Cambridge Creek Watershed Assessment and Action Plan

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Prepared By:

ShoreRivers
114 S. Washington Street
Easton, MD 21601
443-385-0511
info@shorerivers.org
www.shorerivers.org

Funded By:

Chesapeake Bay Trust
Watershed Assistance Program
60 West Street #405
Annapolis, MD 21401
410-974-2941
www.cbtrust.org

ShoreRivers

CBTRUST
Chesapeake Bay Trust

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1.0 Introduction

The purpose of this plan is to provide guidance on the restoration of the Cambridge Creek Watershed. The Cambridge Creek Watershed Assessment and Action Plan outlines a series of recommendations for watershed restoration, describes management strategies, and identifies priority projects for implementation. Planning level cost estimates are provided, where feasible, and a preliminary schedule for implementation by 2025 is outlined. Financial and technical partners for plan implementation are suggested for various recommendations and projects. The watershed plan is intended to assist ShoreRivers, the City of Cambridge, Dorchester County, and the members of the Cambridge Clean Water Advisory Committee in moving forward with restoration of the Cambridge Creek Watershed (Figure 1).

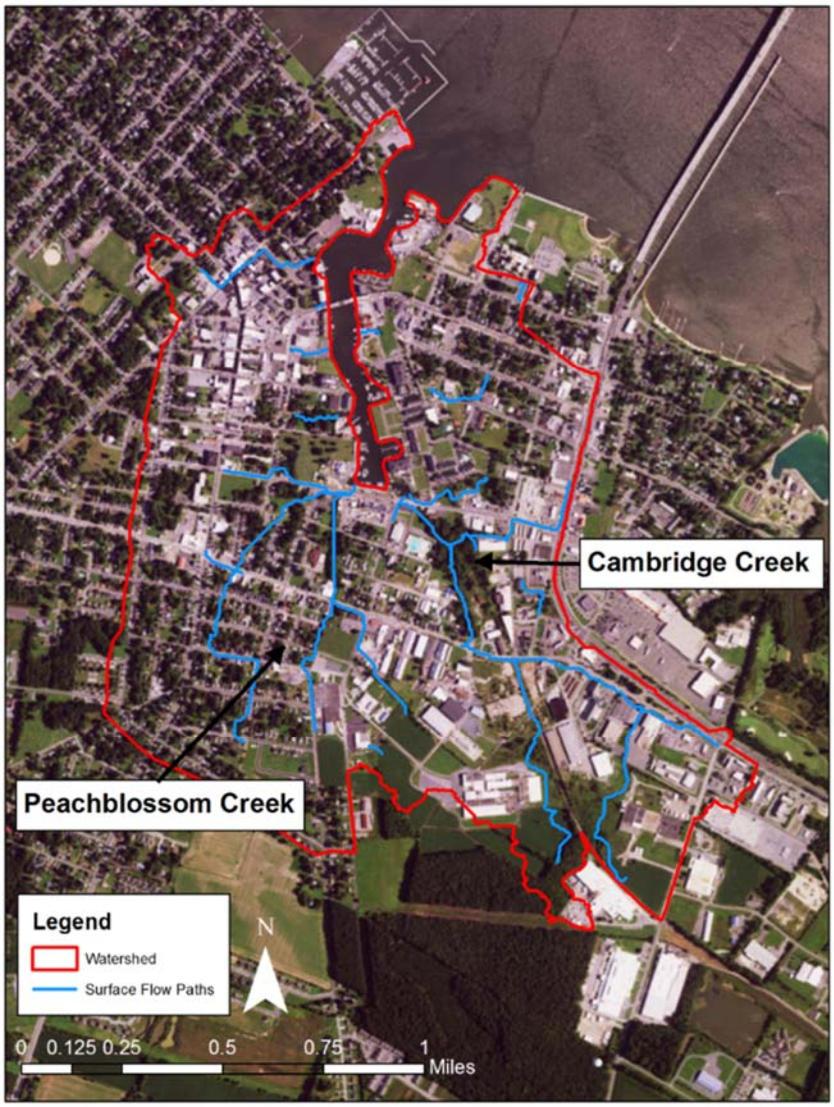

Figure 1: Cambridge Creek Watershed

1.1 U.S. EPA Watershed Planning "A-I Criteria"

In 2003, the U.S. Environmental Protection Agency (EPA) required that all watershed restoration projects funded under Section 319 of the federal Clean Water Act be supported by a watershed plan[1]. EPA identified nine key elements that are critical for improving water quality and should be included in watershed plans that intend to address water quality impairments. These nine elements have come to be known as the "A-I criteria"[2]:

EPA A-I Criteria

A. Identification of Causes and Sources of Impairments
B. Expected Load Reductions
C. Proposed Management Measures
D. Technical and Financial Assistance Needs
E. Information, Education, and Public Participation Component
F/G. Schedule and Milestones
H. Load Reduction Evaluation Criteria
I. Monitoring Component

This watershed plan meets the A-I criteria and Table 4 shows where these criteria are addressed throughout this watershed plan.

Table 1: Location of A-I Criteria Within this Report

Section of the Report	A	B	C	D	E	F	G	H	I
Section 1	X								
Section 2					X				
Section 3			X						
Section 4		X							
Section 5				X		X	X		
Section 6								X	X

1.2 Background

The Cambridge Creek watershed is centrally located in the city of Cambridge, Maryland. It is surrounded by light industry, but was once the hub of a commercial canning industry that employed more than 10,000 people during its height in the early to mid-20th century. The growing industry stimulated urban development around the creek that included a stormwater drainage intended to handle the increased volume of runoff. As this infrastructure continues to

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[1] For more information on 319 grant funding opportunities, visit MDE's Nonpoint Source Program (319) Management and Financial Assistance website at http://www.mde.state.md.us/programs/Water/319NonPointSource/Pages/index.aspx

[2] For a more detailed description on the nine key elements review Chapter 2 of the EPA's *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* https://www.epa.gov/sites/production/files/2015-09/documents/2008_04_18_nps_watershed_handbook_handbook-2.pdf

age and create major stormwater issues, it is important to incorporate alternative stormwater management techniques such as green infrastructure projects that will take stress off the dated system. A specific watershed based plan is necessary for this creek due to its highly urbanized watershed, which makes it unique compared to most of the rural watersheds that dominate the Eastern Shore of Maryland.

In 2010 the Environmental Protection Agency (EPA) established a cleanup plan known as the Chesapeake Bay Total Maximum Daily Load (TMDL). The plan sets federally regulated limits of nitrogen, phosphorus, and sediment load entering the bay. Each state in the bay's watershed was allocated a specific reduction of these pollutants from the different sectors including agriculture, wastewater, and urban stormwater. To achieve these reductions, Maryland developed a watershed implementation plan (WIP) that took the state's allocation and further divided it into the responsibility of each county to reduce its contribution of the overall load[3]. Unlike the majority of the counties, Dorchester County failed to adopt the goals of the state's WIP, leaving them without a plan to address the excess nutrient and sediment loads. Furthermore, because of the rural nature of Dorchester County, the City of Cambridge is not mandated by the State of Maryland to comply with municipal separate stormwater sewer system (MS4) requirements.

Absent the state and federal requirements, this watershed plan will serve as a guidance document for ways that the City of Cambridge and other watershed partners can strategically chip away at pollution loads coming from urban stormwater runoff. This plan was created following the EPA's A-I criteria which is explained in more detail in section 1.2 of this document.

Identification of Causes and Sources of Impairment

Location and Description: Cambridge Creek is a tidal mesohaline creek located in the Choptank River (02060005) watershed, specifically the lower Choptank River, and is in the urban center of Dorchester County, Maryland, the city of Cambridge. Cambridge creek has a watershed of 664 acres that is predominately developed (Figure 2). The majority of the land cover falls into four categories, herbaceous vegetation (lawns, vacant lots, cemeteries, and parks), structures, impervious surface (non-road paved areas), and roads. The amount of area covered by each of the land cover type is displayed in Table 1.

