FLOOD RISK REDUCTION STRATEGIC PLAN





CAMBRIDGE SHORELINE RESILIENCE PLAN

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CITY OF CAMBRIDGE, MARYLAND 410 ACADEMY STREET CAMBRIDGE, MD 21613

Table of Contents

1	About the Plan
2	Introduction to the City of Cambridge
2	Location
3	Government
4	Demographics
5	Historic Preservation
7	Revitalization
9	Planning Initiatives
12	Current Conditions
12	Sources of Coastal Flooding
13	High Risk Areas
14	Previous Flood Risk Reduction Projects
15	Forming the Team
16	Core Planning Team
16	Stakeholder Group
17	Partnerships Along the Way
17	Public Engagement
19	Hazard Risk & Vulnerability
19	Study Area Defined
20	Hazard Risk & Vulnerability
21	Area 1- Gerry Boyle Park- Great Marsh Area
25	Area 2- West End
29	Area 3- Yacht Club & City Marina
32	Area 4- Cambridge Creek
35	Area 5- Sailwinds
37	Loss Estimations- Flood Scenarios
37	FEMA Regulated Floodplain: 1-Percent Annual Chance Flood Event
39	Climate Action Ready Boundary Flood Scenario
40	Nuisance Flooding
41 41 42 47 48 50 51	Flood Risk Reduction Strategies for Today Strategic Approach for Flood Risk Reduction & Resilience Using Innovative Hybrid Design Hybrid Engineered Nature-Based Flood Risk Reduction Strategies Budget for Hybrid Engineered Nature-Based Flood Mitigation Project Storm Water Management System with Enhancements Cambridge Creek Flood Risk reduction Strategies Sailwinds Park

52 52 56 58	Flood Risk Reduction Strategies for Tomorrow Integration of Flood Risk Reduction & Resilience Stormwater and Shoreline Resilience Fee Operations and Maintenance Program- Flood Risk Reduction Project Scoping and Implementation
Appendix A	Data Sources & Limitations
Appendix B	Flood Vulnerability Studies Stormwater Modeling Results Bathtub Modeling Results HAZUS Reports 0 1% Annual Chance Flood Event Scenario 0 Climate Ready Action Boundary (BFE + 3 Feet) Flood Event Scenario
Appendix C	Planning Process & Public Engagement

About the Plan

Flooding is the nation's number one natural disaster, and it can occur inland, along the coast, and across every region of the country. The City of Cambridge is no exception, floods may occur anytime during the year. Flooding is primarily due to the City's location as a coastal community. The City secured funding through the Flood Mitigation Advanced Assistance Grant administered by the Federal Emergency Management Agency (FEMA) to identify projects that reduce or eliminate the risk of repetitive flood damage. The identifications of various types of flood mitigation and resilience strategies is part of the FEMA funding project eligibility criteria. Projects and planning initiatives identified during this process included robust stakeholder engagement. Finally, this plan has been approved and adopted by the City of Cambridge, thereby all flood mitigation and resilience projects seeking FEMA grant funding identified within this plan are eligible.

Flood mitigation and resilience projects identified in this plan have been included within the *Dorchester County Flood Mitigation Plan*. This plan does not duplicate the information within the county flood mitigation plan, but rather compliments and expands the scope and breadth of the flood risk and impacts to the City of Cambridge.

Purpose

The purpose of this plan was to comprehensively evaluate factors and conditions contributing to both existing and future flooding problems. To the extent feasible, develop flood mitigation and resilience strategies that lend themselves to innovative funding opportunities that take advantage of various desirable co-benefits for the environment, economy, and community.

Cambridge Flood Mitigation and Resilience Plan Elements:

- Documentation of the planning process including stakeholder engagement.
- Identification of flood hazard risk including FEMA regulated floodplain, storm surge, nuisance flooding, and sea level rise.
- Development of strategies to reduce flood risk vulnerability and improve resiliency.
- Continued compliance with the National Flood Insurance Program (NFIP).

HAZARD MITIGATION

Hazard Mitigation is defined as any sustained action taken to reduce or eliminate the longterm risk to life and property from hazard events. It is an on-going process that occurs before, during, and after disasters and serves to break the cycle of damage and repair in hazardous areas.

RESILIENCE

Resilience is the ability to adapt to changing conditions and withstand—and rapidly recover from—disruption due to emergencies. In other words, it means bouncing back after something bad happens. This ability to overcome, or bounce back, is a concept that applies to individuals, to communities large and small, to our infrastructure, and to the environment.

Introduction to the City of Cambridge

Location

The City of Cambridge is one of the oldest towns in Maryland dating back to 1684 with the settlement of English colonists. The historic City of Cambridge located in Dorchester County, Maryland, was incorporated in 1793. It is the county seat of Dorchester County and the county's largest municipality. The city has grown over the years, with the last annexation of land occurring in November of 2010. Cambridge is divided into five (5) wards.



Cambridge is located along the south bank of the Choptank River. The city covers approximately ten square miles (6,575 acres) and is the population and employment center for Dorchester County. Overall, the landscape is relatively flat with the urban core rising along a ridge with upper elevations reaching 20 feet above sea level. Moving southeast, the land is low, and a network of tidal streams scores the landscape.

Surrounded and shaped by water, Cambridge is a friendly, boatable and walkable historic community on Maryland's Eastern Shore.

Government

The corporate authority, government, rights, power, and prerogatives of Cambridge are vested in and exercised by five (5) commissioners, each representing one ward, and are collectively known as "The Commissioners of Cambridge." The term of office of each commissioner elected at any general election

held under the City Charter is four (4) years, or until his or her successor takes office. In addition to the Commissioners of Cambridge, the mayor is nominated and elected by the voters of the entire City for a term of four (4) years, or until his or her successor takes office. The City Council meets in public forum at 6 p.m. on the second and fourth Monday of each month in the Council Chambers at 305 Gay Street.

Governmental departments include:

- Administrative and Finance;
- Public Works;
- Planning and Zoning;
- Municipal Utilities;
- Police Department; and,
- Rescue Fire Company.

In addition to governmental departments, various boards and commissions meet regularly.

- Americans with Disabilities Act Committee (ADA)
- Board of Appeals
- Ethics Commission
- Council Compensation Advisory
 Committee
- Historic Preservation Commission
- Housing Authority Board

- Housing Board of Review
- Housing Task Force
- Municipal Utilities Commission
- Planning & Zoning Commission
- Police Board
- Technology Committee
- Traffic & Safety Committee

City Hall, 410 Academy St., Cambridge, Maryland, September 2015. Photo by David R. Herron.



Demographics

According to the 2020 United States Census, the population of the City of Cambridge is 13,096 people, an increase from the reported population of 12,326 people in 2010, an increase of 6.2 percent. The reported 2020 population of Cambridge is the highest reported population within the last four decades.

	1990 Census	2000 Census	2010 Census	2020 Census
City of Cambridge	10,514	10,911	12,326	13,096

Source: Maryland Manual On-Line https://msa.maryland.gov/msa/mdmanual/01glance/html/pop.html

The land area of the City of Cambridge in square miles is 10.34, with a population per square mile of 1,192. The population per square mile for the State of Maryland is 594.8. The following table provides additional demographic data specific to the City of Cambridge.

PEOPLE		
Source: 2020 United States Census; Quick Facts, Cambridge, Maryland-		
https://www.census.gov/quickfacts/fact/table/cambridgecitymaryland,MD/HEA775220		
	City of Cambridge	State of
		Maryland
Age	1	
Persons under 5 years, percent	7.4%	6.0%
Persons 65 years and over, percent	9.0%	5.9%
Housing		
Owner-occupied housing unit rate, 2016-2020	41.9%	67.1%
Median value of owner-occupied housing units, 2016-2020	\$173,800	\$325,400
Median selected monthly owner cost- with mortgage, 2016-2020	\$1,494	\$2,038
Median gross rent, 2016-2020	\$568	\$633
Family & Living Arrangements		
Households, 2016-2020	5,364	2,230,527
Persons per household, 2016-2020	2.20	2.64
Language other than English spoken at home, percent of persons 5 years+,	8.5%	19.0%
2016-2020		
Education		
High school graduate of higher, percent of persons 25+, 2016-2020	86.9%	90.6%
Bachelor's degree or higher, percent of persons 25+, 2016-2020	20.7%	40.9%
Health		
With a disability, under age 65 years, percent, 2016-2020	16.1%	7.6%
Economy		
In civilian labor force, total, percent of population 16years+, 2016-2020	60.3%	66.9%
Income & Poverty		
Median household income (in 2020 dollars), 2016-2020	\$39,063	\$87,063
*Persons in poverty, percent	24.4%	9.0%
Transportation		
Mean travel time to work (minutes), workers age 16 years+, 2016-2020	19.7	33.0
*The Census Bureau poverty definition - Following the Office of Management and	Budget's (OMB) Statist	ical Policy
Directive 14, the Census Bureau uses a set of money income thresholds that vary by family size and composition to		

Directive 14, the Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is in poverty. If a family's total income is less than the family's threshold, then that family and every individual

in it is considered in poverty. The official poverty thresholds do not vary geographically, but they are updated for inflation using Consumer Price Index (CPI-U). The official poverty definition uses money income before taxes and does not include capital gains or noncash benefits (such as public housing, Medicaid, and food stamps)

Historic Preservation

The Cambridge Historic Preservation Commission (HPC) was created in 1990. The HPC consists of five members and one alternate appointed by the Cambridge City Council. By statute, the Historic Preservation Commission (HPC) has as its basic purpose the preservation of sites, structures, and districts of historical, cultural, archaeological, architectural significance together with their appurtenances and environmental settings. It is charged with implementing Cambridge's Historic Overlay Zoning (adopted as Ordinance 814 and amended to the Zoning Code in 2003 per Article IX, Part VI, Section 185-196).

The Commission's mandate is to safeguard Cambridge's heritage and its broadly visible waterfront within the Historic District. To accomplish this task the HPC is required to review and issue Certificates of Appropriateness (COA's) for all exterior alterations to property in the historic district, including alterations that cannot be seen from the street or water based on Guidelines adopted by the City. This includes restoration, rehabilitation, new construction,



renovations, and major landscaping as well as replacing building components, such as roofs, doors, windows, porches, railings, and curb cuts. The Commission does not review paint color.

Port History

The Port of Cambridge is one of Maryland's oldest colonial cities. English colonists arrived there in 1684, finding the indigenous Algonquian-speaking Choptank people living along the river. Today, the Port of Cambridge occupies some of the area of the former Choptank Indian Reservation. During the Colonial era, the colonists farmed the Eastern Shore, first raising tobacco on big plantations. African slaves were used on the plantations. The Port of Cambridge was incorporated in 1793.

During the late 19th Century, food processing industries grew in the Port of Cambridge, including factories that canned sweet potatoes, tomatoes, and oysters. The Phillips Packing Company led industrial growth in the Port of Cambridge, becoming the area's biggest employer. Phillips won contracts with the US Department of Defense during both World Wars, employing some ten thousand workers at its peak.

By the 1960s, Phillips closed its operations, leading to major unemployment in the Port of Cambridge and fueling social problems. During the 1960s, the Port of Cambridge was a center for the Civil Rights Movement. The Maryland National Guard was called to help keep the peace. Passage of the 1964 Civil Rights Act brought public segregation to an end in the Port of Cambridge.

In the early 2000s, Hyatt opened the 400-room Hyatt Regency Chesapeake Bay resort, bringing both tourism and jobs to the Port of Cambridge. The resort has a marina, a spa, and a golf course. In 2007, the George W. Bush spoke at the US House Republican Conference held here. Designated a Main Street community in Maryland in 2003, the Port of Cambridge's Main Street project involves major downtown revitalization efforts that will strengthen the city's economic potential. As a result, the Port of Cambridge's heritage attractions have been enhanced, and it is attracting more tourists.

Source: www. http://www.worldportsource.com/ports/review/USA_MD_Port_of_Cambridge_3730.php

The Department of Public Works provides staff support to the Commission and can assist property owners within the district for the application of COA's. In addition, staff administers and enforces Historic Overlay zoning, issues building permits and responds to property code violations.

Elevating Buildings in the Historic District

Elevating historic buildings that are subject to frequent flooding has been a concern for a number of years by many preservationists. To date, there is no national policy on how this may be undertaken, but there are several statewide and local guidelines that have informed the following for Cambridge's HPC guidance on this issue.

When considering raising a building above current or anticipated future flood levels, the property owner shall consider all character defining features of facades facing public rights of way, including but not limited to foundations, facades, porches, and access such as steps or ramps. The owner shall also consider the effect of raising the building on character defining fences, plantings, sidewalks, and other

important elements of the natural and constructed landscapes facing the primary public right of way.

Cambridge's Historic District includes some properties that are in the floodplain, known as the Special Flood Hazard Area (SFHA) which has a 1% annual chance of flood.

Like Cambridge, areas such as Charleston South Carolina have been historically adversely affected by flooding. To that end, the City of Charleston concluded the best policy for the long-term preservation of historic structures was to support their need to elevate to the necessary FEMA requirement. The City developed Design **Guidelines for Elevating Historic Buildings** document that focuses on four key areas to guide elevation projects for historic buildings: considerations for streetscape/context, site design, foundation design, and architecture/preservation. The City could adopt a similar document to help guide the elevation of historic properties to mitigate flooding.



Revitalization

The city has taken advantage of innovative programs at various levels that provide mechanisms for revitalization, while preserving the heritage, character, and traditions unique to the Eastern Shore. The following designations have been established in the City of Cambridge. Each one has significance and is an asset to businesses and residents through direct benefits, or the eligibility of beneficial resources that accompany the individual program.

- Arts and Entertainment District
- Enterprise Zone
- Historic Preservation District
- HUB Zone
- Main Street District
- Maple Street District / Smart Site
- Maryland Certified Heritage Area City Center Target Investment Zone, Long Wharf Target Investment Zone
- Priority Funding Area
- Priority Funding Area Sustainable Community (Designated Neighborhood and Community Legacy)

Revitalization undertaken by the City have been identified in the <u>Revitalizing Cambridge - One Step at</u> <u>a Time- A Story Map</u>.

- In 2011, Maces Lane was reconfigured to allow for better drainage. Parking, sidewalks, and crosswalks were added for the safety of children traveling to and from school.
- In 2014, Maryland Avenue Gateway was designated as the City's first "Green" and "Complete" Street.
- In 2014, the city received Sustainable Maryland Certified Award.
- In 2016, various improvements were made to Long Wharf Park, including:
 - New porous concrete sidewalk behind new bulkhead and the top cap.
 - Reduction of impervious area.
 - Introduction of brick paver pervious parking spaces.
 - Grass swale areas for treatment and capture instead of direct overboard flow during rain events.
 - New island at entrance to channelize traffic, reduce impervious area, and provide space for an entry sign in the future.
 - Improved ADA access around the parking area.

Long Wharf Park, Porous Concrete Sidewalk Source: the <u>Revitalizing Cambridge - One Step at a</u> <u>Time- A Story Map.</u>

 In 2016 Blighted Housing Study was undertaken along with a 2018 pilot project for housing rehabilitation including property acquisition, strategic demolition, homeowner education, green space development and rehabilitation.

- In 2017, the Cambridge Association of Neighborhoods (CAN) was initiated. The Cambridge Association of Neighborhoods (CAN) is a community organization whose mission is to foster neighborhood cohesion and community engagement through public awareness, community events, social activities, and neighborly assistance. CAN works to enhance the safety, quality of life, and well-being of all Cambridge residents by promoting safe streets, codecompliant housing, cultural and social events, and citizen involvement.
- In 2018, the city hired a Code Enforcement Manager to strengthen the department. A stricter more conclusive effort will keep properties with "Negligible Deterioration" from becoming "At-Risk." Also, efforts will be made to assist those properties identified as "At-Risk" properties from becoming "Severely Degraded." In 2018, Governors Hall, the second deepest port off the Chesapeake Bay next to Baltimore's Inner Harbor received funding for the Wharf Reconstruction Project, \$4 million in State funding, and \$1.7 million contributed by the City of Cambridge.
- In 2019, the city rebuilt the 300 block of the historic brick of High Street. High Street runs from the downtown business corridor to the marina on the Choptank River.
- In 2019, the Cambridge Neighborhood Revitalization Program was initiated. The program focuses on select neighborhoods to stabilize, redevelop and grow through strategic programs, partnerships, new & existing housing, social cohesion strategies, and enhanced human services.
- In 2019, the city re-established it's ADA Compliance Committee. As an extension of the Housing Study, an inventory of the overall sidewalk conditions within the Municipal Boundary has been completed.



Planning Initiatives

Planning related documents and resources for or by the City of Cambridge that relate to flood risk reduction have been uploaded to the project website: <u>www.makecambridgeresilient.com</u> and include the following.



Floodplain Ordinance- 2015 Update

This ordinance applies to all special flood hazard areas within the City of Cambridge. The Federal Emergency Management Agency has identified special flood hazard areas within the boundaries of the City of Cambridge. Special flood hazard areas are subject to periodic inundation which may result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety and general welfare

City of Cambridge Comprehensive Plan



The City of Cambridge began the process of updating the 1996 Comprehensive Plan in 2008. In February 2011, after more than 30 public meetings and workshops, the City of Cambridge Commissioners approved Ordinance Number 1008, inclusive of Exhibit A, to formally adopt the City's new <u>Comprehensive Plan (PDF)</u>. The new plan which sets forth a series of goals for the future prosperity of Cambridge, will help guide future growth and development of Cambridge while ensuring that these changes happen in an environmentally sustainable manner.



2017 Dorchester County All-Hazard Mitigation Plan

The All-Hazard Mitigation Plan forms the foundation for Dorchester County and its municipalities' long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. The purpose of this plan is to identify, plan, and implement cost-effective hazard mitigation measures through a comprehensive approach known as hazard mitigation planning. The Federal Emergency Management Agency (FEMA) requires hazard mitigation plans to be updated every five years. To that end, the Dorchester County Hazard Mitigation Plan update is underway. This is an update to the previous 2017 Hazard Mitigation Plan. Dorchester County's Department of Emergency Services is the lead agency for this plan effort.

2017 Dorchester County Flood Mitigation Plan



Flood and coastal hazard information introduced and presented within the Hazard Mitigation Plan was further developed and refined in the Flood Mitigation Plan planning process. The flood mitigation plan does not duplicate the information within the overall hazard mitigation plan, but rather compliments and expands the scope and breadth of the flood risk and impacts to Dorchester County. This plan is in the update process. Information on the plan update process will be continuously updated on this project website at: <u>www.dorchestermdhazardplans.org</u>.



2018 Dorchester County Historic and Cultural Resources Flood Mitigation & Risk Plan

Through this planning effort Dorchester County sought to examine the risk of flood hazards including coastal flooding, hurricane storm surge, and sea level rise in relation to cultural and historic resources. While critical facilities and general building stock were the focus of both the overall 2017 Dorchester County Hazard Mitigation Plan and the 2017 Dorchester County Flood Mitigation Plan, this planning initiative was undertaken to specifically consider flood hazard risk and vulnerability to cultural and historic resources throughout Dorchester County.

Dorchester County Coastal Flood Vulnerability Study



This document presents the results of a coastal flood vulnerability study of Dorchester County, Maryland conducted by Dr. Michael Scott of Salisbury University at the request of the Eastern Shore Land Conservancy in Easton, Maryland. The goal of the study was to model the potential damage to buildings and their contents from severe periodic coastal flooding events, both today and in the future using a value for predicted sea level change. Specifically, using flood depth data calculated on behalf of the Maryland State Highway Administration, the

flood scenarios of a 1% chance flood in 2015, a 0.2% chance flood in 2015, no periodic flooding in 2050, a 1% chance flood in 2050, no periodic flooding in 2100, and a 1% chance flood in 2100 were evaluated versus the location and value of buildings in Dorchester County. The results are an accounting of the potential damage from periodic flooding, exacerbated by future sea level change. This information should help the residents, business owners, and government officials be aware of particularly vulnerable areas of the county and help make informed decisions about mitigation measures to reduce the potential impacts.



Cambridge Waterfront Community Survey

Cambridge Waterfront Development, Inc. (CWDI) strongly feels that community engagement is a critically important aspect of this redevelopment planning effort from spanning Sailwinds Park proper towards the Cambridge Creek bridge. In collaboration with BCT Design Group, a presentation video and associated survey questions were hosted on a webpage for a period of 6 weeks, between December 2020 – January 2021. During that time, nearly 1,500 individual online form responses were received. Survey results were presented dated March 10, 2021.



Working Waterfront Implementation Plan

The Cambridge Working Waterfront Implementation Plan is the means by which the city can confidently move toward constructing its clear and distinct vision for its future. The plan is a culmination of a project that emphasizes new programs that support waterfront plans, maritime zoning, and new planning tools.



Strengthening Stormwater Management in Cambridge, Maryland

In early 2019, the Environmental Finance Center at the University of Maryland (EFC) began an 18-month project to provide technical assistance to the City of Cambridge and non-profit partners on improving stormwater management efforts in the city. This report is meant to compliment a set of projects led by the Chesapeake Bay Foundation, Shore Rivers, and the Nanticoke Watershed Alliance that have focused on residential stormwater improvements in the City of Cambridge by looking at opportunities to strengthen municipal stormwater programming and work in

tandem with other sectors to reduce overall stormwater flooding and pollution issues in the City. It builds on years of work and progress led by community members and local organizations.

Current Conditions

Sources of Coastal Flooding

Primary sources of coastal flooding within the City of Cambridge include both the Choptank River and Cambridge Creek. Storm damage in the City of Cambridge results from severe thunderstorms that traverse east over the Chesapeake Bay and from tropical storms and hurricanes that follow a northbound route along the Atlantic coastline. The low-lying, relatively undisturbed topography, high seasonal water tables, and poor drainage-high runoff soils combine to provide a high flooding potential. When heavy rainfall and a high river discharge combine with storm tides, low-lying areas adjacent to the Choptank River and Cambridge Creek become inundated with saltwater

The Choptank River is a tidally influenced river which flows into the Chesapeake Bay. Tidal surges extend up the river as far as Greensboro, Maryland, with average tides between 0.4 and 1.6 feet. At Cambridge, the Choptank River is approximately 1.6 miles wide. Storm damage in Dorchester County has resulted from severe thunderstorms that traverse east over the Chesapeake Bay and from tropical storms and hurricanes that follow a northbound route along the Atlantic coastline. When heavy rainfall and a high river discharge combine with storm tides, low-lying areas adjacent to the rivers and estuaries become inundated with saltwater.

The tidal surge for those estuarine areas affected by Chesapeake Bay and Tangier Sound affects the entire shoreline within Dorchester County. The entire open coastline, from the confluence with the Choptank River to Fishing Bay, is more prone to damaging wave action during high wind events due to the significant fetch over which winds can operate.

Source: Dorchester County Flood Insurance Study 24019CV000B, March 16, 2015



High-Risk Areas

Within the Choptank and Cambridge Creek coastal flood risk area, five (5) distinct high-risk areas are characterized by individual site conditions, development along the shoreline, historic flooding, and in several cases the existence of existing flood protection and functionality. These five areas include:

- **1.** Great Marsh Area- Gerry Boyle Park
 - This is a high priority for the City as this area is for public use and hosts both the Ironman/Eagleman and Boat Races. Frequent nuisance flooding and erosion issues persist at this location.
- 2. West End
 - This area includes both private and public property. This area extends from Great Marsh to the City Marina area and is built up to the water's edge. High tide flooding on streets in this area is repetitive and considered a priority for mitigation.
- 3. Yacht Club and City Marina
 - Extending from the Marina to Long Wharf. This is largely open land along Water Street which is subject to nuisance flooding. Homes along Water Street are also subject to flooding due to high tides and major storms.
- 4. Cambridge Creek
 - This area has been fully developed. This area includes historic properties such as Clayton's Crab-Processing Facility and relatively new condominiums and townhomes.
- 5. Sailwinds
 - A twenty-four (24) acre tract under development by the Cambridge Waterfront Development Inc. The area comprising the Sailwinds project area is largely at a higher elevation. The Cambridge Waterfront Development Inc has the flexibility to plan and design the development, thereby concentrating the placement of structures outside of higher flood risk areas.



Previous Flood Risk Reduction Projects Oakley Street Seawall Replacement

This project consisted of the demolition and removal of the existing deteriorated concrete seawall and construction of new concrete wall in the same location. The new concrete wall is similar in appearance but has been elevated approximately 15" to provide additional protection. The project was completed in 2021 and the total project cost was \$342,000 with 75% being funded by a grant from Maryland Department of the Environment and 25% with local funds.

Additional work completed included the installation of scuppers with check valves, rip-rap armor and scour protection, removal of the cofferdam used for dewatering, curb & sidewalk replacement and street resurfacing.



The height of the new wall is elevation 5.0 (NAVD datum). For reference, the recent flood event on Friday October 29, 2021 reached an elevation of 4.15 (NAVD datum).

