, controlling mosquitos, and monitoring facilities to make sure they are operating as intended. Maintenance of green infrastructure is a new responsibility for St. Michaels' Public Works, and as with most municipalities, there is a significant learning curve from traditional maintenance routines. For example, one business owner complained that a Town-owned rain garden near her home and business was breeding mosquitoes. Mosquitoes can be managed with "dunks" or other environmentally friendly larvacides that deter the development of mosquito larvae. Despite the burden of maintaining green infrastructure, there are low-cost opportunities for doing so. Because green infrastructure is nature-based and exhibits flexibility in size and location, it can be ideal for volunteer cleanup and maintenance efforts. Grants are available for green infrastructure capital costs, though less common for long-term maintenance costs, and can be dovetailed with volunteer programs to sustain plant health and green infrastructure performance over time (see Exhibit D).

A common dilemma in the Chesapeake Bay watershed is plentiful interest and funding for green infrastructure technologies, but insufficient funding and a lack of knowledge around maintenance of green infrastructure. St. Michaels' officials have expressed as much with regards to the Town's existing green infrastructure facilities. For example, a problem in St. Michaels is the collection of trash in both public and private living shorelines due to a lack of time and energy to regularly clean the shorelines. Some private property owners previously enthusiastic about living shorelines have contemplated removing them because of the maintenance challenges.¹⁷ With additional training and financial support for the DPW, private property owners and community groups, these types of issues can be easily addressed or avoided altogether.

While green infrastructure practices are becoming the go-to approach for communities working to better manage water quality and quantity, the depth and breadth of available research related to annual operations and management (O&M) costs is limited, making it difficult to budget for annual needs. However, in order to ensure that green infrastructure practices perform as intended, it is critical to include some budgeting assessment of potential annual O&M costs.

¹⁷ Personal communication at St. Michaels Task Force Meeting, September 1, 2015.

King and Hagen, as well as the Center for Watershed Protection, have categorized BMPs into “Urban BMP Types,” and estimated the annual O&M cost of each type as a percent of the initial project cost.¹⁸ We used these Urban BMP Types to attempt to categorize the nine green infrastructure installations in St. Michaels, and applied annual O&M cost to each project. This process can be seen in Table 3.

Table 3. Approximate annual cost of maintaining St. Michaels existing green infrastructure best management practices (BMPs)

Urban BMP Type	Urban BMP Annual O+M Cost	St. Michaels' BMPs	Approx. Annual O+M Cost of St. Michael's BMPs
Bioretention (new-suburban)	\$450.00	ACME Market Bio-Retention	\$2,700.00
		Cherry St Bio-Retention	
		Police Station Rain Garden	
		Nature Trail Parking Lot Rain Garden	
		San Domingo Creek Living Shoreline	
		Maritime Museum Living Shoreline	
Bioswale (new)	\$360.00	Muskrat Park Bioswale and Duckbill Valve	\$360.00
Infiltration Practices w/ Sand, Veg. (new)	\$437.50	Carpenter Street Infiltration Facility	\$875.00
		Medicine Shop Infiltration Facility	
Approx. Total Annual Costs:			\$3,935.00

¹⁸This data is derived from the King and Hagan source below, as well as additional analysis from the Center for Watershed Protection. King, D., Hagan, P. 2011. *Costs of Stormwater Management Practices in Maryland Counties*: Ref. No. [UMCES] CBL 11?043. University of Maryland, Solomons, MD. This report develops and presents planning level unit cost estimates for implementing stormwater best management practices in Maryland counties. These unit costs are expressed as costs per acre of impervious area treated and are estimated specific to the Maryland Assessment and Scenario Tool (MAST).

The Role of Other Public Sector Partners

Talbot County and the State Highway Administration are critical when it comes to maintenance of the Town's stormwater system. As described above, the clearing of SHA's stormwater pipes have a major impact in reducing the frequency and severity of nuisance flooding. Ensuring the SHA upholds its maintenance responsibilities in a timely and quality manner is vital in St. Michaels. Maintenance of some segments of the stormwater system is a shared responsibility that requires time and coordination between parties, and this can lead to overdue maintenance. For example, the Town is presently struggling with stormwater inlet that is constructed of old brick on Chestnut Street. As soon as the water leaves Talbot Street (i.e., State Route 33) and enters Chestnut Street, it becomes the responsibility of the Town. However, the magnitude of water that comes from the mainline on Talbot Street overwhelms the Town's smaller deteriorated brick pipe and the interconnection at Talbot Street and Chestnut has issues that require repair.¹⁹

Likewise, the interconnection at Marengo Street presents a problem as the pipe diameter is too small to address the runoff volume that can come from Talbot Street as the Marengo Street storm drains may have only been designed for Marengo drainage areas at time of original construction. While the Town is prepared to put funding towards repair of the pipes along Chestnut, to do the project correctly there needs to be coordination, and ideally cost-sharing with the SHA. An improved working relationship between the SHA and the Town of St. Michaels and possibly a comprehensive storm drain map and joint maintenance plan will be particularly important as the SHA goes through the design and construction phases of the MD 33 community enhancement and safety project.

Stormwater drainage areas, including ditches and culverts, extend from Talbot County into the Town limits. The downstream stormwater system in St. Michaels is subject to greater quantities of stormwater and water quality issues when Talbot County ditches are not regularly maintained. One business owner just outside of incorporated St. Michaels on MD 33 reported flood damage as the result of heavy precipitation and a poorly maintained ditch adjacent to his property and he has communicated with both the County and the SHA about clearing the ditch. The property owner has elevated some of his assets and built berms to better channel the water. It is critical that the Town of St. Michaels retain a strong relationship with Talbot County to ensure County-owned stormwater infrastructure is being maintained.

Other Important Context for Flooding and Stormwater Management

Flooding and stormwater management in the Town of St. Michaels should be understood through the lens of regulatory and physical factors. On the regulatory side, it is important to consider how the Town implements Maryland's Critical Area Law, stormwater regulations for new construction, and projects that help Talbot

¹⁹ Personal communication between Sean Williamson and Ben Taylor, March 24, 2015.

County meet State-mandated Watershed Implementation Plans and Total Maximum Daily Load requirements. Physically, the Town of St. Michaels has major constraints to overcome including poorly draining soil, a high water table, historic buildings, small lots, and projected sea level rise in the Chesapeake Bay.

Critical Area Impacts

St. Michaels is subject to Maryland's Critical Area law, which is implemented by the Town via ordinance. Due to the Town's waterfront location, any land within 1000 feet of the water is subject to the Critical Area overly requirements. About 62 percent of the total Critical Area overlay in the Town is considered intensely development area (IDA), 11 percent is considered a limited development area (LDA) and another 27 percent is considered resource conservation area (RCA).²⁰ Portions of St. Michaels, such as the Harbor, Navy Point and parts of the San Domingo shoreline are also considered buffer management areas, which permit certain development within a closer proximity of the water due to the already developed condition. The goals of the Town's Critical Area regulations are to: (1) minimize adverse impacts on water quality that result from pollutants that are discharged from structures or runoff, (2) to conserve fish, wildlife, and plant habitat, and (3) to establish land use policies for development in the Critical Area, which accommodate growth as well as address environmental impacts. Details of the Town's Critical Area program can be found in 340-27 of the St. Michaels Town Code.

How land is designated in the Critical Area, how much development occurs in the Critical Area, and the nature of mitigation projects can have a major impact on flooding and stormwater in St. Michaels. While the Critical Area regulations are in place to protect water quality and habitat creation, staff with the State's Critical Area Commission are currently exploring options for making the regulations more amenable to the environmental constraints of Maryland communities to provide property owners with implementable practices while still allowing flexibility in the types of acceptable stormwater practices. Of particular importance to St. Michaels is the ongoing discussion about how to best encourage Critical Area mitigation projects that optimize both water quality and quantity, with a focus on small lot solutions for property owners that do not have the ability to hire an engineer to design a green infrastructure facility.

Local Ordinance Impacts

In addition to the Critical Area regulations, the Town of St. Michaels has a Stormwater Management ordinance, which specifies the process for approval and standards that must be met for new construction via environmental site design standards. Through the implementation of these ordinances, a close working relationship with private stakeholders in the stormwater management field, and investment in public stormwater facilities, the Town of St. Michaels has

²⁰ Commissioners of St. Michaels. St. Michaels Comprehensive Plan 2007. Available online at: http://issuu.com/kimberlyweller/docs/2015_comprehensive_plan_for_st_mic.

demonstrated leadership in managing for water quality. This is best exemplified by a mini-watershed implementation plan (WIP) conducted by Talbot County in St. Michaels. The mini-WIP found that the Town is meeting more than 100 percent of its share of the County's total maximum daily load obligations as measured in 2015.

Physical attribute impacts

There are important physical attributes that impact St. Michaels' exposure to stormwater and flood events, and in turn, its range of options for managing vulnerability to nuisance flooding through an adequate stormwater infrastructure. These include:

- *Poorly draining soil* – Approximately 75 percent of incorporated St. Michaels has poorly draining soil meaning stormwater is slow to permeate the soil and resides for longer on the surface. Most of the Town has C and D soil types with a high amount of sand or deep clay layer that makes ground penetration difficult. Moreover, poorly draining soil can limit the practical green infrastructure opportunities for a given parcel (See Exhibit H).
- *High water table* – It is important to understand the water table level prior to making investment decisions. Approximately 75 percent of St. Michaels has less than 20 inches to the water table (see Exhibit H). This places limitations on the type of stormwater infrastructure that can be installed. The functionality of green infrastructure installed for the purpose of storing and treating stormwater is greatly diminished when water comes up from below a facility via the water table. One St. Michaels resident, for example, installed a French drain in her home's crawl space, but quickly discovered that the installation only served as a conduit for water to enter her crawl space via the high water table. This is a problem that needs to be monitored on both private and public property.
- *Limited topography change* – Much of St. Michaels is low-lying and there is limited grade change available to gravity-feed water off of property and into receiving waters. While pumps could expedite the removal of stormwater, on-site storage of stormwater in either aboveground vessels (e.g., rain barrels and cisterns) or in-ground facilities (e.g., rain gardens, bio-retention) would allow for slower release of runoff allowing some pollutants to be treated or to settle out and would minimize flooding.
- *Land use and historic structures* – St. Michaels is densely developed with little available space on properties to install stormwater management facilities. Total build-out in the Town would only allow an additional 49 dwellings and would entail mostly infill development. Moreover, many of the structures are historic in nature and are not suitable for green roofs, rain barrels, and other technology without significant renovation.
- *Sea level rise in the Chesapeake Bay* – Compounding the issues outlined above and adding an element of urgency to the situation, sea level rise in the Chesapeake Bay is a very real threat for the Town of St. Michaels. Current projections suggest a three millimeters per year increase in relative sea

level rise in the Chesapeake Bay, which translates to a two to three foot increase in relative sea level rise by 2100 from current levels.^{21,22}

The extent of land vulnerable to flooding can be visualized at Maryland's Coastal Atlas, which forecasts storm surge inundation levels associated with hurricanes of varying strengths.²³ It is also worth noting that climate change models predict more severe precipitation in the northeast US over the coming century. More intense storm events suggest St. Michaels' existing stormwater infrastructure capacity will be overwhelmed more frequently and nuisance flooding will become more common. A well designed and maintained stormwater system that anticipates these impacts will be a tremendous asset to the Town as it progresses through this century and looks to cope with sea level rise and precipitation changes. St. Michaels' 2015 Comprehensive Plan includes a chapter on Climate Resilience and highlights the Town's role in reducing risks to climate change, updating flood plain maps and building codes, and participating in the National Flood Insurance Program's Community Rating System (CRS). Enrollment in the CRS system would necessitate the Town of St. Michaels take a series of steps that will ultimately reduce risk of property loss and human life, and result in reduced flood insurance premiums for St. Michaels residents. Resources for the CRS program are presented in Exhibit E.

²¹ Boon et al., 2010. *Chesapeake Bay Land Subsidence and Sea Level Change: An Evaluation of Past and Present Trends and Future Outlook*. Virginia Institute of Marine Science. Available online at: <http://www.vims.edu/GreyLit/VIMS/sramsoe425.pdf>.

²² Najjar et al., 2010. *Potential climate-change impacts in the Chesapeake Bay*. *Estuarine, Coastal and Shelf Science* 86 (2010) 1-20. Available online: http://www.ocvts.org/classroomconnect/classrooms/jwnek/documents/Oceanography/Global_Change_Chesapeake.pdf.

²³ Maryland's Coastal Atlas can be found online here: <http://dnr.maryland.gov/ccs/coastalatlus/>.

Chapter 3 – Recommendations and Resources

The Town of St. Michaels is in the driver’s seat when it comes to managing for stormwater and flooding. Despite constraints, which include poorly draining soils, limited available space, and sea level rise, St. Michaels has in the recent past demonstrated a capacity to mitigate the severity and frequency of nuisance flood events. It will be critical for the Town to focus on the issues it can control and leverage all available resources to stay ahead of flooding issues. Chapter 3 presents recommendations aimed at helping St. Michaels to better manage flooding and stormwater, and is accompanied by implementation resources, which exist as supplemental exhibits to this report. The recommendations that follow are those of the Environmental Finance Center and reflect feedback from the St. Michaels Stormwater and Flood Management Task Force, the St. Michaels’ community at-large, and the application of lessons learned and best practices from other communities.

High Level Recommendations and Guiding Principles

1. **Stay ahead of the curve; devote effort to the issue before it worsens.**

Nuisance flooding is not currently perceived as a major problem in St. Michaels, which is supported by the low level of engagement from the community during the course of this project and the improved situation today relative to five years ago. Nonetheless, it is incumbent upon the Town of St. Michaels to continue investing time and effort into advancing water resource management for the safety and prosperity of the community. “The significance of nuisance flooding is that it is a preview of what will become more frequent, severe, and problematic, particularly under the stress of sea level rise.”²⁴ Small investments in planned preventive maintenance will always be less expensive than reactive crisis management in the face of emergency situations.

“By the time most people think [nuisance flooding] is a problem, it is too late.” – St. Michaels Resident

2. **Invest for nuisance flooding, prepare for catastrophic flooding.**

St. Michaels cannot eliminate flood risks as there will always be a chance for catastrophic hurricanes and tropical storms. The Town will need to navigate significant expense and alterations to the character of the community to markedly reduce risk from these types of low frequency, high-impact events. The best near-term risk management approach as it relates to these

²⁴ Brian Ambrette, 2015. Eastern Shore Land Conservancy, Coastal Resilience Specialist.

catastrophic storm events is to focus on emergency preparedness, resident safety, and land use planning, which are elements this report does not address at great depth.