There are two main tributaries that enter the creek from the south, the main stem Cambridge Creek enters from the southeast and Peachblossom Creek enters from the southwest (Figure 1). Drainage to the creek is complicated by a stormwater system that connects different parts of the watershed that under natural conditions would not be combined. In addition, the city (founded in 1684) has an aged stormwater infrastructure that contains illicit discharges, the sources of which are hard to identify.

[3] To read more about the Chesapeake Bay Cleanup and the State of Maryland's WIP, visits MDE's Chesapeake Cleanup Center website at http://mde.maryland.gov/programs/Water/TMDL/TMDLImplementation/Pages/overview.aspx

Table 2: Cambridge Creek Watershed Land Cover	
Land Cover	**Area (Acres)**
Water	3.99
Tree Canopy	63.95
Herbaceous Vegetation	218.67
Barren	0.04
Structures	107.49
Impervious Surface	198.89
Roads	67.02
Tree Canopy Over Structures	3.05
Tree Canopy Over Impervious Surface	4.09
Tree Canopy Over Roads	1.17
Total	**664.27**

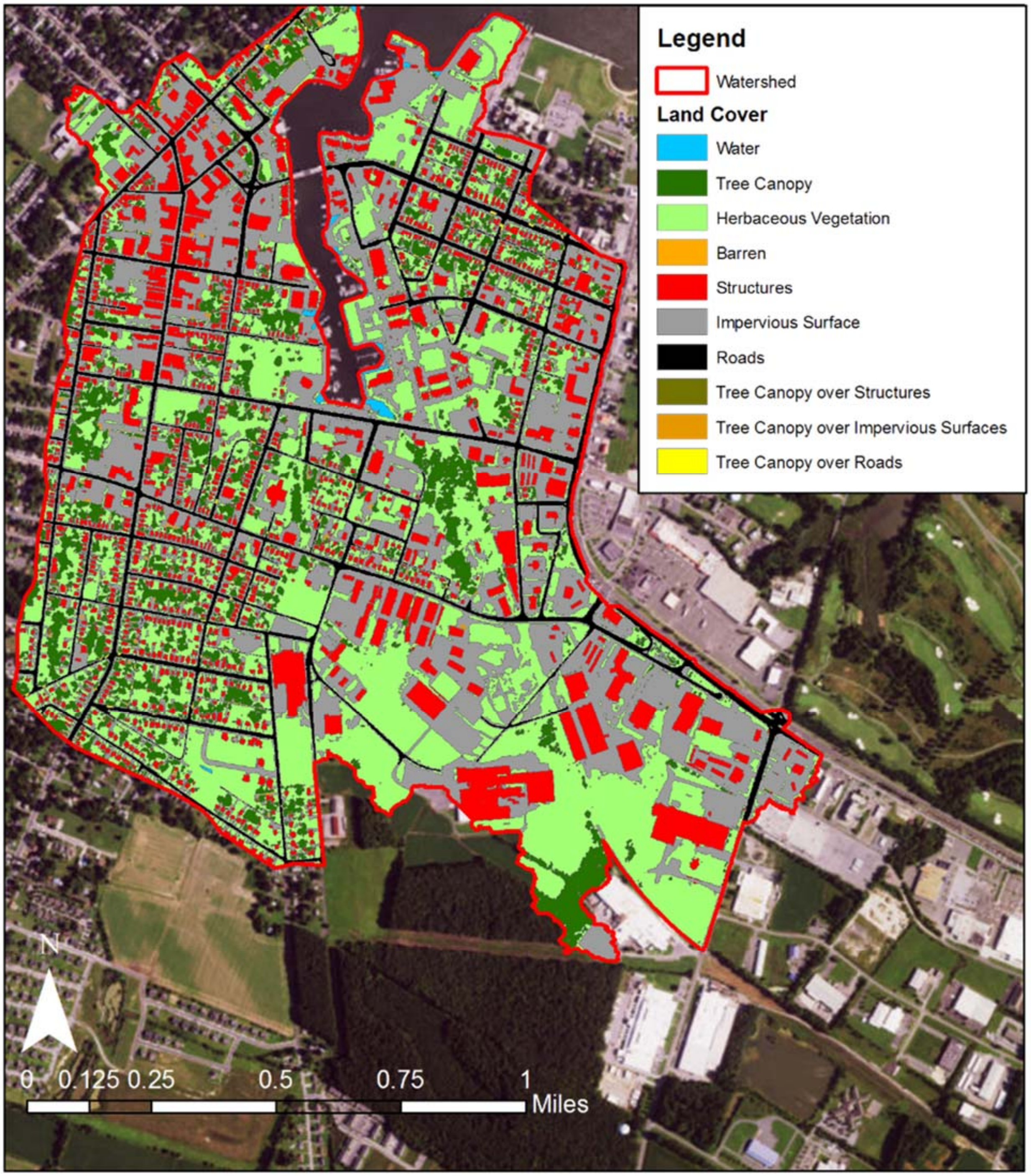

Figure 2: Land Cover within Cambridge Creek Watershed

Ambient Conditions

Cambridge Creek has been sampled randomly over the past decade for nutrients, for general water chemistry, and to assess potential illicit discharges. The only long-term dataset comes from the Maryland Department of Environment (MDE) shellfish harvest monitoring program that tracks fecal coliform. The State has no other on-going data collection occurring in Cambridge Creek or its tributaries.

Dorchester Citizens for Planned Growth (DCPG) sampled total nitrogen (TN) and total phosphorus (TP) from June 2012 through December 2013. Over that period TN averaged 0.69 mg/l and TP averaged 0.08 mg/l. Both TN and TP average concentrations were higher than natural Chesapeake Bay estuarine levels of <0.5 mg/l TN and <0.02 mg/l TP (IAN, 2011) and represent a system that is eutrophic. TN concentrations in Cambridge Creek peaked in late winter and spring and declined throughout the summer (Figure 3). TP peaked in late summer, but there were also peaks in October and December that could be potentially associated with storm events or illegal discharges (Figure 3).