Efforts to Address Ongoing Sewer Backup Issues in the West End Area

Ongoing sewer problems in the West End area has been discussed throughout this planning process including during public outreach sessions. Funding in the City's budget to begin addressing the issue was allocated in 2021. The budget included \$500,000 for planning and design services for improvements to the sewage collection system and Trenton Street pumping station which services the area. Another \$100,000 has been budgeted to remove excessive grit and sediment from the sewer lines to improve capacity and performance. Note: The City was unsuccessful with a FFY 2020 grant request for \$3.86 million from the FEMA Building Resilient Infrastructure and Communities (BRIC) grant program for sewer system upgrades, however this planning process included the identification of projects and associated grant opportunities.

Forming the Planning Team

Core Planning Team

The Core Planning Team (CPT) was established to assist the Project Manager and maintain a consistent project momentum. The CPT met briefing on a weekly basis throughout the planning process.

Core Planning Team Members

- Larry White, City of Cambridge Project Manager
- Georges Hyde, City of Cambridge Engineer
- Herve' Hamon, Dorchester County Planning and Zoning Director
- Mark James, Michael Baker International
- Virginia Smith, Smith Planning and Design

Stakeholder Group

Stakeholders identified for this planning process involved a wide variety of people both internal and external to the City of Cambridge. Different stakeholders play different roles in the City's flood risk reduction planning process. To that end, targeted stakeholders were requested to participant in the group from both government (local, state, and federal) and community organizations. Note: Over the course of the planning process, some members of the stakeholder group changed due to relocation and staff changes.

- Larry White, Project Manager, Strategic Programs Development, LLC
- George W. Hyde, Cambridge City Engineer
- Deborah Cooper, Cambridge Finance Director
- Patricia Escher, Cambridge Planning & Zoning Manager
- Scott Shores, Cambridge GIS/IT Specialist
- Dozia Rahilly, Dorchester County Department of Emergency Services Director
- James Windsor, Dorchester County Department of Emergency Services Planner
- Amanda Fenstermaker, Heart of Chesapeake Country Heritage Area
- Herve Hamon, Dorchester County Director of Planning & Zoning
- Stacey M. Underwood, USACE Silver Jackets Coordinator
- Matt Pluta, Director of Riverkeeper Programs
- Aaron M. Lampman, Associate Professor, Anthropology
- Dick Morse, Cambridge Resident and Individual Consultant
- Daryl Butcher, Cambridge Waterfront Development Inc (CWDI)
- Blake Langford, Maryland Emergency Management Agency
- Dr. Ming Li, University of Maryland, Center for Environmental Science, Horn Point Lab
- Debbie Herr Cornwell, Maryland Department of Planning
- Steve Rideout, Consultant and Former City Council Member for Ward 1
- Sasha Land, Maryland Department of Natural Resources
- Kevin Wagner, Maryland Department of the Environment

The Stakeholder Group met monthly throughout the planning process. The Stakeholder Group reviewed proposed flood risk reduction ideas, concept designs for various mitigation measures

(including feasibility and the likely benefit(s) and cost(s) associated with proposed measures), and public outreach activities. Meeting notes were distributed to Stakeholder Group members and uploaded to the <u>project website</u> for public review.

Partnerships Along the Way

The University of Maryland, Center for Environmental Science, Horn Point Lab are experts in the design of living shorelines. Project Manager, Larry White contacted Dr. Ming Li, University of Maryland, Center for Environmental Science, Horn Point Lab to assist the team in identifying flood risk reduction measures that include living shorelines. Dr. Li joined the Stakeholder Group and the development of concept designs. The University believes, and we agree, that the City of Cambridge Project could be a model for the incorporation of natural systems in flood risk reduction projects for the entire eastern shore of Maryland and Virginia.

Public Engagement

Robust public engagement was undertaken throughout the planning process. One of the first steps included working with the Stakeholder Group developing project "branding" to ensure easy recognition of project outreach materials by the public. The creation of a logo and project website domain name was discussed and voted on by Stakeholder Group members in the Spring of 2021. The name "Cambridge Shoreline Resilience Plan," was identified by the Stakeholder Group to concentrate the project on the high-risk coastal flood areas, the shorelines of the Choptank River and Cambridge Creek. In addition, the term "resilience" was specifically used to demonstrate that this planning effort is for both today and tomorrow.

> To reduce the impacts of disasters on the nation and its community's investment in enhancing resilience is key in planning for tomorrow. Traditional risk management focuses on planning and reducing

vulnerabilities. Resilience management puts additional emphasis on speeding recovery and facilitating adaptation. *Source: https://www.agci.org*

To share information of this planning process continuously throughout the planning process, a





WWW.MAKECAMBRIDGERESILIENT.ORG



project website was developed consistent with the project logo at <u>www.makecambridgeresilient.org</u>.

The project website includes:

- Information "About the Plan,"
- Risk & Vulnerability Mapping for each of the five (5) High-Risk Areas,
- Stakeholder Group Meeting Notes,
- "Public Involvement and Event" information and associated meeting notes,
- Related planning documents "Resources."

In addition to the project website, public engagement opportunities and events were offered throughout the entire planning process. One of the first opportunities included an online Visual Preference Survey (VSP). The VPS offered images of various flood risk reduction solutions used around the world. Participants were asked to rate the images on a scale of 1 to 5. A score of 1 indicated a very negative opinion while a score of 5 indicated a very positive opinion. Furthermore, participants were asked to rate each image independently and not in comparison to other images. Results of the VPS were reviewed by the Stakeholder Group and incorporated into the flood risk reduction measures and concept designs presented herein.

Numerous outreach events were held to provide information and collect feedback from the public as flood risk reduction measures were being developed.

PUBLIC OUTREACH EVENTS & MEETINGS

The August 10th Open House & Listening Session was the first in a series of public meetings scheduled to further explore flood risk reduction solutions.

CAMBRIDGE SHORELINE RESILIENCE PLAN - OPEN HOUSE & LISTENING SESSION

Date: Tuesday, August 10, 2021

Time: 6:00-8:00 PM

Location: Dorchester Center for the Arts, 321 High St, Cambridge, MD 21613

Public meetings to discuss potential project site specific flood risk reduction solutions were held on both September 29th and 30th.

GREAT MARSH AREA PUBLIC MEETING

Date:September 29, 2021Time:5:00-6:30 PMLouding:Court Date is paid Datificant. Courteridate MD 2

Location: Gerry Boyle Park Pavilion A, Cambridge, MD 21613

CAMBRIDGE CREEK PUBLIC MEETING

Date:September 29, 2021Time:7:00-8:30 PMLocation:WHCP Community Radio Community Meeting Room, Cambridge, MD 21613

CITY MARINA PUBLIC MEETING

Date:September 30, 2021Time:4:30-6:00 PMLocation:Cambridge Yacht Club Meeting Room, Cambridge, MD 21613

WEST END PUBLIC MEETING

 Date:
 September 30, 2021

 Time:
 6:30-8:00 PM

Location: Cambridge Yacht Club Meeting Room, Cambridge, MD 21613

MAYOR AND CITY COUNCIL BRIEFING

Date: October 25, 2021 Time: 6:00 PM

Location: Commission Chambers, 605 Gay Street, Cambridge, MD 21613

MAYOR AND CITY COUNCIL BRIEFING

Date:	January 24, 2022
Time:	6:00 PM
Location:	Commission Chambers, 605 Gay Street, Cambridge, MD 21613

The purpose of the Flood Risk Reduction Workshop was to provide an opportunity for property owners to obtain information on various flood risk reduction options, grant, and technical assistance opportunities.

FLOOD RISK REDUCTION COMMUNITY WORKSHOP

Date:	March 22, 2022
Time:	5:30 PM

Location: Dorchester Center for the Arts, 321 High St, Cambridge, MD 21613

PROJECT BRIEFING

Distribution Date: May 19, 2022

This 2-page project briefing containing 2022 activities and flood mitigation concept design enhancements was distributed via email to the Cambridge Association of Neighborhoods and the project website contact listing.

MAYOR AND CITY COUNCIL BRIEFING

Date:June 20, 2022Time:6:00 PMLocation:Commission Chambers, 605 Gay Street, Cambridge, MD 21613

EASTERN SHORE CLIMATE ADAPTATION PARTNERSHIP

Date:	June 21, 2022
Time:	10:00 AM
Location:	Adkins Arboretum

Mr. Larry White, Project Manager, presented the project overview and next steps to the Eastern Shore Climate Adaptation Partnership.

MAYOR AND CITY COUNCIL BRIEFING

Date:	July 18, 2022
Time:	6:00 PM
Location:	Commission Chambers, 605 Gay Street, Cambridge, MD 21613

Hazard Risk & Vulnerability

Study Area Defined



The City of Cambridge along with their Stakeholder Group developed flood risk reduction and resilience strategies for the defined study area. The study area includes the Choptank River shoreline starting from the Cambridge Creek extending past Gerry Boyle Park to Belvedere Avenue. In addition, the Cambridge Creek flood-prone area has also been included. Five (5) separate areas of high-risk, within the overall study area, were defined during the planning process. These five distinct areas are characterized by individual site conditions, development along the shoreline, and the existence of a riprap revetment providing limited flood protection and functionality.

> Area 1- Great Marsh Area at Gerry Boyle Park Area 2- West End Area 3- Yacht Club & City Marina Area 4- Cambridge Creek Area 5- Sailwinds

This planning project was primarily focused on mitigating flood risks along the Choptank River and Cambridge Creek, which are the primary sources of flooding in the city. This flooding is due to high tides, major storms, and inadequate storm water management. This area largely includes the FEMA regulated Special Flood Hazard Area (SFHA), known as the land area subject to the 1% annual chance flood event.

> To reduce the impacts of disasters on the nation and its community's investment in enhancing resilience is key in planning for tomorrow.

Traditional risk management focuses on planning and reducing vulnerabilities. Resilience management puts additional emphasis on speeding recovery and facilitating adaptation. Source: https://www.agci.org

Hazard Risk & Vulnerability

As documented in *Appendix C: Planning Process & Public Engagement* of this plan, flood vulnerability and the design level of protection for proposed projects were discussed at length. Both current and future flood hazard risks were considered. The 1 % annual chance floodplain hazard risk area and repetitive high tide flooding were considered as current conditions, while increased severe storm activity, increased nuisance flooding, and sea level rise were considered as future conditions.

The review of relative sea level rise projection data, tide gauge data, and design standards for flood risk reduction projects prompted further discussion by the group over the course of several months. We referenced several sources for project design level of protection:

- FEMA uses the Base Flood Elevation (BFE) plus 3 feet freeboard for levee/floodwall structure for levee accreditation and to show buildings behind the flood protection structure are outside the BFE.
- The U.S. Army Corp. of Engineers design flood risk reduction projects to a certain Design Flood Elevation, typically BFE, plus an estimated Sea Level Rise (SLR) height of an additional 2-4 feet for risk and uncertainty.
- For grant funding purposes, FEMA flood protection level for flood risk reduction structures is BFE plus 2 feet.

In addition to the review of design standards, and future condition projections, the Maryland Coast Smart regulations, effective September 2020, now require State projects over \$500,000 for construction or projects using State funding to apply the corresponding horizontal limits of the higher 100-year (1 % annual change flood event) + 3 feet. The Coast Smart - Climate Ready Action Boundary (CSCRAB) along with the corresponding digital elevation model was selected for mapping and loss estimation modeling along with the 1 % annual chance flood event for this planning project. This information has been included in this hazard risk and vulnerability chapter for the five areas. In addition, Appendix B: Flood Vulnerability Studies includes: Stormwater Modeling Results, Bathtub Modeling Results, and HAZUS Reports for both the 1% Annual Chance Flood Event Scenario and the Climate Ready Action Boundary (BFE + 3 Feet) Flood Event Scenario.

Area 1- Great Marsh Area at Gerry Boyle Park

The Great Marsh Area including the Gerry Boyle Park is a high priority for the City as this area is designated for public use and hosts both the Ironman/Eagleman Triathlon and speed boat races. Frequent nuisance flooding and erosion issues persist at this location. In addition, this area is within the FEMA regulated 1 % annual-chance floodplain and is susceptible to sea level rise.

Flood Risk Vulnerability Today

FEMA provides communities with updated Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) Reports that focus on the probability of floods and that show where flooding may occur as well as the calculated 1-percent-annual-chance flood elevation.

The 1-percent-annual-chance flood, also known as the base flood, has a 1% chance of being equaled or exceeded in any given year.

As depicted on the map below, properties located in and around the Gerry Boyle Park are vulnerable to the 1-percent-annual-chance flood elevation.



Great Marsh Park & 1 % Annual Chance Floodplain



Erosion of Shoreline along Somerset Avenue- Entrance to Gerry Boyle Park

Stormwater Issues

As its name suggests, the park was once a coastal marshland. Evidence of the marsh landscape is still visible along its northwestern shoreline. The land fill operation established an elevation in the center of the park that is higher than the adjacent properties. The elevated ground gives the park good drainage toward the river but creates areas of saturated ground and flooding at its southwestern border. The grounds near the vehicular entrance (Somerset Avenue at Bay Street) and the pedestrian arrival points (Talbot Avenue and Glenburn Avenue) can be saturated during intense and prolonged periods of rainfall. This area includes Somerset Avenue, Queen Anne Avenue, and Bay Street. Large rain



WBOC Inc. Radio Station located at 2 Bay Street

events send surface water over the parking lot into the Hambrooks Bay with little vegetation to slow the sheet flow down.

Sheet flow means runoff which flows over the ground surface as a thin, even layer, not concentrated in a channel. Sheet flow mainly occurs during extremely high rates of precipitation or in areas with impermeable surfaces; most water that enters surface waters does so through groundwater. *Source:* <u>https://www.lawinsider.com/dictionary</u>

As shown on the map below, stormwater gravity mains, which are underground pipes and channels, above capacity for the 1% annual chance flood are depicted in red.

During heavy rain events large amounts of flow from approximately 1.4 acres collect in low-lying areas of Somerset Ave and Bay Street. Stormwater that is collected from 21.8 acres south of Great Marsh Park is conveyed laterally along Talbot Avenue and Glenburn Avenue meet and both lines lead to an outfall at the end of Glenburn Ave.

A conceptual-level EPASWMM model was developed to analyze the stormwater systems that outfall to Hambrooks Bay as part of this planning project. Data from the City of Cambridge was incorporated into this model. The 1-percent-annual-chance storm scenario was chosen as the modeled event with a 24-hour duration. The rainfall depth for this storm scenario is 9.12 inches. Subbasins were

delineated and a hydrologic analysis was performed using existing land-use data. The results of a stormwater model identified inlets that experience flooding, and pipes that are above capacity.



Flood Risk Vulnerability Tomorrow

Maryland Coast Smart regulations that went into effect on September 1st, 2020 - now require State projects over \$500,000 for construction or State funding to apply the corresponding horizontal limits of the higher 100-year + 3 feet inundation as indicated by the Coast Smart - Climate Ready Action Boundary (CSCRAB).

The FEMA Floodplain Limit remains inundated with an additional 3 feet of water added to it. The Newly Inundated area shows how 3 additional feet of water moves across new areas of the landscape based on the land elevation profile or Digital Elevation Model (DEM). The map layers on this page illustrate that (A) the Digital Elevation Model, should be added to (B) the CS-CRAB Inundation Height to Indicate the Required CS-CRAB Elevation or (A) + (B).

As depicted on the map below, properties in and around the Gerry Boyle Park, as well as properties along both sides of Gerry Boyle Park are vulnerable using the higher 100-year + 3 feet inundation as indicated by the Coast Smart - Climate Ready Action Boundary (CSCRAB).



Area 2- West End

This area extends from Great Marsh to the City Marina area. This area is largely comprised of residential development in close proximity to the shoreline. The shoreline in this area is protected by bulkheads and riprap revetments. The city has replaced the seawall at the end of Oakley Street that was at the end of it's life cycle. The height of the new wall is elevation 5.0 (NAVD datum). For reference, the flood event that occurred on October 29, 2021, reached an elevation of 4.15 (NAVD datum).

Flood Risk Vulnerability Today

FEMA provides communities with updated Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) Reports that focus on the probability of floods and that show where flooding may occur as well as the calculated 1-percent-annual-chance flood elevation. The 1-percent-annual-chance flood, also known as the base flood, has a 1% chance of being equaled or exceeded in any given year.

As depicted on the map below, properties located on the rivers-side of Hambrooks Avenue and along all street ends in the West End are highly vulnerable to the 1-percent-annual-chance flood.



Stormwater Issues

Barrier walls are located at the end of each street along this section of the study area. At one time these barriers provided protection from flooding and erosion, however over the years they have deteriorated, reaching the end of their useful life. Flood waters often breach the walls through openings.

Cambridge Seawall Replacement Project – Dorchester County

A \$256,266 Comprehensive Flood Management grant to the City of Cambridge will help fund the replacement of, and improvements to, a seawall along the Choptank River that has reached the end of its useful life. Improvements include increasing the wall's height and a new tidal check valve. This project is consistent with Maryland's climate change adaptation and resiliency objectives by mitigating the impacts of tidal flooding exacerbated by sea level rise.

Source: <u>https://news.maryland.gov/mde/2021/07/07/board-of-public-works-approves-funding-for-city-of-cambridge-climate-</u> <u>resiliency-and-the-chesapeake-bay/</u>

Hambrooks Avenue running parallel to the Choptank River experiences flooding during heavy rain and high tide events. Between Belvedere Avenue and West End Avenue stormwater is conveyed through a series of linear pipes that outfall at the end of each street. Inlets along Belvedere Avenue, Willis Street, and West End Avenue collect stormwater from approximately 3.7 acre-feet from areas south of Hambrooks Blvd. Stormwater modeling for the West End presented similar results to the areas south of the Great Marsh Park identifying inlets that experience flooding, and pipes that are above capacity. As shown on the map below, stormwater gravity mains, which are underground pipes and channels, above capacity are depicted in red.



Property located at 1 Belvedere Avenue



Flood Risk Vulnerability Tomorrow

Maryland Coast Smart regulations that went into effect on September 1st, 2020 - now require State projects over \$500,000 for construction or State funding to apply the corresponding horizontal limits of the higher 100-year + 3 feet inundation as indicated by the Coast Smart - Climate Ready Action Boundary (CSCRAB).

The FEMA Floodplain Limit remains inundated with an additional 3 feet of water added to it. The Newly Inundated area shows how 3 additional feet of water moves across new areas of the landscape based on the land elevation profile or Digital Elevation Model (DEM). The map layers on this page illustrate that (A) the Digital Elevation Model, should be added to (B) the CS-CRAB Inundation Height to Indicate the Required CS-CRAB Elevation or (A) + (B).

As depicted in the map below, properties located on both sides of Hambrooks Avenue extending further up Belvedere Avenue, Oakley Street, West End Avenue, and Choptank Avenue are vulnerable using the higher 100-year + 3 feet inundation as indicated by the Coast Smart - Climate Ready Action Boundary (CSCRAB).



Area 3- Yacht Club & City Marina

The Yacht Club and City Marina area is open land that extends to Cambridge Creek. This area along Water Street is subject to nuisance flooding. Homes along water street are also subject to flooding due to high tides and major storms. Nuisance flooding along Water Street occurs frequently.

Flood Risk Vulnerability Today

FEMA provides communities with updated Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) Reports that focus on the probability of floods and that show where flooding may occur as well as the calculated 1-percent-annual-chance flood elevation. The 1-percent-annual-chance flood, also known as the base flood, has a 1% chance of being equaled or exceeded in any given year.

As depicted on the map below, the entire length of Water Street, which runs parallel to the Choptank River is inundated by the 1-percent-annual-chance flood. Properties located in the blue shaded area are vulnerable.



Stormwater Issues

Water Street, running parallel to the Choptank River experiences nuisance flooding issues during heavy rain and high tide events. Tidewater backs up into the street via the storm water system, resulting in ponding along the street due to its lower elevation.

Stormwater is conveyed from areas inland of the Long Wharf Park through six large pipe alignments that is collected from approximately 17 acre-feet. The stormwater model identified inlets that experience flooding, and pipes that are above capacity. As shown on the map below, stormwater gravity mains, which are underground pipes and channels, above capacity are depicted in red.



Flood Risk Vulnerability Tomorrow

Maryland Coast Smart regulations that went into effect on September 1st, 2020 - now require State projects over \$500,000 for construction or State funding to apply the corresponding horizontal limits of the higher 100-year + 3 feet inundation as indicated by the Coast Smart - Climate Ready Action Boundary (CSCRAB).

The FEMA Floodplain Limit remains inundated with an additional 3 feet of water added to it. The Newly Inundated area shows how 3 additional feet of water moves across new areas of the landscape based on the land elevation profile or Digital Elevation Model (DEM). The map layers on this page illustrate that (A) the Digital Elevation Model, should be added to (B) the CS-CRAB Inundation Height to Indicate the Required CS-CRAB Elevation or (A) + (B).

As depicted in the map below, properties located on both sides of Water Street including portions of Mill Street, Vue de Leau Street, and High Street are vulnerable using the higher 100-year + 3 feet inundation as indicated by the Coast Smart - Climate Ready Action Boundary (CSCRAB).



Area 4- Cambridge Creek

Residential and commercial properties abound along the Cambridge Creek shoreline. This area includes both historic properties such as Clayton's Crab-Processing Facility and relatively new condominiums and townhomes.

Flood Risk Vulnerability Today

FEMA provides communities with updated Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) Reports that focus on the probability of floods and that show where flooding may occur as well as the calculated 1-percent-annual-chance flood elevation. The 1-percent-annual-chance flood, also known as the base flood, has a 1% chance of being equaled or exceeded in any given year.

As depicted on the map below, the area in and around the mouth of Cambridge Creek at the Choptank River display the largest vulnerability, shaded in blue indicating the 1-percent-annual-chance flood.



Cambridge Creek & 1% Annual Chance Floodplain

Stormwater Issues

Cambridge Creek is surrounded by light industry, commercial and dense residential land uses. Aging stormwater infrastructure continues to create major issues for the City. A specific flood risk model was necessary for Cambridge Creek because it is within a different waterhed than the adjacent areas.

There are two main tributaries that enter the creek from the south, the main stem of Cambridge Creek enters from the southeast and Peach Blossom Creek enters from the southwest. Drainage to the creek is complicated by a stormwater system that connects different parts of the watershed that under natural conditions would not be conveyed to Cambridge Creek.

The stormwater model also included stormwater pipes that outfall into the west and south side of Cambridge Creek, as well as an overall watershed volume analysis. The existing conditions model showed that stormwater volume associated with the outfalls from Cambridge Creek is approximately 233 acre-feet. As shown on the map below, stormwater gravity mains, which are underground pipes and channels, experience high stormwater volumes in conjunction with tidal impacts within outfall areas.


Flood Risk Vulnerability Tomorrow

Maryland Coast Smart regulations that went into effect on September 1st, 2020 - now require State projects over \$500,000 for construction or State funding to apply the corresponding horizontal limits of the higher 100-year + 3 feet inundation as indicated by the Coast Smart - Climate Ready Action Boundary (CSCRAB).

The FEMA Floodplain Limit remains inundated with an additional 3 feet of water added to it. The Newly Inundated area shows how 3 additional feet of water moves across new areas of the landscape based on the land elevation profile or Digital Elevation Model (DEM). The map layers on this page illustrate that (A) the Digital Elevation Model, should be added to (B) the CS-CRAB Inundation Height to Indicate the Required CS-CRAB Elevation or (A) + (B).

As depicted in the map below, the area located along the shoreline of Cambridge Creek are vulnerable using the higher 100-year + 3 feet inundation as indicated by the Coast Smart - Climate Ready Action Boundary (CSCRAB).



Area 5- Sailwinds

Sailwinds, which is a 24-acre tract under development by the Cambridge Waterfront Development Inc. The land area comprising the Sailwinds project is largely at a higher elevation. The Cambridge Waterfront Development Inc has the flexibility to plan and design the development, thereby concentrating the placement of structures outside of higher flood risk areas. Through this planning process, guidance will be provided to the CDWI on flood risk reduction for potential integration into the site design and development.

Flood Risk Vulnerability Today

FEMA provides communities with updated Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) Reports that focus on the probability of floods and that show where flooding may occur as well as the calculated 1-percent-annual-chance flood elevation. The 1-percent-annual-chance flood, also known as the base flood, has a 1% chance of being equaled or exceeded in any given year.



Sailwinds & 1% Annual Chance Floodplain

Flood Risk Vulnerability Tomorrow

Maryland Coast Smart regulations that went into effect on September 1st, 2020 - now require State projects over \$500,000 for construction or State funding to apply the corresponding horizontal limits of the higher 100-year + 3 feet inundation as indicated by the Coast Smart - Climate Ready Action Boundary (CSCRAB).

The FEMA Floodplain Limit remains inundated with an additional 3 feet of water added to it. The Newly Inundated area shows how 3 additional feet of water moves across new areas of the landscape based on the land elevation profile or Digital Elevation Model (DEM). The map layers on this page illustrate that (A) the Digital Elevation Model, should be added to (B) the CS-CRAB Inundation Height to Indicate the Required CS-CRAB Elevation or (A) + (B).



Loss Estimations- Flood Scenarios

Hazus analysis using FEMA's regulated floodplain known as the 1-percent annual chance flood event and Maryland's Climate Action Ready Boundary, which is the 1-percent annual chance flood event plus 3 additional feet of inundation was completed for the Make Cambridge Resilient Flood Mitigation Project.