On the other hand, by focusing squarely on medium frequency, medium impact nuisance flooding, the Town of St. Michaels can more effectively allocate limited staff time and funding towards the issue. Scarce public funds should be directed at heavily populated areas and busy roads exposed to periodic flooding. In the near-term, St. Michaels can indirectly influence the frequency and severity of nuisance flooding through stormwater and shoreline infrastructure projects and regular maintenance.

The risk associated with nuisance flooding can be managed through investments in infrastructure; the risk associated with catastrophic flooding is best managed through sound land use planning, preparedness plans, emergency services, and communication.

- 3. Focus on green infrastructure as the key tool for managing stormwater and flooding.** Green infrastructure uses nature-based solutions to address water management and has the potential to be cheaper, smaller in scale, and more flexible than “hard” stormwater infrastructure and often supplements conventional infrastructure by adding stormwater storage and conveyance capacity at a lower cost than upgrading or expanding conventional infrastructure. Examples of green infrastructure include rain gardens, constructed wetlands, planter boxes, bioswales, living shorelines, and trees. St. Michaels already has multiple green infrastructure facilities (see Exhibit B). A continued green infrastructure approach positions the Town for additional funding and technical assistance. Grants tend to be more prevalent for green infrastructure, as opposed to conventional infrastructure, and integrated public-private financing is well suited to green infrastructure (see Exhibit D, a comprehensive list of grant opportunities for financing green infrastructure and stormwater management in St. Michaels). Also, because of the smaller, decentralized scale associated with green infrastructure, there are more opportunities to tap into inexpensive or no-cost technical assistance (e.g., Eagle scout project to build a landscape planter box).

Implementation Resource: Exhibit D – Grant Resources for Financing Green Infrastructure and Stormwater Management Projects in St. Michaels

- 4. Prioritize regular cleaning and maintenance of stormwater and shoreline infrastructure.** Managing stormwater system assets, whether it is traditional gray or green, enables the infrastructure to function as intended, minimizes flood impacts, and reduces risk. The Town’s existing stormwater inlets, catch basins, ditches, pipes, and outfalls need to be in good working

order to minimize nuisance flooding. The Town's DPW has shown complete competence in how they identify stormwater structures in disrepair and clean and maintain St. Michaels' stormwater infrastructure, but the system and community would benefit from more frequent system checks and cleaning. This is generally important as the stormwater system ages and is particularly important after severe precipitation events, which can wash debris and sediment into stormwater channels.

Implementation Resource: *Exhibit E – Green Infrastructure Maintenance Training for St. Michaels, a workshop from the Maryland Sea Grant Extension*

In turn, there should be sufficient staff time dedicated to cleaning and monitoring the Town's stormwater system. While it is costly to support more staff and there are few financing options beyond use of general funds to do so, other options exist including training to ensure staff is being efficient and applying maintenance best practices, or to leverage volunteers (discussed further below). The need for maintenance and training is especially true when it comes to green infrastructure. The Town of St. Michaels should prioritize DPW training, especially for green infrastructure maintenance, and otherwise support a rigorous process for evaluating and maintaining the Town's stormwater system.

- 5. Focus on the Talbot Street watershed and shoreline infrastructure.** Based on the perceived risk of nuisance flooding, as defined by probability and consequence of flood events, investments in stormwater and flood infrastructure should be prioritized by the following hotspots: (1) south Talbot Street, (2) north of San Domingo Creek, (3) the south harbor area, and (4) the north harbor area (see Figure 6).

Investments that can reduce the severity and frequency of high water on Talbot Street should be prioritized. The community has identified Talbot Street as the road most impacted by nuisance flooding. The issues in the Talbot Street drainage area, particularly the southern portion, can be resolved through pipe jetting, pipe replacement, pipe capacity expansion, and upstream stormwater storage facility installation, which will collectively reduce the pressure on the south Talbot Street hotspot.

Of course, most major stormwater work along Talbot Street will require the cooperation and investment from the SHA, but the Town can take unilateral steps including upstream storage and ensuring secondary stormwater conveyance channels owned by the Town are well maintained. Beyond Talbot Street itself, there are investments at the shoreline that can have a valuable impact for the entire community.

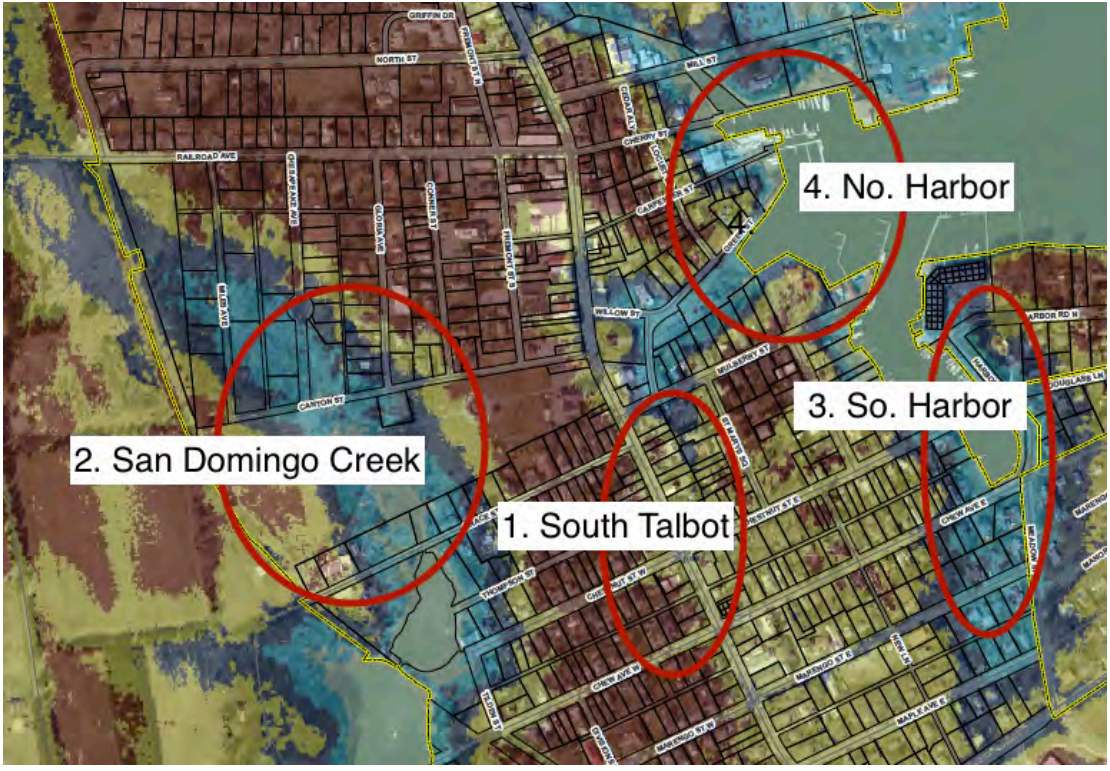


Figure 6. Flooding hotspots in St. Michaels, numbered from high to low priority

Implementation Resource:
Exhibit C – Prospective Green Infrastructure and Stormwater Facilities in St. Michaels, Map + Analysis + Photos

For example, the area north of San Domingo Creek and Grace Avenue would benefit from upstream storage and downstream tidal control. Proposed bio-retention and submerged wetlands around Grace and Thompson (i.e., Critical Area mitigation projects) could improve nuisance flooding in this area. In the south harbor area, where there are about five stormwater outfalls, there is a need for tide gates to minimize the backflow of tidal events and storm surge into the stormwater system. Tide gates in the south harbor could help address nuisance flooding as far inland as Talbot Street, and more likely, at the nearby Green, Chew, and Maple Streets. Finally, the north harbor area is particularly susceptible to tidal flooding, which can be compounded by severe precipitation and a congested stormwater outfall near Honeymoon Bridge. Upstream stormwater and/or tidal storage could help to alleviate flooding in this part of St. Michaels. Exhibit C highlights prospective green infrastructure and stormwater facilities, which might be installed to alleviate nuisance flooding in various locations throughout St. Michaels.

- 6. **Get residents involved; connect them with technical and financial resources.** There is not enough available public space nor sufficient public funds to drastically improve nuisance flooding through public property

alone. St. Michaels should leverage the appetite of many residents to improve stormwater management on their property. This sentiment aligns with the Town's 2007 Comprehensive Plan, which states "incentives should be developed for owners to install stormwater BMPs including rooftop disconnects, French drains, and rain gardens."²⁵ Residents that participated in outreach and education events consistently requested more information on private property stormwater management solutions.

The Town is encouraged to facilitate private property solutions by connecting residents to experts, ideas, and financial resources where possible. Utilize staff time and dedicate a small amount of funding towards stormwater management outreach and education (e.g., coordinate an

Implementation Resource:
*Exhibit G – St. Michaels
Stormwater Management Tools, A
Resource for Property Owners*

awareness event with food and prizes to attract participation, communicate stormwater management tips in the Town newsletter a few times each year). There is a network of experts working on behalf of the residents of

Maryland and St. Michaels able to provide technical expertise at a very low cost (i.e., Maryland Sea Grant Extension). There are also local business and other non-profit groups that have valuable resources to offer. The Town might also strive to highlight stormwater management strategies via a regular newsletter or via its website. Finally, the Town can facilitate private action by identifying and promoting technologies and solutions that are effective and suitable for landscape conditions and the Town's cultural sensibilities (i.e., clarify what is acceptable with the Historic District Commission).

Specific Solutions to Further Explore

The six recommendations above are high-level directions that should guide the Town of St. Michaels as it decides how to allocate scarce resources towards managing nuisance flooding in the community. However, the list is not exhaustive or particularly detailed considering various proposed solutions that surfaced over the course of this project per conversations with the St. Michaels Stormwater and Flood Management Task Force and the community at-large. It is important to reiterate that the purpose of this study is not to propose specific engineering solutions, but rather to evaluate and propose policy, programmatic, and financing solutions that will enable additional investment in and improve performance of the Town's stormwater infrastructure. What follows is a more defined set of policy, programmatic, and financing solutions for managing nuisance flooding in St. Michaels. Potential solutions for managing nuisance flooding in St. Michaels include:

²⁵ Commissioners of St. Michaels. St. Michaels Comprehensive Plan 2007. Available online at: http://issuu.com/kimberlyweller/docs/2015_comprehensive_plan_for_st_mic.

1. **Reduce the cost of green infrastructure maintenance by leveraging volunteer programs.** In Caroline County, the Public Works Department and the afterschool program at Lockerman Middle School have partnered to develop an experiential learning program that benefits the County and students. Under the guidance of the Public Works Department and the County's Environmental Planner, students are assisting with the planting and cleanup of bio-retention areas throughout the County and gaining valuable hands-on science and biology experience. The Town of St. Michaels could partner with the St. Michaels' Community Center or the St. Michaels' Middle School to initiate a similar program. Funding for the program could come from a Chesapeake Bay Trust Environmental Education grant or another source of educational grants. Likewise, other community groups such as Master Gardeners might be interested in hosting an annual green infrastructure maintenance day and recruiting volunteers to help with maintenance and cleanup. Local kayakers might be recruited to assist with an annual trash cleanup day of the Town's living shorelines.
2. **Financing through public-private partnerships.** A successful program from Virginia couples public green infrastructure installations with marketing for local businesses. The Streetscape Appearance Green Enhancement (SAGE) program awards roadside advertising rights to companies in exchange for a fee, which goes towards installing and maintaining green infrastructure.²⁶ Similar to the Adopt-a-Highway program, the SAGE program advertises for a business that has paid a small fee and shown its community support. The revenue is used to develop a tasteful, community-approved sign that aligns with the program and to cover the cost of installing and/or maintaining a green infrastructure facility. The sign is co-located with green infrastructure, and it acknowledges that the facility is made possible with the support of the business. In coordination with the St. Michaels Business Association, a similar sponsorship program could work in St. Michaels in select locations around the community.
3. **Regionalization and cost sharing with neighboring communities.** St. Michaels is not the only municipality on Maryland's Eastern Shore coping with nuisance flooding. In 2014, the Town of Oxford adopted an ordinance to create the Stormwater Management and Shoreline Protection Fund, which will finance management of stormwater and nuisance flood issues in Oxford. Oxford is heavily invested in addressing their nuisance flooding situation, and like St. Michaels, is looking to do so cost effectively. St. Michaels could partner with Oxford, Talbot County, or other jurisdictions in the region and share the cost of staff time and/or equipment. For example, as of 2013 Oxford was considering purchasing equipment to jet stormwater pipes in the

²⁶ More information available online at:

http://efc.umd.edu/assets/wip_presentations/va_sw_forum_ppts_6-17-13_3.pdf.

community. St. Michaels has historically hired an outside firm to clean the pipes because purchasing the equipment is so costly and seldom necessary. However, not owning the jetting equipment has prevented St. Michaels from cleaning the stormwater pipes as thoroughly and often as the Town otherwise could have been. The jetting equipment in particular would be ideal for sharing across municipalities on the Eastern Shore and would drastically reduce the cost per municipality. Likewise, St. Michaels has only had about one-third of its stormwater system video recorded and completing the system video recording would provide valuable information to the Town. St. Michaels might achieve some bulk purchase discounts for this recording service by partnering with another community.

4. **Coordinated bulk purchases for St. Michaels residents.** To the extent multiple St. Michaels property owners are interested in investing in stormwater and flood management on their property (i.e., landscape boxes, cisterns, living shorelines, bulkhead repairs, etc.), there could be an important role for the Town of St. Michaels and/or an independent third-party in coordinating a bulk purchase to reduce costs for property owners.

The bulk purchase model has been successful in Maryland, including on the Eastern Shore, in the area of solar photovoltaic panel procurement, and it has resulted in a close to 30 percent reduction in the cost per-residential system relative to a non-bulk purchase arrangement.

The economies of scale associated with a bulk purchase could significantly reduce the cost per property owner for stormwater technology. The added bonus of such a bulk purchase is that it is a limited time opportunity and marketing campaign in-and-of-itself, which can serve to further educate residents and motivate them to participate. It is extremely difficult for residents to self-organize a purchasing consortium, and furthermore, to have the technical and procurement savvy to get the best possible deal for multiple disparate properties. With the purchasing agency of St. Michaels and its ability to galvanize residents, the Town could coordinate with a third-party technical expert to design the procurement process, recruit property owners, and advise both the Town and property owners throughout the transaction.