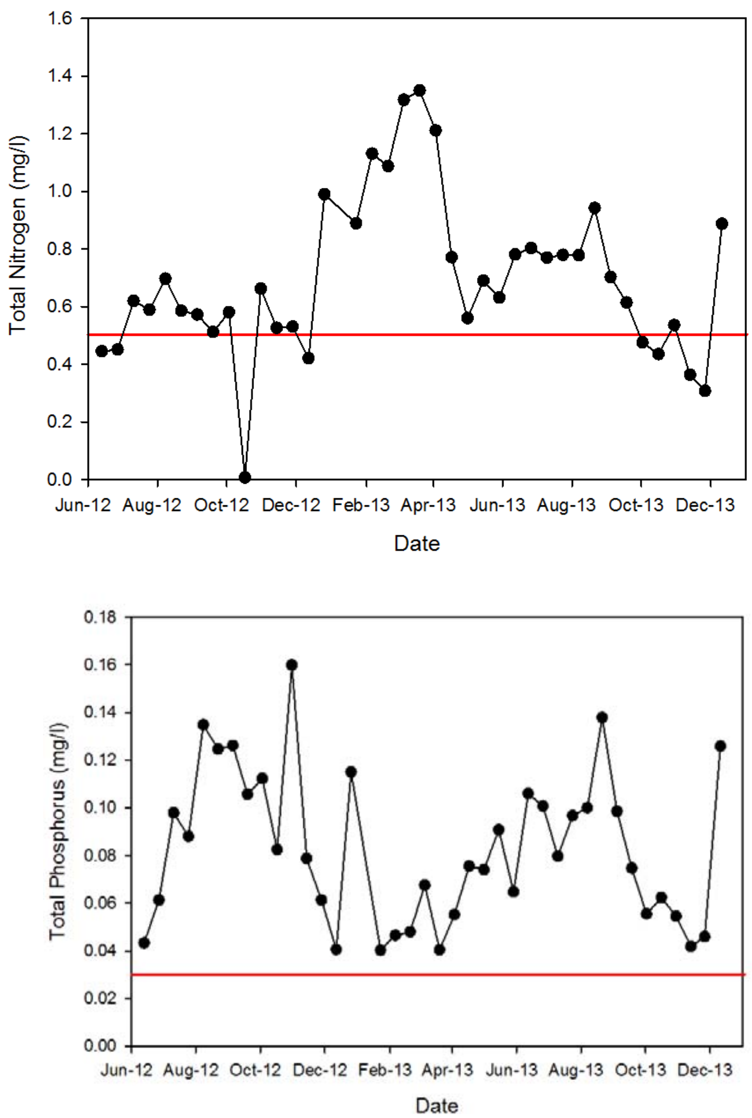

Figure 3. Total nitrogen and total phosphorus (mg/l) samples from Cambridge Creek collected by Dorchester Citizens for Planned Growth (DCPG).

Water chemistry data collected by DCPG concurrently with nutrient data identified that the creek experiences periods of suboptimal levels of dissolved oxygen (DO) to sustain fisheries. Migratory and shallow water fish, such as white perch and striped bass, need dissolved oxygen levels >5.0 mg/l in order to survive and thrive. Cambridge Creek experienced periods in late summer where dissolved oxygen was <4.0 mg/l and experienced a sustained period of low DO in July and August 2013. During the entire sampling period DO averaged 6.5 mg/l indicating that the low DO events were episodic and most likely tied to either algal blooms or storm events. Unfortunately, a longer record of dissolved oxygen does not exist for the creek nor were bottom dissolved oxygen samples taken to assess benthic conditions.

Salinity during the 2012-2013 sampling period ranged between 5 and 12 ppt and averaged 8.9 ppt. The one 5 ppt salinity reading was associated with a 1.75 inch storm event. Previous to the event, salinities levels were 7 to 8 ppt. This highlights that Cambridge Creek is highly influenced by stormwater runoff from the city of Cambridge and rain events have the potential to drastically change salinities levels, which can have a deleterious effect on aquatic organisms that are not adapted to sudden salinity changes.

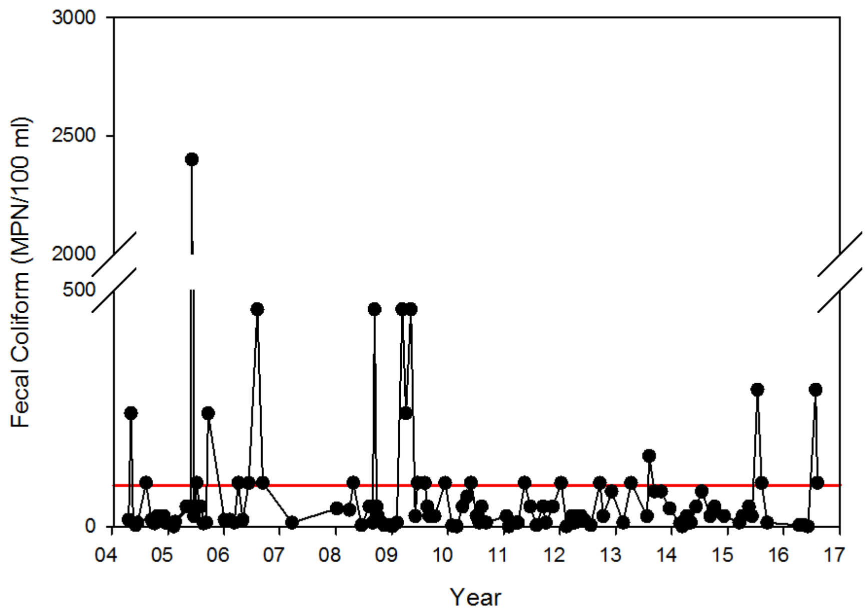

Figure 4. Fecal coliform data collected by the Maryland Department of the Environment (MDE) at the outlet of Cambridge Creek.

Water clarity ranged between 1.5 ft to just over 2.5 ft and averaged 2.14 ft. Good water clarity is imperative for the growth of submerged aquatic vegetation (SAV). If sunlight cannot penetrate to the bottom or near the bottom of the water column then SAV cannot grow. SAV is important habitat for blue crabs, juvenile fish, and bait fish. Most of Cambridge Creek is >10 ft. deep and cannot support SAV and the channel is periodically dredged to maintain 14 ft depth.

Fecal coliform has been monitored near the outlet of the creek since 2004 and represents the only longer-term water quality data set for Cambridge Creek. Figure 4 shows that over the 2004 to 2016 period, fecal coliform averaged (arithmetic mean) 78 MPN/100 ml and the 90th percentile was 98.7 MPN/100 ml. There have been periodic spikes over 200 MPN/100 ml with the highest count of 2400 MPN/100 ml. Cambridge Creek is closed for shellfish harvest because it falls within the "safety zone" for the Cambridge Wastewater Treatment Plant[4] and due to the number of marinas on the creek. For human contact the Environmental Protection Agency recommends using the geometric mean of 35 cfu/100 ml Enterococci as an indicator level of hazardous conditions in marine waters (EPA, 2012). There is no direct relationship between Fecal Coliform measured using the MPN method and Enterococci measured as cfu, but it is safe to assume measurements of Fecal Coliform levels greater than 200 MPN/100 ml would indicate signficant potential for human illness from recreational contact.

[4] To view the details and boundaries of the safety zone for the Cambridge Wastewater Treatment Plant please visit: http://mde.maryland.gov/programs/Marylander/fishandshellfish/Documents/www.mde.state.md.us/assets/document/shellfish/MDE_Closedarea_Descriptions.pdf#

Figure 5: Cambridge Creek stormwater outfalls that were used to estimate nutrient and sediment loads to Cambridge Creek.

Causes and Sources of Pollution

Nonpoint Source Pollution and Sources: Cambridge Creek watershed is a primarily developed watershed that has a storm drain network to capture stormwater. This creates a complex situation where nonpoint source pollution can be concentrated into stormwater pipes and mixed with regulated point source discharges. In general the nonpoint source pollution stems from either residential or urban land practices, including, but not limited to, lawn fertilizer application, road salt application, herbicide and pesticide application, hydrocarbons from road surfaces, detergents, and atmospheric deposition. At the boundary of the watershed there are a few agricultural fields (classified as herbaceous cover in Figure 2.) that would contribute nutrient and sediment pollution, but the size and extent is minimal when compared to the urban nonpoint source load.

Evaluating the major storm sewer systems that discharge into Cambridge Creek identifies the potential nutrient and sediment loads entering the creek. Due to the lack of data collected, a Stormwater Management Model (SWMM) was run in order to estimate nitrogen, phosphorus, and sediment loads entering Cambridge Creek from seven storm sewer outfalls (Figure 5). Analysis was completed for a single 24 hour 3.4 inch Type II SCS design storm event and for 1-year precipitation collected from station in Cambridge, MD, GHCND:US1MDDR0007 CAMBRIDGE 1.4 WNW MD US, 38.5669,-76.7032, over the period: 7/15/16-7/15/17. Neither modeled events accounted for illicit discharges, evaporation, tides, groundwater inflow, or antecedent conditions. In order to model nutrient and sediment loads, generic event mean concentrations (EMC) were used in conjunction with the two storm events. The EMCs used in the model may not be representative of the exact concentrations in Cambridge, but are representative of concentrations observed in many urban areas (see Appendix A for additional information). During the 3.4 inch modeled storm event the seven outfalls produced 64.9 lbs. of nitrates, 21.8 lbs. of phosphorus, and 5,759 lbs. of total suspended sediment (TSS). The total volume of water discharged into the creek during this event was 9.0 x 10^6 gallons (Table 3).