1- Percent Annual Chance Flood Scenario Loss Estimations

The hazus analysis for the 1- percent annual chance flood scenario was initially conducted for the Great Marsh Area and then was expanded to include both the West End and the Yacht Club-City Marina Areas. The Great Marsh project area is outlined in red along the coastal line. At-risk structures are the building footprints denoted in red. The black dot represents the location of the structures lowest adjacent grade. The lowest adjacent grade is the lowest point of the ground level immediately next to the structure. Beginning north of the Great Marsh area extending just past the City Marina, additional at-risk structures added to the analysis are building footprints depicted in yellow. The orange dot on each building footprint indicates the lowest adjacent grade for the structure.



Building and content loss for both Great Marsh Area and Extended Project Area total is estimated at \$2,597,202.00. Implementing flood mitigation measures to prevent flood risks from occurring in these

areas would eliminate or reduce flood risk from the 1- percent annual chance flood event to the 92 structures (85 residential, 3 other (government buildings) and 2 commercial buildings, are at risk to the 1% annual chance flood event.)

Climate Action Ready Boundary (CRAB) Flood Scenario Loss Estimations

The Hazus analysis using Maryland's Climate Action Ready Boundary flood scenario included the Great Marsh, West End, Yacht Club, and the City Marina areas. Results produced by this analysis include both building, content loss estimations, debris generation, and shelter needs. The full report is located in Appendix B, however this report is labeled "for official use only" due to the detailed property information within. Therefore, general findings from the report have been extrapolated for inclusion in this portion of the plan.

The map below depicts the at-risk structures within the Climate Ready Action Boundary (CRAB). The project area is outlined in red along the shoreline. At-risk structures are the building footprints denoted in red. The black dot represents the location of the structure's lowest adjacent grade. The lowest adjacent grade is the lowest point of the ground level immediately next to the structure.



Building and content loss for Make Cambridge Resilient Flood Mitigation Project Area, which includes the Great Marsh, West End, Yacht Club, and the City Marina areas were calculated. A total of 273 at-risk structures, 267 residential, 2 commercial, and 2 government, are within the Climate Ready Action Boundary (CRAB). The estimated loss estimation for these structures is \$ 11,899,735. The loss estimation is comprised of both building and content loss.

Nuisance Flooding

The shoreline of Cambridge is naturally susceptible to various types of flooding due to its low elevation, proximity to tidal waters, high water table, and poorly drained soils. Modifications to the landscape such as the addition of buildings and pavement have only added to the challenge—impervious surfaces redirect and concentrate rainwater, overwhelming natural systems' ability to handle the flows. An aging storm sewer system will contribute to flooding issues if water backs up in locations that pipes were originally intended to drain. All of these challenges are exacerbated and complicated by climate change that is already causing recurring tidal flooding problems in Cambridge. Increasing magnitude and frequency of rain events is being conveyed by an aging storm system with inadequate capacity.

Tidal flooding that occurs in the absence of a weather event—sometimes called "sunny day flooding"— is labeled nuisance flooding by the state of Maryland and defined as, high tide flooding that causes a public inconvenience.

In Cambridge, tidal nuisance flooding occurs most notably at the entrance of Great Marsh Area-Gerry Boyle Park, at the ends of the streets in the West End and City Marina areas and along Water Street. Higher tides in these locations interact with storm drains and exacerbates the situation. Other areas that are impacted by nuisance flooding include the Yacht Maintenance Company property.

Areas shown in blue on the adjacent maps indicate nuisance flooding.



Flood Risk Reduction Strategies for Today

Strategic Approach to Flood Risk Reduction & Resilience Using Innovative Hybrid Design

A risk assessment for the five distinct planning areas was conducted and presented to both the stakeholder group and the public during the planning process. To account for both current and future flood conditions, a flood protection level of seven feet (7 ft) above **Mean Sea Level** (MSL) was determined for both planning and project design elevation purposes. This 7ft flood protection level is 2 ft above **Base Flood Elevation** (BFE). *Note: <u>Stakeholder Meeting Notes</u> include details on flood protection level discussion and determination.*

Mean Sea Level

Refer to a tidal datum, or frame of vertical reference defined by a specific phase of the tide. Tidal datums are locally derived based on observations at a tide station and are typically computed over a 19-year period, known as the National Tidal Datum Epoch (NTDE).

Base Flood Elevation

The elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year. The BFE is shown on the Flood Insurance Rate Map (FIRM).

Over the course of the planning process a range of flood risk reduction and resilience strategies were identified and evaluated. Input from both the stakeholder group and the public were sought through a series of meetings, project website, and **visual preference survey**.



A detailed technical analysis was conducted on various options. Examples of design options included:



Evaluation criteria used in the technical analysis included the following:

- Social
- Acceptance
 Public Safety / Technical
- Administrative
 / Regulatory
- Cost Benefit / Economic
- Environmental Impact



Results of both the visual preference public survey and the detailed technical analysis matrix were presented at a series of public meetings held within each of the distinct planning areas. Finally, periodic briefings of the City Council and presentations to various organizations were conducted to both provide information and to garner feedback.

Hybrid Engineered Nature-Based Flood Risk Reduction Strategies

Over the course of the planning process, which included robust stakeholder engagement and public outreach events, the project has evolved and is now characterized as a hybrid engineered naturebased flood mitigation project. For instance, an integrated living shoreline with earth/rockfill embankment for flood protection is the preferred option, as this option provides flood protection, shoreline restoration, and a natural aesthetic. The incorporation of additional nature-based solutions continued throughout the planning and design process developed. Multiple systems were incorporated into the project concept designs for redundancy.

The following concept design features are included in our integrated living shoreline with earth/rockfill embankment concept design.

- Rock Sill –riprap breakwater first line of defense, serves to calms flood water.
- Oyster Reef- at toe of rock sill supports wave attenuation, increases living shoreline habitat diversity & enhances water quality.
- Elevated Marsh- mitigates storm surge and allows deposition of nutrient and growth of vegetation with increasing sea level rise.



 Earth & Rockfill Embankment – allows elevation of salt marsh to reduce impact of storm surge and prevents water levels exceeding design base flood of 7 ft above Mean Sea Level (MSL).

Plantings on landside on top of fill provides sand dune like features.



Along the way, mitigation strategies and concept designs evolved. Stakeholder participation informed this process and ultimately resulted in the hybrid engineered design that includes nature-based concept designs. For instance, rather than using a traditional flood wall, the use of a rockfill embankment with living shoreline is the preferred option. The rockfill section will need to include an appropriate filter of either graded stone and gravel or filter cloth and be constructed along the shoreline at the top of the slope of the living shore. The rockfill containment may be constructed at the edge of the shoreline and with minimum excavation requirements, reducing the impacts of construction on existing infrastructure along the shoreline. In addition, optimization of the living shoreline design will assist in the reduction of wave attenuation and shoreline erosion. The anticipation is that using these hybrid design concepts will result in a higher level of flood protection.

The other main system features that will impact performance will be the size of the rock sill and the type of vegetation selected for the marsh. Typically, the rock sill in medium energy environments, such as the Choptank River, can have a top elevation a foot or more above MHW as shown below. This acts as a breakwater to reduce the energy of wave action. This includes adding an oyster reef at the toe of our rock sill, which will be submerged. Research on these types of sills is still ongoing, however these living shoreline reefs seem to be most successful at locations with evidence of a healthy natural oyster population already present. While loose oyster shell (shell plant) is highly suitable for oyster restoration reef building, it is usually not effective for reducing wave height and energy by itself except for very low energy settings. However, they can improve water quality that would be an added benefit to our project.

The other key factor in enhancing the performance of our living shore will be the selection of vegetation for the marsh. Based on previous research, the expectation is that the equivalent of another foot of flood protection may be achieved because of the reduction of wave energy due to the frictional resistance provided by marsh vegetation.

The project area map and concept design graphics on the following pages offer additional information on this hybrid engineered nature-based flood risk reduction strategy.



The project areas map below identifies concept design features along the Cambridge Shoreline.

Cambridge Shoreline Resilience Plan - Project Areas

MAP, DOIT

To leverage flood risk reduction employing the best features of both a living shore and earth/rockfill embankment is ideal.



Integrated Living Shoreline with Earth Embankment, Marsh, Riprap Sill, and Oyster Reef

Integrated Living Shoreline with Rockfill Embankment, Marsh, Riprap Sill, and Oyster Reef



The integrated living shoreline with earth/rockfill embankment will be planted on the landside providing sand dune like features.









Budget for Hybrid Engineered Nature-Based Flood Mitigation Project As part of the development of the concept design, a budget for various aspects of the project was developed.

HYBRID ENGINEERED NATURE-BASED PROJECT BUDGET					
Living Shoreline					
Systems Component	Units	Amount	Unit Cost	Cost	
Mobilization and Demobilization	LS			\$650,000	
Rock Sill (Armor/Riprap Stone)	Tons	15,658	\$114	\$1,785,000	
Filter Cloth	Rolls	30	\$700	\$21,000	
Elevated Marsh Constructed of Dredged Material	CY	51,117	\$30	\$1,535,510	
Marsh Vegetation Plantings	SY	38,377	\$5	\$191,889	
Oyster Reef	LF	6,908	\$75	\$518,100	
Monitoring and Maintenance	LS			<u>\$200,000</u>	
Total Cost:				\$4,901,499	
Earth Embankment Bellevue Avenue to Belvedere Ave	nue/Water Str	eet to Cambrid	ge Creek		
Systems Component	Units	Amount	Unit Cost	Cost	
Mobilization/Demobilization	LS			\$50,000	
Clearing and Grubbing and Excavate core trench	LF	356	\$200	\$71,200	
Earth Embankment	LF	6427	\$600	\$3,856,200	
Core Trench	LF	6427	\$30	\$19,281	
High Performance Reinforced Turf Matt	SY	6052	\$25	\$151,300	
Landscaping	LS			<u>\$100,000</u>	
Total Cost:				\$4,247,981	
Rockfill Embankment Belvedere Avenue to Yacht Club					
Systems Component	Units	Amount	Unit Cost	Cost	
Mobilization/Demobilization including Barge and					
Crawler for offshore placement of rockfill	LS			\$300,000	
Clearing and Grubbing of foundation area	LF	1542	100	\$154,200	
Rockfill material and placement	CY	2056	300	\$616,800	
Gravel Filter Material	CY	1042	200	\$208,400	
Random earth fill between marsh and gravel filter	CY	914	150	\$137,100	
Landscaping	LS			<u>\$100,000</u>	
Total Cost:				\$1,516,500	
Stoplog Structure for High Street					
Systems Component	Units	Amount	Unit Cost	Cost	
Flip Up Flood Barrier, Hydraulically Operated	LS				
Example				\$150,000	
Installation	LS			<u>\$150,000</u>	
Total Cost:				\$300,000	
Stormwater Management System- See Page 48					
Total Cost:				\$4,893,561	
		Тс	tal Project Costs	s \$15,859,541	

Storm Water Management System with Enhancements

In addition to enhancements made to the flood mitigation concept design, an integrated engineered nature-based storm water management concept design has evolved over the course of this planning process. The following features have been included in the concept design.

- Backflow preventers at the end of existing storm water lines that outfall in the Choptank River to prevent high tides backing up into the streets.
- New storm water management system landside to collect, store, and release storm water back to the river that accumulates during high tides.
- Nature-based green infrastructure at various locations within the city to reduce surface water runoff and allow for controlled release to the environment.

These enhancements to the stormwater management system will intercept storm water at designated locations just upstream of their outfalls and include pumping water to new collection areas. In addition, new underground storage facilities will be installed to provide for the retention of water prior to the slow release into the Choptank River.

Great Marsh- Gerry Boyle Park Area

The proposed engineered stormwater remediates flooding due to severe rain events during high tide conditions. Proposed stormwater pipes, shown in purple on figure below, will intercept flow upstream of their outfalls. For instance, proposed pipes at Oakley Street intercept at Hambrooks Avenue and is pumped to new collection area at the end of Glenburn. The proposed new piping and pumping

stations and associated storage will increase the capacity of the existing stormwater network. In addition, new piping will take the stormwater to the proposed below grade storage area where it will be held prior to release into the Choptank River, which will alleviate backflow from the Choptank River during high tide events in this area.



West End and City Marina Areas

The proposed engineered stormwater remediates flooding due to severe rain events during high tide conditions in portions of the West End and City Marina areas. Proposed stormwater pipes, shown in purple on figure below, will intercept flow upstream of their outfalls. In addition, two below grade storage facilities are proposed for this area. One of the new facilities will store water from outfalls on Vue De Leau and High Street, while the other new facility will store stormwater from outfalls on Mill Street and Choptank Avenue. Finally, a green infrastructure project such as bioswales between Mill Street and Choptank Avenue and Vue De Leau Street, will be integrated into this area to reduce stormwater runoff and improve water quality prior to releases into the Choptank River.



Cambridge Creek Flood Risk Reduction Strategies

Cambridge Creek is lined with bulkheads and predominantly newer construction built to code. This planning area includes large condominium buildings and multi-unit commercial structures that are too large to elevate. Therefore, no overarching flood risk reduction strategy can be implemented along Cambridge Creek. The most practicable approach is to undertake various flood risk reduction measures in Cambridge Creek including wet and dry flood proofing, individual flood barrier installations, and the installation of green infrastructure measures.

The <u>Cambridge Creek Watershed Assessment and</u> <u>Action Plan</u> includes green infrastructure bioretention projects. Projects within the Plan include both private and public property. Two example bioretention projects identified on public property include #423 and #424, both of which are within the Cambridge Creek Area at or near the County Office Building.

- Project #423- Capture water runoff from County Office Building from parking lot prior to entering Cambridge Creek. Ponding occurs in this area.
- Project #424- The Court Lane side of the Dorchester County Government building has some space for a street side bioretention cell with another cell located at the end of Gay St. Currently, water flows directly down Court Ln. and Gay St. into Cambridge Creek. The bioretention would help intercept this runoff before it enters the creek, allowing for reduction of peak flows, sediment, and phosphors from entering Cambridge Creek.



Wet Floodproofing

Includes permanent or contingent measures applied to a structure or its contents that prevent or provide resistance to damage from flooding while allowing floodwaters to enter the structure or area. Generally, this includes properly anchoring the structure, using flood resistant materials below the Base Flood Elevation (BFE), protection of mechanical and utility equipment, and use of openings or breakaway walls.

Dry Floodproofing

Includes measures that make a structure watertight below the level that needs flood protection to prevent floodwaters from entering. This type of floodproofing is often used to protect nonresidential structures, water supplies, and sewage systems.

An example of a dry floodproofing measure is to apply a waterproof veneer, such as a layer of brick backed by a waterproof membrane, directly to the outside surface of an existing structure.

Flooding can cause sewage from sewer lines to back up through drainpipes. These backups not only cause damage that is difficult to repair, but they also create health hazards. One way to protect against this hazard is to install backflow valves, which temporarily block drainpipes if water travels up them the wrong way. If a structure's lowest level has a floor drain that empties to the exterior of the building, installing a floating floordrain plug can also prevent flood waters from backing up the drainpipe and entering the structure.

Flood Barriers

Barriers around any opening, preventing water leakage or redirects water around.

Green Infrastructure

In 2019, Congress enacted the <u>Water</u> <u>Infrastructure Improvement</u>, which defines green infrastructure as "the range of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspirate stormwater and reduce flows to sewer systems or to surface waters."

Sailwinds Park

Cambridge Waterfront Development Inc. is a nonprofit economic development corporation managing the development of the waterfront for the Sailwinds Park area. Possible development on the site includes hospitality, food, and beverage, mixed-use commercial/retail and residential. Concept plans include public amenities such as a promenade with walking and biking trails; greenspace for recreation, events, and entertainment; continued unrestricted access for the boat ramp; and a beach for swimming.



Throughout the Make Cambridge Resilient plan development process, the Stakeholder Group provided guidance to CWDI on flood risk, both current and projected future conditions, for integration into site design and development options. The CWDI plan is to design the proposed promenade to elevation 7.5 ft above Mean Sea Level (MSL) and floodproof everything else to an elevation 9 ft. above MSL. There will be a large buffer of open space between the Choptank River and planned new development, as well.

Flood Risk Reduction Strategies for Tomorrow

The **Make Cambridge Resilient Flood Mitigation Plan**, funded by FEMA's Flood Mitigation Advanced Assistance Grant program, enabled the City of Cambridge to develop mitigation strategies including project concept designs to reduce flood risk. To maintain the momentum of the Make Cambridge Resilient planning initiative and move to the implementation of mitigation and resilience strategies, the City is seeking additional funding to increase capabilities and build capacity for project implementation and the institutionalization of flood risk reduction for both current and future conditions. As with all planning initiatives, implementation of the plan is the next step.

Integration of Flood Risk Reduction & Resilience

While this planning process included the review and utiilization of information from various planning documents, initiatives, and resources for or by the City of Cambridge that related to flood risk reduction, new ideas for integration of flood risk reduction have been developed as a result. New ideas and recommendations for planning, codes, and FEMA's Community Rating System (CRS) are detailed below.

City of Cambridge Comprehenisive Plan Update, Design Standards, & Ordinace Updates

The City of Cambridge began the process of updating the 1996 Comprehensive Plan in 2008. In February 2011, after more than 30 public meetings and workshops, the City of Cambridge Commissioners approved Ordinance Number 1008, inclusive of Exhibit A, to formally adopt the City's Comprehenisive Plan. In 2013, the Maryland General Assembly passed and the governor signed <u>House</u> <u>Bill 409</u> that changed the review cycle for comprehensive plans from every 6 years to every ten.

Action Items for Consideration:

• Designate coastal high hazard area as an **overlay zone**. Additional requirements include the use of permeable surfaces on new parking spaces and stormwater infiltration requirements. This includes the implementation of nature-based stormwater management practices to reduce surface water runoff and improve water quality.

Overlay Zone means a mapped overlay superimposed on one or more established zoning areas which may be used to impose supplemental restrictions on uses in these areas or permit uses otherwise disallowed.

Coastal Zone Management (CZM) overlay zone or coastal management easement could be established to straddle flood mitigation and resilience project areas across private property A CZM is a dynamic system made up-of several distinct areas. These areas may include wetlands, flood plains, river estuaries, salt marshes, mud flats, and tidal pools.

- Enhance or develop land-acquisition, relocation assistance or buyout programs.
- Enhance land-use policies to prepare for the impacts of climate change such as restricting new development or redevelopment in coastal high hazard areas and updating shoreline setback requirements.

- Require consideration of climate change and future sea-level rise in the siting and design of public facilities and infrastructure. This may include commercial and residential development.
- Develop policies to promote use of green infrastructure or living shorelines.
- Add as a goal: Protect, enhance, and create living shorelines and nearshore habitat.
- For all shoreline restoration projects on City-owned properties, living shoreline restoration techniques should be considered. Any designs should take into account projections for sea level rise.

Working Waterfront Development Plan

The Cambridge Working Waterfront Implementation Plan is the means by which the city can confidently move toward constructing its clear and distinct vision for its future. The plan is a culmination of a project that emphasizes new programs that support waterfront planning and development, maritime zoning, and new planning tools. Due to the ongoing flood risk reduction planning and project scoping for the Gerry Boyle Park, a condensed version of this plan was adopted by the City. **The Make Cambridge Resilient Flood Mitigation Plan** and project scoping is referenced in the Cambridge Working Waterfront Implementation Plan.

Community Rating System

Residents in the unicorporated areas of Dorchester County have lower flood insurance premiums as a result of Dorchester's initiative to implement better floodplain management measures encouraged by the <u>National Flood Insurance Program (NFIP</u>). These measures have reduced the risk of flooding and resulted in a decrease in insurance premiums for communities across the county. <u>FEMA</u> oversees the NFIP, which administers a program called the <u>Community Rating System (CRS)</u>. As a member of the CRS, Dorchester County is within an elite group of 16 communities in Maryland that have received this recognition. With the steps taken by Dorchester County to protect its citizens and increase its resiliency, it has advanced its CRS standing to a Class 6 participant. The Class 6 rating qualifies eligible NFIP policy holders in Dorchester County for an average savings of \$185.00 in annual premiums. For policy holders in the Special Flood Hazard Area (SFHA), the average savings is \$218. In addition, each policy written in the non-SFHA zones of Dorchester County receives a 10% annual premium discount, for an average savings of \$71. Overall, entering CRS as a Class 6 rating results in a total approximate savings of \$235,941 annually for the county.

CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed minimum NFIP requirements. The program includes 10 different class rating levels based on the number and type of activities initiated by participating communities. Each level corresponds to a percentage discount on National Flood Insurance policy premiums within the county. For each Class that a community moves up to, it provides its residents with an additional 5% reduction in their flood insurance premiums up to a 45% reduction for a Class 1 community. As a Class 6 community, Dorchester County enables its residents to receive a 20% reduction on their flood insurance premiums. Under the CRS, local officials are asked to meet three goals: (1) reduce flood losses; (2) facilitate accurate insurance



National Flood Insurance Program Community Rating System A Local Official's Guide to Saving Lives, Preventing Property Damage, and Reducing the Cost of Flood Insurance FBMA 8371/2018



rating; and (3) promote the awareness of flood insurance. Communities who apply to participate in the CRS are required to provide information demonstrating their floodplain management program exceeds the minimum compliance requirements of the NFIP. Once the information is verified, FEMA provides flood insurance premium discounts. Participation in the CRS is voluntary. There's no application fee, and all CRS publications are free.

Action Item for Consideration:

The City of Cambridge is eligible to submit an CRS application.

- The Mayor must appoint a CRS coordinator to serve as the liaison between the community and FEMA. The coordinator should know the operations of all departments that deal with floodplain management and public information. The coordinator should be able to speak on behalf of the City.
- Submit a letter of interest to FEMA Region 3. Note: On the CRS Resources website (www.CRSresources.org) you can find a sample letter; the CRS Quick Check, a tool that helps you assess the community's possible credit points; and further instructions.
- Potential points could be awarded for new regulations. For example, regulate development in the 500-year floodplain (shaded Zone X on the FEMA FIRMs) or the CS-CRAB.

Sample Letter

Community Letter of Interest to Join the CRS {Community letterhead} {Date} {Name} Federal Emergency Management Agency Region {} {Address} {City, ST, Zip} {See the list of FEMA Regional Offices at: <u>http://crsresources.org/100-2/</u> .}					
Dear {name}: The City/Town/County of {name} interested in participating in the Community Rating System (CRS) so that our residents for discounted flood insurance premiums.	ame} is ; will qualify				
Our CRS Coordinator is {name}, who can be reached at {phone} or {E-mail address}.					
We will cooperate with FEMA, the Insurance Services Office, Inc. (ISO), and the CRS verification process to ensure that our credited activities are fully earned and warranted.					
Please ask ISO to visit us to review our program in depth and verify the creditable activ understand that approval from the FEMA Regional Office is needed for the ISO/CRS Spe visit the community. Sincerely, {name} {title}	vities. We vecialist to				
{Note: This letter must be signed the by Chief Executive Officer of the community, such Mayor or City Manager.} cc: {ISO/CRS Specialist} {State NFIP Coordinator for your State of ISO/CRS Specialists at: http://crsresources.org/100-2/.}	h as the e} {See the list				

Stormwater and Shoreline Resilience Fee

Stormwater is water runoff generated when rain and snowmelt events flow over land, structures or other impervious surfaces and does not infiltrate into the ground.

The City of Cambridge will continue to experience sea level rise and larger storms in the future that may exceed the capacity of its aging stormwater management system. Currently, the City of Cambridge relies on the local budget to pay for stormwater maintenance and/or upgrades or other flood-related problems, competing with other needs for limited resources.

Stormwater management infrastructure requires long-term maintenance and upgrades to maintain its ability to capture heavy rainfall, manage runoff, and control the inflow of tidal waters. In addition, the City plans to implement more nature-based stormwater management and shoreline protection measures that complements our engineered systems, will require development and maintenance, and must be part of the overall approach to make the city resilient to the impacts of sea level rise and major storms. Finally, more nature-based stormwater infrastructure is needed to store, convey, and treat stormwater before it is released to the Choptank River and Cambridge Creek to address the reality that we are experiencing increasing sea-level rise and more severe storms.

Ensuring that a dedicated local funding stream for stormwater management, flood risk-reduction solutions, and shoreline protection measures for the city can be accomplished through a minimal utility fee or a special taxing district.

Action Item for Consideration: Institute a dedicated budget for maintenance of the current stormwater and shoreline resilience infrastructure and a long-term capital improvement plan addressing both current and future infrastructure needs.

Option A: Adopt a stormwater and shoreline resilience fee that would raise the revenue necessary to invest in water management infrastructure such as stormwater retention solutions and other flood-related risk reduction solutions.

- Improvements and upgrades. This infrastructure includes ditches, swales, culverts, drains, outfalls, tide gates, storage areas, bulkheads, living shorelines and other structures placed to control water levels.
- Eastern Shore Example: Oxford, Maryland Stormwater Management and Shoreline Protection Fund, Ordinance 1403.

Option B: Create a special tax district, charging a yearly flat fee to residential and commercial properties located in a specified geographic area, that would raise the revenue necessary to invest in water management infrastructure such as stormwater retention solutions and other flood-related risk reduction solutions.