5. **Resources for low to moderate-income populations.** An estimated one-third of homes in St. Michaels are second homes serving as vacation homes and/or real estate investments. By most standards, St. Michaels is an affluent community and residents have the financial resources to make investments in water management on their property if they see fit. However, St. Michaels has a low to moderate-income population including a public housing complex near Fremont and Dodson Streets as well as elderly housing at the south entrance of Town. There are also a number of detached homes occupied by elderly individuals on fixed incomes. *What should the Town of St. Michaels do*

to facilitate stormwater management on these low to moderate-income properties?

In terms of financial assistance, there were no grant programs identified that focus exclusively on low to moderate-income populations. However, the St. Michaels community could set up a fund-raising campaign and/or volunteer effort to help elderly or disabled residents with property beautification and stormwater management. One potential avenue for fundraising includes the community of artists in St. Michaels via the St. Michaels Art League. Stormwater management devices including planter boxes and rain barrels can be painted by local artists and auctioned with a portion of the proceeds going towards buying materials (e.g., plants, soil) to help with beautification and stormwater management projects on public spaces, and possibly low to moderate income properties. Beyond fundraising, the Town should work diligently to connect technical experts and other resources to these low to moderate-income populations.

6. **Enrollment in the National Flood Insurance Program’s Community Rating System.** The Community Rating System (CRS) is a voluntary program and part of the National Flood Insurance Program. The CRS program rewards communities that take proactive steps towards minimizing flood risks with reduced flood insurance premiums for their residents. There are approximately 180 properties in the Town of St. Michaels with a flood insurance policy under the National Flood Insurance Program – participation in the CRS could yield reduced flood insurance premiums and reduced risk to flooding. The CRS is notoriously difficult for small communities because there are some significant engineering, design, and consulting costs associated with meeting the criteria of the program let alone the commitment of staff time. Nonetheless, there are resources available to St. Michaels including the CoastSmart Communities program from the Maryland Department of Natural Resources, which has in the past provided grants to local governments to help cover the costs associated with meeting CRS requirements.²⁷ Also, the cost sharing approach with other Maryland municipalities (discussed above) may be well-suited to reducing the cost of attaining CRS requirements.

Exhibit F presents a more detailed overview of the CRS program.

7. **Pursue flexibility under Critical Area regulations.** Staff from the Maryland Critical Area Commission, serving on the St. Michaels Stormwater and Flood Management Task Force, presented recently completed work examining the potential for local Critical Area ordinances to be modified to achieve greater

²⁷ CoastSmart Communities Program available online at: <http://www.dnr.state.md.us/coastsmart/>

coastal resiliency benefits.²⁸ While the work is still very much in the preliminary phase and requires further evaluation by the Critical Area Commission, there are some promising ideas presented, which if applied to St. Michaels Critical Area ordinance, could yield a more efficient and impactful law. For example, in portions of the Town designated as Intensely Developed Area a property owner has the option of mitigating for stormwater impacts from 500 square feet of newly developed space by planting five trees or 15 shrubs, among other on-site best management practices. While this is a relatively easy method for complying with Critical Area regulations, trees and shrubs provide little relief for stormwater quantity. “This is a lost opportunity in a town that experiences nuisance flooding which is exacerbated by existing impervious surface.”²⁹ Alternatively, a fee-in-lieu payment can lead to more efficient stormwater management technologies being installed, or installing technologies in locations where stormwater management is badly needed. By paying the fee-in-lieu, currently set at \$2.50 per square foot of impacted residential space, the Town can direct project funding to locations where stormwater management may be more impactful. The Town can also find economies of scale by aggregating fee-in-lieu payments and investing in larger facilities, which individual property owners would be unlikely to undertake. At present, there are restrictions on how fee-in-lieu monies can be raised and disbursed, which prevents the Town from capturing these efficiencies. A modification to the Town’s Critical Area ordinance might add flexibility to how and where fee-in-lieu revenue can be used. It is too early to give concrete direction to the Town of St. Michaels on its’ Critical Area ordinance, and specifically changes to the fee-in-lieu structure. Nonetheless, St. Michaels should follow the lead of the Critical Area Commission and peer communities, and re-evaluate their Critical Area ordinance when the time is right.

8. **Identify acceptable stormwater management features and technology as it pertains to Historic District regulations.** A constraint to actively managing stormwater is the St. Michaels’ Historic District and uncertainty about what is and is not acceptable under the Historic District regulations in terms of stormwater technology placement and design. Many of the buildings in the Historic District were constructed before the notion of stormwater management existed and there is significant opportunity to add stormwater management capacity on these buildings. At the same time, it is very important that the Town retain its historic charm and comply with Historic District regulations. The Town’s Historic District includes approximately the area north of Chew and south of Fremont streets along Talbot Street – an area susceptible to nuisance flooding in the past. The Town would be doing a

²⁸ DeWeese, A. 2015. Final Report: A Local Framework for Coastal Resilience Strategies for Critical Area Jurisdictions. Prepared by the Maryland Critical Area Commission.

²⁹ Ibid.

service to its residents by clarifying the Historic District regulations as they relate to potential stormwater technologies. The Town of St. Michaels, the Historic District Commission, and the Town's stormwater engineer should work together to identify a set of designs and technologies that would serve to both manage stormwater and meet Historic District regulations. In turn, the Town can develop a cheat sheet for residents with photographs indicating the type of technology, design, and placement acceptable under the Historic District regulations.

Project Team

Sean Williamson, Program Manager, EFC

Sean Williamson joined the EFC in 2012 and manages energy and climate change adaptation work as it relates to local governments. Sean is actively investigating the intersection between stormwater management and sea level rise in Maryland's coastal communities, and options for financing adaptation. Prior to joining EFC, Sean worked at the Center for Integrative Environmental Research at the University of Maryland where he researched renewable energy, greenhouse gas reduction policies, and ecological economics. Sean strives to make data-driven decision-making and clear communication the central components of his work with communities and stakeholders. He graduated from the University of Maryland School of Public Policy with a Master of Public Policy and holds a Bachelor of Science from Cornell University.

Jennifer Cotting, Research Associate, EFC

Jennifer Cotting joined the University of Maryland Environmental Finance Center in 2004 and is currently the center's Research Associate for Green Infrastructure Finance. In this role, Jennifer manages EFC's green infrastructure programming which spans large landscape conservation and habitat management, as well as urban land use and stormwater management applications of green infrastructure. Jennifer serves as a guest lecturer on green infrastructure financing for the University's Green Infrastructure and Community Green courses and Virginia Tech's Executive Masters in Natural Resources Program, and frequently collaborates with green infrastructure colleagues at the Syracuse University EFC. Current and recent projects include: the Green Infrastructure Financing Map; Improving Local Government Capacity to Implement Watershed Planning; and Development of the National Urban and Community Forestry Advisory Council's Ten Year Action Plan. Prior to becoming a Research Associate, Jennifer served as the Center's Assistant Director for three years and spent five years as a Program Manager. She received her M.S. in Sustainable Development and Conservation Biology from the University of Maryland and her B.A. in Communications from Marymount University.

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Jeff Richardson, Superintendent of the Department of Public Works, and **Roy Myers**, St. Michaels Commissioner. In addition, thank you to all St. Michaels Commissioners for your engagement on this project, including **Joanne Clark**, **Ann Borders**, **Joyce Harrod**, and **Jaime Windon**.

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***Exhibit A - Annotated Maps with
Feedback from St. Michaels
Community***

St. Michael's Community Supported Stormwater and Flood Management Project –
Environmental Finance Center, September 28, 2015

Exhibit A – Annotated Feedback from Community with Accompanying Maps

Map A		
#	Approximate Location	Specific Feedback
2	Water Street	Repeated basement flooding (several feet of water) in spite of installed drainage system. Related to storm drain back up?
3	Mulberry Street	Are there storm drains on mulberry Street for our sump pump to empty into?
4	S. Talbot & W. Chestnut	Heavy flooding on Talbot in front of the market.
5	Harbor Road	Rising tidal water in Fall at full moon or heavy south winds up bay. Docks flood more regularly during the year.
7	S. Talbot Street	Stormwater surrounds my home. The water crosses from my front steps (up to the 3rd step usually) straight across Talbot St to my neighbors' front steps; it drains, but slowly.
9	Grace Street	Stormwater plus tidal surge cover the street plus most of the yard at 123 Grace St.
10	Harbor Road	Storm plus tidal surge cover the road at Harbor Rd W. Also the front yards plus some backyards on this street
11	Church Street	Stormwater on high tide floods impacts Church Street. Before duckbill tide gate installed.
22	W. Chew Avenue	Although our property is an higher elevation than most in town, getting to other locations may become a problem with sea level rise.
24	Grace Street	Water collecting on Grace St, after a heavy rain; no stormdrain, flooding is all on grace St after rain.
27	Outside of St. Michaels	Stormwater/water quality concerns from Town of St. Mike's into San Domingo
31	Chestnut/Tilden Street and Talbot	My concern is frequent Tilden St flooding and Talbot St.
32	Chestnut/Tilden Street	How could we create retention at end of the street?
39	West to the St. Luke's cemetery	Failing culvert needs to be replaced.

St. Michael's Community Supported Stormwater and Flood Management Project –
Environmental Finance Center, September 28, 2015

Map B		
#	Approximate Location	Description/note
1	Mulberry Street	Are there storm drains on mulberry Street for our sump pump to empty into?
6	Playground off railroad avenue	Public Play area on Railroad Ave, adjacent to drainage way that floods subject park - saturated for days after event, useless to public. Occurs several times per year.
8	Willow Street	Flooding due to storm drain in low area and problems at high tide/ drain tide to harbor nowhere for water to go heavy rain & tide.
21	E. Chew Avenue	President: 1. Only townhouse in St. Mike's 2. 100% of property is impervious surface. Area between: East Chew & Chestnut floods (New street re-design puts strain on stormwater infrastructure).
23	Dodson Avenue	Laying water in backyard right up to the house. Had to get a pump put in the water cover the tip of my cane, the road has a dip in front of the yard that needs looking at as well.
25	Brooks Lane	Whole yard floods from drainage.
26	Perry Cabin Drive	Concerned about stormwater quality.
29	Dodson Avenue	Neighborhood flooding, the houses elevations are higher than the drainage, water stands in pools for a very long time.
36	North Street and N. Talbot Street	Water Table is high, moisture problems in foundation - you can see water coming out of foundation during medium events.
37	Cherry Street and Honeymoon Bridge	Experiences significant flooding during high tides.
38	S. Talbot Street/Grace Street/Thompson/ W. Chestnut	Flooding/ stormwater along Talbot sits on high side of road on south Talbot.

Map C		
#	Approximate Location	Description/note
19	E. Maple Avenue	Rocks piled at new drains; too many and they are stopping stormwater.
20	E. Maple Avenue	Water comes up from new drain.
28	E. Maple Avenue	My whole yard under water in rain over 1"; E Marengo St. behind me floods even with 5 storm grates; ditches need to be dug out, pipes need flushing out.
30	W. Chew Avenue	The majority of the storm water issues were resolved when the road was reengineered during the roadwork project last year. What remains are issues of drainage ditches filling up because of blockages. Standards for these ditches need to be developed, followed and enforced.

St. Michael's Community Supported Stormwater and Flood Management Project –
Environmental Finance Center, September 28, 2015

Map A



Map B

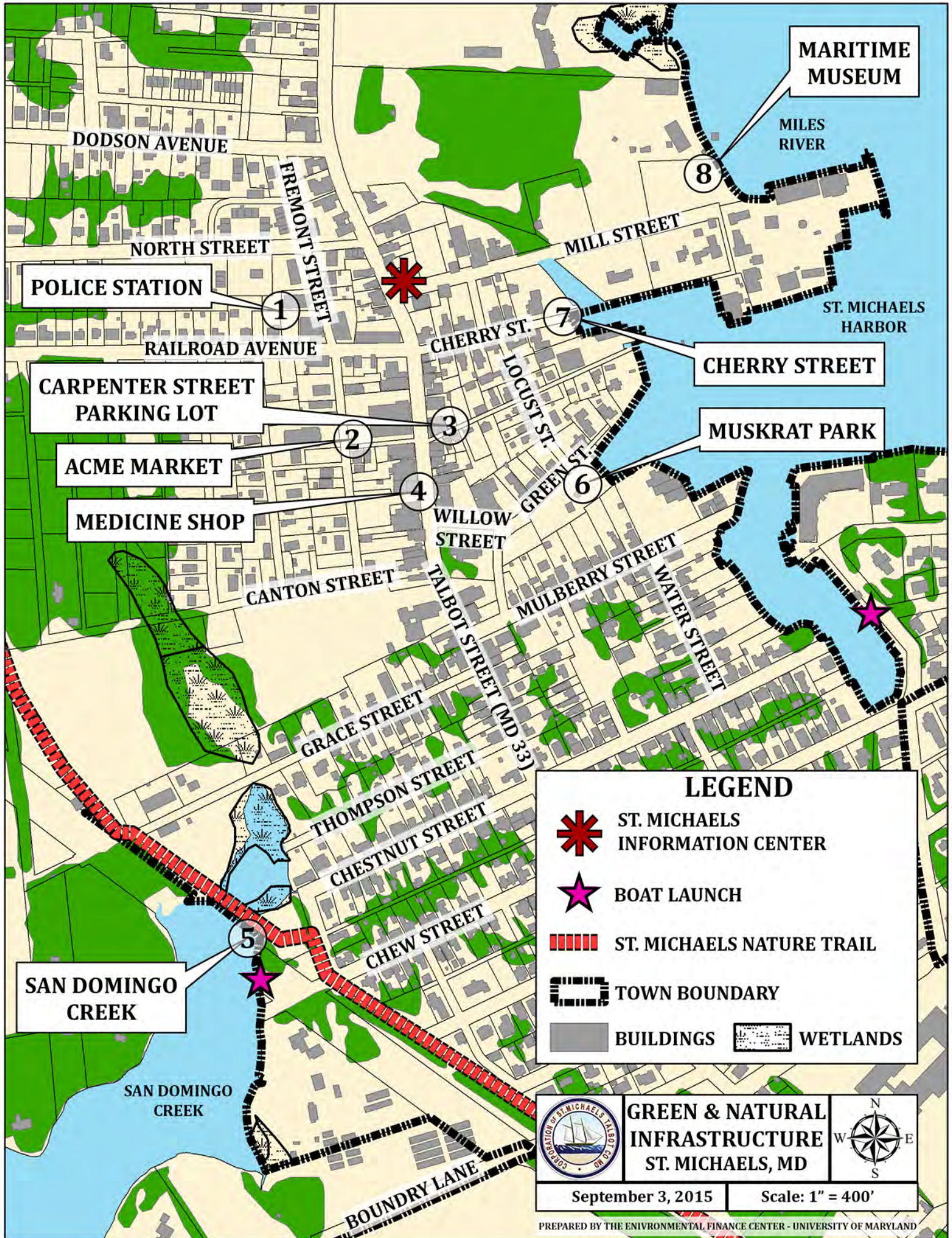


St. Michael's Community Supported Stormwater and Flood Management Project –
Environmental Finance Center, September 28, 2015