Table 3. Modeled 3.4 inch storm event using PCSWMM. Seven outfalls were used in the model to determine nutrient and sediment load to Cambridge Creek.

Outfall Node	Flow Freq. (%)	Avg. Flow (CFS)	Max Flow (CFS)	Total Volume (10^6 gal)	Total Nitrates (lbs)	Total Phosphorus (lbs)	TSS (lbs)
OF1	96.83	3.37	56.84	1.511	10.687	3.658	971.239
OF2	95.39	2.52	40.65	1.100	6.778	2.668	735.207
OF3	99.45	7.54	127.20	3.435	23.423	8.318	2,233.501
OF4	98.23	0.92	14.13	0.428	3.872	1.029	252.425
OF5	98.37	1.17	14.11	0.579	4.884	1.393	350.508
OF6	98.45	1.93	38.00	0.890	7.481	2.141	539.993
OF7	97.61	2.37+	43.53	1.063	7.760	2.580	676.118
System	97.76	19.82	332.53	9.006	64.885	21.787	5,758.991

The full year (7/15/2016-7/15/2017) modeled had a total of 42.9 inches of precipitation, which is typical for the region. There were 105 precipitation events during the year period with the largest one-day rain event depth of 3.90 inches. During the year period, the seven outfalls produced a total of 735.2 lbs. of nitrates, 239.2 lbs. of phosphorus, and 62,869 lbs. of TSS (Table 3). The total volume of water discharged from the outfalls to Cambridge Creek was 101.1 x 10^6 gallons (Table 4). During the entire year period the average flow frequency (percentage of time water was discharging from outfalls) was 34.9%. This year model provides a good indication of the nutrient and sediment loading to the creek and a starting point for pre-best management practice nutrient and sediment loading.

Table 4. Full year PCSWMM model for Cambridge Creek to calculate estimated nutrient and sediment loads before best management practice installation.

Outfall Node	Flow Freq. (%)	Avg. Flow (CFS)	Max Flow (CFS)	Total Volume (10^6 gal)	Total Nitrates (lbs)	Total Phosphorus (lbs)	TSS (lbs)
OF1	36.60	0.20	2.50	16.861	120.277	40.175	10,595.099
OF2	34.59	0.14	1.65	11.182	68.632	26.277	7,188.770
OF3	37.68	0.41	5.23	36.256	249.520	85.993	22,898.721
OF4	32.62	0.07	0.79	5.615	50.253	13.358	3,274.818
OF5	33.96	0.11	1.26	8.650	71.253	20.590	5,206.676
OF6	34.68	0.14	1.55	10.981	91.193	25.977	6,543.693
OF7	34.42	0.14	1.78	11.503	84.027	27.464	7,160.926
System	34.93	1.21	14.75	101.048	735.156	239.156	62,868.702

Point Source Pollution and Sources:

In 1972 a component of the Clean Water Act was established to control point source water pollution through a permitting system. Point sources are defined as any conveyance such as a pipe or a man-made ditch that eventually discharges directly into the surface water. Municipal, industrial, and other facilities must obtain a National Pollution Discharge Elimination (NPDES) permits if their discharges go directly to surface waters. Maryland Department of the Environment (MDE) issues the NPDES permits in Maryland as a means of limiting the amount of pollution entering surface waters from industrial and municipal facilities. The Cambridge Creek watershed has six NPDES permitted facilities, which are shown in the Table 5 below.

Table 5: NPDES Permitted Facilities in the Cambridge Creek Watershed			
Facility Name	**Address**	**Permit Type**	**Permit No.**
Cambridge Inc.	105 Goodwill Rd.	[Individual] Discharge Permit	16DP3149
		[General Permit] Discharges of Stormwater Associated with Industrial Activity	12SW3229
Cambridge International Plant 2	1001 Goodwill Ave	[General Permit] Discharges of Stormwater Associated with Industrial Activity	12SW0348
Egide USA Inc.	4 Washington St.	[General Permit] Discharges of Stormwater Associated with Industrial Activity	12SW1406
Generation III Marina	205 Cedar St.	[General Permit] Discharges from Marinas	10MA9234
Wise Oil & Fuel Inc.	741 Race St.	[General Permit] Discharges of Stormwater and Hydrostatic Test Water from Oil Terminals	MDG344568
Yacht Maintenance Co.	101 Hayward St.	[General Permit] Discharges from Marinas	10MA3729

The discharge or "effluent" from these facilities includes toxics, organic, and inorganic materials that can have a devastating impact on the water quality in Cambridge Creek if permit limits are exceeded. Of the six permitted facilities in the watershed, three have been inspected in the past five years (Cambridge Inc., Cambridge International Plant 2, and Egide USA Inc.) and none of those inspections resulted in finding a violation or a formal enforcement action by the state. Cambridge Inc., however, has a history of violating its permit limits for Volatile Organic Compounds (VOCs), and the release of toxic chemicals. A full analysis of the permitted facilities and the pollutants they discharge can be found in Appendix B.

Maryland's NPDES program offers key avenues for public participation in the permit issuing process. By being involved, citizen and watershed groups can advocate for permit limits that protect local water quality, and enforceable conditions that provide accountability when permit limits are violated. Figure 6 illustrates opportunities and advice for public involvement at each step of MDE's permitting process. For a full description of this process, basic information, tools and tips to assist anyone in analyzing and commenting on NPDES permits in Maryland, reference the Citizens Guide to Public Participation in Maryland's NPDES Permitting Program[5]. In terms of protecting Cambridge Creek from point sources of pollution, citizen advocacy and enforcement groups should monitor the permitted facilities mentioned in Table 5 and reference the Citizen Guide to effectively navigate the process and advocate for strong, enforceable permits.

[5] To view the Citizens Guide to Public Participation in Marylands NPDES Permitting Program visit: https://www.shorerivers.org/s/Citizen-Guide-Public-Participation-in-Marylands-NPDES-Permitting-Program-July-2017.pdf