- Special Districts cover a specific geographic area and as such there is a clearer connection between the taxes/assessments being levied by a Special District and the benefits that the residents in the Special District are receiving.
- Special District taxes/assessments are levied on an annual basis and therefore are not rolled up into the home price/mortgage as is the case with impact fees.

- Over time, Special Districts draw upon a large pool of citizens to finance public infrastructure not placing this filnacial burden solely on new residents as is the case with impact fees.
- Special Districts often require the preparation of an annual budget thereby making them more accountable and transparent to the residents.
- Special Districts may be used in combination with other financing mechanisms thereby accelerating the financing of public improvements in advance of growth.
- Impact fees do not readily allow for the issuance of bonds to finance the construction of infrastructure in advance of growth.

Town of Oxford, Maryland- Funding Proposal (Excerpt from PowerPoint presentation by Cheryl Lewis, **Town Manager**

Stormwater Utility (SMSP) Funding Options with final Proposal									
				San	ple SMSP rat	te based o	n .03	increa.	se
Proposing an additional .03 to the current tax rate	- establishing	\$ 100,000 of		As	sessment	SMSP	F	ee	
collected real property taxes designated to Stormy	vater Utility Fu	ind in Budget Ordinance		\$	200,000	0.03	\$	60	
FY 2014 - Property Tax Rate (Current)	0.2483	FY 2015 - proposing the same rate plu	us SMSP	\$	300,000	0.03	\$	90	
Proposed Stormwater Fee (SMSP) Addition	0.0300	\$ 104,662 estimated additional fu	nds	\$	400,000	0.03	\$	120	
				\$	500,000	0.03	\$	150	
Total Proposed FY 2015 Real Property Rate	0.2783			\$	600,000	0.03	\$	180	mean/average
				\$	700,000	0.03	\$	210	
* Based on assessed value of all properties				\$	800,000	0.03	\$	240	
* Tax Exempt locations would not be billed unless	we elect to bill	l manually in the future		\$	900,000	0.03	\$	270	
* Lots with no structures would also be billed				\$	1,000,000	0.03	\$	300	
** Mortaged properties would have fee distribute	d with mortgag	je pmnt		\$	2,000,000	0.03	\$	600	
** Virtually no administrative cost to bill and no ad	lditional admin	istrative cost to collect		\$	3,000,000	0.03	\$	900	
** Easily designated to Stormwater Fund as a Budg	eted permaner	nt deposit to this account		\$	4,000,000	0.03	\$	1,200	

....

Operations & Maintenance Program- Flood Risk Reduction Project Scoping and Implementation Goal is to develop city's capacity and capability to implement flood mitigation plan and continually evaluate and implement risk reduction measures to achieve long term resiliency.

Staff Position

Action Item for Consideration: Obtain grant funding to hire a new staff position, environmental professional, managed within city governmental structure responsible for the oversight, operation, and maintenance of flood mitigation infrastructure and further development of the City's flood risk reduction efforts. In addition, the steering committee established for the "Make Cambridge Resilient Flood Mitigation Plan" will be expanded and will continue to meet throughout providing assistance to the project manager on project scoping, implementation, and public outreach efforts.

- Program will include multiple complementary initiatives in support of making Cambridge resilient to sea level rise and major storms.
- Initial three-year period of performance that could be extended
- Under future grants currently planning submission under FEMA 2021 Hazard Mitigation Grant Program (HMGP).
- Open to others for support in specific areas such as workforce development
- Estimated cost to be \$200k per year or \$600k over three years.
- Proposed city cost match is \$25k per year which can be made up of in-kind staff support labor.

The addition of a staff position to coordinate and provide oversight will help to ensure that all flood risk reduction projects and planning initiatives are in concert with one another and all future City planning, and development efforts based on future projections of sea level rise and needs for climate adaptation.

Establish and Implement Educational and Training Program

The development of a workforce to support the long term needs of the Make Cambridge Resilient flood mitigation efforts will further institutionalize flood risk reduction and the use of nature-based solutions within the City Cambridge. This effort will compliment other community engagement efforts. The steering committee and nonprofits such as Shore Rivers and Partnership for ILearning for support will be integral to this effort.

Action Item for Consideration: Develop resource support plan identifying needs for flood risk reduction project and new community development program. This plan will outline the steps necessary for workforce development and volunteer opportunities to support the long term needs of the Make Cambridge Resilient flood risk reduction efforts.

Green Infrastructure Plan and Compatibility Map

Nature-based solutions reduce the volume and flow rate of stormwater runoff and remove contaminants from stormwater.

Action Item for Consideration: Develop a green infrastructure compatibility map to guide efforts based on available open space, the slope of land, soil hydraulic conductivity, and presence of or ability to create pervious surfaces. Next, develop a city-wide green infrastructure plan that will identify specific natured based solutions that may be implemented based on site conditions and future development plans including infrastructure and property improvement plans.

- Phase 1- identify information needs such as where surface water can infiltrate below the surface based on site features. slope, soil type
- Phase 2- production of GIS base maps such as green areas, map of natural surface infiltration potential and potential exclusion areas for the evaluation of alternative nature-based flood mitigation feature
- Phase 3- create green infrastructure compatibility map that identifies those areas most compatible with various nature-based flood risk reduction measures.

Cambridge Creek Watershed Assessment Bioretention Projects

The Cambridge Creek Watershed Assessment (CCWA) includes green infrastructure and community greening projects. Three priority projects were selected by the City and reviewed by the Make Cambridge Resilient Stakeholder Group for inclusion into this planning effort. All three projects are on publicly owned land.

Priority Project Details:

- Site 311, Trenton Street The scope of the project can be scaled to fit all on public land without impacting nutrient and sediment reductions substantially. Runoff would be captured from the street and diverted before it reaches the boat ramp to be captured by the bioretention. The bioretention would be planted in native species to add to the aesthetics of the park.
- Site 423, County Office Building Capture and treat runoff water from City Hall parking lot using bioswale GI technology that incorporates walkway. Need County buy-in.
- Site 422, Lot in front of City Hall Installation of bioswales GI technology that will capture and treat runoff water before entering Cambridge Creek.



In addition, the twelve recommendations included on page 15 of the CCWA have also been reviewed and integrated into this planning initiative.

- Outreach and education of residents on lawn care practices. Administer a fertilizer outreach campaign with property owners and lawn care professionals. Educate them on the impacts of fertilizers and the alternative practices that are available.
- 2) Stormwater retrofitting demonstration projects. Using the stormwater demonstration station at Sailwinds Park as an example, install projects like rain barrels and rain gardens in high-profile areas for members of the public to see. Provide educational signage and walking tours that highlight the benefits of these low-maintenance and cost-effective practices.



- 3) Vacant lot revitalization program. The Cambridge Creek watershed includes a large amount of vacant and abandoned lots. In partnership with the city and county, develop a program that revitalizes the vacant lots. Incorporate stormwater management practices, increased green space, and other useful elements. Identify how the vacant lots are currently being used by the nearby community and implement a design that enhances that use. Leverage vacant lot revitalization to engage community members, gather support, and provide education.
- 4) Faith-based outreach and engagement. The Cambridge Creek watershed includes many churches and places of worship. Watershed partners should engage with these faith communities and provide education on creation care and stewardship of our land and water. Watershed partners should work with congregations to implement restoration projects on their church properties, as well as provide the members with homeowner education and the tools and resources to implement projects on their home properties.
- 5) Point-source monitoring and engagement. There are six facilities that have permits to discharge their runoff within the Cambridge Creek watershed. Using the Citizens Guide to Public Participation in Maryland's NPDES Permitting Program, monitor and engage in permit compliance and reissuing processes. Advocate that each permit includes strong permit limits and enforceable permit conditions, and provide accountability when a permit is violated.
- 6) Construct treatment wetlands where possible. Treatment wetlands are one of the most effective ways to absorb stormwater runoff and the nutrients and pollutants that it carries.
- 7) Increase participation in the Marylanders Grow Oysters (MGO) program. The MGO program is an opportunity for citizens to engage in oyster restoration. Through the program, citizens who have access to docks or piers are given the equipment and spat-on shell

oysters needed to participate in oyster gardening. The growers help to maintain and protect the young oysters during their vulnerable first year of the life, so they can be planted on local sanctuaries where the oysters can enrich the local ecosystem and the oyster population.

- 8) Education and outreach to school-aged children. Educate school children on environmental issues including land development, non-point source pollution, water quality degradation and habitat destruction. Teach students about the solutions to these problems and engage them in restoration efforts, tree plantings, trash cleanups, and educational signage projects.
- 9) Participate in local code and ordinance reviews. Focusing on erosion controls, right-ofways, and site designs, help to update local ordinances so they are conducive to implementing clean water projects. Encourage more street trees plantings in the right-of-way. Provide stricter regulations for construction sites with bare soils and erosion possibilities.
- 10) Implement restoration on public land whenever applicable. By implementing projects on public land, the government is demonstrating to watershed residents the new way of conducting business and managing stormwater runoff. Lead by example.
- 11) Plan for increased rainfall amounts and intensity, and regional plant species migration due to changing climate patterns. By planning for these expected changes, we will be able to implement projects that are more resilient to the effects of climate change. Rain fall is becoming more intense and more frequent, while we are also experiencing longer periods of drought-like conditions. These changes will have an effect on the size of our stormwater practices, as well as the plants that are used in green infrastructure projects.
- 12) Monitor the health of Cambridge Creek as a means of tracking progress. Keep a pulse on the health of Cambridge Creek by conducting an on-going water quality monitoring program. Test the water for physical degradations as well as chemical impairments. Test the dissolved oxygen levels at the surface and the bottom of the water column. Test the nutrients and bacteria levels from different areas throughout the creek and the surrounding watershed. Identify emerging hot spots of pollution.

Action Item for Consideration: Assess areas of Cambridge not included in the Cambridge Creek Watershed Assessment, thereby assessing the City in it's entirety.

Project Implementation and Tracking

To ensure plan implementation of the action items detailed in Flood Risk Reduction Strategies for Today and Tomorrow, performance measures should be established and subsequently tracked by the Steering Committee and City staff moving forward. As a next step, the Steering Committee should convene to review recommended action items, the status of submitted grant applications, and any new grant applications under consideration. Following this review, action items should be prioritized and integrated into the City's multi-year budget.

To track the implementation and success of actions, performance measures should be established.

Performance measurement is generally defined as regular measurement of outcomes and results, which generates reliable data on the effectiveness and efficiency of programs.

The Steering Committee should consider the following in determining performance measures:

- What are the Target Outcomes
- Define measures
- Develop tracking system
- Manage data collection

The following is a listing or potential items that the Steering Committee may consider.

- Linear Feet of Shoreline Protection Created
 - o Earth and Rockfill embankment
 - Rock Sill and Oyster Reef
 - Floodwall at Street Ends
 - o Acres of Marsh Development
- Planning and Policy Changes
- Vegetation Planted
- Vegetation Establishment
- Volunteer Participation/Hours
- Oyster Reef Establishment
- # of Grants and Funding Obtained
- # Outreach Initiatives and # of People reached/attending
- Acreage of Open Space through Acquisition
 - o Park land
 - o Marsh/Wetland
- Bio Retention Installation
- Stormwater retention areas and capacity
- Installation new stormwater piping linear feet
- Installation new Pumping station created
- Installation of backflow valves
- Loss avoidance
- Stormwater and Flood Mitigation Fee (collected, used, grant match)

Appendix A: Data Sources & Limitations

HAZUS Modeling

Hazus is a nationally standardized risk modeling methodology. Hazus is used to determine potential losses from disasters. The Hazus flood model calculates physical damage and economic loss due to coastal and/or riverine inundation. Losses are calculated using functions that relate the depth and type of flooding to the degree of damage for various categories of buildings.

Water Surface Elevation Grid: This dataset represents the flood elevations calculated for the 1-percent-annual-chance flood event.

Flood Depth Grid: Flood Depth Grids are created for each flood frequency calculated during a Flood Risk Project. These grids communicate flood depth as a function of the difference between the calculated water surface elevation and the ground. Coastal flood depth grids are created for areas where the dominant wave hazard is overland wave propagation. The grid depicts the difference in elevation between the wave crest elevation, or BFE, and the ground. Coastal areas will typically only receive a depth grid for the 1-percent-annualchance (base) flood for which overland wave propagation results are produced as a part of the FIS; however, approximate methods may be used to estimate wave crest elevations for other flood frequencies, if desired.

Maryland PropertyView Parcel data for various attributes were extrapolated and used.

Google Maps Street View/ Hazus Technical Manual/ Maryland PropertyView were used to determine foundation type, and to visually verify number of floors for each structure included in the study area.

Data Limitations: First floor elevations were not available for integration into the HAZUS models used for this planning effort. Using the methodology from the FEMA Flood Risk Map Products for Maryland, the lowest adjacent grade for each building footprint was used.

The value of the lowest elevation for each building structure (polygon feature) was determined using the ArcGIS Zonal Statistics tool and the 2019 Maryland LiDAR Dorchester County - DEM Feet data.

Using the tool, the output is a raster depicting only the DEM cells with the lowest elevation values. These cells were converted to point data utilizing the Raster to Point

tool within ArcGIS. The lowest adjacent grade points were joined with Maryland Property View parcel data points.

Sea Level Rise Bathtub Model

Assumption taken in the static bathtub modeling approach is that ocean fills up the same way that a tub does when you add water — the lower parts fill up first and then the higher parts fill until the water level just keeps rising at the same level everywhere in the tub.

Stormwater Model

A conceptual-level EPASWMM model was set up to analyze the stormwater pipe systems that outfall to the Choptank River. The pipe, inlet, and manhole data were taken from the City of Cambridge GIS records. Where gaps appeared in the existing conditions storm infrastructure data, assumptions were made based on nearby data.

A 1-percent-annual-chance storm was chosen as the modeled event with a 24-hour duration. The rainfall depth for this storm is 9.12 inches. Subbasins were delineated and a hydrologic analysis was performed using existing land-use data. The model also included stormwater pipes that outfall into the west and south side of Cambridge Creek.

Appendix B: Flood Vulnerability Studies

- Stormwater Modeling Results
- Bathtub Modeling
- HAZUS Reports
 - o 1% Annual Chance Flood Event Scenario
 - Climate Ready Action Boundary (BFE + 3 Feet) Flood Event Scenario

Stormwater Management System

There are two components of the storm water management system. They include (1) the installation of backflow preventers at the ends of existing storm water lines that outfall in the Choptank river to prevent high tides backing up into the streets, (2) the design and construction of a new storm water storage system landside to collect and discharge storm water back to the river that accumulates during high tides or major storm events. This stormwater system remediates flooding by installing infrastructure in three different areas: Gerry Boyle Park, in between Mill Street and Choptank Avenue just west of Long Wharf Park, and Long Wharf Park in between Mill Street and High Street.

In the Gerry Boyle Park area and adjacent area to the east, there are five outfall pipes where stormwater volume will be collected/controlled. Oakley Street, Belvedere Avenue, and Glenburn Avenue. There is a small stormwater pipe system that outfalls from Bay Street where only a backflow preventer is proposed. Stormwater coming through the downstream end of the pipe system on Oakley Street will be intersected by installing one pump in the road or in the vicinity of the intersection underground in a manhole structure, with an associated control panel. This pump will pump water to a pump station located at the end of Glenburn Avenue into a collection area. Proposed Reinforced Concrete Pipe (RCP) will need to be installed to

make this connection. Another existing stormwater pipe system will also outfall into this collection area, as the collection area will be right at the existing pipe outfall. As the stormwater builds up in the collection area, it will be pumped by two pumps at the pump station up to a stormwater storage detention system located at Gerry Boyle Park for the purpose of storing water throughout the storm event. As the water collects in this system it will be discharged by pump through a pipe that will outfall beyond the proposed



embankment meant to keep back the river water. A third pump will be located at the pump station and will be used as a backup in case one of the two other pumps needs maintenance. A control panel and a backup generator will be at this location as well.

The storage facility located at Gerry Boyle Park will have an invert elevation such that there will be some excavation necessary, but also some fill over the system. This will allow the storage facility to blend in with the proposed embankment. This will also provide some distance between the storage facility invert and the groundwater table, or will allow for less groundwater table exposure. The stormwater collection area at the pump station has a main use of temporarily storing water so that it can be pumped to the storage facility, but improvements can be proposed so that there is an environmental benefit as well. For example, the collection area can be designed as a wet detention pond, with all storage area located above the groundwater table. The living shoreline is in close proximity to this area, and plants can be installed in the wet detention pond that will blend in with the living shoreline. The plantings have the potential to provide some water quality treatment to the stormwater through the design of the pond.

Green infrastructure such as wet swales, bioswales, rain gardens, etc. will be considered in the Park area to divert and control stormwater runoff while adding an element of treatment. Stormwater especially from roads and parking lots contain numerous pollutants, and adding a filtration aspect to a stormwater system through green infrastructure is beneficial. The green infrastructure can be incorporated into the embankment design while allowing the Park to be available to multiple uses for the community. A swale design can collect water from gently-sloped grading and divert the water to certain points/outfalls in the Park. The swales can direct any stormwater that ponds on the inland side of the embankment. The swales can be designed to either outfall into the River or outfall into rain gardens, small wetland cells, or bioretention cells. The swales and contributing drainage areas can be laid out such that the park can entertain multiple uses and the green infrastructure does not take up the majority of the space. The swales and end point filtration devices add a water quality benefit to the area, and filter the stormwater before it enters the Choptank River. Walking paths can be made with pervious pavers or permeable concrete to create additional filtration practices.

The second part of the stormwater system will manage stormwater at three stormwater pipe outfalls in between Mill Street and Choptank Avenue located just west of Long Wharf Park. A storage facility will intersect these storm water pipes upstream of the outfall so that stormwater will enter into the system through gravity. The stormwater storage system that will manage stormwater from outfalls on Vue De Leau Street and High Street is located in Long Wharf Park east of Mill Street. The stormwater in the existing



outfall pipes will be diverted into the storage facility by gravity.

Once stormwater begins to accumulate in the storage facilities, this will activate one pump located at the Long Wharf Park location that will pump the stormwater through a discharge pipe that connects the two storage facilities and divert the stormwater into the storage facility in between Mill Street and Choptank Avenue. This pump is optional, as there is also an option to allow the water to flow from one storage facility into the other by gravity. As the stormwater accumulates, it will be pumped out through a discharge pipe and outfall into the Choptank River past the proposed sea wall. The detailed design will allow smaller storm frequencies to pass through the existing outfall pipes, and the storage facilities will only be activated during larger events. It is expected that the storage facilities in the vicinity of the Marina will be mostly if not all excavation due to the inverts of the existing stormwater pipes being low in elevation compared to ground surface. The design and construction of the storage facilities will have to take the groundwater table and hydrostatic pressure into account. A small shed/structure will house the pump control panel and a backup generator. An extra pump will also be installed at the discharge pipe to use as a backup.

Green infrastructure will be proposed in the open areas on either side of Mill Street, and the storage facility locations will be incorporated to create a holistic design of the available space with multiple functional and aesthetic uses. In particular, French drains or small diameter HDPE pipes placed perpendicular to the road will convey stormwater runoff on Water Street away from the road/gutters into green infrastructure such as a wet/bioswale. The swale design will be incorporated with the proposed embankment while allowing the area to be available to multiple uses for the community. The design will also help to alleviate flooding on Water Street. The swales can convey the water to drainage points that will discharge into the underground storage facility while providing an element of treatment to the water through plantings, gravel, and soil. The swales can also outfall into other green infrastructure elements such as rain gardens or small wetland cells. Because the groundwater table is high in this area, that will have to be incorporated into the design. Pervious pavers or permeable concrete can be considered as materials for walkways that add an extra level of filtration.

A conceptual-level EPASWMM model was set up to analyze the stormwater pipe systems that outfall to the Choptank River mentioned above. A 1-percent-annual-chance storm was chosen as the modeled event with a 24-hour duration. The rainfall depth for this storm is 9.12 inches. The existing conditions model showed that the combined stormwater volume associated with the outfalls from Gerry Boyle Park, the Marina, and Cambridge Creek is approximately 277 acrefeet.

Existing Conditions Stormwater Volume Results				
Modeled Storm	100-Year 24-Hour Precipitation (in)	Wet Weather Inflow (10^6 gal)	Wet Weather Inflow (acre-ft)	
100 Yr	9.12	90.4	277	

After the proposed improvements described above were implemented, it was found that a reduction in flooding at inlets resulted from the improvements being put in place. In the table below, it describes the number of inlets experiencing flooding discharge, and the number of inlets that had the flooding discharge lessened or removed.

Number of Inlets	Number of Inlets	Flooding Decreased or
Flooding in Existing	Flooding in Proposed	Removed in Number of
Conditions	Conditions	Inlets
145	15	130

By installing backflow preventers on all outfall pipes, incorporating additional storage, adding pumps, and incorporating green infrastructure, the conceptual modeling shows that the proposed improvements reduce the flooding at inlets, relieves some pressure on the existing stormwater pipe system, and allows for incorporation of green infrastructure benefits into the stormwater design.
Bathtub Modeling

Cambridge Bathtub Modeling

Following steps were taken to develop modeling framework and perform static bathtub modeling. Figure 1 shows detailed workflow for calculating flooding extents and flood depths.

- 1. Vertical datum adjustment for analyzing sea level rise scenarios
 - a. Choose a sea level rise elevation above mean sea level (MSL), i.e. 2 feet
 - b. Calculate datum adjustment for converting current MSL to North American Vertical Datum (NAVD88) vertical datum, i.e. -0.09 for Cambridge NOAA station.
 - c. Add this elevation to chosen SLR value. The resultant number will be final elevation for static bathtub modeling.
- 2. Static Bathtub model development and processing:
 - a. DEM Processing for Existing Conditions:
 - i. Download high resolution Topography Digital Elevation Model (DEM) from iMAP web portal
 - ii. Process DEM for any large sinks or fills within study area
 - iii. Convert Elevations from meters to feet
 - iv. Transform the vertical datum of DEM to NAVD88. See figure 1 for existing conditions DEM from iMAP
 - b. Geospatial Analysis for flooding extents and depth
 - Perform "map algebra" in ArcMap to extract raster pixel values equal and smaller than the prescribed SLR elevation, i.e. "%DEM.tif%"<= float(%SLR elevation%)
 - ii. Reclassify extracted raster into pixel values of 1 where it is lower than SLR elevation and No data where it is higher.
 - iii. Now clip the raster to the coastline of the study area to remove areas found in Ocean
 - iv. Convert clipped raster to polygon shapefile using "raster to polygon" process in ArcMap
 - v. Now run "select by location" process in ArcMap to extract all polygons connected to ocean. Figure 2 provides an illustration of 4-point connectivity used for flooding analysis of areas below sea level rise in this process.
 - vi. The resulting polygon shapefile will be the extent of flooding due to a given SLR elevation
 - vii. In order to calculate the flood depths, take the reclassified raster created in step ii and multiply by the SLR elevation
 - viii. Subtract multiplied raster from vii to the original DEM to extract flood depth raster.
 - c. Estimating Overtopping Height
 - i. Develop a polygon shapefile with

- ii. Create a modified version of the study area DEM with elevations of the coastal structures around the coastline
- iii. Perform the geospatial analysis as described in part b
- iv. Clip the flooding depth on top of the coastal features using a polygon shapefile
- v. Save the resultant raster as overtopping height on coastal features.

Assumption taken in the static bathtub modeling approach is that ocean fills up the same way that a tub does when you add water — the lower parts fill up first and then the higher parts fill until the water level just keeps rising at the same level everywhere in the tub.



Figure 1 Static bathtub model workflow



Figure 2 Bathtub sea level rise modeling using four-point connectivity



Figure 3 Existing Conditions DEM from iMAP for Cambridge, MD



Figure 4 Coastal features mapped along shoreline of Cambridge, MD

CAMBRIDGE SHORELINE RESILENCE PLAN

FLOOD SCENARIO – 1% ANNUAL CHANCE FLOOD EVENT



For Official Use Only – Not for Public Distribution

MAKE CAMBRIDGE RESILIENT FLOOD MITIGATION PROJECT

FLOOD SCENARIO – MARYLAND COASTSMART CLIMATE READY ACTION BOUNDRY



For Official Use Only – Not for Public Distribution

Appendix C: Planning Process & Public Engagement

Planning Process

A core planning team comprised of Larry White- Cambridge Project Manager, Georges Hyde-Cambridge City Engineer, Herve Hammond- Director of Dorchester County of Planning and Zoning, Mark James- Michael Baker, and Virginia Smith- SP&D met every Monday throughout the planning process.

A diverse group of stakeholders were identified and met periodically throughout the planning process. The first meeting was held in March of 2021. The May 2021 meeting included a field visit. A total of twelve stakeholder group meetings were held.

A project website was developed as part of the public outreach initiatives undertaken during this planning process. Public outreach also included an online visual preference survey. An open house and listening session was held in August of 2021, along with four additional public meetings. In addition, a Flood Risk Reduction Community Workshop was held in March of 2022. Finally, briefings to the Mayor and City Council, Planning Commission, Eastern Shore Climate Adaptation Partnership, and Cambridge Waterfront Development Inc. were provided over the course of this planning process.