Map C



***Exhibit B – Existing Green
Infrastructure Facilities in St.
Michaels: Map + Photos***



MARITIME MUSEUM







MILES RIVER

ST. MICHAELS HARBOR

CHERRY STREET

MUSKRAT PARK

LEGEND

-  ST. MICHAELS INFORMATION CENTER
-  BOAT LAUNCH
-  ST. MICHAELS NATURE TRAIL
-  TOWN BOUNDARY
-  BUILDINGS
-  WETLANDS



GREEN & NATURAL INFRASTRUCTURE
ST. MICHAELS, MD



September 3, 2015

Scale: 1" = 400'



1 – Police Station Rain Garden



2 – ACME Market Bio-Retention



3 – Carpenter Street Infiltration Facility



4 – Medicine Shop Infiltration Facility



5 – San Domingo Creek Living Shoreline



6 – Muskrat Park Bioswale & Duckbill Valve



7 – Cherry St. Bio-retention



8 – Maritime Museum Living Shoreline



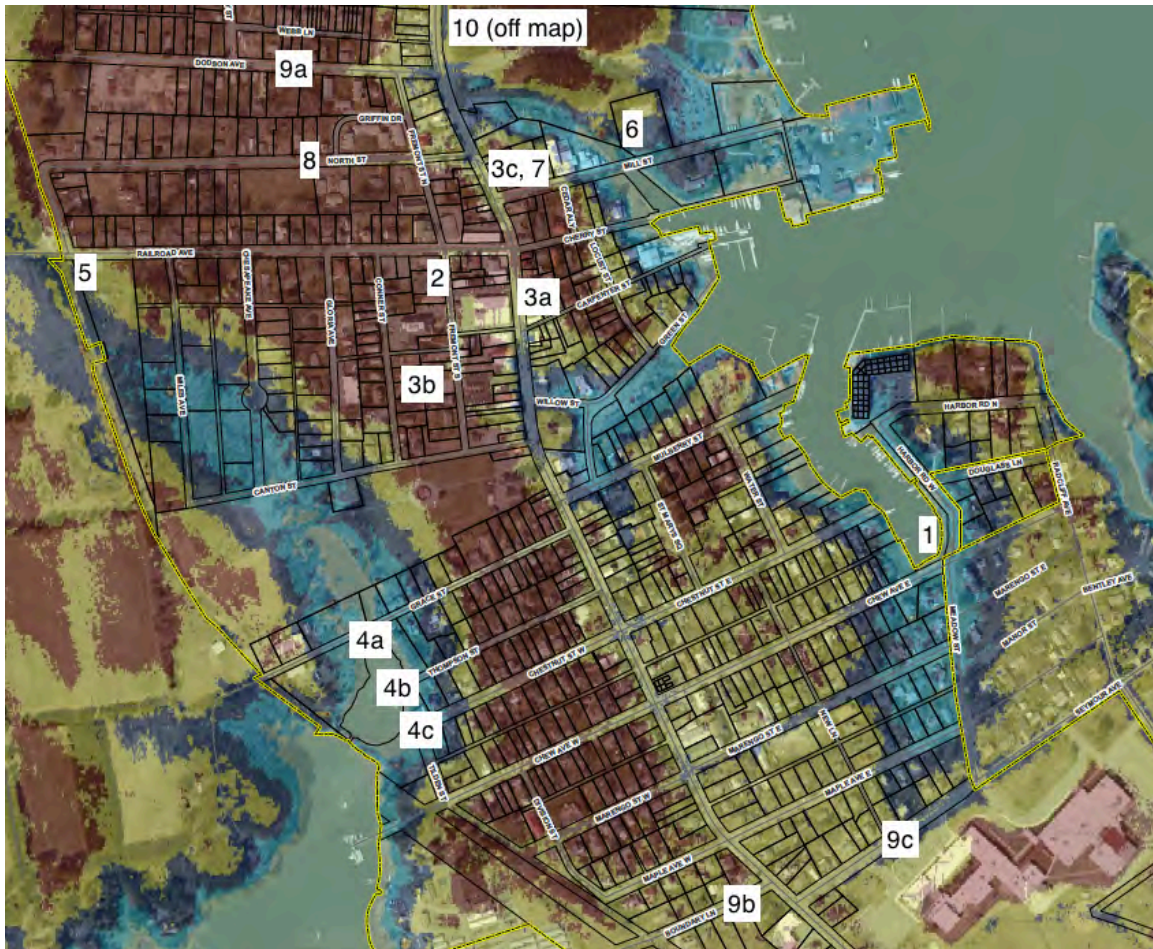
9 – Nature Trail Parking Lot Rain Garden (Off Map)

***Exhibit C – Prospective Green
Infrastructure and Stormwater
Facilities in St. Michaels: Map +
Analysis + Photos***

Potential Stormwater and Flood Management Capital Improvement Projects and Operations and Maintenance Activities in St. Michaels

This document presents an overview of potential stormwater and flood management capital improvement projects in the Town of St. Michaels. It is intended to serve as a planning tool for the Town as it evaluates different investment options in the future. Also, the emphasis is on green infrastructure as a mechanism for storing and treating water and for better positioning the Town for grant opportunities. These projects were selected by EFC-UMD with guidance from the Town of St. Michaels and other stakeholders including the Town’s stormwater engineer. The projects vary in terms of their stage of development (e.g., proposed critical area mitigation projects adjacent to San Domingo Creek vs. a green street) and scope (e.g., a simple rain barrel vs. an entire green street). In addition to capital improvement projects, the Town should be prepared to invest in training, staff time for infrastructure operations and maintenance, and education and outreach.

The approximate location of the capital improvement projects, an accompanying table detailing each project. Related photographs can be found below.



DRAFT – September 27, 2015 from University of Maryland Environmental Finance Center

Capital Improvement Projects to Improve Stormwater and Flood Management				
Reference # (see Map)	Name	Description	Priority	Rough Cost Estimate and Funding Source
1 (see photo #1 below)	Duckbills at Town Harbor outfalls	Duckbill valves prevent tidal/storm surge backflow into stormwater outfalls; approximately 5 outfalls at harbor. Tidal backflow is an issue along this southern portion of Town (source: Ben T. & Jeff R.).	High	<\$5,000 each; Unlikely to be funded with grant dollars
2 (See photo #2)	Landscape planter box at Police Station	Above ground planter boxes store a significant amount of rainwater and add beautification element to Town. Sized to store 100-300 gallons w/ downspouts connected via PVC pipe (source: Eric B.).	High	<\$1,000; Strong candidate for CBT mini-grant. O&M requirements
3a, 3b, 3c (see photo #3)	Rain barrels, 4 barrels located throughout Town	Rain barrels store rainfall reducing the stormwater load going into the Town's stormwater system. Potential sites include the Lacaze Meredith Building, the Community Garden Shed on Fremont, the public restrooms at Mill St. and Talbot St. 4 th rain barrel location to be determined (source: Jean W. & Sarah A.).	Low	4 made available to Town via CBT grant. O&M requirements.
4a, 4b, 4c (see photo #4)	Stormwater Mgmt. at San Domingo Creek	Three projects currently under evaluation at the foot of Grace (bio-retention), Thompson (submerged gravel wetland), and West Chestnut (submerged gravel wetland) per Inn at Perry Cabin mitigation project under Critical Area Ordinance. Water treatment benefits will be significant; water storage benefits should be evident as well.	Medium	No capital cost to Town. O&M requirements.
5 (see photo #5)	Railroad Avenue Habitat Creation	Tree planting, meadow creation and habitat creation. Secondary benefits for stormwater management along Back Creek (source: Sarah A.).	Low	Costs unknown.
6 (see photo #6)	Skate Park Stormwater Storage	Potential site for stormwater treatment and storage including a planter box and/or rain garden. Proximity to Mill Street outfall and congested stormwater pipes is an important feature of this prospective project (source: Jean W. & Sarah A.).	Low	Costs unknown. See grant resource list for potential funding options.
7 (see photo #7)	Mill St. Parking Lot Bioswales	Town owned parking lot at intersection of Talbot and Mill Street has existing green space w/ trees. Lot could be graded to store and treat more stormwater with bioswales, native plants, etc.	Low	<\$15,000. See grant resource list for potential funding options.
8 (see photo #8)	North St. ditches to bioswales	North Street has some of the Town's last remaining open ditches. Ditches could be transformed to bioswales to treat and store stormwater (source: Sarah A.).	Medium	<\$15,000. See grant resource list for potential funding options.
9a, 9b, 9c (see photo #9)	Green Streets, 3 potential locations	A comprehensive street retrofit including sidewalk planters, bioswales, permeable pavement, and other features. A green street manages a significant amount of stormwater. Potential locations include Seymour Ave., Boundary Lane, and Dodson St.	Low	~\$100,000-500,000; Strong candidate for CBT Green Streets Grant
10 (no photo available)	Stormwater facility near ball fields	A stormwater facility will be sited near the Talbot County ball fields by the water tower per the Inn at Perry Cabin mitigation project under Critical Area Ordinance.	Medium	No capital cost to Town. O&M requirements.
O&M and Related Activities to Improve Stormwater and Flood Management				
11 (Not on map)	Green Infrastructure Training, O&M for DPW	With increase in green infrastructure in Town, DPW staff needs training and resources to manage. O&M for green infrastructure is chronically underfunded across communities. May also include emergency management training.	High	~\$1,000 for materials (e.g., dunks and plants) & ~\$1,000 for training; unlikely to be funded with grant dollars
12 (Not on map)	Community Edu. & Outreach for Staff	The Town of St. Michaels can assist private property owners in managing stormwater and tidal water by connecting residents to experts and resources.	High	40 hours of staff time/year; \$250 for marketing, food

Photo Set # 1: Outfalls at Town Harbor

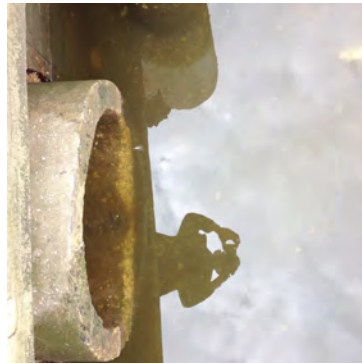
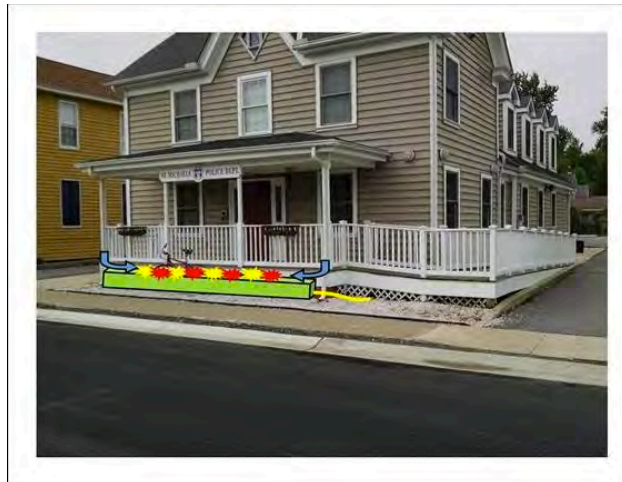


Photo Set #2: Planter Box at Police Station



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Photo Set #3: Rain Barrels at Various Locations (L Photo is Lacaze Meredith, R Photo public restrooms at Mill St. and Talbot St.).



Photo Set # 4: Stormwater Management at San Domingo Creek (L Photo is foot of W. Chestnut facing San Domingo, R Photo is Grace St. facing Talbot St.).



Photo Set #5: Railroad Avenue Habitat Creation



Photo Set #6: Skate Park Stormwater Storage



Photo Set #7: Mill Street Parking Lot Bioswales



Photo Set #8: North Street Ditches to Bioswales



Photo Set #9: Green Streets (L Photo at Boundary Lane, R Photo at Dodson)



***Exhibit D – Grant Resources for
Financing Green Infrastructure and
Stormwater Management Projects in
St. Michaels***

Grants Resource Guide for St. Michaels, Maryland
(Focus: Stormwater management, green infrastructure, innovative water quality programs)