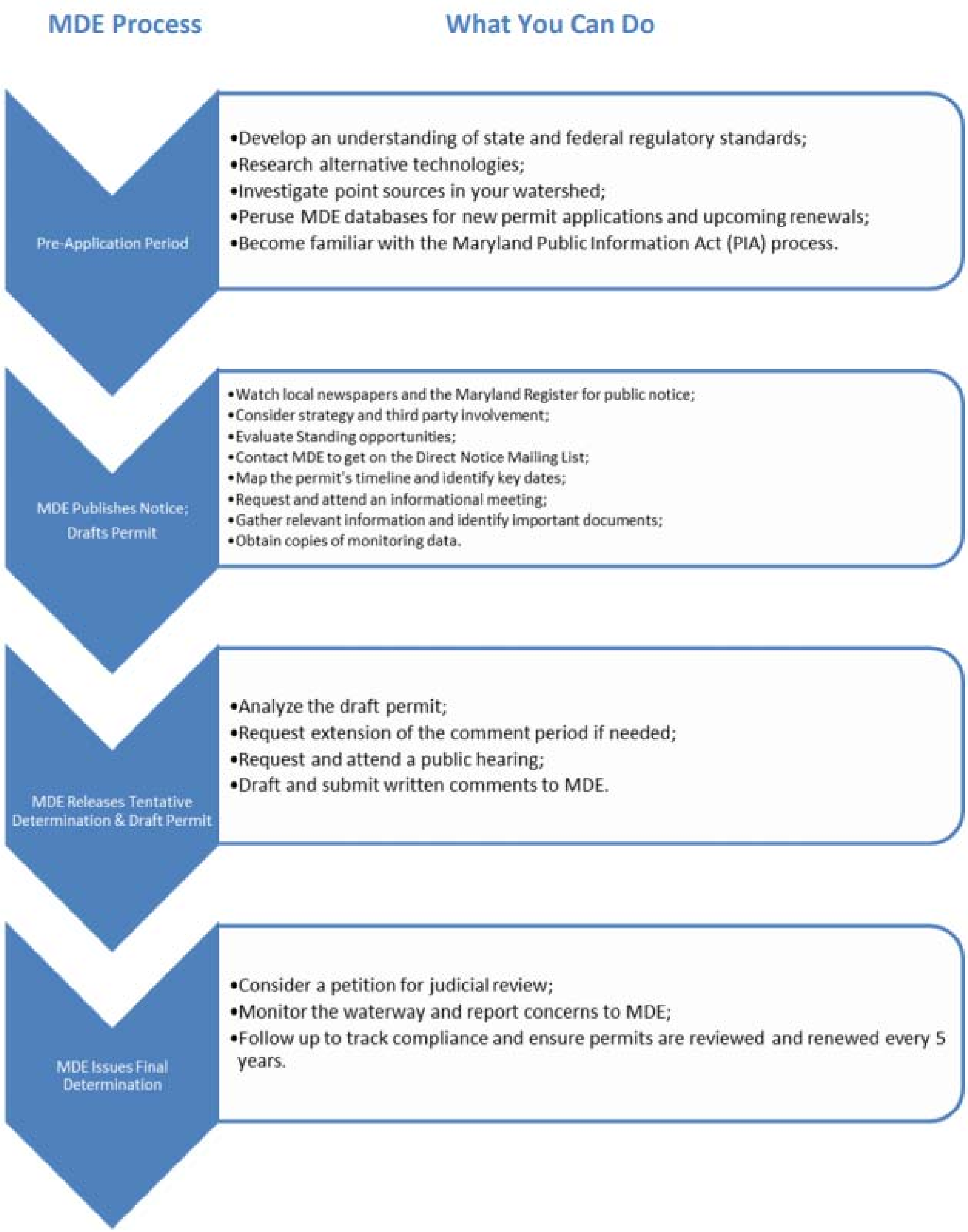

Figure 6: Opportunities for Public Involvement in MD's NPDES Permitting Process

2.0 Watershed Goal, Strategies and Recommendations

Restoring Cambridge Creek is a community-wide effort that requires participation from a number of stakeholders with a diverse set of skills. In 2015 the Cambridge Clean Water

Advisory Committee (CWAC) was endorsed by the city as a group that makes recommendations and engages in water quality improvement activities. The committee is composed of participants from ShoreRivers (formerly Midshore Riverkeeper Conservancy), the Chesapeake Bay Foundation, University of Maryland Sea Grant Extension, Dorchester Citizens for Planned Growth, Eastern Shore Land Conservancy, Nanticoke Watershed Alliance, and the City of Cambridge Department of Public Works. The committee developed a plan titled *Moving Towards Clean Water: a 10-Year Plan*[6] which identifies six goals that will help the City achieve clean water:

1. Reduce the amount of impervious surface by 20 acres;
2. Increase cityscape canopy trees with 500 new tree plantings;
3. Re-direct downspouts and install 1,000 rain barrels;
4. Develop a city-wide urban nutrient management plan;
5. Increase green space in street right-of-ways by up to 1 acre;
6. Install or retrofit 40 acres of stormwater facilities.

This Cambridge Creek Watershed Assessment and Action Plan expands on CWAC's plan by identifying specific restoration projects that support the committee's goals, and by providing specifics not included in the 10-year plan.

When developing this assessment and action plan, several watershed partners were interviewed in attempt to understand their mission, skill sets, and recommendations for this plan. A highlight of each partner's ability to participate in this action plan can be found in Appendix C. The following strategies resulted from the many stakeholder interviews, site visits, and project identifications.

2.1 Watershed Goal

A healthy and clean Cambridge Creek that is safe for swimming and fishing, and is free from all water quality impairments.

2.2 Strategies

1. **Quantify the problem in terms of nutrient loads.** Identify flow-paths and nutrient sources.
2. **Public-private partnerships.** Leverage the city's resources in collaboration with the skills and expertise from the diverse group of watershed partners.
3. **Increase the knowledge of businesses, homeowners, faith communities and school-aged students**. Education is essential for creating behavior change.
4. **Implement stormwater retrofit practices wherever space and site conditions permit**. Urban runoff is best treated when stormwater is forced to absorb into the ground.

[6] To read the Cambridge CWAC's plan, visit https://extension.umd.edu/sites/extension.umd.edu/files/_docs/FINAL_Moving%20Toward%20Clean%20Water%20-%20Cambridge%20Report.pdf

5. **Increase public access to and awareness of Cambridge Creek.** Build an appreciation for the creek and all of its potential.
6. **Incorporate climate change adaptation strategies in project planning and implementation.** Impacts of climate change will affect how restoration practices perform into the future.

2.3 Recommendations

This section describes 12 recommendations for restoring the Cambridge Creek watershed. Not listed in order of priority, these recommendations are a result of fieldwork findings and stakeholder interviews. Stormwater and other urban retrofits are both beneficial and expensive when implemented individually, so multiple recommendations should be implemented simultaneously in order to effectively bring about restored water quality. Combining these efforts with education and pollution prevention can lead to long-term behavioral change. Targeted outreach to homeowners and businesses can have a beneficial impact while additional funding can be secured for the more costly recommendations.

1. **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 waste 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.[7]
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 review**s. Focusing on erosion controls, right-of-ways, 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.

3.0 Watershed Restoration Practices

This section provides an overview of the key recommended practices for restoring Cambridge Creek. Successful restoration requires collaboration among local, county and state government, watershed partners, businesses, and residents. Local and state governments are able to implement capital projects such as large-scale roadway stormwater retrofits, and change ordinances and municipal operations to encourage continued restoration. Watershed partners, businesses, and residents are encouraged to implement smaller scale project and programs such as rain gardens, lawn care education, outreach, and restoration of streams and wetlands. The variety of practices

[7] For information on the Marylanders Grow Oyster program please visit http://dnr.maryland.gov/fisheries/Pages/MGO/index.aspx

recommended in this plan are primarily urban stormwater retrofits, and are described in more detail below.

Impervious Surface Reduction - Impervious surfaces are land surfaces that repel rainwater and do not permit it to infiltrate (soak into) the ground. As urban development started occurring within the Cambridge Creek watershed, natural flow paths were paved over for roads, parking lots, and buildings, resulting in a stormwater sewer network that captures and transports runoff to the creek without the benefit of natural filtration through soil and plant roots.

Efforts to remove unnecessary or failing impervious surface areas are being undertaken all over the bay watershed and range in capacity from volunteer community groups, to local government capital improvement projects. Prime areas for impervious surface removal include unused parking lots, deteriorated walkways, and areas that can be used for green infrastructure stormwater management projects

Figure 7: Depave, a non-profit from Seattle, WA organizes volunteer groups to manually remove impervious surfaces.

Urban Forest Buffer – Forest buffers are used in urban areas where stormwater has the increased potential to travel and transport pollutants as surface runoff. Urban forest buffers refer to an area where a collection of trees are planted to help buffer a local waterway from surface runoff, or a location that separates two or more densely paved areas. Urban Tree Canopy (UTC) in general provides an important stormwater management function and can be a valuable tool in filtering and absorbing water, which would otherwise add stress to a dated stormwater sewer system like that in the Cambridge Creek watershed.