Stakeholder Group Meeting Notes



Date: March 9, 2021

Meeting was conducted virtually between 2PM and 4PM

Objective: Introduce the Michael Baker team to members of the steering group and Present the Work Plan to complete Phase 1 of the plan

Meeting Details:

- Meeting started off with Steering group and contract introductions, a brief introduction to project phases and work that has been completed to date.
- Reviewed support documents that will be used in the plan. This included planning documents and source data needed to obtain Choptank River water levels .
- 5 phases of the Work Plan were presented, and opportunity given for steering group to comment on each task.

Task 1: Finalize Project Management Plan and Phase 1 Work Plan

- Task 2: Kick off Meeting with the City's Project Management Team and Project Steering Group
- Task 3: Public Outreach Support and Establish Project Website
- Task 4: Vulnerability and Risk Assessment
- Task 5: Mitigation Strategies/Concept Designs
- Task 6: Documentation and Planning Process
 - A project timeline was presented that included 4 public outreach efforts monthly steering group meetings that will be scheduled between March 1 and October 31.
 - In closing a number of administrative items were discussed. This included getting feedback from the members on meeting occurrence, a suggested domain name and project
 - Many of the discussion points became follow-up items captured in the survey for further committee member input.

Questions/Comments:

- City to reach out to community associations for inclusive approach
- City has Facebook page that is well utilized
- Status of stimulus bill in Washington and its impact on infrastructure projects.

Next Steps:

- Steering Group work with the Maryland Coast Smart Council incorporate the CRAB into flood risk/vulnerability mapping
- Planning project goals and objectives should be reviewed and discussed by the Steering Committee at the next meeting
- Compile survey results and report back to steering group



CAMBRIDGE SHORELINE RESILIENCE PLAN STAKEHOLDER MEETING NOTES APRIL 13, 2021

Virtual meeting conducted. Stakeholder in attendance included:

Name	Organization/Department
Amanda Fenstermaker	Dorchester Director of Tourism
Larry White	Strategic Programs Development, LLC
Patricia Escher	Cambridge Planning & Zoning Manager
Kayhla Cornell	MEMA-Mitigation Planner
Stacey Underwood	USACE Silver Jackets Coordinator
Kevin Wagner	MDE-Community Assistance Program Manager
Debbie Herr Cornwell	Maryland Department of Planning
Daryl Butcher	Cambridge Waterfront Development Inc (CWDI)
George Hyde	Cambridge City Engineer
Steve Garvin	Dorchester Emergency Management Planner
Herve Hamon	Dorchester Director of Planning & Zoning
Sasha Land	DNR- Flood Mitigation Planner
Jaleesa Tate	MEMA-State Hazard Mitigation Officer
Tom Bolan	Cambridge Finance Director
Steve Rideout	
Scott Shores	Cambridge GIS/IT Specialist
Matt Pluta	Director of Riverkeeper Programs
Patrick Comiskey	Cambridge City Manager

Stakeholder Survey Results

Results of the stakeholder survey were reviewed by meeting participants. Results included:

- Website domain name: makecambridgeresilient.org;
- Monthly meetings of the stakeholder group, held on the 2nd Tuesday of each month.

Draft Project Website Preview

Meeting participants were shown the draft website and including individual pages and initial site content. The website included the plan logo and color scheme.

Draft Project Goals & Objectives

Suggestions were made by meeting participants following the review of draft goals and objectives.

- Use current goals as overarching goals then develop site specific objectives, such as mitigate roadway flooding within area.
- Objective 1 Clarify if the plan will be submitted as a Nuisance Flood Plan; alter language Objective 1. Sasha Land indicated that she is willing to assist the City with NFP and is available for further discussion.

Overview of "High Risk Areas"

These areas include:

- (1) Great Marsh Park,
- (2) West End where private property exists along the shoreline,
- (3) Yacht Club and City Marina where open land extends to Cambridge Creek,
- (4) Cambridge Creek, which is fully developed along its banks, and

(5) Sailwinds, which is a 24-acre track under development by the Cambridge Waterfront Development Inc.

Ideas for potential projects in each of the high risk areas were outlined in the slideshow.

- Stacey Underwood, USACE suggested scheduling a site visit for stakeholders, as many are not familiar with the areas under discussion.
- A suggestion was made by Sasha Land, DNR, to consider adding specialists to assess each area, for instance, a technical team based on the specifics of each area and the mitigation ideas under consideration.
- In addition, Ms. Land suggested researching additional best management practices to include each site's concept designs, such as, floating docks.
- A suggestion was made and echoed by several state agency representatives that a special meeting be convened with stare agency partners to discuss the planning process, goals, objectives, and potential mitigation ideas.

Great Marsh Living Levee Project

Slides were presented depicting potential ideas/renderings for this area. Comments from stakeholders included:

- Understand how the park is currently used and consider how the concept design may alter the use Ironman/Eagleman
 - Events only occur once a year, flood mitigation more important than accommodating events.
- Flood risk management measures that alter the FEMA regulated floodplain will prompt map revisions, this type of work must be coordinated with multiple project partners and agencies, including affected property owners.
- The question as to whether there was a federal interest in this area was posed.
- Idea was given for a joint review panel for concept design.
- Stacey Underwood indicated that USACE designs flood risk management projects to a certain Design Flood Elevation (could be the Base Flood Elevation but does not have to be) plus an estimated Sea Level Rise height plus an additional 2-4 feet for risk and uncertainly.
- Jaleesa Tate, MEMA indicated that any changes to the SOW, must be submitted and approved by FEMA prior to commencing said work.

Next Steps

- Stakeholder Website Review & Comment
- Public Launch of Website- May 2021
- Stakeholder Meeting & Site Visit- May 25th at 1:30 PM
- State Agency Partners Meeting- TBD
- Great Marsh Area Open House(s)- TBD

FEMA uses the BFE plus 3 feet freeboard for the top of levee/floodwall structures for levee accreditation and to show the buildings behind are outside the BFE - they do not incorporate SLR.



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CAMBRIDGE SHORELINE RESILIENCE PLAN STAKEHOLDER MEETING NOTES May 27, 2021 1-4:30 PM

In-person	meetina	and field	visit	conducted.	Stakeholder	in	attendance	included:
in-person	meeting		VISIL	conducted.	Otartenoidei		allendance	moluucu.

Name	Organization/Department
Larry White	Project Manager, Strategic Programs Development, LLC
Kayhla Cornell	MEMA-Mitigation Planner
Stacey Underwood	USACE Silver Jackets Coordinator
Kevin Wagner	MDE-Community Assistance Program Manager
Debbie Herr Cornwell	Maryland Department of Planning
George Hyde	Cambridge City Engineer
Steve Garvin	Dorchester Emergency Management Planner
Herve Hamon	Dorchester Director of Planning & Zoning
Sasha Land	DNR- Flood Mitigation Planner
Jaleesa Tate	MEMA-State Hazard Mitigation Officer
Nevin Stambaugh	MEMA-Mitigation Planner
Jacazza Jones	MEMA- Mitigation Fiscal Administrator
Jesse Diehl	MEMA-Mitigation Planner
Steve Rideout	Consultant and Former City Council Member for Ward 1
Dick Morris	Citizen
Matt Pluta	Director of Riverkeeper Programs

Welcome & Overview

City of Cambridge Project Manager Larry White opened the meeting and asked all attendees to introduce themselves and who they represented. A brief overview of the project was presented to the committee including accomplished items and where we stand in the planning process, an introduction to the topics that were presented, what is expected of the committee members from the meeting and a description of the 5 project sites that committee were able to view during a field visit.

Restoration of Barren Island and James Island- Presentation

Kristen Fidler, Director of Harbor Development MDOT Maryland Port Authority presented on the dredging program MDOT administers in many parts of the bay and its tributaries. Highlights of the presentation include:

- The success of the program is attributed to the stakeholder engagement and sharing of information. A key partner is the ACOE.
- Dredge program is based on keeping Maryland and the Chesapeake Bay competitive with adjacent port markets. In order to be competitive and the channel must be kept to a depth greater than 50 feet for the movement of goods. If no dredging is done the channel will go from 50 feet to 45 feet in 3 years.
- Dredging is needed to remove the constant buildup of silt material in the channel. The program splits the Bay into 4 sections and dredging planning is supported by a stakeholder group of 9. The program produces approx. 5 million yards of dredge material per year.
- The beneficial use of dredge material is defined in statue to restore or enhance aquatic environments.

- Poplar Island: Planned area for dredged material on island will be full in ten years. As part of a 30 year plan a new location a new location to store dredged material will need to be identified in the mid Bay section to take the place of Poplar Island.
- James Island: The program has identified this island as the next project site. It is anticipated that this island will begin to receive federal dredge material in 2024
- Baren Island: Is currently under study for next generation of Dredging in the mid Bay section.
- The program supports smaller dredging project in tributaries of the Bay that improve navigation and provide opportunities for dredge material to support barrier development to protect adjacent shorelines.
- Refer to MDOT presentation handout for additional details.

Risk Assessment Modeling & Analysis

Muthukumar S Narayanaswamy from Michael Baker provided a summary of bath tube flood model that was developed for the Choptank River. Results for three flood scenarios were presented:

- SLR Projections of 2.0ft by 2050
- BFE + 2.0ft of freeboard + SLR Projections of 2.0ft by 2050 for total of 9ft.
- Base Flood Elevations identified by FEMA

The presentation focused on the data processing and methodology that was used to develop the modeling. Illustrations were used to represent the steps that were necessary to identify existing coastal features and the steps that were needed to adjustments for flaws/gaps in the Lidar data.

Under the first scenario (SLR Projections of 2.0ft by 2050) flooding was limited to areas that residents typically experience during high tides and include areas on each side of Great March Park, at the end of roads in West End fronting the shoreline along Hambrooks Ave, and the mouth of Cambridge Creek.

Under the second and third scenarios (SLR Projections of 2.0ft by 2050 plus + BFE + 2 ft. of freeboard totaling 9ft.) almost all areas will breach, and extensive parts **of north part of the** City will be inundated with water. However, under the BFE model areas are breached but flooding only occurs adjacent to the MD Highway 50 bridge abutments.

A case study using scenario 1 (SLR Projections of 2.0ft by 2050) was also presented showing the extent of flooding and levels of mitigation that would be needed to limit flooding in areas that would be considered nuisance flooding today. This level of protection would eliminate nuisance flooding which is a high priority for the City. It would also be less expensive and lighter lift that would provide positive outcomes to current flooding condition. Specific mitigation methods were not identified as part of this study, only levels of protection that would be needed and an improvement that was represented with a GIS polygon. In every case the anticipated flooding under scenario one was mitigated.

Two fact sheets were distributed as part of a participant packet that provided background information on the steps that were undertaken to determine the SLR including technical assistance from Sasha Land, Maryland Department of Natural Resources, used in the model as well as the summary of the model and the results of the case study before and after mitigation for each study site.

Mitigation Concept Ideas

As part of a field preparation committee members were asked to think about what types of mitigation measures, they would like to see and what measures should be considered. Items that were presented include coordination efforts that will be needed to tie mitigation measures across private/public property, potential conflicts with private docks and navigation of pleasure watercraft, permitting and innovative land use policies/zoning regulations that could be considered, and the consideration of offshore, nearshore and onshore flood risk reduction measures for each study site

A fact sheet for concept visions was distributed as part of the participant packet that provided background on each study site, primary land management policy goals, design considerations and living shoreline applications. The fact sheet was supplemented with a location map and illustrations for mitigation measures at each study site. The intention of this fact sheet was to give steering committee members conceptual design ideas that they could discuss while on the field visit.

These areas include:

- (1) Great Marsh Park,
- (2) West End where private property exists along the shoreline,
- (3) Yacht Club and City Marina where open land extends to Cambridge Creek,
- (4) Cambridge Creek, which is fully developed along its banks, and

(5) Sailwinds, which is a 24-acre track under development by the Cambridge Waterfront Development Inc.

Ideas for potential projects in each of the high risk areas were outlined in the slideshow.

- In addition, Ms. Land suggested researching additional best management practices to include each site's concept designs, such as, floating docks.
- A suggestion was made and echoed by several state agency representatives that a special meeting be convened with stare agency partners to discuss the planning process, goals, objectives, and potential mitigation ideas.

Field Visit Including Five (5) Identified Sites

These areas include:

- (1) Great Marsh- Gerry Boyle Park
 - Project will consist of multi-use plan that includes residential, park amenities, flood risk
 reduction measures and tie into County property west of site/private property east of
 site
 - Existing stormwater flooding issues upland is planned to be conveyed to station and pumped
 - Project will require buy-in from private properties on all sides of park
 - Evidence of erosion to West side of park property and is undercutting service road. Existing riprap protecting the park is failing due to erosion of base material.
 - Rooster Island will be considered as part of a later Phase of the project.
 - Breakpoints that were identified in model currently have beach access and are also the areas that were previously identified for crab claw headwater feature.
 - Recommend taking a tiered approach that will save money, provide different levels of protection and opportunities for enhanced aquatic environments. This involves low level protection at shoreline and higher level of protection along southern boundary of park.

Comments provided during the field visit included:

Reconfiguration/reimaging the park from both a floodplain management and recreation usage perspective. Existing asphalt roadway is an ongoing maintenance issue. New placement of the roadway and parking area(s) within the park could provide additional recreation opportunities near the water, while mitigating the closing of the road and ongoing maintenance issues due to undercutting and flooding. Restoring the natural functioning of the floodplain and restoration of the existing shoreline to a more natural condition, such as a living shoreline, could exponentially improve the conditions of the park and reduce the impacts of flooding. Keeping in mind the quote "floods are acts of God, but flood losses are largely acts of man" by Glibert F. White, is apropos. Additionally, using this area for stormwater storage/retention may also be a viable mitigation action to reduce nuisance flooding to structures behind the park.

Workshop Questions for June 8 Meeting	
What existing problems do you see?	
What are the main physical features that should be considered?	
Are there any barriers that need to be addressed?	
What level of flood protection should be considered?	
What type of mitigaiton measures should be considered?	
Are there any hinging permitting procedural requirements?	
What are the main drawbacks to this mitigation measure?	
Are there any funding sources that could support mitigation measures?	
How would this mitigation measure tie into the others?	
General Comments:	

(2) West End where private property exists along the shoreline- Oakland Street at Seawall

- Flood walls in the location are in poor condition high tide waters were evident in street at the time of the visit. Funds have been received for repair/reconstruction of walls only at the end of streets.
- Area has flooding associated with failing stormwater systems as well as tidal water intrusion. Stormwater solutions should include conveyance improvements with pump station.
- Condos that were constructed in 2006 have revetment to about 5 feet (BFE) (first floor elevation is 7 ft) and floodwall at end of street will be replaced to BFE 5' which is one foot higher that existing – need to be conveyed to a station and pumped.
- City owns the marina, and a portion of the slips are YC. Floating dock around marina but all slips are stationary.

Comments provided during the field visit included:

Lack of continuity in existing structural flood protection.

Design revetment to allow community access to water. During visit committee member pointed out kids use beach areas and swim in river.

Workshop Questions for June 8 Meeting	
What existing problems do you see?	
What are the main physical features that should be considered?	

Are there any barriers that need to be addressed?	
What level of flood protection should be considered?	
What type of mitigaiton measures should be considered?	
Are there any hinging permitting procedural requirements?	
What are the main drawbacks to this mitigation measure?	
Are there any funding sources that could support mitigation measures?	
How would this mitigation measure tie into the others?	
General Comments:	

(3) Yacht Club entrance at bulkhead

- Existing bulkhead on city property was installed in 2006
- Storm drain issues along Water Street that will need to be mitigated by collection and pumping

Comments provided during the field visit included:

Area of interest was the city parking lot that has 19 spaces set aside for the yacht club on the side of the lot away from the city marina and the strip of land between the parking lot and the retaining wall at the river that goes along the side of the yacht club down to the city park and then along the water over to Jim Brady's house on Choptank.

If you go back and look, the there is a slope to the land from the edge of the parking lot to the retaining wall. One idea was to put sea grasses along the edge of the wall with additional dirt placed there as well to act a somewhat of a barrier for water washing over that wall. While it would not be high enough to prevent possible major flooding, it could be attractive and could act as a buffer. Along the parking lot and street going to the park, she suggested building a small mound of ground to do two things, - be an additional buffer from water coming on land from the river and reducing the runoff of water from the parking lot into the river.

That coupled with additional sea grass plantings there could act as another attractive barrier that would also help reduce pollutants from the parking lot going into the river.

The challenge would be who would take care of the plantings and see that they were properly watered? Possibly the city could be convinced to build and plant the barriers including a watering system that would be connected to the yacht club's water supply so that there could be a shared cost of improving the area that benefits the yacht club and also helps the city to reduce runoff and water breaking over the wall there. Another part of the challenge there is the seaweed and debris that backs up into the corner of the fence down near the pump house. This is a place that the city has talked about having a bike rental and kayak rental place with a floating dock. Possibly having some dredge fill being placed down in that area could help reduce heavy waves that are certainly impacting the seawalls there and would also allow for a floating dock for someone to start a business there. Potential business could include a kayak and/or bike rental shop.

Workshop Questions for June 8 Meeting	
What existing problems do you see?	
What are the main physical features that should be considered?	
Are there any barriers that need to be addressed?	
What level of flood protection should be considered?	
What type of mitigaiton measures should be considered?	
Are there any hinging permitting procedural requirements?	
What are the main drawbacks to this mitigation measure?	
Are there any funding sources that could support mitigation measures?	
How would this mitigation measure tie into the others?	
General Comments:	

(5) Sailwinds, which is a 24-acre track under development by the Cambridge Waterfront Development Inc.

- City owned and managed properties. Development setbacks are in place 120 200 feet
- Existing hospital is planned to be demoed and relocated. Existing plan allows for large setbacks from shoreline
- Recommendations of the plan should incorporate planned land uses for Sailwinds
- Bacteria issues are found in stagnant water therefore the City cannot label it a swimming beach. This is due to lack of flushing water in corners of claw.

Workshop Questions for June 8 Meeting
What ways can the steering committee assist with Sailwinds proposed development?
Are there any coastal land development regulations in place elsewhere that should be considered here?
Are there any barriers that need to be addressed?
What level of flood protection should be considered?
What type of mitigaiton measures should be considered?
Are there any funding sources that could support mitigation measures?

How would this mitigation measure tie into existing bulkhead improvements?	
General Comments:	

Next Steps

- Public Launch of Website- Link on City Website completed & Facebook Post, however additional outreach is needed.
- Stakeholder Meeting #4- June 8, 2021, from 1:30 3:00 PM
- Open House(s)- TBD
- Visual Preference Public Survey



CAMBRIDGE SHORELINE RESILIENCE PLAN STAKEHOLDER MEETING NOTES June 18, 2021 1:30- 3:00 PM

Virtual Meeting- Stakeholders in attendance included:

Name	Organization/Department
Larry White	Project Manager, Strategic Programs Development, LLC
Kayhla Cornell	MEMA-Mitigation Planner
Daryl Butcher	Cambridge Waterfront Development Inc (CWDI)
Patricia Escher	Cambridge Planning & Zoning Manager
Debbie Herr Cornwell	Maryland Department of Planning
George Hyde	Cambridge City Engineer
Aaron Lampman	Associate Professor, Anthropology
Herve Hamon	Dorchester Director of Planning & Zoning
Deborah Cooper	Cambridge Finance Director
Jaleesa Tate	MEMA-State Hazard Mitigation Officer
Steve Rideout	Consultant and Former City Council Member for Ward 1

Welcome & Overview

City of Cambridge, Project Manager, Larry White opened the meeting with a brief overview of the work that has been completed. He provided a brief explanation of the meeting purpose and outcomes. Following his briefing, steering committee members introduced themselves and the meeting agenda was presented by meeting facilitator, Mark James, Michael Baker International.

Risk Assessment Modeling & Analysis

Arslaan Khalid, Michael Baker International provided a summary of the bathtub flood model that was developed for the Choptank River using two scenarios: NOAA nuisance flooding 2.7ft and NOAA nuisance flooding + 2ft SLR, which totals 4.7ft by 2050. Low lying areas and existing flood risk reduction structures that are susceptible to breaching were identified and the resulting flooding associated with the breach was presented for both flood scenarios. Using this GIS based flood modeling, shoreline elevations were adjusted to reflect the total elevation needed to mitigate breaching in both flood scenarios.

Mitigation Concept Ideas

As part of the follow-up exercise to the May field visit committee members were asked to consider types of mitigation measures, they would like included in the site specific mitigation and shoreline resilience strategies. It is important to note, that mitigation measures discussed by meeting participants will necessitate coordination of efforts to tie mitigation measures across private/public property. In addition, permitting and innovative land use policies/zoning regulations could be considered, and the consideration of offshore, nearshore and onshore flood risk reduction measures for each study site. Information gathered during the meeting has been included in the "Workshop Questions" table for each site. Due to time limitations, the information was not fully collected. The "Workshop Questions" tables are now fillable PDF tables, which will allow stakeholders unable to attend the meeting to easily add information. Please review what has already been collected, and add your thoughts using the fillable spaces provided.

(1) Great Marsh- Gerry Boyle Park

- Project will consist of multi-use plan that includes residential, park amenities, flood risk reduction measures and tie into County property west of site/private property east of site
- Existing stormwater flooding issues upland is planned to be conveyed to station and pumped
- Project will require buy-in from private properties on all sides of park
- Evidence of erosion to West side of park property and service road undercutting. City has placed rip-wrap in this area that continually wash away.

Workshop Questions for June 8 Meeting			
What existing problems do you see?	Consistency between park amenities and flood protection. Asset to the City, however flooding and erosion resulting maintenance issues prove problematic. Assess issues to flooding at park entrance is an issue, as well.		
What are the main physical features that should be considered?	Use of park for major events and amenities that meet park user needs. Public access to the river at the park is important. And public access in this case is more than just the boat ramp, but also includes the 2-3 'soft' shoreline areas where community members enter the water to swim, recreate on the sand, launch kayaks and paddle boards, etc.		
Are there any barriers that need to be addressed?	Funding and existing site design. What are the flood damages/impacts that are trying to be prevented? Any of these projects are likely to be costly and a cost/benefit analysis should be done to show if they are cost effective. If some buildings are already elevated, this will reduce the benefits of the project. Positive BCR will be needed for most federal funding sources. The stormwater problem creates a barrier. In addition to conveying and pumping the stormwater the site design should include green infrastructure to provide water quality treatment during the conveyance. GI will also provide a co-benefit of water quality treatment during smaller rain and flooding events.		
What level of flood protection should be considered?	At a minimum, BFE- 5ft. 4.6/5 feet should be absolute minimum. Phase 1 elevation (SLR of 2.1 by 2050) of 2 feet is too low and does not incorporate 2.6 foot of daily high tide. Recommend project is as high as feasibly possible (8-9 feet). Entire study area (park to yacht club) should probably have same level of protection unless they are hydraulically independent of each other. If one area's level of protection is lower than an adjacent area, water may be able to get around (via surface or stormwater system) behind the higher level of protection areas and flood structures. The level that is determined by the CRAB.		
What type of mitigation measures should be considered?	Consistent and comprehensive flood risk reduction strategy. Stormwater redesign including possible water retention. Biggest concern is stormwater and pumping access water out of areas behind walls – not just Great Marsh. Redesign of park to reduce flooding impacts to amenities and mitigate flooding to properties located behind the park. Possible French drain system along park property.		

	Drain Somerset by pumping water out behind what will be built. Create sidewalks over stormwater system that will also create walking path to and from park. Bay Street low point collection and pumping – Bow Creek Typically flood risk management structures are built behind parks/open space and they are allowed to flood (while protecting/flood proofing the amenities). However, with SLR, you will want to ensure the park is accessible with higher seas and high tides. A lower living shoreline/levee could provide some protection to the park from erosion and SLR. Raising the perimeter road could also be considered. However, any line of protection around the park perimeter will cost more than a shorter line of protection on higher ground closer to the buildings it is protecting. A lower structure could be constructed to reduce flooding from SLR (and would be less visible and more acceptable to the homeowners) and then temporary barriers/panels installed when large storm surge is expected since there is adequate warning time. However, for large areas, installation could take quite a bit of time/manpower/resources. Restoration of Rooster Island may help reduce erosion to the park but will not reduce flooding from SLR or major storm surge. What happens to the stormwater when the pumps fail due to the electrical or mechanical failures during extreme weather events? A contingency plan for the stormwater should be built into the design.
Is there any hinging permitting procedural requirements?	MDE permitting USACE permitting if measures are in the water Consider FEMA floodplain regs
What are the main drawbacks to this mitigation measure?	Limitation in design - Do we want to limit park amenities and redesign road entrance? Consider uses that are in park today that will have to be thought out before design starts. Coordinate with neighbors. Also, potential to bring into design radio station property as part of Master Plan for park. Purchase of radio station may have political implications. Operation and maintenance of certain measures Any elimination of public access.
Are there any funding sources that could support mitigation measures?	Yes, a comprehensive design for the park and the Great Marsh Area will ideally include park amenity enhancements, flood mitigation, shoreline resilience, stormwater improvements, retention, and pumping. Many funding sources are available, proper project management and sequencing will be necessary.
How would this mitigation measure tie into the others?	A variety of measures are needed for this area and will require robust coordination. USACE/FEMA have funding programs requiring a positive BCR will be required. FRM projects for adjacent areas will need to tie together unless they are hydraulically independent.