STATE PROGRAMS

Organization	Program	Description	Eligibility	Funding Amount	Deadline	Contact Information	Priority funds	Match	Website
Maryland Department of the Environment	Comprehensive Flood Management Grant Program	Promote development of local flood management plans, fund studies of watersheds and support capital projects for flood control and watershed management. Also provides grants to subdivisions immediately after floods for acquisition of damaged dwellings. Elevations and relocations of homes are eligible for funding.	County and municipal governments	Recently used to fund 50% for the non-federal share of the FEMA Hazard Mitigation Grant Program.	Varies	Carver Struve 410-517-3624	None listed	None listed	http://www.mde.state.md.us/programs/Water/Flood/HazardMitigation/ComprehensiveFloodManagementGrantProgram/Pages/Programs/Water/FloodMitigation/FloodMgmt/index.aspx
	Water Quality Financing Administration - Capital Project Assistance	Provides low-interest loans to local governments to finance wastewater treatment plant upgrades, nonpoint source projects, and other water quality and public health improvement projects.	Public and private entities	Varies	Currently open through January 29, 2016	Jag Khuman 410-537-3119 or jag.khuman@maryland.gov	Includes stream corridor restoration and shoreline erosion control	No, but some awards require payback.	http://www.mde.state.md.us/programs/Water/Quality/Finance/Fund/Pages/Programs/Water/Quality/Finance/Water_Quality_Finance.aspx
Maryland Department of Natural Resources	Chesapeake and Atlantic Coast Bays Trust Fund	Seeks to fund the most cost-effective, efficient nonpoint nutrient and sediment reduction project proposals in geographic targeted areas of the State. The Trust Fund encourages multi-year, multi-partner projects that will achieve the greatest reduction per dollar invested.	Funding is available to local governments and non-governmental organizations, including bi-county agencies, counties, municipalities, forest conservancy district boards, soil/water conservation districts, resource conservation and development councils, academic institutions and nonprofit organizations having a demonstrated ability to implement non-point source pollution control projects.	Varies	Letter of Intent due: January 15, 2016 Full proposals due March 31, 2016 5:00pm Technical Review will take place April 2016 – June 2016 Awardees will be announced no later than July 1, 2016	Gabe Cohee gabe.cohee@maryland.gov	None listed	Encouraged, not required	http://dnr7.maryland.gov/programs/TrustFund/Pages/TrustFund_grants.aspx
	CoastSmart Communities Grant	Encourage the incorporation of coastal hazards, sea level rise, and/or related coastal management issues into local long-term strategic planning, codes and ordinances, permitting processes, and education and outreach campaigns, etc.	Municipalities and counties in the coastal zone (Worcester, Somerset, Wicomico, Dorchester, Talbot, Caroline, Queen Anne's, Kent, Cecil, Harford, Baltimore, Baltimore City, Anne Arundel, Prince George's, Calvert, Charles, St. Mary's).	Up to \$75,000 annually per year	Most recent round was due March 13, 2015.	Kate Skaggs kate.skaggs@maryland.gov	Preference given to projects that focus on reducing community vulnerability to coastal hazards and/or sea level rise.	No match required	http://dnr7.maryland.gov/CoastSmart/Programs/Pages/CoastSmartCommunities.aspx
National Fish and Wildlife Foundation	Chesapeake Bay Small Watershed Grants	Grants will be awarded for projects that promote community-based efforts to protect and restore the diverse natural resources of the Chesapeake Bay and its tributary rivers and streams.	Eligible applicants include non-profit 501(c) organizations, state government agencies, local governments, municipal governments, and Indian tribes, and K-12 educational institutions.	\$20,000 to \$200,000	Most recent round was due May 14, 2015.	Jake Reilly, Program Director, Chesapeake Bay jake.reilly@nfwf.org Elizabeth Nellums, Manager, Chesapeake Program Elizabeth.Nellums@NFWF.org Mark Melino, Coordinator, Chesapeake Program Mark.Melino@nfwf.org Program office: (202) 857-0166	Restoration and protection of pivotal habitats, improving conservation on private lands, and improving urban stormwater management. Targeted river and watershed restoration, green infrastructure in urban landscapes, and innovation on crosscutting issues.	These grants require minimum non-Federal matching contribution valued at 25% of the total project cost, equal to one-third of the grant request.	http://www.nfwf.org/chesapeake/Pages/Updatingforgrants.aspx#VjWm1NVtk0
	Environmental Solutions for Communities Grant Program	This program seeks to promote sustainable communities through Environmental Solutions for Communities by supporting highly-visible projects that link economic development and community well-being to the stewardship and health of the environment.	Non-profit 501(c) organizations, state government agencies, local governments, municipal governments, Indian tribes, educational institutions.	\$25,000 - \$100,000	Most recent round was due December 10, 2015.	Sarah McIntosh (All Geographies) Coordinator, Community-Based Conservation 202-595-2434 Sarah.McIntosh@nfwf.org Carrie Clingan Manager, Community-Based Conservation 202-595-2471 Carrie.Clingan@nfwf.org	Supporting sustainable agricultural practices and private lands stewardship; Conserving critical land and water resources and improving local water quality; Restoring and managing natural habitat, species and ecosystems that are important to community livelihoods; Facilitating investments in green infrastructure, renewable energy and energy efficiency; and Encouraging broad-based citizen and targeted youth participation in project implementation.	The ratio of matching funds offered is one criterion considered during the review process, and projects that meet or exceed a 1:1 match ratio will be more competitive. Matching funds may include cash, in-kind contributions	http://www.nfwf.org/environ/communitatulations/Pages/2016RFP.aspx#VjWm1NVtk0
	Five Star & Urban Waters Restoration Program	Seeks to develop community capacity to sustain local natural resources for future generations by providing modest financial assistance to diverse local partnerships for wetland, riparian, forest and coastal habitat restoration, urban wildlife conservation, stormwater management as well as outreach, education and stewardship. Projects should focus on water quality, watersheds and the habitats they support.	Non-profit 501(c) organizations, state government agencies, local governments, municipal governments, Indian tribes, and educational institutions.	Awards range from \$20,000* to \$50,000 with an average size of \$30,000 and 40-50 grants awarded per year	Most recent round was due February 3, 2015.	Sarah McIntosh (All Geographies) Coordinator, Community-Based Conservation 202-595-2434 Sarah.McIntosh@nfwf.org Carrie Clingan Manager, Community-Based Conservation 202-595-2471 Carrie.Clingan@nfwf.org	Competitive proposals will address each of the five following priorities: On the ground restoration and planning, partnerships between diverse organizations (projects must have 5 partners minimum), environmental outreach, education and training, specific and measurable results, and long-term sustainability.	The ratio of matching funds offered is one criterion considered during the review process, and projects that meet or exceed a 1:1 match ratio will be more competitive. Matching funds may include cash, in-kind contributions	http://www.nfwf.org/fivestars/Pages/Dome.aspx#VjWm1NVtk0
	Innovative Nutrient and Sediment Reduction Program	Grants will be awarded to projects that dramatically accelerate quantifiable nutrient and sediment reductions through innovative, sustainable, and cost-effective approaches, methods, and new technologies.	Non-profit 501(c) organizations, state government agencies, local governments, municipal governments, Indian tribes, and educational institutions.	\$200,000 to \$500,000	Most recent round was due May 14, 2015.	Jake Reilly, Program Director, Chesapeake Bay jake.reilly@nfwf.org Elizabeth Nellums, Manager, Chesapeake Program Elizabeth.Nellums@NFWF.org Mark Melino, Coordinator, Chesapeake Program Mark.Melino@nfwf.org Program office: (202) 857-0166	Restoration and protection of pivotal habitats, improving conservation on private lands, and improving urban stormwater management. Targeted river and watershed restoration, green infrastructure in urban landscapes, and innovation on crosscutting issues.	These grants encourage non-Federal matching contributions valued at 50% of the total project cost, equal to the grant request	http://www.nfwf.org/chesapeake/Pages/Updatingforgrants.aspx#VjWm1NVtk0
	Technical Capacity Grants Program	Provides grants directly to eligible applicants acting on behalf of eligible beneficiaries for delivery of technical services that enhance the capacity of local partners to implement high-impact and cost-effective on-the-ground restoration efforts. Funded projects are not expected to include significant on-the-ground restoration actions, but instead to enhance the technical capacity of beneficiaries to implement more effective restoration through existing programs and/or future funding and project opportunities	Non-profit 501(c) organizations, local governments (including soil and water conservation districts), municipal governments, and Indian tribes. Eligible applicants: list of pre-approved organizations found on the grant website.	Grants not exceeding \$50,000	2015 deadlines: - Agricultural conservation projects were due Feb 19 - Restoration and Community Stewardship projects were due April 16 - Stormwater Management due Sep 17 (see priority funds for differentiation of project types)	Jake Reilly, Program Director, Chesapeake Bay jake.reilly@nfwf.org Elizabeth Nellums, Manager, Chesapeake Program Elizabeth.Nellums@NFWF.org Mark Melino, Coordinator, Chesapeake Program Mark.Melino@nfwf.org Program office: (202) 857-0166	This program has three application cycles per year for a rotating set of priority investment areas, including (1) agricultural and conservation, (2) restoration and community stewardship, and (3) stormwater management.	There is no match requirement for the Technical Capacity Grants Program. However, projects are encouraged to provide non-federal cash or in-kind match	http://www.nfwf.org/chesapeake/Pages/TechnicalCapacity.aspx#VjWm1NVtk0

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Foundation Programs</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Chesapeake Bay Trust</p>	<p>This grant program encourages outreach and community engagement activities that increase stewardship ethic of natural resources and on-the-ground restoration activities that demonstrate restoration techniques and engage Maryland citizens in the restoration and protection of the Chesapeake Bay and its rivers.</p> <p>Track 1: Outreach projects should: Raise public awareness and engagement in the challenges and solutions to restoring Maryland's natural resources, such as local green spaces from urban to rural, parks, streams, rivers, and bays.</p> <p>Track 2: Restoration projects should: Engage people in on-the-ground community-based projects that both benefit the community and benefit the quality of one or more natural resources.</p>	<p>501(c)3 Private Nonprofit Organizations Faith-based organizations Community Associations Service, Youth, and Civic Groups Municipal, County, Regional, State, Federal Public Agencies Soil/Water Conservation Districts & Resource Conservation and Development Councils Forestry Boards & Tributary Team Public and Independent Higher Educational Institutions</p>	<p>Track 1: Outreach: \$5,001 - \$20,000 for projects focused on education and awareness as project outcomes \$5,001-\$50,000 for behavior change projects.</p> <p>Track 2: Restoration: \$5,001-\$25,000 for implementation projects \$5,001 - \$75,000 for projects that combine restoration and outreach elements to measurably build knowledge within the community served.</p>	<p>Most recent round was due December 10, 2015.</p>	<p>For assistance, please contact either: Kacy Wetzel at (410) 974-2941 ext. 104; kwetzel@cbrtrust.org or Abbi Hüntinger at (410) 974-2941 ext. 106; ahuntinge@cbrtrust.org</p>	<p>See previous RFP for details: http://www.cbrtrust.org/af/cf/%7B82A714E-8219-45E8-8C3D-50E611847C8B%7D/09620RFP__FY16%20%20Final.pdf</p>	<p>Encouraged but not required.</p>	<p>http://www.cbrtrust.org/af/cf/mjPKPCmH/b_54537c7a_6d99/Watershed_and_Restoration.htm</p>
	<p>This program will support design assistance, watershed planning and programmatic development associated with protection and restoration programs and projects that lead to improved water quality in the Maryland portion of the Chesapeake Bay watershed, the Maryland portion of the Youghiogheny watershed, and the Maryland Coastal Bays.</p>	<p>The Funding partners welcome requests from Maryland local government and non-profit applicants seeking to fund projects within counties for which 2014-2015 Two-year Milestone commitments have been provided to MDE. For local partners that have not yet submitted milestones to MDE, proposals will be considered if substantive milestone commitments are provided by a local government representative to MDE prior to the RFP closing date. See RFP for full list of organizations.</p>	<p>\$50,001 to \$75,000</p>	<p>Most recent round was due September 3, 2015.</p>	<p>For assistance, please contact either: Kacy Wetzel at (410) 974-2941 ext. 104; kwetzel@cbrtrust.org or</p>	<p>Funding will support earliest phases of restoration projects, and will assist with programmatic project support including: leveraging resulting designs, plans, or projects to craft future proposals to the Maryland Chesapeake and Atlantic Coastal Bays Trust Fund; Developing deliverables that will implement WIP Phase II strategies; and, crafting proposals for implementation funding through programs at the Chesapeake Bay Trust or other sources of support.</p>	<p>Encouraged but not required.</p>	<p>http://www.cbrtrust.org/af/cf/mjPKPCmH/b_54537c7a_6d99/Watershed_Assistance.htm</p>
	<p>This program seeks to implement cost-effective wetland projects to provide valuable wetland functions, including habitat for a wide range of species and improved water quality, flood attenuation, recharge of groundwater, and aesthetics in Maryland's local watersheds and ultimately the Chesapeake Bay, Youghiogheny River, and Atlantic Coastal Bays.</p>	<p>Non-profit organizations, for-profit entities, community associations, faith-based organizations and more. The list varies by project type and track so please see RFP for full list of organizations.</p>	<p>\$500,000</p>	<p>Most recent round was due December 10, 2015.</p>	<p>Tom Leigh tleigh@cbrtrust.org 410-974-2941, x 101</p>	<p>In order of priority: Nontidal wetland restoration Nontidal wetland creation Nontidal wetland enhancement Wetland preservation</p>	<p>Encouraged, not required</p>	<p>http://www.cbrtrust.org/af/cf/mjPKPCmH/b_8710772a_6d14/Nontidal_Wetlands.htm</p>
	<p>Funding to expand and enhance Bay environmental education programs for pre-K through 12 grade students in Maryland, with a focus on increasing environmental stewardship by building and expanding pre-K through 12 environmental education programs and increasing student access to programs that provide meaningful outdoor learning experiences.</p>	<p>Non-profit organizations, community associations, faith-based organizations and more. See RFP for full list of organizations.</p>	<p>Applicants may request from \$5,001 to \$35,000 per year for three years (maximum is \$105,000 total award over years 2016-2019). The Trust anticipates making one or two multi-year awards. Applicants can submit two year or three year requests but all applicants for multi-year requests must talk with Trust staff prior to formulating proposals.</p> <p>Mini grants program offers up to \$5,000.</p>	<p>Most recent round was due December 4, 2015.</p> <p>Mini grants are available on a rolling basis.</p>	<p>Jamie Baxter jbaxter@cbrtrust.org 41-974-2941 x 105</p>	<p>None listed</p>	<p>Encouraged, not required</p>	<p>http://www.cbrtrust.org/af/cf/mjPKPCmH/b_8600085a_7261/Environmental_Education.htm</p>
	<p>Projects that connect Maryland residents with activities that enhance communities, engage residents, and improve natural resources.</p>	<p>Non-profit organizations, community associations, faith-based organizations and more. See RFP for full list of organizations.</p>	<p>Mini grants program offers up to \$5,000.</p>	<p>Proposals are accepted on an on-going basis until funds for the fiscal year are exhausted. Please note that the Trust must receive all proposals a minimum of six weeks prior to the start of the proposed project.</p>	<p>Emily Stransky estransky@cbrtrust.org 410-974-2941 x112</p>	<p>Activities such as tree plantings, rain gardens, stream cleanups, and storm drain stenciling. To see a longer list of potential projects, read the full RFP. Please note the RFP has changed from previous years so please read for updates.</p>	<p>Encouraged, not required</p>	<p>http://www.cbrtrust.org/af/cf/mjPKPCmH/b_8600107a_6d14/Community_Engagement_and_Restoration_Mini_Grants.htm</p>
	<p>The goal of the Chesapeake Bay G3 Grant Program is to help communities implement sustainability plans that reduce stormwater runoff, increase the number and amount of green spaces in urban areas, improve local and Bay water quality, and enhance the quality of life.</p>	<p>Local government, non-profit organizations, and neighborhood/community associations. Funding can be applied anywhere in the Chesapeake Bay watershed portion of EPA Region 3 (Delaware, Pennsylvania, Virginia, West Virginia and Washington, D.C.) and all of Maryland.</p>	<p>Up to \$75,000 for implementation projects Up to \$30,000 for design projects Up to \$20,000 for white papers</p>	<p>Most recent round was due March 13, 2015.</p>	<p>Sadie Drescher sdrescher@cbrtrust.org (410) 974-2941 ext. 103</p>	<p>Cost effective and innovative low impact development/green infrastructure BMPs; gray infrastructure re-design and/or repair projects; Stormwater projects that seek to mitigate flooding.</p>	<p>Encouraged, not required</p>	<p>http://www.cbrtrust.org/af/cf/mjPKPCmH/b_7735695a_5592/Green_Streets_Green_Jobs_Green_Towns.htm</p>

***Exhibit E – Green Infrastructure
Maintenance Training Workshop, a
workshop from the Maryland Sea
Grant Extension***

November 23, 2015

Mr. Sean Williamson, Program Manager
Environmental Finance Center
1211 Preinkert Field House
Building 054
College Park, Maryland 20742

RE: St. Michaels Green Infrastructure Maintenance Information and Workshop

Dear Sean,

As requested, please find the revised scope of work and budget for the *Town of St. Michaels Green Infrastructure Maintenance* project. I am pleased to be part of this important and exciting project and am looking forward to working with the project's partners on it in the coming months.