In this watershed it is important to increase forest buffers along the headwaters of Peachblossom Creek and Cambridge Creek, and any clearing of trees or greenspace directly adjacent to these waterways should be avoided. Building out from the banks of these creeks, partners and the City of Cambridge should work to increase the UTC throughout the entire watershed.


Figure 8: Forest buffer alongside an urban stream in New York.

Urban Tree Planting – Urban tree planting refers to city-scape, street tree plantings that are arranged throughout the city's roadways and residential and business properties. This practice is different than urban forest buffers in that the plantings aren't necessarily buffering a waterway or large amounts of impervious surfaces. Urban tree plantings are considered the fillers in a city's UTC and in addition to providing stormwater management benefits; they also reduce the urban heat island effect, reduce heating and cooling costs, lower air temperature, reduce air pollution, increase property values, and provide wildlife benefits.


Figure 9: Street trees along an urban center.

Urban Grass Buffer – Similar to urban forest buffers, grass buffers act as a filter that captures and absorbs runoff. Urban grass buffers include a diverse mixture of warm and cold season grasses that are allowed to grow tall, while their roots grow deep into the soil. Urban grass buffers should be maintained and cut once or twice a season in order to keep out undesired and invasive plants, but the area should not be maintained as often as typical residential lawn.

Figure 10: Urban grass buffer example showing tall grasses buffering a paved area.

New and Retrofitted Wetlands – Stormwater wetlands are practices that include significant shallow wetland areas to treat urban stormwater runoff, but often may also incorporate small permanent pools and/or extended storage to achieve the full water quality benefit. Often referred to as pocket wetlands in urban areas, this best management practice (BMP) includes a variety of native wetland plants that help to absorb and filter stormwater runoff. As opposed to a bioretention area, stormwater wetlands are designed to hold water for a longer period of time in order to allow for adequate filtering. These wetlands provide an aquatic habitat in an otherwise terrestrial area.

Figure 11: Restored wetland at RTC Park in Easton, MD.

New and Retrofitted Bioretentions – Bioretentions are stormwater treatment facilities that capture and temporarily store runoff. Once it enters the BMP area, the water is slowly released and passed through a filter bed of sand, organic matter and soil, often referred to as a bioretention mix. Depending on the design, the filtered runoff may continue to filter into the groundwater, or may be returned to the stormwater conveyance system via an underdrain. The treatment areas are typically planted with native grasses and plants that help to filter out any pollutants, as well as provide aesthetic and habitat benefits to the practice. Oftentimes native pollinator plants are used to attract butterflies and other beneficial pollinator species.

Figure 12: Bioretention project at a local church in Easton, MD

Bioswale – A bioswale is a landscape BMP that is designed to remove nutrients and sediment while transporting rainwater. A bioswale typically consists of a soil medium that includes sand, organic matter like compost, and soil, native vegetation, sloped banks, and sometimes riprap. Bioswales can be meandering or straight lines depending on the landscape, and the amount of time that water stays within the channel is maximized up for 24 hours to allow for sufficient nutrient and sediment removal.

Figure 13: A bioswale on the campus of California State University

Vegetated Open Channels – This practice is similar to a bioswale in that it is used to remove nutrients and sediment as water is transported through a channel. Unlike bioswales, vegetated open channels do not necessarily include the same soil medium that consists of organic matter and sand, but they do include native vegetation and sloped banks, and sometimes riprap as needed. Vegetated open channels are a less expensive alternative retrofit option than a bioswale, and can be very effective given the amount of insufficiently vegetated open channels throughout the City of Cambridge.

Figure 34: Example of vegetated open swale in Maryland.

Green Roof – Green roofs consist of garden features that cover the roof of a building. While the design of green roofs can vary depending on the structure and shape of the roof, they most often include a vapor barrier immediately above the roof structure, a soil medium on top of the vapor barrier, and native vegetation planted throughout. In order to reduce the amount of soil needed, therefore reducing the weight added to the roof, projects are encouraged to use succulent plants. These types of plants can grow in very little to no soil, and they require very little water making them perfect for a rooftop which can be difficult to fully water. And for this same reason, grasses are not a desired plant to use for this type of project. Green Roofs are a relatively new practice that is starting to gain popularity as more education on the installation and maintenance of this practice is made available.

Figure 15: A green roof on top of a nature center in Pennsylvania.

Green Street – A green street is a term used to describe a variety of practices that are implemented along roadways and intended to absorb and treat the stormwater coming from the roadway, sidewalks, and surrounding impervious surfaces. Green street features may include bump-outs from a side walk that is designed with a bioretention practice to allow water to store within the bump-outs, curb cuts that allow water to enter into landscaped areas where it can be absorbed, permeable pavers in areas where street side parking may occur, street trees, native plantings, and a variety of other green infrastructure practices. Maryland Avenue within the city of Cambridge is an example of a green street which includes many of the elements mentioned above.

Figure 16: Green Street in Bainbridge, WA that has bioretentions installed into the sidewalk with curb cuts.

4.0 Project Selection and Prioritization Methods

4.1 Project Selection

The methods for identifying and determining the scope, details and estimated cost of each project started with a desktop analysis of the watershed. Flow paths were first determined by analyzing the city's network of stormwater infrastructure and the watershed's land cover characteristics. This helped identify the location of the major flow paths that are entering the Cambridge Creek, and the size of the sub-watersheds that each of the flow paths drain. The watershed was then broken up into sections based on these flow paths. Each section was broken into quadrants with the outside boundary consisting of the section boundary (Figure 9, Appendix D). Each section was assessed over a day period through a walking visual inspection. Projects were recorded based on what section and subsection that they were located. Here is an example of the numbering scheme:

3	2	4
Section	Subsection	Project #

In the example above the numbering is referencing a project that is located in section 3, subsection 2, and project number 4. In Appendix F and Appendix G the project ID will simply be the combination of the three numbers, so it will read 324. For sites that have more than one potential project there is an additional letter identifier after the last number. An example of this would be project 115 A and 115 B. These projects are located in section 1, subsection 1, project number 5, but 115 A is a bioretention at this location and 115 B is a tree planting at the same location.

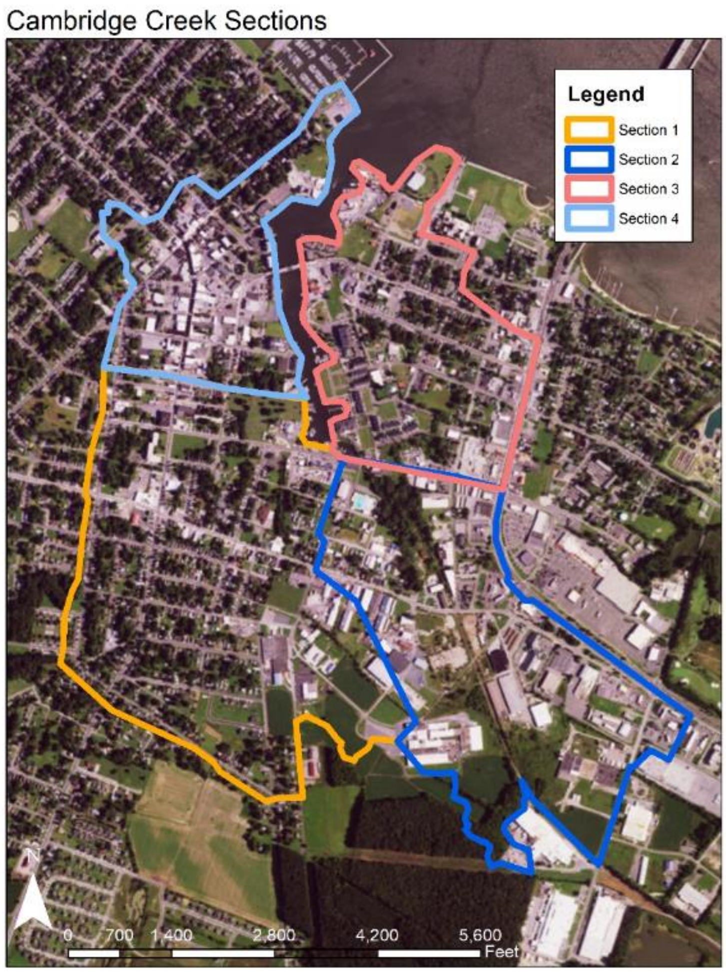

Figure 17. Cambridge Creek assessment sections.