General Comments:

Address nuisance flooding in neighborhood behind park...just going to get worse

Public outreach component is critical to success. Concern that 3 – 4 ft wall may be difficult to get buy-in from the community. VA Beach pumps to discharge stormwater inland flooding – convey water to large pumps and discharge, while effective, very expensive.

Option – movable flood barriers- NYC example. Use of a tier flood wall that can be deployed Important to use system that can be adjusted.

(2) West End where private property exists along the shoreline- Oakland Street at Seawall

- Flood walls in the location are in poor condition high tide waters were evident in street at the time of the visit. Funds have been received for repair/reconstruction of walls
- Area has flooding associated with failing stormwater systems as well as tidal water intrusion. Stormwater solutions should include conveyance improvements with pump station.
- Condos that were constructed in 2006 have revetment to 7 feet and floodwall at end of street will be replaced to BFE 5' which is one foot higher that existing – need to be conveyed to a station and pumped.
- City owns the marina, and a portion of the slips are YC. Floating dock around marina but all slips are stationary.

Workshop Questions for June 8 Meeting		
What existing problems do you see?	Private property buy-in. Existing floodwall/revetment/bulkhead of different levels of protection. Increasing floodwall placement and heights may not be popular with the community members.	
What are the main physical features that should be considered?	Private property, docks, and viewshed	
Are there any barriers that need to be addressed?	Yes, coordination with property owners is needed to inform mitigation options.	
What level of flood protection should be considered?	Minimum BFE, which accounts for NOAA Nuisance Flooding and 2ft of SLR Believe we should be looking as high as feasible - 8/9 feet to provide reduce storm surge risk in addition to SLR	
What type of mitigation measures should be considered?	Shoreline resilience measures in conjunction with flood mitigations.	
Is there any hinging permitting procedural requirements?		
What are the main drawbacks to this mitigation measure?	Tying into private owner FRM measures	
Are there any funding sources that could support mitigation measures?	I see this all as an FRM system. Think Park, West End and Marina should be studied/funded together (unless they are hydraulically independent).	
How would this mitigation measure tie into the others?	Existing flood protection structure however these are not consistent throughout the project area,	
General Comments: How can we a consistent flood wall along area and adjust dock structures. Build up wall in existing location or nearshore – perception is not intrusive if it is furtherACOE permit and navigable water concerns.		

(3) Yacht Club entrance at bulkhead

- Existing bulkhead on city property was installed in 2006
- Storm drain issues along Water Street that will need to be mitigated by collection and pumping

Workshop Questions for June 8 Meeting	ng
What existing problems do you see?	What exactly are we trying to reduce flood risk to? Houses behind Water Street? Yacht Club? Parking area? Erosion related to wave energy from over-topping waves was evident along the bulkhead. A no-mow buffer along the bulkhead could help hold together the shoreline to some degree.
What are the main physical features that should be considered?	
Are there any barriers that need to be addressed?	This area is often a public access point for people to fish from the shoreline. Any design should incorporate fishing access.
What level of flood protection should be considered?	Believe we should be looking as high as feasible - 8/9 feet to provide reduce storm surge risk in addition to SLR
What type of mitigation measures should be considered?	Build mound adjacent to the Higher bulkhead/floodwall around parking to accommodate SLR. Floodproof /raise Yacht Club if needed. Floodwall/levee near Water Street, could do something creative with levee along City open space area.
Is there any hinging permitting procedural requirements?	MDE, USACE permits
What are the main drawbacks to this mitigation measure?	
Are there any funding sources that could support mitigation measures?	
How would this mitigation measure tie into the others?	
General Comments:	·

(5) **Sailwinds**, which is a 24-acre track under development by the Cambridge Waterfront Development Inc.

- City owned and managed properties. Development setbacks are in place 120 200 feet
- Existing hospital is planned to be demoed and relocated. Existing plan allows for large setbacks from shoreline
- Recommendations of the plan should incorporate planned land uses for Sailwinds
- Bacteria issues are found in stagnant water therefore the City cannot label it a swimming beach. This is due to lack of flushing water in corners of claw.

Workshop Questions for June 8 Meeting	
What existing problems do you see?	
What are the main physical features that should be considered?	Public access at the beach and the waterfront walk-way.
Are there any barriers that need to be addressed?	

Next Steps

- Stakeholder Meeting #5- August 10, 2021, from 1:30 3:00 PM
- Open House(s)- TBD
- Visual Preference Public Survey- July 2021



CAMBRIDGE SHORELINE RESILIENCE PLAN STAKEHOLDER MEETING NOTES September 15, 2021 1- 3:30 PM

Virtual Meeting conducted. Stakeholders in attendance included:

Name	Organization/Department
Larry White	Project Manager, Strategic Programs Development, LLC
Stacey Underwood	USACE Silver Jackets Coordinator
Kevin Wagner	MDE-Community Assistance Program Manager
Patricia Escher	Manager, Cambridge Planning and Zoning
George Hyde	Cambridge City Engineer
Herve Hamon	Dorchester County Director of Planning & Zoning
Steve Rideout	Resident
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Welcome & Project Updates

City of Cambridge Project Manager, Larry White opened the meeting with a review of the meeting agenda topics. Mr. White then reviewed project updates:

City of Cambridge Projects Underway

Oakley Street Seawall Replacement

Work has begun on the demolition and removal of the existing concrete seawall and construction of a new concrete wall. The new concrete wall will be similar in appearance but will be elevated to 5ft BFE, an additional 15'. The total project cost is approximately \$342,000 with 75% being funded by a grant from Maryland Department of the Environment and 25% with local funds.

Sanitary Sewer Rehabilitation

The City has included funding in the current budget to begin addressing sanitary sewer problems. This includes funding for planning and design services, as well as maintenance of existing sewer lines to improve conveyance. The budget Includes \$500,000 for planning and design services for improvements to the sewage collection system and trenton street pumping station which services the area. Another \$100,000 has been budgeted to remove excessive grit and sediment from the sewer lines to improve capacity and performance. The City is planning to resubmit the sanitary sewer remediation project under the 2021 BRIC Grant Program as part of a comprehensive shoreline resiliency project.

Modifications to Phase I & New Phase 2 Scope of Work (SOW) Refinement

Refinements were made to the initial scope of work based upon information learned and feedback gathered since the initiation of this planning project. While these changes are within the overall grant project scope of work, the detailed task specific (SOW's) for the project phases have been refined. A stormwater analysis will be completed to access existing flood conditions and suggest stormwater improvement that will mitigate area flooding during rain events and periods of high tides. In addition, work related to benefit cost analysis was incorporated.

• The goal is to develop a system that will complement the existing storm water system. the new systems will be designed to collect and discharge storm water to

the river after the current storm water discharge lines are shut-off to prevent river water from backing up into the streets due to high tides,

- The system design in open areas such as great marsh will include a drainage system designed to channel and collect storm water, and a pumping system to discharge storm water and any water that may overtop the flood protection barrier during a major storm back to the river.
- The system design in densely populated areas such as the west end will also provide for the channeling and collection of storm water at low points such as the ends of streets on the shore and include submersible pumps to discharge the water to the river.

Conceptual Design Matrix Updates

The Stakeholder (steering committee) meeting held on August 10th primarily focused on various potential design options for each of the high-risk areas. Feedback provided by meeting participants was integrated into the deign matrix project scoring tool. In addition, webinars were held, August 25th and 26th to allow participants to walk through the design matrix scoring tool and discuss various aspects of each option.

Finally, Mr. White discussed the overall strategic goal of contiguous level of flood protection along the entire alignment of the Choptank River because there is no way to hydraulically separate areas.



Design Matrix Results

Mark James, Michael Baker International provided results from the concept design matrix tool. He reviewed general comments that were gathered from various meetings held in August, including the public meeting held on August 10th.

- Future public meeting presentations will include stormwater management flood mitigation.
- Select flood protection barrier options that preserve access to the water for fishing and crabbing.
- Flood protection level if at FEMA BFE or higher, we may be required to add 2 ft of freeboard.
- Earth embankment will require more land to build than a floodwall.
- Need to address how living shore would work where there are existing piers.
- Use of dredge material for living shore may be complex and require implementation over several years.
- Difficult for any of Steering Committee members to evaluate Benefit Cost Ratio.

Mr. James proceeded to review project site specific slides with the members. Comments on these slides included:

- Sasha Land, DNR suggested that existing and past projects be reviewed for any relevant data and findings that may be used in this planning effort. She also suggested site visit(s) to recent projects that may offer insight into design concepts developed for Cambridge, (Anne Arundel County living shoreline projects).
- Pat Escher, Cambridge Planning and Zoning suggested reviewing past park planning documents for integration into this planning effort. She will forward documents to Larry White, Project Manager. Ms. Escher also suggested that a presentation be made to the Planning Commission, considering integration with the City Comprehensive Plan and Master Park Plan.
- Herve Hamon, Dorchester County Planning and Zoning requested further consideration of the flood protection at Gerry Boyle Park due to park usage, large events, and economic benefit of the park to the City.
- Many members expressed the need to preserve and promote public access to the water in the flood risk reduction strategies development.

Great Marsh

- It is currently proposed that an earth embankment be constructed where there is sufficient room such as in the Great Marsh area, Earthen Berm on south side of park would cost less because of reduced length and height of embankment requirements.
- Storm water management is a major issue in the Great Marsh area that needs to be addressed.



West End

- A flood wall would best be suited to the West End where there is limited space and where homes are close to the water.
- Suggest the floodwall be pulled back further away from the shore to allow fishing and crabbing from shore.
- Flood protection may be increased by placing glazed panel on top the floodwall at a future date.





City Marina

- Integrated Bulkhead Enhancement floodwall would work in vicinity of Yacht Club and be fairly low maintenance.
- Earth embankment with vegetation could be constructed along alignment of Marina leaving sufficient room for access to boats and fishing and crabbing.



Cambridge Creek

- Residential structures within the floodplain should be evaluated for potential elevation and/or acquisition based on flood vulnerability.
- Residential Condo and commercial structures will need to be floodproofed to at least the Flood Protection Elevation (BFE + 2 feet of freeboard).
- City needs to participate in Community Rating System to earn credit for any flood mitigation enhancement resulting in dry and wet flood proofing.

Sailwinds

- CWDI Plan is to design promenade to elevation 7.5 ft and flood proof everything else to elevation 9 ft.
- This is a good option, but it dependent on human intervention. If buildings are designed to be dry floodproofed, emergency plans should be developed, and tested annually, so that owners and staff know what to do in the event of an emergency

Note: The team will evaluate additional flood mitigation measures during Phase II of our project. This includes the design and construction of a breakwater and/or a barrier island. Both rockfill and living breakwaters reduce the effects of storm surge and coastal erosion by absorbing wave energy during storm events. As waves break on the structure, their energy is reduced, calming waters on the shoreward side of the breakwater, and reducing the direct impacts to the shoreline.

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Ginny Smith, SP&D discussed the upcoming public meeting series scheduled for the end of September. This series of public meeting will be held to provide information and obtain feedback from the public on site specific concept designs.

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Kevin Wagner	MDE-Community Assistance Program Manager
Amanda Fenstermaker	Heritage Area Management Board
eorge Hyde	Cambridge City Engineer
Herve Hamon	Dorchester County Director of Planning & Zoning
Steve Rideout	Resident
Scott Shores	Cambridge GIS/IT Specialist
Deborah Herr Cornwell	Maryland Department of Planning
Matt Pluta	Director of Riverkeeper Programs

Welcome & Project Updates

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Phase I project development moving closer to realization

- Excellent local citizen input and public support in meetings September 29th and 30th
- Firming up project details level of protection/living shore
- MEMA support of project and preparing documentation for 2021 BRIC grant application
- HMA funding opportunities & application packaging options

Technical support for living shore - UMCES Horn Point Partnership

- UMCES, expert in design of green flood mitigation measures in estuaries including living shore
- Initial call was on September 27th with planning team and UMCES staff
- Developing working relationship
- Project partnership and long-term opportunities/benefits

City Council update October 25th

- Advanced communication on grant matching funds commitment by City Commissioners
- Request for community support

Ginny Smith, SPD, provided an update on community outreach initiatives.

- Project website is updated periodically to include steering committee and public meeting notes.
- Visual Preference Survey- survey results are reviewed periodically by Core Planning Team. To date, 112 surveys have been completed, both hard copy and online.
- Targeted property owner meetings were conducted in September to discuss project and access.
- Four public meetings were conducted on September 29th and 30th. The focus of these
 meetings included: flood risk communication, design options including co-benefits, and level of
 protection. Project meetings were site specific and include Great Marsh Area, Cambridge

Creek, City Marina, and the West End. Meeting notes have been uploaded on the project website.

Mark James, Michael Baker, provided additional information on preferred design option(s) for each of the project sites based on previous steering committee input and feedback from the public.

- Overall level of protection for all project sites was recognized as 7ft, preferred by the public, as a minimum. While this was preferred, concerns on the aesthetics and changes to the viewshed were voiced.
- Including access to the water in all flood risk solution designs for each project site, as feasible, was stressed.
- Due to positive feedback on 7 ft level of continuous protection, renderings depicting earthen berms and/or floodwalls along with living shoreline are under development for upcoming public outreach activities.
- In addition, information on the Stormwater Management Analysis was presented.
 - Develop a System That Compliments Existing Storm Water System.
 - Designed to convey and discharge storm water to the river after the current storm water discharge.
 - Valves attached to outfalls to prevent river water from backing up into the streets during high tides/surge.
 - Consider Open Areas to Store Stormwater
 - Include a drainage system designed to channel and collect stormwater.
 - Include pumps to discharge stormwater and any water that may overtop the flood protection barrier during a major storm back to the river.
 - Collect and Pump Road Runoff
 - Areas of the west end will be re-designed to channel and collect stormwater at low points such as the ends of streets and include pumps to discharge the water into the river.

Comments from committee members for consideration and follow-up include:

- Integration of feedback into design concepts, specifically green infrastructure, and managed retreat-potential flood acquisition opportunities.
- Including water access at City Marina project area, potential bulkhead removal and laying back bank for gradual slope and living shoreline.
- Opportunities for beneficial use of dredge materials using local resources.
- Exploring various grant opportunities other than FEMA funding.
- Ongoing maintenance and associated costs.
- Positive comment on the community interest for this project and the valuable input obtained from community members from VPS and meetings.
- Inclusion of water quality considerations and best practices.
- "Community Greening" inclusion into the project and outreach initiatives.

Next Steps:

- Continued meeting(s) with targeted property owners Radio Station, Great Marsh Area, & West End
- Meeting with City Council- October 25th to discuss BRIC Application (Phase I Design & Phase II Construction)
- Initiate Cambridge Shoreline Stormwater Improvement Assessment
- FEMA project applications
- November 9th Stakeholder meeting


CAMBRIDGE SHORELINE RESILIENCE PLAN STAKEHOLDER MEETING NOTES November 9, 2021 1- 3:00 PM

Virtual Meeting conducted. Stakeholders in attendance included:

Name	Organization/Department
Larry White	Project Manager, Strategic Programs Development, LLC
Stacey Underwood	USACE Silver Jackets Coordinator
Steve Rideout	Resident
Pat Escher	Cambridge Planning and Zoning Division Manager
Deborah Herr Cornwell	Maryland Department of Planning
James Windsor	Dorchester County Dept. of Emergency Services
Dozia Rahilly	Director Dorchester County Dept. of Emergency Services
Christa Lash	Michael Baker International
Mark James	Michael Baker International
Virginia Smith	SP&D

Project Updates

City of Cambridge Project Manager, Larry White opened the meeting with a review of the FEMA Building Resilient Infrastructure and Communities (BRIC) grant application components and highlights.

Proposed project will be completed in two phases: phase 1 design & phase II construction. The project includes an innovative hybrid design that combines engineered structures with nature-based systems. The project will provide flood protection, living shoreline creation, and adaptive flood risk management in consideration of accelerating sea level rise and stronger storms in a changing climate.

There are five components to our proposed flood mitigation project.

- 1. Design and construction of a flood barrier consisting of an earth embankment in open areas and a floodwall where space is limited along the shoreline of the Choptank River extending from higher ground in Dorchester County to the mouth of Cambridge Creek.
- 2. Design and construction of a nature-based living shoreline on the river side of the flood barrier with marsh wetlands vegetation and a rock sill/breakwater at the toe to increase natural storm water infiltration, dissipate wave energy and reduces storm surges, prevents erosion, and enhance ecological development and improve water quality.
- 3. Design and construction of a stormwater management system that includes the installation of controls on storm drains that discharge to the river to prevent high tides form backing up into the streets and a new supplemental system to collect and discharge stormwater that may accumulate on the landside of the flood barrier during major rain events when storms occur during high tides.
- 4. Purchase & demolition of high-risk property immediately adjacent to Gerry Boyle Park. Our goal is to purchase this property through a FEMA Grant. We would then restore this property's wetland as part of our nature based living shore project. We are including this acquisition in this project because we see the acquisition of at-risk properties and part of a broader long-term strategy for the City.

5. Support to residents in area on potential flood mitigation measures they can do themselves and sources of grant funding. The project team will continue with our public outreach efforts through the design and construction process. This will include providing guidance and support to residents on how they obtain grants to reduce their personal risk by elevating and flood proofing their homes, working with the city to improve storm water drainage on roads, or the construction of other water management activities such as rain gardens etc.

Project Partnerships

The project team will maintain the public outreach effort and the technical support available through our Steering Committee and engineering consultants. We will add the UMCES at Horn Point to support the design and construction of our Living Shore.

- Stakeholder Participation Through our Project Steering Committee, the city is working with Maryland State agencies such as DNR, MDE, MEMA, MDP, and non-profit organizations that offer relevant grants within our project SOW.
- Living Shore The University of Maryland CES at Horn Point are experts in the design of living shorelines and will provide much support and credibility to our project. The University believes, and we agree, that the City of Cambridge Project could be a model for the incorporation of natural systems in flood mitigation projects for the entire eastern shore of Maryland and Virginia.
- Public Participation -Local businesses and residents may be willing to contribute to this important project, particularly those that would benefit directly.
- City of Cambridge- The City may be willing to offer additional support, as needed, based on grant opportunities.

Next Steps:

- BRIC Grant Application Submittal to Maryland Department of Emergency Management (MDEM), formerly known as MEMA, by November 13, 2021.
- FEMA BRIC Submittal- January 2022
- City Council Briefing
- Public Outreach Event- MD Silver Jackets Flood Mitigation for Property Owners Workshop in February 2022 (Potential for collaborative outreach event benefitting all of DC, specifically the Cambridge Shoreline Resilience Plan, Hoopersville Flood Resilience and Twin Point Cove Flood Resilience Planning Projects.



CAMBRIDGE SHORELINE RESILIENCE PLAN STAKEHOLDER MEETING NOTES January 11, 2022 1:30- 3:00 PM

Virtual Meeting conducted. Stakeholders in attendance included:

Name	Organization/Department
Larry White	Project Manager, Strategic Programs Development, LLC
Stacey Underwood	USACE Silver Jackets Coordinator
Steve Rideout	Resident
Daryl Butcher	Resident
Pat Escher	Cambridge Planning and Zoning Division Manager
Carlene Shaw	Cambridge Planning and Zoning
Deborah Herr Cornwell	Maryland Department of Planning
James Windsor	Dorchester County Dept. of Emergency Services
Dozia Rahilly	Dorchester County Dept. of Emergency Services
Adam Cox	Maryland Department of Emergency Management
George Hyde	City of Cambridge Engineer
Herve Hamon	Dorchester County Planning and Zoning
Kevin Wagner	Maryland Department of the Environment
Sasha Land	Maryland Department of Natural Resources
Ming Li	University of Maryland- CES Horne Point
Matt Pluta	Shore Rivers- Choptank River Keeper
Brian Clay	Michael Baker International
Mark James	Michael Baker International
Virginia Smith	SP&D

Building Resilient Infrastructure and Communities (BRIC)

City of Cambridge Project Manager, Larry White opened the meeting with highlights from the FEMA Building Resilient Infrastructure and Communities (BRIC) grant application for the Make Cambridge Resilient-Flood Mitigation Project (Design & Construction). The project includes an innovative hybrid design that combines engineered structures with nature-based systems. The project will provide flood protection, living shoreline creation, and adaptive flood risk management in consideration of accelerating sea level rise and stronger storms in a changing climate.

- BCA of 1.25 with justification of benefits and costs
 - Tidal Damages HAZUS for anticipated 2050 flood levels 273 at risk properties plus yearly economic benefits major events (ironman, boat races, and other regional events) – \$15,655,869
 - Stormwater Damages annualized flood damages to sanitary sewer system from surge inflow and infiltration over last 5 years 11 occurrences, average 2.2 occurrences per year
- Benefits based on preventing losses due to flooding with protection to elevation of 8 ft above MSL. 7 ft plus one (20 percent of 5 ft surge or foot reduction) expected in storm surge due to living shore. Research paper to support this plus UMCES agrees this is reasonable.
- Storm Water Management System with nature based storage and controlled discharge of storm water.
- Added renderings of project to communicate what our flood mitigation project may look like.
- Addressed Protection of Historic Properties

- Addressed Environmental Impacts of Construction/ use of dredge material.
- Project Description with 9 Attachments

BRIC Submittal Schedule

- Addressed MDEM review comments following initial submittal
- Resubmitted to MDEM on January 5th
- FEMA submittal- January 28TH
- City local match of 27% & technical assistance- University of Maryland CES at Horn Point

BRIC Project Site Renderings & Sketch Up Demonstration- Conceptual Design

Brian Clay, Landscape Architect with Michael Baker International displayed the (3) project renderings developed for inclusion in the BRIC grant application. In addition, Mr. Clay demonstrated the 3D modeling displaying the concept design ideas for meeting attendees. Comments included adding note(s) or display box to renderings displaying pier access, recreational walkways, additional street end viewing platforms. Finally, stakeholders suggested potentially adding rendering for Gerry Boyle Park area and stormwater retention area(s). Future presentations of the rendering and 3D modeling should include benefits of flood risk reduction features. *Note: Concept design renderings and BRIC grant application along with various attachments have been uploaded to the Microsoft Teams Project Folder*.

Additional Grant Applications

MD Department of Natural Resources- Chesapeake and Coastal Grants Gateway FY23 Grant Application Due Date: 12/15/2021

Tech Review Jan-March 2022.

Project Selection April to June 2022

Funding July 1,2022

- Outcome 3 Utilize Natural and Nature Based Infrastructure to Enhance Community Resilience to Climate Change
- **Project** "Gerry Boyle at Great Marsh Living Shoreline A Make Cambridge Resilient Projectthis is the living shore around the perimeter of the Park.

MD Department of Environment - Comprehensive Flood Mitigation Grant CFMG -

Grant Application Due Date: Jan 31, 2022

Award may take up to 18 months.

Proposing BRIC Project requesting funds for half of the City Match Requirements for BRIC

• Federal Hazard Mitigation Assistance grant programs (incl. HMGP, BRIC, and FMA grants) may fund up to 75% of the cost of flood mitigation projects, while the remaining 25% can be evenly split between the State CFMGP and the local governments.

National Fish and Wildlife Federation/NOAA- Emergency Coastal Resilience Fund – emphasis is on nature-based systems that protect population/infrastructure as well as fish and wildlife. Will include UMCES at Horn Point as a team partner.

Grant Application Due Date: Feb 3, 2022

Project – Entire living shore component of Make Cambridge Resilient Flood Mitigation Project

Project Phasing

PHASE 1- focus has been on risk mitigation, i.e., building infrastructure to mitigate current risk to our population and built environment to the best of our ability.

PHASE II- focus is on the development of a program that includes multiple "action plans" that will collectively and systematically reduce our risk to storm surge and projected sea level rise over time. Below is an example of a systematic strategy to risk reduction.

PHASE III- focus will be on risk avoidance over the long term. Our priority is to avoid risk due to a potential sea level rise projection of 5.7 feet by the year 2100. Storm surge is exacerbated by sea level rise.

Upcoming Public Outreach

- City Council Project Update- January 24, 2022
- Planning Commission Project Update- March 1, 2022
- Flood Risk Reduction Community Workshop- March 2022

Larry White is scheduled to meet with both the City Council and the Planning Commission to provide project information and highlights. Comments from both meetings will be reviewed and integrated into the planning project. This information will be shared during the monthly Stakeholder Group meetings.

Information regarding outreach meetings and events will be advertised and shared across various media platforms. In addition, updated content will be added to the project website.

Steve Rideout mentioned the idea of a *Make Cambridge Resilient* article series within the Talbot Spy website/publication. Larry White

and Ginny Smith will follow-up with Steve on this idea.



Topics slated for the upcoming *Flood Risk Reduction Community Workshop* include topics that have been identified by community members during previous *Make Cambridge Resilient* outreach events. The purpose of workshop is to provide an opportunity for property (residential and commercial) owners and renters to obtain information on various flood risk reduction options, grant, and technical assistance opportunities.