An important aspect of this project is that as the Town of St. Michaels continues to implement additional water quality enhancing best management practices (BMP) to address the stormwater needs of the community, the information developed as part of this project will be set up in such a manner that it can easily be added to or updated. Additionally, it can be scaled up or down in the event other municipalities are interested in adopting a similar approach to addressing their BMP maintenance issues.

If you have any questions or need additional information, please don't hesitate to contact me.

Sincerely,



Eric H. Buehl
Regional Watershed Restoration Specialist
University of Maryland Sea Grant Extension Program

Tasks and Timeline

1. Inventory and photo document existing Town BMPs for standard maintenance needs (Jan 2016).
2. Meeting with Town of St. Michaels Public Works Director, Town Manager, and Planner/Zoning Officer, and Planning Commission, Parks and Rec. Board, Katya Landscapes, Master Gardeners, and the Town's Stormwater Engineer to discuss project goals/objectives, scope, and timeline (Feb 2016).
3. Select plants for rain barrels (Feb 2016)
4. Install rain barrels, plant material + signs (March 2016)
5. Review existing regional BMP maintenance information for relevant content and applicability (March 2016).
6. Develop draft BMP maintenance information outline (April 2016).
7. Submit draft outline to Town for review and revise if necessary (April 2016).
8. Draft routine BMP maintenance guide (May 2016).
9. Review maintenance information with Town officials and revise if necessary (June 2016).
10. Hold BMP maintenance workshop w/ Public Works Staff + Residents (June 2016).

Budget

Total: \$750.00.

Printed Materials

Printing copies of maintenance information-

Printed copies of various information required for the BMP maintenance information ≈ \$130 Maximum. Preference of St. Michaels is to allocate printing costs to Green Infrastructure Related Supplies (See below).

Green Infrastructure Related Supplies

Native plant/rain barrel materials for use during workshop-

Native grasses, wildflowers, and shrubs (plugs in flats and container-grown) with exact species and quantities TBD based on BMP condition at time of inventory. The Town of St. Michaels requires that all efforts be made to purchase plants at wholesale price.

Other supplies related to green infrastructure facilities-

Planters and demonstration signs to be paired with recently installed rain barrels, and other green infrastructure supplies as directed by the Town of St. Michaels.

Total budget for green infrastructure related supplies ≈ \$530 Minimum. Preference of St. Michaels is to allocate printing costs to Green Infrastructure Related Supplies.

Travel

Estimated mileage for meetings, BMP inventory, workshop preparation, and workshop in St. Michaels-

4 trips @ 37 miles per trip = 148 miles

148 miles X \$0.575 per mile = \$85.10 ≈ \$90

***Exhibit F – National Flood Insurance
Program’s (NFIP) Community Rating
System (CRS): A Checklist and
Program Overview***



Community Rating System

March 2014

The National Flood Insurance Program (NFIP) Community Rating System (CRS) was implemented in 1990 as a voluntary program for recognizing and encouraging community floodplain management activities exceeding the minimum NFIP standards. Any community in full compliance with the minimum NFIP floodplain management requirements may apply to join the CRS.

1,296 Communities Participate in the CRS

Nearly 3.8 million policyholders in 1,296 communities participate in the CRS by implementing local mitigation, floodplain management, and outreach activities that exceed the minimum NFIP requirements.

Under the CRS, flood insurance premium rates are discounted to reward community actions that meet the three goals of the CRS, which are: (1) reduce flood damage to insurable property; (2) strengthen and support the insurance aspects of the NFIP; and (3) encourage a comprehensive approach to floodplain management.

Although CRS communities represent only 5 percent of the over 22,000 communities participating in the NFIP, more than 67 percent of all flood insurance policies are written in CRS communities.

CRS Classes

The CRS uses a Class rating system that is similar to fire insurance rating to determine flood insurance premium reductions for residents. CRS Classes* are rated from 9 to 1. Today, most communities enter the program at a CRS Class 9 or Class 8 rating, which entitles residents in Special Flood Hazard Areas (SFHAs) to a 5 percent discount on their flood insurance premiums for a Class 9 or a 10 percent discount for Class 8. As a community

engages in additional mitigation activities, its residents become eligible for increased NFIP policy premium discounts. Each CRS Class improvement produces a 5 percent greater discount on flood insurance premiums for properties in the SFHA.

Best of the Best

Four communities occupy the highest levels of the CRS. Each has developed a floodplain management program tailored to its own particular hazards, character, and goals. Under these programs, each community carries out numerous and varied activities, many of which are credited by the CRS. The average discount in policyholder premiums varies according to a community's CRS Class and the average amount of insurance coverage in place. Some highlights:

Roseville, California was the first to reach the highest CRS rating (Class 1). Damaging floods in 1995 spurred Roseville to strengthen and broaden its floodplain management program. Today the City earns points for almost all CRS creditable activities. The average premium discount for policies in the Special Flood Hazard Area (SFHA) is \$832.

Comprehensive planning for floodplain management has been a key contributor to **Tulsa, Oklahoma's** progress in reducing flood damage from the dozens of creeks within its jurisdiction. The City (Class 2) has cleared more than 900 buildings from its floodplains. The average premium discount for policies in the SFHA is \$583.

King County, Washington (Class 2) has preserved more than 100,000 acres of floodplain open space and receives additional CRS credit for maintaining it in a natural state. The average premium discount for policies in the SFHA is \$650.

Pierce County, Washington (Class 2) maintains over 80 miles of river levees. County officials annually mail informational brochures to all floodplain residents. The average premium discount for policies in the SFHA is \$666.

* CRS Class changes occur on May 1 and October 1 of each year. The data contained in this fact sheet were current through May 2014.

CRS Credit

A community accrues points to improve its CRS Class rating and receive increasingly higher discounts. Points are awarded for engaging in any of 19 creditable activities, organized under four categories:

- Public information
- Mapping and regulations
- Flood damage reduction
- Warning and response.

Formulas and adjustment factors are used to calculate credit points for each activity.

The communities listed below are among those that have qualified for the greatest premium discounts:

Class 1: Roseville, California

Class 2: Tulsa, Oklahoma
King County, Washington
Pierce County, Washington

Class 3: Sacramento County, California

Class 4: Fort Collins, Colorado
Skagit County, Washington
Snohomish County, Washington
Charleston County, South Carolina
Maricopa County, Arizona
Louisville-Jefferson County, Kentucky
Thurston County, Washington

Benefits of the CRS

Lower cost flood insurance rates are only one of the rewards a community receives from participating in the CRS. Other benefits include:

- Citizens and property owners in CRS communities have increased opportunities to learn about risk, evaluate their individual vulnerabilities, and take action to protect themselves, as well as their homes and businesses.
- CRS floodplain management activities provide enhanced public safety, reduced damage to property and public infrastructure, and avoidance of economic disruption and loss.
- Communities can evaluate the effectiveness of their flood programs against a nationally recognized benchmark.

- Technical assistance in designing and implementing some activities is available to community officials at no charge.
- CRS communities have incentives to maintain and improve their flood programs over time.

How to Apply

To apply for CRS participation, a community must initially inform the Federal Emergency Management Agency (FEMA) Regional Office of its interest in applying to the CRS and will eventually submit a CRS application, along with documentation that shows it is implementing the activities for which credit is requested. The application is submitted to the Insurance Services Office, Inc. (ISO)/CRS Specialist. ISO works on behalf of FEMA and insurance companies to review CRS applications, verify communities' credit points, and perform program improvement tasks.

A community's activities and performance are reviewed during a verification visit. FEMA establishes the credit to be granted and notifies the community, the State, insurance companies, and other appropriate parties.

Each year, the community must verify that it is continuing to perform the activities that are being credited by the CRS by submitting an annual recertification. In addition, a community can continue to improve its Class rating by undertaking new mitigation and floodplain management activities that earn even more points.

CRS Training

CRS Specialists are available to assist community officials in applying to the program and in designing, implementing, and documenting the activities that earn even greater premium discounts. A week-long CRS course for local officials is offered free at FEMA's Emergency Management Institute (EMI) on the National Emergency Training Center campus in Emmitsburg, Maryland, and can be field deployed in interested states. A series of webinars is offered throughout the year.

For More Information

A list of resources is available at the CRS website: www.fema.gov/national-flood-insurance-program-2/community-rating-system For more information about the CRS or to obtain the CRS application, contact the Insurance Services Office by phone at (317) 848-2898 or by e-mail at nfipcrs@iso.com.

Become CRS “Ready”

If your community is interested in joining the Community Rating System (CRS), there are a few steps that will help you in the Community Assistance Visit (CAV) and the CRS application itself:

- Review your floodplain ordinance against the R3 checklist. If not minimally compliant you will need to re-adopt. Consider higher standards that will support CRS and earn more activity points.
- Ensure your Hazard Mitigation Plan is adopted.
- Complete the CRS Quick Check (with a minimum 500 points).
- Review your community’s Rep Loss list for structures that have been mitigated or removed. This list can be obtained from your State NFIP Coordinator. Corrections should be made on an AW501 form that is submitted to ISO.
- Institute an administrative requirement for Elevation Certificates (ECs) on all as-built construction. Encourage other homeowners to give you a copy as well. Start a file to submit copies with the CRS application.
- Take the L273/E273 class – we want you to fully understand the National Flood Insurance Program so that you can pursue the higher standards of CRS. If you have already taken the class, sign up for E278 “The Community Rating System” at EMI (not mandatory before you apply for CRS but valuable before your next cycle visit).

Once these steps are completed, submit a Letter of Intent (LOI) signed by the community CEO to Mari Radford, FEMA R3. We will then schedule your CAV within 6 months.

CRS Quick Check and sample LOI:

http://www.fema.gov/media-library-data/20130726-1908-25045-6843/crs_quick_check_ff_086_0_35_omb_1660_0022_edition_2013.pdf

R3 Checklist will differ state by state. Contact your FEMA planner for an updated copy.

Where do I get an AW501?:

http://www.fema.gov/media-library-data/20130726-1446-20490-1224/fema_497_usersguide_nt_v3.1_apndx_g.pdf

How do I sign up for E273 or E278?

<http://training.fema.gov/EMI/>

More CRS Resources:

<http://crsresources.org/>

Contact: Mari Radford mari.radford@fema.dhs.gov or 215/931-2880 for more information.

***Exhibit G – St. Michaels Stormwater
Management Tools: A Resource for
Property Owners***



Stormwater Management on Your Property: Best Practices and Tools

*St. Michaels property owners choose to manage stormwater because it protects their property, treats pollution and cleans the Bay, and reduces burdensome flooding on public roads and parks. There are many tools for improving stormwater management on your property. There is no one solution that will work for everyone and it is important to do your research. In general, stormwater should be directed away from buildings and **should not** be directed into the street. Good stormwater management involves maximizing infiltration by allowing lawns, gardens, and the tools described below to do their job.*

French Drains

A French drain is a trench filled with gravel containing a perforated pipe that collects and directs stormwater. French drains prevent water from penetrating or damaging building foundations, but may be used to expedite removal of surface water on any piece of land. French drains must be sited and designed with the height of the water table in mind. Cost: under \$200 without labor.

Rain Gardens and Stormwater Planters

On its surface, a rain garden looks a lot like a conventional garden. However, rain gardens are designed to collect more water – potentially 100% of the local drainage area! Rain gardens should be sited downslope from runoff and be planted with sun-loving and water tolerant plants. If a high water table precludes a rain garden on your property, an aboveground stormwater planter is an attractive alternative. A stormwater planter typically borders your building foundation and is watered via downspouts. The planter can host an array of water tolerant plants and can store hundreds of gallons of runoff from your roof. Cost: \$300-600 without labor.



Photo: Stormwater planter

Rain Barrels and Cisterns



Rain barrels and cisterns store runoff from your roof. Water storage delays the release of stormwater reducing local flooding problems and allowing property owners to later use the water for gardening, watering the lawn, or even drinking (if properly filtered). Rain barrels can store around ~55 gallons of water and are very easy to install and maintain. Cisterns are typically larger and can hold 100+ gallons of water. Rain barrels cost under \$150 and cisterns can cost \$200-500.

Native Plants

The easiest step property owners can take to manage stormwater is to plant native plants, trees and shrubs. Including Indian Grass, Little Blue Stem, and Heath Aster, these species have deep root systems that absorb and treat stormwater. Native plants can be purchased or transplanted for very little cost.

See Reverse for Resources to Help you Better Manage Stormwater



Stormwater Management on your Property: Resources for St. Michaels

The list that follows offers resources for helping property owners to further research stormwater management tools, technical experts to contact, and other ideas for getting projects started.

- **Essential Reading**

Rain Gardens Across Maryland, University of Maryland Extension. Available online at: https://extension.umd.edu/sites/default/files/docs/articles/Rain_Gardens_Across_MD.pdf

From My Backyard to Our Bay, University of Maryland Extension. Available online at: <https://www.extension.umd.edu/sites/default/files/docs/Backyardtothebay5-3.pdf>.

Native Plants of Maryland: What, When and Where, University of Maryland Extension. Available online at: <https://extension.umd.edu/hgic>.

Homeowner Guide for a more Bay-Friendly Property, Chesapeake Stormwater Network. Available online at: <http://chesapeakestormwater.net/be-bay-friendly/>.

- **Technical Assistance**

Eric Buehl, Regional Watershed Restoration Specialist for Talbot County and the Upper Shore, University of Maryland Sea Grant Extension. *Eric can help property owners decide what the best stormwater control measure is for their property.*

Mikaela Boley, Master Gardener Coordinator for Talbot County, University of Maryland Extension. *Mikaela can help property owners learn about native gardening and planting and assist with other stormwater management questions.*

Town of St Michaels Code Enforcement Officer, be sure to contact the Town of St Michaels if there are any concerns about Historic District requirements or other Town ordinances.