4.2 Calculating Load Reductions

Once projects were identified and recorded in each section, the FieldDoc calculator was used to estimate nutrient and sediment load reductions[8]. FieldDoc is a standardized method for project

[8] To review the FieldDoc user guide please visit: http://www.nfwf.org/chesapeake/Documents/FieldDoc-User-Guide.pdf

reporting and calculating nutrient and sediment reductions in accordance with the latest version of the Chesapeake Bay Watershed Model. Reductions were determined based on the type of BMP that was being proposed, and the size of the drainage area that the project is treating.

4.3 Estimating Costs

The estimated cost of the projects were completed by using a combination of the 2011 MDE technical report *Cost of Stormwater Management Practices in Maryland Counties*, and the RSMeans Construction Cost Index.

The technical report provided pre-construction and construction cost for 24 different stormwater best management practices (BMPs)[9]. Pre-construction costs include the cost of site discovery, surveying and design, planning, and permitting. For the various BMPs, the pre-construction cost ranges from 10-40% of the BMP construction costs. The construction costs include capital, labor, material and overhead costs. The pre-construction and the construction costs are expressed per acre of impervious area treated, not per acre of BMP.

For each project, the pre-construction and the construction costs were added and then multiplied by the number of acres that the project will be treating. This cost was then adjusted using the Overall County Stormwater BMP Cost Adjustment Index for Dorchester County. The 2011 Mean Construction Cost Indices list cost indices for 13 Maryland cities, and the indices for Maryland counties is based on the nearest of those 13 cities. The representative means index city used for Dorchester County is Easton, MD.

The 2011 cost estimates for Dorchester County was then adjusted to reflect 2018 estimated prices. Since 1964 the RSMeans has been as nationally recognized cost index, and is commonly used to look for the percentage of change in escalation from year to year. The index uses the base of 1993=100. The percentage of change between 2011 and estimated 2018 is an 11.4% escalation. 11.4% of the 2011 value was added to determine the 2018 construction cost in Dorchester County[10].

The costs of nutrients and sediment removal were then determined using the load reduction estimates calculated by the FieldDoc calculator. The total project costs were divided by the pounds of nutrients and tons of sediment expected to be treated by the project. This provides information on the effectiveness of the project, and enables the projects to be prioritized based on their efficiencies.

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[9] To review the Technical Report please visit: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjw9OSvz4DYAhVjc98KHR_zBIAQFggnMAA&url=http%3A%2F%2Fwww.mwcog.org%2Fasset.aspx%3Fid%3Dcommittee-documents%2FkI1fWF1d20111107094620.pdf&usg=AOvVaw3dLCmdoovP4QSxpgcWORE8

[10] To review the RSMean Historical Index data, please visit: https://www.rsmeansonline.com/references/unit/refpdf/hci.pdf

It's important to point out that these costs estimates are geared towards local government and do not account for the labor and overhead costs associated with hiring a third party project manager. These costs also only include the initial pre-construction and construction costs, and do not include routine or intermittent maintenance costs. Project partners are encouraged to consider the long-term maintenance of each project. Maintenance costs can be cut down by using volunteer groups like local Master Gardner clubs, youth environmental clubs, church congregations, girls and boy scouts, and other community groups. A maintenance plan for each project should also be developed and adopted by the owner/manager of the project site.

It's also important to note that the estimated costs are expected to escalate as this plan gets older. To determine updated estimates, partners should refer to the RSMeans Cost Index reports that are released quarterly. By calculating the percent change from the 2018 index value to the future index value, partners can calculate a cost estimate based on different years after 2018.

5.0 Cambridge Creek Watershed Restoration Practices

5.1 Project Prioritization

Projects were prioritized based on the ratio of cost per pound (or ton) for nutrient or sediment reduction to the overall cost of the project ($ per lb. or ton/project cost). This ratio was used for ranking because it provided a better description on the relative impact of the cost of nutrient or sediment reduction in relation to the total project cost. Cost per pound (or ton) was initially going to be used, but this only ranked projects that were very inexpensive high and, in general, these projects did not have a substantial impact on nutrient and sediment loads. Ratios are expressed as a fraction and displayed as a decimal. The smaller the decimal the more cost effective the practice. Using nitrogen as a key indicator, the cost efficiency for nitrogen removal is colored according to the following scale:

Table 6: The Cost Efficiency Scale for Each Projects Ability to Remove Nitrogen.

Color	Percent Effective
(green)	90% more cost effective than other projects
(yellow)	50-89% more cost effective than other projects
(grey)	1-49% more cost effective than other projects
(orange)	<1% more cost effective than other projects.

A table that includes all the details associated with each project, including the cost efficiency ratio, can be found in Appendix F, whereas all of the projects and their project descriptions including photos, can be found in Appendix G.

5.2 Implementation Schedule

The Cambridge Clean Water Advisory Committee released a 10-year report in 2015 with specific goals to be achieved over that period. The 10 year period was identified to coincide with the 2025 Chesapeake Bay cleanup deadline. This watershed plan intends to be consistent with those deadlines and achieving the six goals. Understanding that this plan was released on January 1, 2018, three years after the CWAC goals were released, there will need to be a significant effort put towards reaching those goals under an expedited timeline. Therefore the following timeline is suggested for implementation under the remaining eight years.

Table 7: Implementation Timeline – Percentage of Goals Achieved By Year

Goal	2018	2019	2020	2021	2022	2023	2024	2025
Reduce the amount of impervious surface by 20 acres	10%		25%		50%		75%	100%
Increase cityscape canopy trees with 500 new tree plantings	10%		25%		50%		75%	100%
*Re-direct downspouts and install 1,000 rain barrels	10%	25%		50%		100%		
*Develop a city-wide urban nutrient management plan		50%		100%				
Increase green space in street right-of-ways by up to 1 acre	10$		25%		50%		75%	100%
Install or retrofit 40 acres of stormwater facilities	10%		25%		50%		75%	100%

*Partners are encouraged to conduct community outreach to residents on an on-going basis as a catalyst to gaining support for the actions in this plan and encouraging future BMP implementation. Rain barrel giveaways have proven to be a successful tool in gaining participation at community outreach events and should be considered whenever possible.
**The development of a city-wide urban nutrient management plan is a program development goal and partners should plan to have this program developed and implemented with enough time to see actual reductions in nutrients by 2025.
***The goals that are specific to constructing BMPs will require a significant amount of time in the pre-construction phase for planning, design and permitting. Partners are encouraged to start on this phase early so ensure that there's time for implementation before 2025.

5.3 Funding Strategy

To best prepare the city of Cambridge and watershed partners for implementing the projects and strategies identified in this plan, Appendix E provides a list of funding sources that have historically supported similar efforts. By identifying the funder, the purpose, the funding limit, and the date of the last RFP for each grant program, partners can plan accordingly.