Next Steps:

- FEMA BRIC Submittal- January 28, 2022
- Submittal of Additional Grants
- City Council Briefing- January 24, 2022
- Monthly Stakeholder Group Meeting- February 8, 2022
- Planning Commission Briefing- March 1, 2022
- Monthly Stakeholder Group Meeting- March 8, 2022
- Flood Risk Reduction Community Workshop- March 2022



CAMBRIDGE SHORELINE RESILIENCE PLAN STAKEHOLDER MEETING NOTES March 8, 2022

1:30- 3:00 PM

Virtual Meeting conducted. Stakeholders in attendance included:

Name	Organization/Department
Larry White	Project Manager, Strategic Programs Development, LLC
Stacey Underwood	USACE Silver Jackets Coordinator
Steve Rideout	Former City Council Representative for Ward 1
Daryl Butcher	CWDI Board Member
Deborah Herr Cornwell	Maryland Department of Planning
James Windsor	Dorchester County Dept. of Emergency Services
Adam Cox	Maryland Department of Emergency Management
George Hyde	City of Cambridge Engineer
Kevin Wagner	Maryland Department of the Environment
Sasha Land	Maryland Department of Natural Resources
Matt Pluta	Shore Rivers- Choptank River Keeper
Mark James	Michael Baker International
Virginia Smith	SP&D

Project Update

Larry White, Project Manager discussed the 2022 grant portfolio including:

- FEMA BUILDING RESILIENT INFRASTRATURE & COMMUNITIES (BRIC)
 - o Submitted to MDEM on January 6th, and then to FEMA on January 28th
 - o Multiple project components along shoreline included within project designated high risk areas
 - Funding Available for Design Oct 2022 and Construction Oct 2023
- MDE COMPREHENSIVE FLOOD MITIGATION GRANT (CFMG)
 - o Submitted to MDE January 31st
 - BRIC SOW (Potential to fund half of the City's required as match for BRIC)
 - Award may take up to 18 Months
- MD DNR CHESAPEAKE AND COASTAL GATEWAY GRANT
 - Submitted Dec 15th
 - o "Living Shoreline at Great Marsh"
 - o Funding available July 2022 for Design & Construction
- NFWF W/NOAA-EMERGENCY COASTAL RESILIENCE FUND
 - Proposal Submitted Feb 3rd
 - o "Living Shore Component Design and Construction"
 - Funding Available Design Oct 2022 and Construction Oct 2023

Project updates were provided to the City Council, Planning Commission, Cambridge Waterfront Inc. (CWDI) and to several media outlets.

- January 24, 2022- Project Update to City Council
- February 8, 2022- Project Update to Planning Commission
- February 9, 2022- Meeting with Matt Leonard, CWDI to discuss Design Standards

 Combating Sea Levels in Cambridge: A Chat with Larry White on the City's Flood Migration Project February 9, 2022, by <u>Spy & WHCP Community Radio</u> Video posted on project website- *This video is approximately 18 minutes in length*.

Public Outreach Event- Flood Risk Reduction Community Workshop

The purpose of the workshop is to provide an opportunity for property owners to obtain information on various flood risk reduction options, grant, and technical assistance opportunities.

- March 22, 2022, from 5:30-8:30 PM at the Dorchester Center for the Arts
- Workshop will include both display stations and presentations (Agenda Attached.)
- Media Outreach include newspapers, radio, civic groups, website(s), social media, project email group listing

An additional public outreach event is planned for May 2022. This outreach event will focus on the Cambridge Shoreline Resilience Project by providing participants with updated information including the Cambridge Creek Watershed Analysis and an opportunity to comment on elements of the draft plan document.

Plan Going Forward

- To date, planning focus has been on <u>Risk Mitigation</u>, i.e., building infrastructure to mitigate risk to our population and built environment (Make Cambridge Resilient Flood Mitigation project)
- In Progress (1) Enhancing Project concept Design in preparation of Funding for project design and construction, and (2) working with residents in Identifying and Developing Risk Mitigation Strategies and plans for at Risk properties along Cambridge Creek
- Going forward focus WILL BE on implementing multiple "Action Plans" that will collectively and systematically <u>reduce our risk</u> to sea level rise and storm surge over time.
- In consideration of reducing risk of sea level rise and storm surge the following applies:
 - **Reducing risk of impact of storm surge-** Design for overtopping and ability to increase level of protection



Use of High-Performance Turf Reinforcement Mat



- Improving Concept Design Make Cambridge Resilient Project in anticipation of funding available in Oct 22 design and construct
 - Optimize living shore design to reduce wave propagation and impacts of storm surge
 - Implement DUTCH STRATEGY "LIVING WITH WATER" in project design
 - Maintain the Defend urban areas

- Prefer easy to adapt flood risk reduction measures versus those that are difficult to change
- Use natural systems and avoid obstructing natural pathways.
- Strengthen natural processes for restoration and flood protection.
- **Forward Planning** to institutionalize flood risk reduction in future planning and development efforts
 - Integrate our flood mitigation strategy into the City's Comprehensive Plan and Working Waterfront Implementation Plan.
 - **Participate in the FEMA Community Rating System (CRS)** which provides guidance for planning and executing flood mitigation measures and a means for interacting with neighboring communities in the process.
 - **Recruit a Flood Management Administrator** and SME to lead this effort. A position description is under development.
- **Risk Avoidance** by limiting future development in high-risk areas based of long-term projections of sea level rise
 - **Strengthen Design Guidelines** for all new construction in our floodplain. The city currently requires first-floor elevations be 2ft above BFE or 7 ft. Consideration should be given to increasing the minimum first floor elevation to 3ft above BFE, which would be the same requirement as Dorchester County.
 - **Plan and Design future City infrastructure improvements to reduces risk**. e.g., higher elevation, further removed from THE SHORE, flood-proofing.
- **Public Outreach** to educate the public on how they can reduce their risk and potential grant funding to support it.
 - **Maintain public involvement** in all flood mitigation project planning, design, construction, and maintenance going forward
 - **Develop and implement a public education program** on what residents can do to reduce their personal risk to flooding and what source of grant funding may be available.
 - All residents on how they can reduce their risk to damages due to flooding and storm surge, e.g., elevating their homes, rain gardens, rain barrels, installation of bio retention.
 - **Residents Along Shore of Choptank River that may be impacted** by our Make Cambridge Resilient Project on what to expect during the design and construction process
 - Cambridge Creek Businesses and Residents that have properties at risk on

opportunities and resources/ grant funding available to reduce their flood risk,

e.g., dry and wet flood proofing.

Next Steps:

- Media Campaign Advertising Workshop
- Website Content Update
- Flood Risk Reduction Community Workshop- March 2022
- Development of Plan Elements for Draft Plan
- Public Outreach Event- May 2022



CAMBRIDGE SHORELINE RESILIENCE PLAN STAKEHOLDER MEETING NOTES May 10, 2022

1:30- 3:00 PM

Virtual Meeting conducted. Stakeholders in attendance included:

Name	Organization/Department
Larry White	Project Manager, Strategic Programs Development, LLC
Stacey Underwood	USACE Silver Jackets Coordinator
Steve Rideout	Former City Council Representative for Ward 1
Daryl Butcher	CWDI Board Member
Deborah Herr Cornwell	Maryland Department of Planning
Dozia Rahilly	Dorchester County Dept. of Emergency Services
James Windsor	Dorchester County Dept. of Emergency Services
Pat Esher	Cambridge Planning and Zoning Manager
Carlene Shaw	Cambridge Planning and Zoning
Brian Roche	City of Cambridge Commissioner- Ward 1
George Hyde	City of Cambridge Engineer
Kevin Wagner	Maryland Department of the Environment
Sasha Land	Maryland Department of Natural Resources
Matt Pluta	Shore Rivers- Choptank River Keeper
Mark James	Michael Baker International
Virginia Smith	SP&D

Project Update- Larry White, Project Manager

- Enhancements to "Make Cambridge Resilient" Flood Mitigation Project
 - Over the course of the planning process, which included robust stakeholder engagement and public outreach initiatives, the project has evolved and is now characterized as a hybrid engineered nature-based flood mitigation project.
 - More nature-based solutions will be integrated into this evolving process.
 - Increased confidence in multiple systems the more redundancy built into the project.
 - Please see the pages 5-31, these pages include the slide deck presented during the meeting for additional information specific to project enhancements and other agenda topics included herein.
- Make Cambridge Resilient Community Support Follow-on Project Grant Application
 - Grant application under development for continued community support and management during the design/build process. This grant application will be submitted to FEMA under the
 - Provides for public input to the planning, design, and construction of our flagship flood mitigation project and future complimentary green infrastructure projects.
 - Provides support to the city, businesses, non-profits, and residents in the planning and implementation of additional risk reduction strategies and projects that may further reduce risk of sea level rise and major storms over time.

Flood Mitigation Strategies- Cambridge Creek- Make James, Michael Baker

- Lined with bulkheads and predominant newer construction built to code. consist of large condominium buildings and multi-unit commercial structures that are too large to elevate.

- No overarching flood mitigation strategy can be implemented along perimeter of Cambridge Creek.
- The most practicable approach to implement flood mitigation measures in Cambridge Creek include:
 - o Dry/Wet Flood Proofing
 - o Individual Flood Barrier Installations
 - Installation of Green Infrastructure

Note: Stacey Underwood asked about the potential of elevation project(s) in this planning area. Elevation of residential and commercial structures are potential mitigation strategies for this planning area.

Cambridge Creek Watershed Assessment (CCWA): Green Infrastructure Ideas- Matt Pluta, Director of Riverkeeper Programs

- The Cambridge Creek Watershed Assessment (CCTA) includes various bioretention green infrastructure projects. Three priority projects have been selected for inclusion into this planning effort. All three projects are on publicly owned land.
- In addition, the twelve recommendations included on page 15 of the CCWA have also been reviewed and integrated, as applicable.
- Priority Project Details:
 - Site 311, Trenton Street The scope of the project can be scaled to fit all on public land without impacting nutrient and sediment reductions substantially. Runoff would be captured from the street and also diverted before it reaches the boat ramp to be captured by the bioretentions. The bioretentions would be planted in native species to add to the aesthetics of the park.
 - Site 423, Between Snappers and City Hall Capture and treat runoff water from City Hall parking lot using bioswale GI technology that incorporates walkway. Need property owner and County buy in
 - Site 422, Lot in front of City Hall Installation of bioswales GI technology that will capture and treat runoff water before entering Cambridge Creek.
- Committee member voiced concern that systems have been constructed in the past and not maintained which leads to failure. The City should consider maintenance into the program. The City plans to use FEMA funds received from the Cambridge Resilient Community Support project in part to manage grants, public outreach and implementation of this program.

Plan Development

- The Plan will serve as the final project deliverable documenting the planning process, sources of flooding, vulnerability, and flood mitigation strategies.
- Plan Outline has been approved by the Core Planning Team (CPT).
- The Stakeholder Group will have an opportunity to review and comment on the working draft document.
- The Draft Plan will be uploaded on the project website for review.

Public Outreach

- A project update briefing sheet is under development. The briefing sheet will be distributed to the project email contact listing, CAN, and Steve Rideout for newsletter. Daryl Butcher suggested sending the briefing sheet to the Chamber of Commerce, as well.
- Larry White, Project Manager plans to brief the City Council at one of their upcoming public meetings. The date is pending. We will inform our project email contact listing members of the meeting when meeting information is available.

Next Steps:

- Submittal of Community Support Follow-on Grant Application- May 2022

- Project Update/Highlight Briefing Sheet- May 2022
- Website Content Update
- Development of Plan Elements for Draft Plan- May through July 2022
- City Council Briefing- June 2022

Comments providers by stakeholder team members included:

- Investigate ongoing maintenance needs of green infrastructure and the City's strategy to address ongoing maintenance.
- Evaluate all the open area available for water storage to see how much we could reduce storm water runoff.
- Treatment/wetland systems upland to Cambridge Creek watershed as well as areas that drain to the Choptank River to reduce TMDL's. Consideration for discharge permits must be included for stormwater.
- Integrate all the new flood mitigation measures into a plan to see what the cumulative improvement can be made or will be made in risk reduction. Suggested that if 2-foot freeboard is used as a flood mitigation measure in one location that it is duplicated in other properties that border Cambridge Creek
- Encourage the use of Maryland MyCoast- capturing real time data. This data can be used to document flooding including date, time, physical location, and photo.
- A question regarding the capacity and method of treatment that will be considered for the underground stormwater systems:

Volume Description:

The 277 ac-ft. is an estimate of the. There is a storage system proposed for the Gerry Boyle Park area and the Marina/Long Wharf Park area. The volume corresponding to Cambridge Creek is not included in these stormwater storage systems, so the two storage areas contain less volume than the 277 ac-ft.

Design of the storage system:

For each of the two stormwater storage systems, pumps are utilized to pump stormwater into the storage system. Once water starts to enter the storage system, a float valve is used to measure the depth of water in the storage system. Once the depth reaches a specific elevation in the storage system, this activates pumps to pump the water out of the storage system into the Choptank River past the proposed flood wall/embankment. The storage system is needed to control the operation of the pumps, and the pumps are needed because due to lack of elevation, this system cannot operate from gravity alone. So, the storage systems are not designed to store the entire 100-YR storm event (they would have to be very large), pumps are added so that the storage system size can be made smaller.

Capacity of Gerry Boyle Park Storage System: Volume - 120,000 cubic feet / Dimension - 300' X 100'

Capacity of Marina/Long Wharf Park Storage System: Long Wharf Park (west of Mill St): Volume - 60,000 cubic feet / Dimension – 200' X 100' Long Wharf Park (east of Mill St): Volume - 105,000 cubic feet / Dimension – 350' X 100'

These capacities were chosen first because of constraints/size of the area they will be constructed in (available area) and then ensuring that with the specific pumps enabled, benefits can be seen in flood mitigation of the storm drain system it is attached to.

One example of a manufacturer we can use is Contech. They do a lot of underground stormwater storage and have a variety of different products to choose from based on the specific site characteristics

and layout. The manufacturer will assist in the detailed design and will know all of the standards associated with the specific system.

Two Examples of Stormwater Storage Systems:



Stormwater Detention/Infiltration





CAMBRIDGE SHORELINE RESILIENCE PLAN STAKEHOLDER MEETING NOTES July 12, 2022 1:30 – 3:00 PM

Virtual meeting conducted. Stakeholder in attendance included:

Name	Organization/Department
Larry White	Strategic Programs Development, LLC
Tom Carroll	City Manager
Patricia Escher	Cambridge Planning & Zoning Manager
George Hyde	Cambridge City Engineer
Deborah Herr Cornwell	Maryland Department of Planning
Kevin Wagner	MDE-Community Assistance Program Manager
Sasha Land	DNR- Flood Mitigation Planner
Daryl Butcher	CWDI Board Member
Ming Li	University of Maryland Center for Environmental Science
Steve Rideout	Community Member
Mark James	Michael Baker International
Virginia Smith	SP&D

Project Update – Larry White, Project Manager

- Remaining Needs

The team will continue efforts of shoreline resiliency project through public outreach and continued studies. There are 4 key factors that have to be addressed going forward:

- Address operations and maintenance requirements?
- More nature-based features in the storm water management system
- City-wide plan to identify opportunities for implementing nature-based solutions
- Identify entity responsible for all this long term?
- Community Development Program

Creation of a flood risk management program that will be managed by a newly established department that will be responsible for managing city flood risk reduction efforts.

 2022 FEMA HMGP funding sought to support the program and hire managing staff. This will provide funding to support the program for first three years. Additional funding opportunities will be considered to continue program after period of performance ends.

Scope of the program involves 4 key elements:

- Develop and implement operations and maintenance program for flood Mitigation Project
- Integrate flood risk management into all future city planning and development efforts
- Develop and implement nature-based solutions at the municipal level
- Develop a workforce to support the long-term needs

The program will utilize the existing planning framework, steering committee and tools that have been established by the Make Cambridge Resilient planning effort over the past 2 years.

- Maintain the Make Cambridge Resilient website in support of the Community Development Program
- Maintain the Make Cambridge Resilient Steering Committee for technical and regulatory consultation

- Establish design standards and modify the City's floodplain ordinance to include nature-based systems
- Create a green infrastructure compatibility map to guide efforts

WBOC Radio Station Acquisition

An update on the radio station acquisition project was provided that included a positive response and feedback from MDEM. The BCA will be based on historical damages and is revealing a positive BCR. A completed application, BCA and BCA justification will be completed and submitted to MDEM before the July 31 deadline.

Planning Document – Virginia Smith

The steering committee will be given an opportunity to review and provide comments on the draft Flood Risk Reduction Strategic Plan. The plan is 75% complete and will be distributed to committee members next week along with meeting minutes.

Comments providers by stakeholder team members included:

Tom Carroll, City Manager

• Please provide Tom any material we need to share with the city council in advance of Larry White's briefing by Wednesday July 20.

Kevin Wagner

- MDE has money for loans through the Clean Water State Revolving Fund that target communities that need technical assistance (Open from December through January). Loans under this program can be used to acquire and demolish structures as long as the acquired property utilized green infrastructure
- See CWSRF eligibility handbook: <u>Overview of Clean Water State Revolving Fund Eligibilities</u>. Page 15, under green infrastructure says: "Replacement of gray infrastructure with green infrastructure including purchase and demolition costs."
- o Contact Jeff Fretwell, Director of Maryland's Water Quality Financing Administration
- MES is supporting Poplar Island; implied they may be able to support our new community development program.

Ming Li

- Complemented the team by saying we were on the right track to developing a watershed approach that employs nature-based solutions.
- UNCES Horn Point would be pleased to help us with the training of a workforce. That is what they do and would be great support. The center has staff that can train community members how to take care and maintain green infrastructure

Sasha Land

- Ms. Land inquired if we have heard anything on our CoastSmart Communities Grant (living shore around GB Park), She expects funds to be awarded soon.
- Questions about a consistency between flood barrier living shoreline park improvements and the park master plan. The city developed a plan for the park as part of the Working Waterfront Plan, but the City Planning Commission did not endorse it.
- The city has a draft plan for the park that we put together with the help of Herve Hammond, but it was not completed. Accounting for the park plans will be considered as part of the DNR grant which may need a scope change. Sasha pointed out that we would need public involvement in the development of that plan.
- Sasha made several comments about Green Infrastructure planning as part of the overall community support project. She suggested focusing on project implementation not just developing plans. She said we need to tie all the past projects we have completed or have planned into it. Mark James mentioned that we are only presenting the conceptual framework at this point and our plan is to capture related data to develop GIS overlays. Furthermore, while the Make Cambridge Resilient Flood Mitigation Community Development Program is primarily a planning and coordination process, we will be

executing as we go, for example, acquiring properties that may be used for various green infrastructure project. Sasha said she would send us information of smaller community GI Plans.

 \circ Sasha was pleased to hear the update on the Radio Station Acquisition.

Additional Comments

- Potential opportunity: review of properties on Mill Street and the vacant property. This is a large area that may be purchased for parkland through voluntary buy-out program. This area is also a low point where water backs up from the Marina during heavy rain events. Suggest looking into purchasing contiguous properties that have a wide impact.
- The acquisition and demolition of properties in floodplains the number of properties within city tax base, so the city might not be interested unless there was some consideration through a grant or a loan with loan forgiveness. Another consideration is the maintenance of any newly created park area which would be additional costs. Finally, considering all the park land that would be potentially converted, the city may want to consider establishing a parks department to manage the properties.
- The property owners in the lower part of Mill Street might not be interested in that area being parkland. In consideration of the above comments, it would be an area that would be much larger and less expensive that buying up properties right on the river.
- 30% of Dorchester County is state land. Maybe an income solution for the city would be legislation that brings state tax money to the city in exchange for these parks being developed to help clean the river and address sea level rise.

Public Meetings

CAMBRIDGESHORELINE RESILIENCEPLAN

OPEN HOUSE & LISTENING SESSION - AUGUST 10, 2021

To engage project stakeholders, an open house and listening session was held on August 10, 2021, at the Dorchester Center for the Arts. The open house, held in the gallery area, included graphic displays, informational brochures, and a flood modeling station. The listening session, held in the upstairs Performance Hall, included a brief project overview and then a series of discussion questions that participants discussed amongst those within their table group. Each table group selected a spokesperson who gave a report out to the larger group. The listening session was a great opportunity to hear public concerns specific to flooding and ideas for flood risk reduction solutions for both current and future conditions.



LISTENING SESSION- ICE BREAKER

What do you think is the best thing about living in the City of Cambridge?

The following items were listed by participants and are not presented in any particular order or prioritization.

-The friendly giving people; -Laid back environment, peaceful; -Small town atmosphere; -The waterfront-Choptank River; -Neighbors; -Sense of Community; -Activities, especially water-related; -Walkability from West End to Downtown; Culture & Heritage; -Seafood (Rockfish); -Architecture; -Yacht Club; -Sailing; -Events; -Location is far enough away from congestion, but not too far away from more urban areas; -Great Marsh Park; -Volunteerism/participation in local events and politics; -Walkability & biking; Access to water and boating; Water access to other areas around Eastern Shore and the Chesapeake Bay.

LISTENING SESSION- FLOODING ISSUES

#1 Who in the community is most at-risk to flooding?

The following items were listed by participants and are not presented in any particular order or prioritization.

-Those within the floodplain area; -Area between Choptank River and Hambrooks, also area along Water Street up to the 100 block; Residents in the West End; -Business owners & employees; -Waterfront homes in low lying area; -Residents in the West End (Choptank, Water, Mill, West End, Oakley, Willis, Belvedere); -People along Water Street & Hambrooks Blvd.; -Eldery & Infirm; -Public Schools; -First responder stations.

CAMBRIDGESHORELINE RESILIENCEPLAN

LISTENING SESSION- FLOODING ISSUES

#2 What in the community is most at-risk to flooding?

The following items were listed by participants and are not presented in any particular order or prioritization.

-City sewer system; -Personal & commercial property in the West End; -First responder stations and vehicles; -Yacht Club; -Park between Mill & Choptank; -Marina; -Great Marsh Park; -Radio Broadcasting Building on Queen Anne; -Roads, Sewers- storm & sanitary; -Long Wharf; -Marina; Waterfront; -Non-shoreline area drainage ditch systems; -Public Health (when sewer system is impacted); -Residential homes-sewer backup; -Great Marsh Park (public recreation); -Seafood industry; -Marina; -Public health and safety (sanitation and floodwaters); -Mobility due to standing floodwaters

LISTENING SESSION- FLOODING ISSUES

#3 What could be done to solve these flooding problems?

The following items were listed by participants and are not presented in order or prioritization. Rather than a running listing of comments from all table groups, the following comments are presented per table group.

-Upgrade/replace wastewater system and add pumping stations; -Find mechanism to clean out storm drains; -Enforce City Code to keep yard waste off street and out of storm drains; -Street constructions to address runoff issues by need; -Increase infrastructure to avoid runoff; -Add breakwaters along Hambrooks/Water; -Restore Rooster Island;

-One-way valves built into seawalls; -Improve flood walls and use design compatible with historic residential neighborhood; -Incorporate living shorelines; -Dredge and add fill to Great Marsh Park area and park area between Choptank Avenue and Yacht Club Drive; -Solutions for private property need to be considered with plans for public land.

-Upgrade sewer (storm & sanitary); Strategic Plan so work is not piecemeal; -Integrated water management plan; -Retreat: property buyouts of zero block;

-West End- large seawall with pedestrian access on top, connecting entire West End of Town; -Piping system that allows water to go out, but not come back in (at the end of streets that already have seawalls; -Collection system in low areas (Water Street & Hambrooks Blvd.) bringing water to Water Treatment Plant, which would need additional capacity; -Replace sewer lines; -Combination of detention and retention.

-Control duck valves installation; -Extend pipes that end at roads edge; -Need service & maintenance; -Review and upgrade pump and pipe size for increased flow; -Dredge problem areas and use fill in low lying areas; Increase elevation of Park and install living shoreline; -Make solutions that available for public land available to private property, as well; -Consistent floodwall along entire shoreline with access gates for private property; -Lack of budgeting by the City for road construction and dealing with flooding issues such as blocked drains and ongoing maintenance.

-Collect stormwater and return to river; update sewer and drainage system; -Improved maintenance.

-Immediate: stop high tide flooding from backing up in the streets; -Urgent: separate/manage storm water and sanitary sewer system addressing both issues concurrently; -Pump systems to get storm water out and get water to treatment plant.

LISTENING SESSION- FLOODING ISSUES

#3 What could be done to solve these flooding problems? (Continued from previous page.)

The following items were listed by participants and are not presented in order or prioritization. Rather than a running listing of comments from all table groups, the following comments are presented per table group.

-Combination of hightide with heavy rain results in water coming from both directions and the storm pipe drain between Mill and Choptank Avenues has valves that do not work due to clogging and maintenance issues. Repair the valves to prevent high tide flooding impacts; -No systematic approach to assessing and managing issues relating to unplanned sewage discharge.

Storm check valves in all storm drains and seawall drains due to high tide issues; -Build and reconstruct/extend seawalls; more pumps on sewer system.