Contact Information	Contact Information
Eric Buehl Email: ebuehl@umd.edu Office: 410-827-8056 ext. 176	Mikaela Boley Email: mboley@umd.edu Office: 410-822-1244 ext. 12

- **Finding Plants and Equipment**

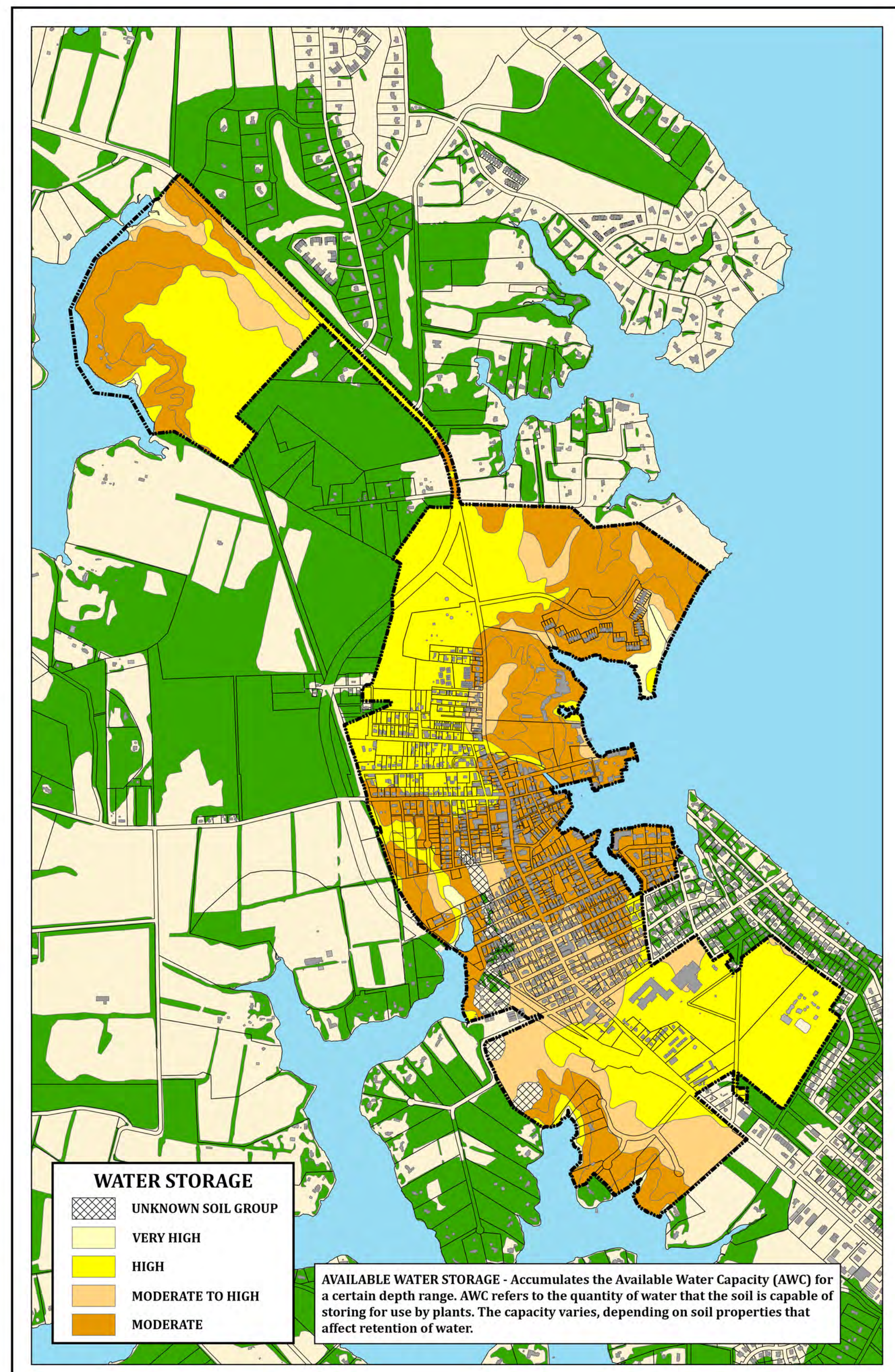
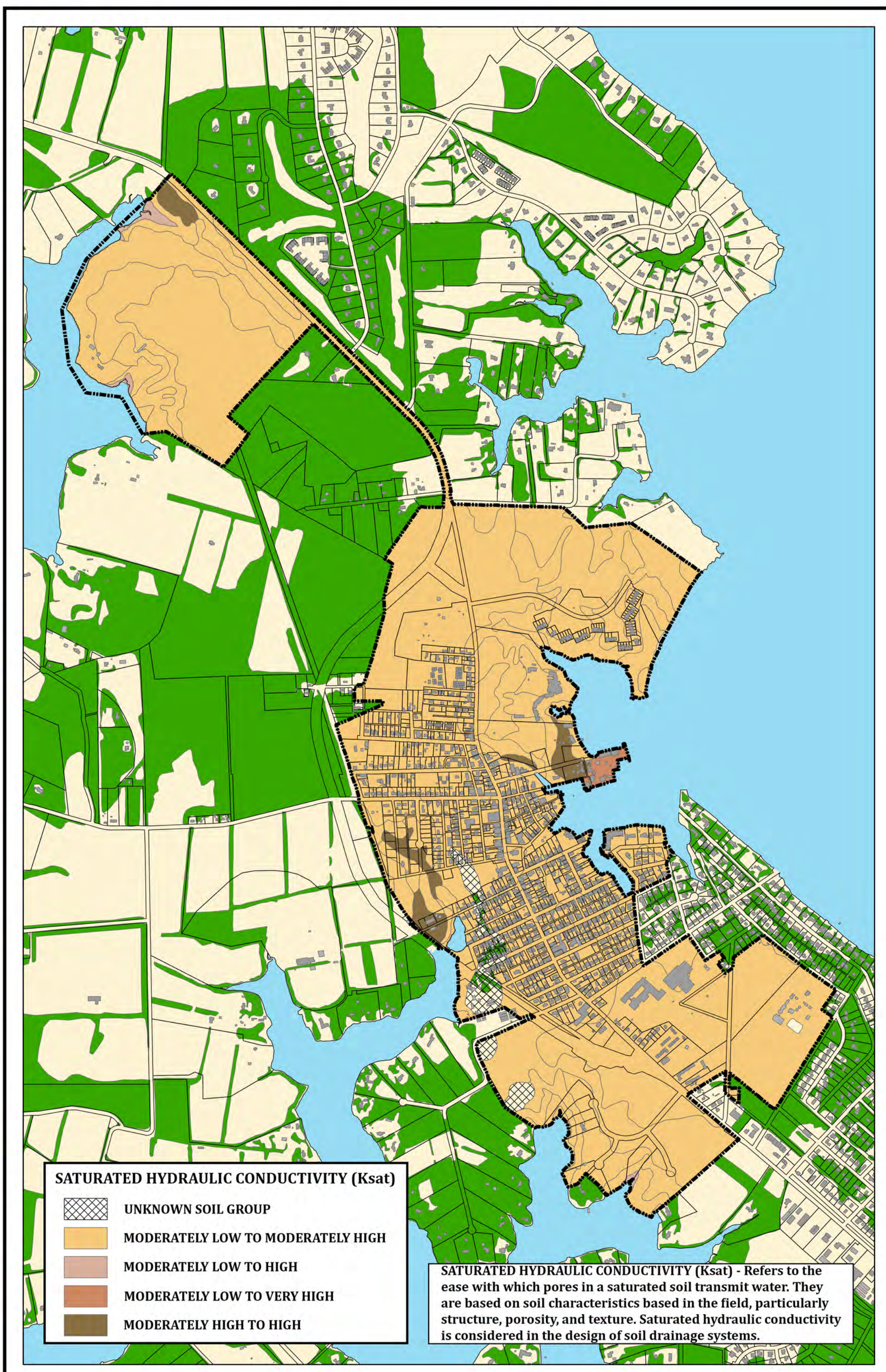
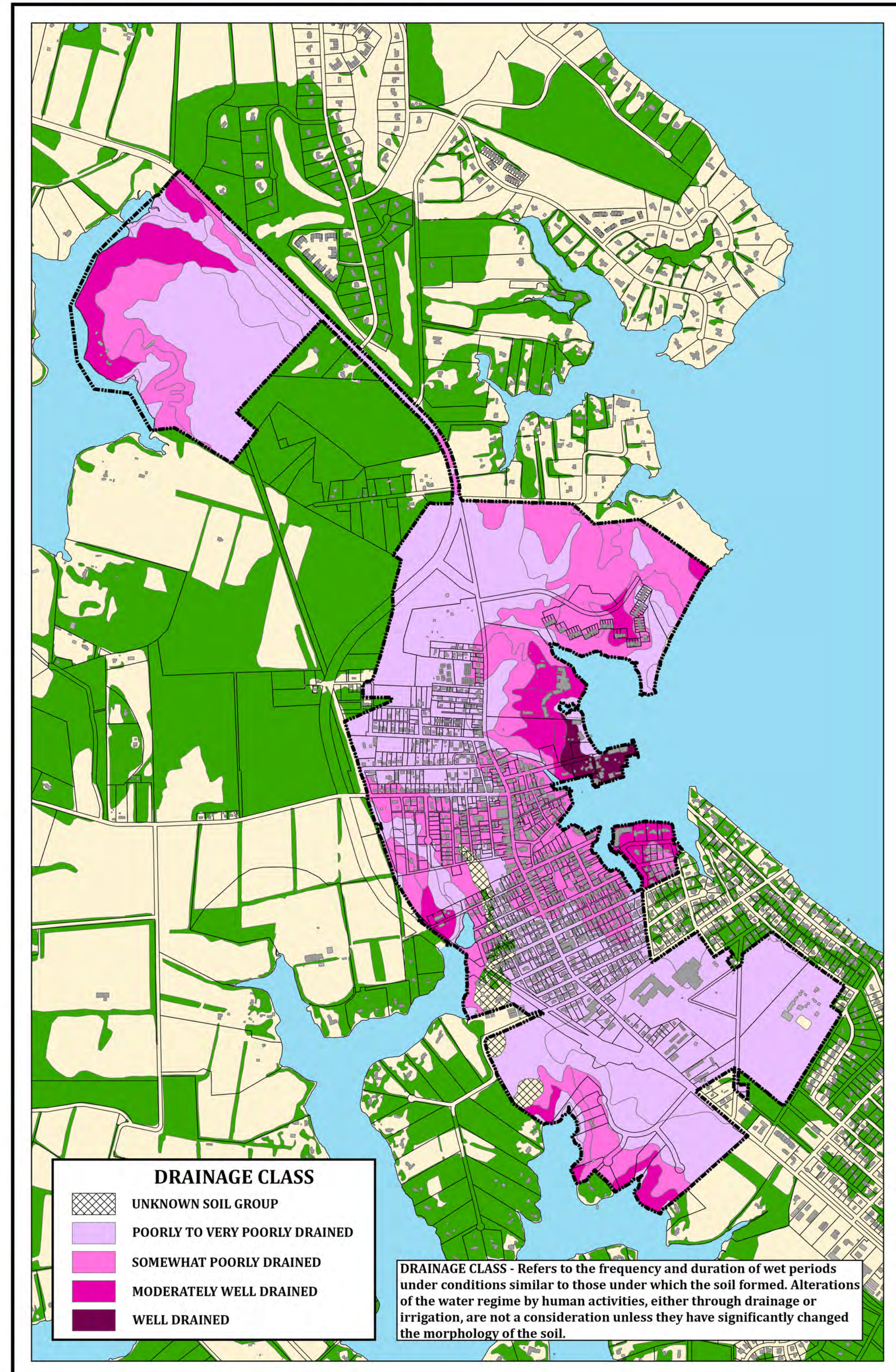
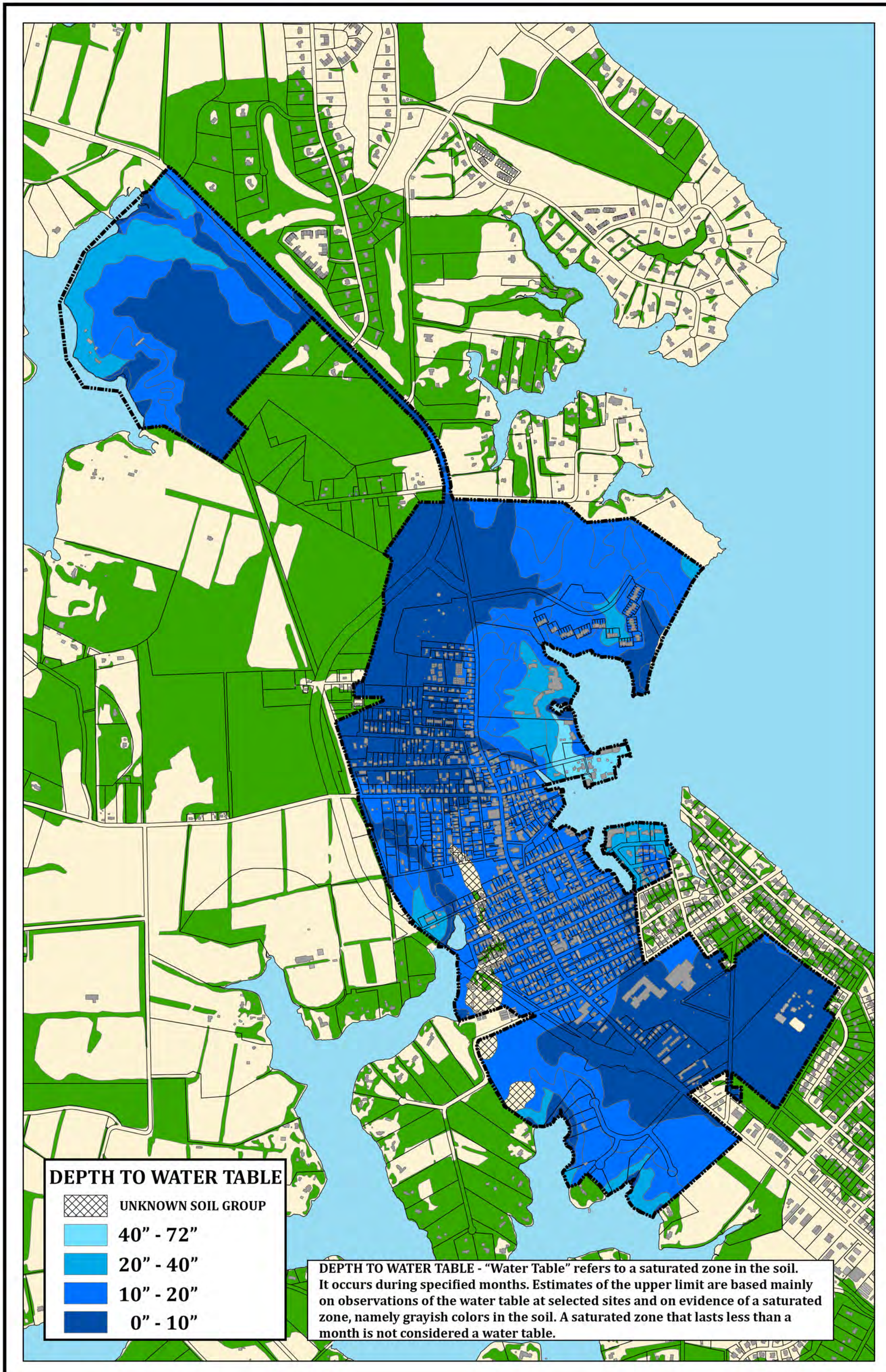
Multiple local businesses sell native plants and stormwater management equipment (e.g., rain barrels, cisterns), and garden clubs frequently have native plants sales.

- **Financial Assistance**

Look for plant sales and seek out volunteers to help design and install projects (e.g., garden clubs, neighbors, or Boy scouts). Also, on big projects consider cost sharing with a neighbor.



***Exhibit H – Four Maps of St. Michaels
Physical Environmental Attributes
(i.e., depth-to-water table, drainage
type, soil conditions, and water
storage capacity)***



***Exhibit I – Outreach material and
media coverage from the St.
Michaels Community-Supported
Stormwater and Flood Management
Project***

Give Us Your Feedback on Flooding and Stormwater in St. Michaels

In February 2015, a special Flood Management and Stormwater Task Force* was created to evaluate flooding and stormwater issues in the Town of St. Michaels. In particular, the Task Force wants to document residential and business experience with high water and stormwater events as well as gauge the community's attitude towards potential solutions.

Under the guidance of the Task Force, the University of Maryland Environmental Finance Center will hold a series of neighborhood meetings to discuss flooding and stormwater threats in the community as well as conduct in-depth interviews with businesses, residents, and other community stakeholders. In late 2015, the University of Maryland Environmental Finance Center will present findings and recommendations to the Task Force and the St. Michaels community.

The St. Michaels Flood Management and Stormwater Task Force is looking for input from the community and will be hosting two neighborhood meetings this spring. Your participation is appreciated!

St. Michaels Neighborhood Flooding and Stormwater Meetings

Meetings will be held between **5:30-7:00pm at the St. Michaels branch of the Talbot County Library located at 106 Fremont Street**. Beverages and snacks provided.

- Meeting 1: *Monday, March 30, 2015*
- Meeting 2: *Monday, April 13, 2015*

Meeting agenda:

- Introduction and project background
- Brief survey and discussion of stormwater and flooding issues
- Mapping exercise: Tell us where the problem areas are located
- Solution stations: Chart a course of action for what can and should be done.
- Conclude and adjourn

To learn more about the St. Michaels Flooding and Stormwater Management project, please see Deborah Renshaw with the Town of St. Michael's or contact Sean Williamson at UMD (srw46@umd.edu, T: 301-405-8259).

** The Task Force includes the Town of St. Michaels, the University of Maryland Environmental Finance Center, the Eastern Shore Land Conservancy, and the Maryland Critical Area Commission. This project is made possible with financial support from the Chesapeake Bay Trust.*



Give Us Your Feedback on Flooding and Stormwater in St Michaels!

Please take 10 minutes to complete an online survey

In early 2015, a special Flood Management and Stormwater Task Force was created to evaluate flooding and stormwater issues in the Town of St. Michaels. In particular, the Task Force wants to document residential and businesses' experiences with high water and stormwater events, as well as gauge community attitude towards potential solutions.

Under the guidance of the Task Force, the University of Maryland Environmental Finance Center is looking for residents and businesses of St. Michaels to take a short survey focused on stormwater and flood management in the Town. The survey can be found online at:

https://umdsurvey.umd.edu/SE/?SID=SV_6xo7dKyvMwoLuGF

To learn more about the St. Michaels Flooding and Stormwater Management project, please see Deborah Renshaw with the Town of St. Michaels or contact Sean Williamson at UMD (srw46@umd.edu, T: 301-405-8259).



St. Michaels Business Breakfast on Flooding and Stormwater

Friday June 5, 9:30-10:30am

@ St. Michaels Branch of Talbot County Library, 106 Fremont Street

A light breakfast will be available

The St. Michaels Flood Management and Stormwater Task Force has heard from many homeowners about stormwater and flooding issues, but we need to hear from the business community. What are your experiences with extreme precipitation events and/or tidal flooding? Is it a serious problem for you or your customers? What actions would you like to see taken?

Please attend the business breakfast and give us your feedback.

Meeting agenda:

- *Introduction and project background*
- *Discussion of stormwater and flooding issues*
- *Mapping exercise: Tell us where problem areas are located*
- *Conclude and adjourn*

To learn more, please see contact information on reverse. If you can't attend, please consider taking the online survey. Thank you!



Resources for Managing Stormwater on Your Property – St Michaels

Summer Educational Series

Join the Town of St Michaels and the St Michaels Flood and Stormwater Task Force for an interactive series on solutions to stormwater management on your personal property. The summer events will feature steps residents can take to manage stormwater on their property. *Contact Sean with questions: 301-405-8259.*

Saturday, June 27 – Stormwater Awareness Day

Carpenter Street Saloon Bio-Retention Ribbon Cutting and Rain Barrel Workshop

10:00-11:30am @ Parking Lot Behind the Carpenter Street Saloon

Join your neighbors in helping the Town of St. Michaels usher in a recently completed bio-retention facility behind the Carpenter Street Saloon. Following the ribbon cutting ceremony, experts from Maryland Sea Grant Extension will conduct a workshop on buying, installing, and maintaining rain barrels on your property. Two attendees will receive a free rain barrel! *This event is brought to you by the Town of St Michaels and the Watershed Restoration Specialists of Maryland Sea Grant Extension.*

Tuesday, July 21

Rain Garden Landscaping for Stormwater Storage

6:00-7:00pm @ Environmental Concern, 201 Boundary Lane St. Michaels

Learn how rain gardens can be used to address issues with flooding from stormwater. This event will introduce rain gardens with a focus on their benefits to the environment and your property. Participants will leave with the basic knowledge of how rain gardens are designed, created and maintained. *This event is brought to you by Environmental Concern Inc.*

Saturday, September 12

Native Plants for Cleaner Water

10:00-11:00am @ Environmental Concern, 201 Boundary Lane St. Michaels

Discover the basics of native plant selection to bayscape your lawn and clean the bay. Participants will learn how to plant and maintain native plants in their landscape. Recommendations will be made for native plants that are best suited for stormwater management and for attracting songbirds and butterflies to your garden. Visit our Native Plant Sale afterwards to purchase plants for your yard. *This event is brought to you by Environmental Concern Inc.*

Made possible with support from the Chesapeake Bay Trust



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MARYLAND
EXTENSION
Solutions in your community



Give Us Your Feedback on Flooding and Stormwater in St Michaels!

Please take 10 minutes to complete an online survey

In early 2015, a special Flood Management and Stormwater Task Force was created to evaluate flooding and stormwater issues in the Town of St. Michaels. In particular, the Task Force wants to document residential and businesses' experiences with high water and stormwater events, as well as gauge community attitude towards potential solutions.

Under the guidance of the Task Force, the University of Maryland Environmental Finance Center is looking for residents and businesses of St. Michaels to take a short survey focused on stormwater and flood management in the Town. The survey can be found online at:

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To learn more about the St. Michaels Flooding and Stormwater Management project, please see Deborah Renshaw with the Town of St. Michaels or contact Sean Williamson at UMD (srw46@umd.edu, T: 301-405-8259).



Bio-retention @ parking lot behind
Carpenter Street Saloon



Rain garden @ parking lot behind St.
Michaels Police Station

St. Michaels Stormwater and Flood Management Project Timeline

- January, 2015
 - EFC awarded funding from the Chesapeake Bay Trust to assemble community-supported plan for reducing the frequency and severity of flood events in the Town of St. Michaels
 - Town of St. Michaels submits letter of support agreeing to contribute staff time and resources to assist with project implementation
- February
 - February 18 – Kickoff meeting for St. Michaels Flood and Stormwater Management Task Force
- March
 - March 24 – Interview with Ben Taylor, St. Michaels’ stormwater engineer with DBF, Inc.
 - March 30 – First neighborhood stormwater and flood management meeting held at Talbot County library in St. Michaels
 - March 30 – Interview with Maureen Golden, Resident
- April
 - April 7 – Email correspondence with Mary Dabroski, Business Owner (Blue Crab Coffee)
 - April 13 – Interview with Jeff Richardson, Department of Public Works Superintendent
 - April 13 – Second neighborhood stormwater and flood management meeting held at Talbot County library in St. Michaels
- May
 - May 5 – Interview with Alex Deweese and Kate Charbonneau, representatives from Maryland’s Critical Area Commission
 - May 14 – Phone interview with David Lighty, St. Michaels business owner
 - May 21 – Interview with Debbie Renshaw, Code Enforcement and Planning/Zoning Officer
 - May 21 – Interview with Eric Rosen, St. Michaels business owner
 - May 27 – Launch of online St. Michaels stormwater and flood management survey
- June
 - June 5 – Business Breakfast on Flooding and Stormwater
 - June 5 – Interview with Roy Myers, Town Commissioner
 - June 27 – Carpenter Street Saloon Bio-Retention Ribbon Cutting and Rain Barrel Workshop
- July
 - July 14 – Close St. Michaels stormwater and flood management survey
 - July 21 – Workshop on Rain Garden Landscaping for Stormwater Storage hosted by Environmental Concern Inc.
 - July 24 – Phone interview with Bill Gilmore, Chesapeake Bay Maritime Museum
- August
 - August 14 – Call with Jean Weismen and Sarah Abel on project updates
- September
 - September 1 – Meeting of the St. Michaels Flood and Stormwater Management Task Force

- September 12 – Workshop on Native Plants for Cleaner Water hosted by Environmental Concern Inc.
 - September 23 – Meeting with Jean Weisman and Sarah Abel on project updates
- October
 - October 14 – Presentation of project, findings and recommendations to the Commissioners of St. Michaels
- December
 - Draft report delivered to St. Michaels for comments and review
- Spring 2016
 - Scheduled green infrastructure training workshop with St. Michaels' DPW staff and Eric Buehl, UMD Sea Grant Regional Watershed Restoration Specialist

St. Michaels Stormwater and Flood Management Survey

Spring 2015



The St. Michaels Flood Management and Stormwater Task Force wants to know more about your stormwater and flooding concerns. All St. Michaels residents and business owners are invited to participate in this short survey. Your feedback will help the Town to better understand existing problems and prioritize flood management investments in the future. The University of Maryland Environmental Finance Center developed the survey and is responsible for sharing results with the Task Force and the St. Michaels community. There is no requirement to complete the survey if you are uncomfortable or confused by the questions. Further inquiries and questions can be sent to Sean Williamson at srw46@umd.edu, 301-405-8259.

Please complete and return the survey.

PRIVATE and PUBLIC PROPERTY STORMWATER SURVEY

- 1. What is your tie to St. Michaels? Please check all that apply:**
 Renter Homeowner Business owner Work in area Other _____
- 2. Please tell us where you live/work in St. Michaels Please provide street (# not necessary):**
_____ Check box if this is coastal/waterfront property.
- 3. How would you characterize stormwater and flooding on your personal property?**
Check just one:
 A non-issue A small concern A moderate concern A serious concern
- 4. How would you characterize stormwater and flooding on public property including roads, sidewalks, beaches, parks and other areas in St. Michaels? Check just one:**
 A non-issue A small concern A moderate concern A serious concern
- 5. Please list in order which specific roads in St Michaels are most impacted when subject to stormwater or flood events:**
Most impacted road: _____
Next most impacted road: _____
- 6. In your experience, what are the most common causes of flooding in St. Michaels?**
Please rank numbers from 1-3: Stormwater including rainfall & snowmelt
 Tidal/riverine flooding (high tide flooding) Storm surge and wind driven flooding
 Its difficult to say what causes the flooding Other _____

Survey continues to back

7. Over the past few years, have you noticed an increase in flood frequency or volume in St Michaels? Check just one:

- Increase in flood frequency Increase in flood volume Increase in both Neither

8. I attribute changes in flood/stormwater volume and frequency to: Check all that apply:
No changes: I haven't observed any changes

Flooding has improved because: New stormwater/flood control measures in Town
 Better maintenance and cleaning of stormwater infrastructure (e.g., by the Town of St. Michaels) Street rehabilitation projects Better weather Other _____

Flooding has worsened because: Sea level rise Worse weather Actions taken or not taken by public entities (e.g., the Town of St. Michaels, the State) Actions taken or not taken by private interests Other _____

9. Climate change induced sea level rise is worsening our flooding problems in the Town of St Michaels and the community should respond immediately: Check just one.

- I strongly disagree I disagree I don't know I agree I strongly agree

10. If provided with the necessary resources, which actions would you take on your personal property to reduce flooding? Please rank numbers from 1-3 (select just 3)

- Re-grading Install a french drain Install, rebuild or expand a retaining wall/bulkhead
 Install, rebuild or expand a revetment/breakwater Install a rain garden or another stormwater control measure Install a living shoreline Other _____
 None of the above; I am satisfied with water management on my property.

11. If provided with the necessary resources, what investments would you like to see the Town of St. Michaels make to reduce flooding and stormwater in the community?

- Please rank numbers from 1-3 (select just 3): Invest in new stormwater control measures to reduce road flooding Invest in more living shorelines to manage stormwater and tidal flooding
 Invest in maintaining and cleaning the existing stormwater system along roads
 Invest in educational and technical resources to help private property owners manage flooding
 Invest in green infrastructure to manage flooding Other _____
 None of the above, no action is necessary.

12. As a member of the St. Michaels community, I am willing to contribute financial resources to stormwater/flood mitigation measures through donation, taxes, fees, or other means. Check just one:

- I strongly disagree I disagree I am neutral and would need more information
 I agree I strongly agree

13. Do you have any further stormwater/flooding concerns or suggestions?