CAMBRIDGE SHORELINE RESILIENCE PLAN

Great Marsh Area-Gerry Boyle Park

September 29, 2021

5:00 PM - 6:30 PM

Gerry Boyle Park- Pavilion A, Somerset Ave, Cambridge, MD 21613, USA

Public Meeting Notes

Meeting Discussion Topics:

- Outreach Initiatives
- Recent Projects & Stormwater Assessment
- Flood Risk & Vulnerability- Great Marsh Area
- Ideas for Flood Risk Protection
- Level of Protection

Outreach Initiatives

- Project Website- <u>www.makecambridgeresilient.org</u>
 - Several meeting participants indicated that they had visited the project website. The project website is periodically updated and serves as a "one stop shop" for all project related information. Meeting participants were encouraged to visit the project website.
 - Email sign-up prompt has been included on the project website to stay informed about upcoming events. The newspaper, radio, Cambridge Association of Neighborhoods and City website also provides information on outreach events.
- Visual Preference Survey
 - Over one hundred (100) people have completed the online survey. Survey results have been integrated into the planning process. For those meeting participants who had not had an opportunity to complete the survey, the project website and the City of Cambridge website homepage include the VPS.
- Cambridge Shoreline Resilience Plan Open House & Listening Session was held on August 10th at the Dorchester Center for the Arts.
 - Approximately eighty (80) people attended the outreach event. The open house, held in the gallery area, included graphic displays, informational brochures, and a flood modeling station. The listening session, held in the upstairs Performance Hall, included a brief project overview and then a series of discussion questions that participants discussed amongst those within their table group. Each table group selected a spokesperson who gave a report out to the larger group. The listening session was a great opportunity to hear public concerns specific to flooding and ideas for flood risk reduction solutions for both current and future conditions.
 - Concerns pertaining to both the sanitary and stormwater systems were voiced, as well as concerns over current and future flooding. Please see detailed meeting notes for additional information on the project website located under the "Public Involvement & Events" tab.
- Public meetings to discuss project site specific flood risk reduction solutions were scheduled on September 29th and 30th. The four sites included: Great Marsh Area-Gerry Boyle Park Public Meeting, Cambridge Creek Public Meeting, City Marina Public Meeting, and the West End Public Meeting.

Recent Projects

Oakley Street Seawall Replacement

This project will consist of demolition and removal of the existing deteriorated concrete seawall and construction of a new concrete wall in the same location. The new concrete wall will be similar in appearance but will be elevated approximately 15" to provide additional protection. A contract for construction has been awarded and construction started in early September and is projected to last several months. The total project cost is approximately \$342,000 with 75% being funded by a grant from Maryland Department of the Environment and 25% with local funds.

Efforts to Address Ongoing Sewer Backup Issues in the West End Area

The City is aware of ongoing sewer problems in the West End area and has included funding in the current budget to begin addressing the issue. The budget includes \$500,000 for planning and design services for improvements to the sewage collection system and Trenton Street pumping station which services the area. Another \$100,000 has been budgeted to remove excessive grit and sediment from the sewer lines to improve capacity and performance. The City was unsuccessful with a recent grant request for \$3.86 million from the FEMA Building Resilient Infrastructure and Communities (BRIC) grant program for sewer system upgrades but will continue to seek grant opportunities.

Partnership with University of Maryland Center for Environmental Science Horn Point (UMCES Horn

Point) Larry White shared with meeting participants the following information:

- Project Team has been researching state-of-the art design, construction, and quantification of benefits of "Living Shore projects" as part of flood mitigation projects.
- UMCES at Horn Point has conducted extensive research related to storm and wave energy dissipation in estuaries such as the Chesapeake Bay and are considered a leader in the design of living shores and other offshore flood mitigation measures.
- Given UMCES capabilities in this area and unique knowledge of the Chesapeake Bay and issue related to sea level rise in the region, the project team is engaged in discussions to support the City of Cambridge Project.
- The project team will take advantage of the research completed by UMCES in this area in preparing our 2021 FEMA BRIC Grant application and plan to implement an agreement with them to support our project design team once we receive notice of funding for our project.

Stormwater Management Assessment

Stormwater management systems are typically designed to a 10-yr storm. As part of this new stormwater assessment, other storm scenarios will be considered. The assessment includes:

- Determine what year storm conveyance, storage, and pumps will be sized.
- Evaluate additional capacity that will be needed to convey water that overtops planned shoreline barriers.
- Evaluate placement of tide gates and pumps at end of the road conveyance lines.
- Evaluate placement of sub-surface drain and weeping tile in open spaces to convey water to storage locations with pump station.

Updates on the stormwater management assessment will be provided as they become available.

🚴 City of Cambridge, MD - Stormwater Network

with Web AppBuilder for ArcGIS



- 1-15" Outfall Pipe
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600ft -76.082 38.581 Degrees

Flood Risk Vulnerability- 1% Annual Chance Floodplain



Great Marsh Park & 1 % Annual Chance Floodplain

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Food Risk Vulnerability- Climate Ready Action Boundary



Maryland Coast Smart regulations that went into effect on September 1st, 2020 - now require State projects over \$500,000 for construction or State funding to apply the corresponding horizontal limits of the higher 100-year + 3 feet inundation as indicated by the Coast Smart - Climate Ready Action Boundary (CSCRAB).

The FEMA Floodplain Limit remains inundated with an additional 3 feet of water added to it. The Newly Inundated area shows how 3 additional feet of water moves across new areas of the landscape based on the land elevation profile or Digital Elevation Model (DEM). The map layers on this page illustrate that (A) the Digital Elevation Model, should be added to (B) the CS-CRAB Inundation Height to Indicate the Required CS-CRAB Elevation or (A) + (B)

Potential Ideas for Flood Risk Reduction and Resilience

Design options for the Great Marsh Area-Gerry Boyle Park identified by the Steering Committee were presented to meeting participants. Both options 2 and 3 were the preferred options.





Option 1. Riprap revetment with earthen berm enhancement.

Option 2. Riprap revetment with earthern berm enhancement with living shoreline.



Option 3. South side earthen levee/berm parallel to Bay Street with living shoreline around the perimeter- shoreline of Great Marsh Park.



Option 4. Integrated floodwall with Living shoreline modified to existing conditions.



Additional comments, questions, and suggestions collected from meeting participants included:

- Will a park plan be developed in conjunction with mitigation actions?
- Add tab to website link to similar projects that have been completed
- Aesthetics of the Park area is important
- Park amenities are important
- Between Somerset and Queen Anne's drainage ditch
 - Always has water
 - Property with water issues drains into it
- Maintain access to the water
- Walkway along floodwalls/berms from Belvedere to Yacht Club
- Maybe send survey of options to homeowners along park for input
- Concern for changes to the park at same time with park
- Keep Park amenities
- Choptank Newsletter documents Iron Man total revenue for community
- Somerset/Queen Anne drainage ditch
- Question about water coming from marsh land at radio station & discussion on Pinks Pond
- Property owners west of the park are in favor of any mitigation effort. Have lost substantial amount of shoreline and ongoing ponding in yards / streets
- Discussed area of high point in park and how that can be used to advantage
- Discussed cost benefit of building barrier across park vs around perimeter

Level of Protection

The map depicting a continuous protection along the shoreline was presented and discussed. As part of this discussion participants were asked for their feedback on the level of protection needed for proposed flood risk reduction solutions.

Level of Protection

- Minimal of 5 feet
- Additional level of protection 7 feet
- Meeting participants provided positive feedback for additional level of protection to be competitive and obtain available funding while we can.

Contiguous level of flood protection along the entire alignment of the Choptank River because there is no way to hydraulically separate areas.



CAMBRIDGESHORELINE RESILIENCEPLAN

West End Public Meeting

September 30, 2021

6:30 PM – 8:00 PM Cambridge Yacht Club- Meeting Room

Public Meeting Notes

Meeting Discussion Topics:

- Outreach Initiatives
- Recent Projects & Stormwater Assessment
- Flood Risk & Vulnerability- West End
- Ideas for Flood Risk Protection
- Level of Protection

Outreach Initiatives

- Project Website- <u>www.makecambridgeresilient.org</u>
 - Several meeting participants indicated that they had visited the project website. The project website is periodically updated and serves as a "one stop shop" for all project related information. Meeting participants were encouraged to visit the project website.
 - Email sign-up prompt has been included on the project website to stay informed about upcoming events. The newspaper, radio, Cambridge Association of Neighborhoods and City website also provides information on outreach events.
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 - Over one hundred (100) people have completed the online survey. Survey results have been integrated into the planning process. For those meeting participants who had not had an opportunity to complete the survey, the project website and the City of Cambridge website homepage include the VPS.
- Cambridge Shoreline Resilience Plan Open House & Listening Session was held on August 10th at the Dorchester Center for the Arts.
 - Approximately eighty (80) people attended the outreach event. The open house, held in the gallery area, included graphic displays, informational brochures, and a flood modeling station. The listening session, held in the upstairs Performance Hall, included a brief project overview and then a series of discussion questions that participants discussed amongst those within their table group. Each table group selected a spokesperson who gave a report out to the larger group. The listening session was a great opportunity to hear public concerns specific to flooding and ideas for flood risk reduction solutions for both current and future conditions.
 - Concerns pertaining to both the sanitary and stormwater systems were voiced, as well as concerns over current and future flooding. Please see detailed meeting notes for additional information on the project website located under the "Public Involvement & Events" tab.

Public meetings to discuss project site specific flood risk reduction solutions were scheduled on September 29th and 30th. The four sites included: Great Marsh Area-Gerry Boyle Park Public Meeting, Cambridge Creek Public Meeting, City Marina Public Meeting, and the **West End Public Meeting**.

Recent Projects

Oakley Street Seawall Replacement

This project will consist of demolition and removal of the existing deteriorated concrete seawall and construction of a new concrete wall in the same location. The new concrete wall will be similar in appearance but will be elevated approximately 15" to provide additional protection. A contract for construction has been awarded and construction started in early September and is projected to last several months. The total project cost is approximately \$342,000 with 75% being funded by a grant from Maryland Department of the Environment and 25% with local funds.

Efforts to Address Ongoing Sewer Backup Issues in the West End Area

The City is aware of ongoing sewer problems in the West End area and has included funding in the current budget to begin addressing the issue. The budget includes \$500,000 for planning and design services for improvements to the sewage collection system and Trenton Street pumping station which services the area. Another \$100,000 has been budgeted to remove excessive grit and sediment from the sewer lines to improve capacity and performance. The city was unsuccessful with a recent grant request for \$3.86 million from the FEMA Building Resilient Infrastructure and Communities (BRIC) grant program for sewer system upgrades but will continue to seek grant opportunities.

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Stormwater Management Assessment

Stormwater management systems are typically designed to a 10-yr storm. As part of this new stormwater assessment, other storm scenarios will be considered. The assessment includes:

- Determine what year storm conveyance, storage, and pumps will be sized.
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Updates on the stormwater management assessment will be provided as they become available.

🚴 City of Cambridge, MD - Stormwater Network

with Web AppBuilder for ArcGIS



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Potential Ideas for Flood Risk Reduction and Resilience

Design options for the West End identified by the Steering Committee were presented to meeting participants. Both options 3 was preferred.

Option 1. Riprap revetment with earthen berm enhancement.





Option 2. Riprap revetment with earthen berm enhancement with living shoreline.



Option 3. Integrated floodwall with Living shoreline modified to existing conditions.



Additional comments, questions, and suggestions collected from meeting participants included:

- Drainage pipes age of pipes & are they still viable
- End of Willis is used as a beach by community members want to keep that ground is eroding leaving pools of water from high tides coming in City Marina
- To max level of protection
- Floodwall
 - \circ $\;$ Build up on the inland side so not just a wall $\;$
- Who will maintain the flood protection?
- Set back so piers are not impacted
 - Need to show people picture illustrating piers and marsh
- Have a variety of berms and seawalls along West End
- Participants need to see what flood measures will look like renderings are wanted
- Map of Isabel showing flood extent does this exist?
- Upload PowerPoints or portions of PowerPoints to project website
- Must preserve the sand on beach
 - Need to find a way to do so
- Walkway along top of berms wanted
- Glazed Seawall
 - Who would maintain this?
 - \circ $\;$ Birds roost on these, sea water builds up
 - Not preferred
- Post when Council Meeting will occur
 - o Targeting October 25th
 - Need public attendance supporting the project
- Issues with standing water
- Level of Protection going all in build to higher level of protection
- Design Options #3
 - At floodwall backfill gradual slope
- Maintenance ongoing and funding?
- Variety along shoreline
 - Wall at end of street or property
 - o Berm/wall
 - Outside of wall
- Pictures of elevation
- Walkway on top of berm
- End of Willis (beach) access to water swimming
- Measures include beach access
- Homeowner's input

Level of Protection

The map depicting a continuous protection along the shoreline was presented and discussed. As part of this discussion participants were asked for their feedback on the level of protection needed for proposed flood risk reduction solutions.

Level of Protection

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Contiguous level of flood protection along the entire alignment of the Choptank River because there is no way to hydraulically separate areas.



CAMBRIDGE SHORELINE RESILIENCE PLAN

City Marina Public Meeting

September 30, 2021

4:30 PM – 6:00 PM Cambridge Yacht Club-Meeting Room

Public Meeting Notes

Meeting Discussion Topics:

- Outreach Initiatives
- Recent Projects & Stormwater Assessment
- Flood Risk & Vulnerability- City Marina
- Ideas for Flood Risk Protection
- Level of Protection

Outreach Initiatives

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 - Concerns pertaining to both the sanitary and stormwater systems were voiced, as well as concerns over current and future flooding. Please see detailed meeting notes for additional information on the project website located under the "Public Involvement & Events" tab.

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Recent Projects

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- The project team will take advantage of the research completed by UMCES in this area in preparing our 2021 FEMA BRIC Grant application and plan to implement an agreement with them to support our project design team once we receive notice of funding for our project.

Stormwater Management Assessment

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Cambridge Yacht Club, City Marina & 1% Annual Chance Floodplain

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Food Risk Vulnerability- Climate Ready Action Boundary



Cambridge Yacht Club, City Marina & Climate Ready Action Boundary (CRAB)

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Potential Ideas for Flood Risk Reduction and Resilience

Design options for the City Marina identified by the Steering Committee were presented to meeting participants. Option 3 was the preferred options. Earth embankment with walkway on top placed in middle of parcel. Living shoreline could be constructed along alignment of bulkhead west of City Marina entrance & along west side of parking lot.







Option 2. Integrated floodwall with Living shoreline modified to existing conditions.



Option 3. Earth berm at Yacht Club.



Option 4. Bulkhead enhancements with gradual slope and native plantings.



Additional comments, questions, and suggestions collected from meeting participants included:

- Separate study being conducted for marina
 - 3 piers will be floating
 - These piers flood with king tides
- Option for the east side preferred
 - Walkway along the top is wanted
- Street access/entrance into yacht club
 - How would that be affected/incorporated into design
 - Gates, retractable flood walls
- Aesthetics impacted?
- Keep water accessible
- Duck walk floods with heavy rain, area turns into a marsh
- Level of Protection
 - Berm 3-4 feet about ground level
- Consider wave action
- Consider oyster reefs
- Impacts to circle entrance around lighthouse
- Tourism do not want it deterred
- Parking lot repaired, detention ponds added, new bulkheads completed approximately 5 years ago
 - Top of bulkhead is 3 feet
 - Used for boats coming in
- Include west side of yacht club because of storm surge area impacted
- Gradual incline berm from street side
 - o Build living shoreline on water side with sill on west side
- Park side could be steeper
- Like the idea of having the area as a wildfire attraction
- Channel to marina
 - Come in from east instead of south needs dredge
- Boaters are concern about marina
- Local dredge opportunities- use of local dredge material for project sites
- Significant issues with sanitary
- Love the idea of bulkheads with living shoreline city property
- Kevin provided information on mdfloodmaps.com and tools available for property owners
- Distinction between where we have room
 - Edge of yacht club around park
 - Options for top log structure? Or change grade level of ground
- Issue- Viewshed and natural features and access to water
- Northwest waves
- Do what we need to do to protect add natural concepts
- Breakwater from marina is a floating breakwater that does not work
- Potential for oyster reef outside of area
- Offshore (breakwaters/barrier islands)
- Extension or add bulkhead west side where storm surge impacts

Level of Protection

The map depicting a continuous protection along the shoreline was presented and discussed. As part of this discussion participants were asked for their feedback on the level of protection needed for proposed flood risk reduction solutions.

Level of Protection

- o Minimal of 5 feet
- Additional level of protection 7 feet
- Meeting participants provided positive feedback for additional level of protection.

Contiguous level of flood protection along the entire alignment of the Choptank River because there is no way to hydraulically separate areas.



FLOOD RISK REDUCTION COMMUNITY WORKSHOP

Date: March 22, 2022 Time: 5:30 PM – 8:30 PM Location: Dorchester Center for the Arts Hosted by: The City of Cambridge & Dorchester County

Join Us!

This event is open to the public.

The Flood Risk Reduction Community Workshop will provide an opportunity for property owners to obtain information on various flood risk reduction options, grant, and technical assistance opportunities. 5:30-6:00 PM Open House with Display Stations

- Make Cambridge Resilient Flood Mitigation Project
- Hoopersville
 Resiliency Study
- Twin Point Cove Resiliency Study
- Dorchester
 County Hazard
 Mitigation Plan
- CRS & Flood
 Insurance
- Mid-Chesapeake Bay Island Ecosystem Restoration Project

 MyCoast Maryland

6:00-8:30 PM Presentations

- Techniques to Reduce Flooding for Homes
- Floodplain
 Management:
 We're All in This
 Together!
- Using River-Friendly Yard Practices to Mitigate Flooding
- MyCoast MD; Be a voice for your community; Take pictures; Submit a Report; Inspire Action!
- FEMA Hazard Mitigation Assistance Grants

FLOOD RISK REDUCTION COMMUNITY WORKSHOP

March 22, 2022

5:30 PM - 8:30 PM

Dorchester Center for the Arts located at 321 High Street Cambridge, MD Hosted by: The City of Cambridge and Dorchester County

Purpose: To provide an opportunity for property owners to obtain information on various flood risk reduction options, grant, and technical assistance opportunities.

Public Meeting Agenda

5:30-6:00 PM **Open House**- Please visit the various display stations and speak to subject matter experts in the Gallery Area and Second Floor Performance Hall.

Open House Display Stations

- Make Cambridge Resilient Flood Mitigation Project-Larry White, Project Manager
- Hoopersville Resiliency Study- Anna Johnson, PE, BayLand Consultants & Designers
- Twin Point Cove Resiliency Study- John Ouellette, Versar
- Dorchester County Hazard Mitigation Plan- Michele King, SP&D & Jimmy Windsor, Dorchester County Dept. of Emergency Services
- CRS & Flood Insurance Jason Boothe, Dorchester County Environmental Planner
- Mid-Chesapeake Bay Island Ecosystem Restoration Project- Kristen Keene, MDOT Maryland Port Administration
- MyCoast Maryland- Sasha Land and Kate Vogel- Coastal Planners, Chesapeake & Coastal Service, Department of Natural Resources

6:00-6:10	Welcome & Introductions Larry White, Make Cambridge Resilient Flood Mitigation Project Manager and Herve' O. Hamon, Dorchester County Director of Planning and Zoning
6:10-7:00	Presentations- Second Floor Performance Hall
	Techniques to Reduce Flooding for Homes and Businesses - This presentation will

introduce techniques for modifying residential and commercial buildings to reduce flooding.

Presenter: Jason Stick, Geographer U.S. Army Corps of Engineers - Baltimore District Technical Assistance Branch

Floodplain Management: We're All in This Together! - This presentation will provide an overview of the National Flood Insurance Program (NFIP) and how it can be a resilience tool to reduce flood risk in the community. We'll cover the three key components of the NFIP: Flood Risk Mapping, Floodplain Management Regulations and Mitigation Actions, and Flood Insurance. We'll also talk about the NFIP's Community Rating System (CRS) that benefits Dorchester County residents by reducing the cost of their flood insurance.

Presenter: Kevin G. Wagner, Community Assistance Program Manager, Maryland Department of the Environment

Using River-Friendly Yard Practices to Mitigate Flooding - This presentation will provide information on River-Friendly Yards practices, resources, and ShoreRivers' rebate program, so you can leave ready to make positive change in your own backyard.

Presenter: Matt Pluta, Director of Riverkeeper Programs- Choptank Riverkeeper, ShoreRivers

- 7:00-7:30 **Break-** Please visit the various display stations and speak to subject matter experts in the Gallery Area and Second Floor Performance Hall.
- 7:30-8:30 **Presentations Continued** Second Floor Performance Hall (see next page)

MyCoast MD; Be a voice for your community; Take pictures; Submit a Report;

Inspire Action! - MyCoast Maryland is a portal to collect and analyze photos of flooding and storm damage. Photos are linked to data about weather and tides to create reports that help government agencies, business owners, and residents understand impacts in your community and encourage action to reduce localized flooding.

Presenters: Sasha Land and Kate Vogel- Coastal Planners, Chesapeake & Coastal Service, Department of Natural Resources

FEMA Hazard Mitigation Assistance Grants – This presentation provides information on FEMA's hazard mitigation assistance funding for eligible mitigation measures that reduce disaster losses. Mitigation project grant applications are developed by local governments and submitted to the Maryland Department of Emergency Management (MDEM). MDEM is responsible for selecting local mitigation projects from around the State that aligns with MDEM's mitigation priorities for submittal to FEMA. FEMA grant programs for flood mitigation include Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), and Building Resilient Infrastructure and Communities (BRIC).

Presenter: Adam Cox, Lead Hazard Mitigation Specialist, Maryland Department of Emergency Management.

2022 ACTIVITIES & OUTREACH

Activities completed in 2022 included:

- FEMA BRIC Submittal- January 28, 2022
- Submittal of Additional Grants
- City Council Project Briefing- January 24, 2022
- Monthly Stakeholder Group Meeting- February 8, 2022
- Planning Commission Project Briefing- March 1, 2022
- Monthly Stakeholder Group Meeting- March 8, 2022
- Flood Risk Reduction Community Workshop-March 22, 2022
 - Presentations were uploaded to the project website following the Workshop. A follow-up email was distributed to more than 100 members of the public who have signed-up to be on the project contact listing.
- Monthly Stakeholder Group Meeting- May 10, 2022
- City Council Project Briefing- June 20, 2022





FLOOD MITIGATION PROJECT CONCEPT DESIGN WITH ENHANCEMENTS

Over the course of the planning process, which included robust stakeholder engagement and public outreach events, the project has evolved and is now characterized as a hybrid engineered naturebased flood mitigation project. For instance, an integrated living shoreline with earth/rockfill embankment for flood protection is the preferred option. As this option provides flood protection, shoreline restoration, and a natural aesthetic. As the planning and design process continues, we will continue to incorporate additional nature-based solutions into this evolving process. To increase our confidence, we have incorporated multiple systems into the project for redundancy.

The following features are included in our integrated living shoreline with earth/rockfill embankment concept design.

- Rock Sill –riprap breakwater first line of defense, serves to calms flood water.
- Oyster Reef- at toe of rock sill supports wave attenuation, increases living shoreline habitat diversity & enhances water quality.
- Elevated Marsh- mitigates storm surge and allows deposition of nutrient and growth of vegetation with increasing sea level rise.
- Earth & Rock Fill Embankment allows elevation of salt marsh to reduce impact of storm surge and prevents water levels exceeding design base flood of 7 ft above Mean Sea Level (MSL).





Plantings on landside on top of fill provides sand dune like features.

STORM WATER MANAGEMENT SYSTEM WITH ENHANCEMENTS

In addition to enhancements made to the flood mitigation concept design, an integrated engineered nature-based storm water management concept design has evolved over the course of this planning process. The following features have been included in the concept design.

- Backflow preventers at the end of existing storm water lines that outfall in the Choptank River to prevent high tides backing up into the streets.
- New storm water management system landside to collect, store, and release storm water back to the river that accumulates during high tides.
- Nature-based green infrastructure at various locations within the City to reduce surface water runoff and allow for controlled release to the environment.

These enhancements to the stormwater management system will intercept storm water at designated locations just upstream of their outfalls and include pumping water to new collection areas. In addition, new underground storage facilities will be installed to provide for the retention of water prior to the slow release into the Choptank River.

CAMBRIDGE CREEK FLOOD MITIGATION STRATEGY

Cambridge Creek is lined with bulkheads and predominantly newer construction built to code. This planning area includes large condominium buildings and multi-unit commercial structures that are too large to elevate. Therefore, no overarching flood risk reduction strategy can be implemented along Cambridge Creek. The most practicable approach is to undertake various flood risk reduction measures in Cambridge Creek including dry/wet flood proofing, individual flood barrier installations, and the installation of green infrastructure measures.

SUMMER 2022 PLANNING EFFORTS

Efforts completed over the course of this planning process will be documented in a cohesive plan document. Finalized flood mitigation strategies both short and long-term will be detailed in the Plan. The Plan will be uploaded to the project website and made available to the public.

Finally, a new grant application will be submitted this summer to obtain additional capacity and support to the City to manage the project through design and construction as well as to ensure that flood risk reduction and nature-based solutions are included in future planning and development efforts. We will continue to monitor all grant applications and announce grant awards as they are received.