The Cambridge Creek Watershed Assessment and Action Plan was designed to provide all of the project information necessary to seek design and implementation funding for the projects identified. Each project page found in the appendix includes enough detail to be considered a fact sheet for that specific project. It was intended to be designed this way so project partners can simply include the project fact sheet with their grant application.

The grant programs identified in the table below are made available state- and nation-wide depending on the program, and therefore it is a very competitive process. To prepare more competitive applications to fund this Action Plan, watershed partners are encouraged to reference the partner details in Appendix C. to form strategically unique and supportive partnerships. Watershed partners are encouraged to engage businesses, local governments, churches, and community associations to create public-private-nonprofit partnerships to help achieve the goals of this plan.

As mentioned earlier, this plan includes all of the elements of the EPA's A-I criteria which makes these projects eligible for funding under EPA's 319 Nonpoint Source Pollution Program. In Maryland the 319 Nonpoint Source Program is administered by MDE.

6.0 Monitoring and Reporting Progress

Watershed partners and funders will have a vested interested in determining whether or not the projects that are being implemented are successful. Success can be measured in many ways including direct improvements to water quality indicators, such as water clarity, reduced nitrogen and phosphorus levels, increased habitat and fish abundance. Success can also be measured indirectly through metrics associated with the projects, including gallons of stormwater filtered, total pounds of nitrogen and phosphorus removed, number of rain gardens installed, etc.

The monitoring plan includes the monitoring of the overall stream as it relates to aquatic indicators, as well as monitoring the progress toward achieving the six 10-year goals identified by the Cambridge Clean Water Advisory Committee (see section 2.0). Watershed groups such as Dorchester Citizens for Planned Growth and ShoreRivers, who have experience and the capabilities to monitor water quality, should continue to test the water as they have done in the past. Identifying long-trends in data will help us understand if the work being performed on the land is generating a sustainable change in water quality. On-going water quality monitoring in Cambridge Creek will also help to identify any additional hot spots of pollution that might be forming, as well as provide a snapshot of what the water quality is throughout the different seasons.

In order to monitor the progress towards the 10-year goals, the city of Cambridge and the Clean Water Advisory Committee should continue to collect information and create a clearing house of projects that have been implemented and plan to be implemented. The committee should assess progress towards the 10-year goal twice each year, if not more frequent. Measuring progress is a way to motivate watershed partners and encourage more implementation. The more frequent the committee assesses the progress, the more conversations and strategizing will occur among the partners.

To help monitor the progress made in terms of project implementation, and therefore nutrient load reduction, the FieldDoc calculator should be used as a monitoring tool. All of the projects presented in this plan have been entered and saved in the FieldDoc database. Once a project is implemented, partners can enter that information into the database. This type of on-going tracking should be done in a coordinated effort between the city of Cambridge and the Clean Water Advisory Committee. Given the absence of a Dorchester County WIP, and the reporting requirements that are including in that plan, the Committee should prepare a yearly summary of progress that can then be submitted to MDE and other interested officials. This will help to ensure that the projects that are being implemented are accounted for and contributing to the load reductions identified in the Chesapeake Bay Cleanup Plan.

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Appendices

Appendix A: PCSWMM Model Documentation

Storm Event Modeled: SCS_24h_Type_II_3.4in SCS_24h_Type_II_3.4in INTENSITY (in/hr) with recording interval of 5 min., Green-Ampt infiltration method with dynamic flow routing method

Pollutant Concentrations used were event mean concentration:

Open Space: Nitrates: 0.0 mg/l
Phosphorus: 0.3 mg/l
TSS: 100 mg/l
Residential: Nitrates: 1.075 mg/l
Phosphorus: 0.28 mg/l
TSS: 72 mg/l
Transportation: Nitrates: 1.16 mg/l
Phosphorus: 0.3 mg/l
TSS: 67 mg/l

*Values were based on PCSWMM general values and not necessarily reflective of Cambridge

**************************	Volume	Depth
Runoff Quantity Continuity	acre-feet	inches
**************************	---------	-------
Total Precipitation	40.701	3.400
Evaporation Loss	0.000	0.000
Infiltration Loss	11.413	0.953
Surface Runoff	28.938	2.417
Final Storage	0.452	0.038
Continuity Error (%)	-0.251	

**************************	Nitrates	Phosphorus	TSS
Runoff Quality Continuity	lbs	lbs	lbs
**************************	----------	----------	----------
Initial Buildup	0.000	0.000	0.000
Surface Buildup	67.849	22.814	6033.434
Wet Deposition	0.000	0.000	0.000
Sweeping Removal	0.000	0.000	0.000
Infiltration Loss	0.000	0.000	0.000
BMP Removal	0.000	0.000	0.000
Surface Runoff	67.849	22.814	6033.434
Remaining Buildup	0.000	0.000	0.000
Continuity Error (%)	0.000	0.000	0.000

**************************	Nitrates	Phosphorus	TSS
Quality Routing Continuity	lbs	lbs	lbs
**************************	----------	----------	----------
Dry Weather Inflow	0.000	0.000	0.000
Wet Weather Inflow	67.821	22.805	6030.994

Groundwater Inflow	0.000	0.000	0.000
RDII Inflow	0.000	0.000	0.000
External Inflow	0.000	0.000	0.000
External Outflow	64.885	21.787	5758.986
Flooding Loss	2.740	0.955	255.489
Exfiltration Loss	0.000	0.000	0.000
Mass Reacted	0.000	0.000	0.000
Initial Stored Mass	0.000	0.000	0.000
Final Stored Mass	0.194	0.065	17.169
Continuity Error (%)	0.002	-0.008	-0.011

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal	Total Nitrates lbs	Total Phosphorus lbs	TSS lbs
OF1	96.83	3.37	56.84	1.511	10.687	3.658	971.239
OF2	95.39	2.52	40.65	1.100	6.778	2.668	735.207
OF3	99.45	7.54	127.20	3.435	23.423	8.318	2233.501
OF4	98.23	0.92	14.13	0.428	3.872	1.029	252.425
OF5	98.37	1.17	14.11	0.579	4.884	1.393	350.508
OF6	98.45	1.93	38.00	0.890	7.481	2.141	539.993
OF7	97.61	2.37	43.53	1.063	7.760	2.580	676.118
System	97.76	19.82	332.53	9.006	64.885	21.787	5758.991

Storm Event Modeled: CC_16_17, COCORAHS data collected in Cambridge, MD
Site: GHCND:US1MDDR0007 CAMBRIDGE 1.4 WNW MD US, 38.5669,-76.7032 , period: 7/15/16-7/15/17

INTENSITY (in/hr) with recording interval of 5 min.
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
CC_16_17	CC_16_17	VOLUME	1440 min.

************************** Runoff Quantity Continuity **************************	Volume acre-feet ---------	Depth inches -------
Total Precipitation	513.473	42.890
Evaporation Loss	0.000	0.000
Infiltration Loss	203.098	16.965
Surface Runoff	310.119	25.904
Final Storage	0.271	0.023

Continuity Error (%) ..... -0.003

************************** Runoff Quality Continuity **************************	Nitrates lbs	Phosphorus lbs	TSS lbs
Initial Buildup	0.000	0.000	0.000
Surface Buildup	737.480	240.569	63059.725
Wet Deposition	0.000	0.000	0.000
Sweeping Removal	0.000	0.000	0.000
Infiltration Loss	0.000	0.000	0.000
BMP Removal	0.000	0.000	0.000
Surface Runoff	737.480	240.569	63059.725
Remaining Buildup	0.000	0.000	0.000
Continuity Error (%)	0.000	0.000	0.000

************************** Quality Routing Continuity **************************	Nitrates lbs	Phosphorus lbs	TSS lbs
Dry Weather Inflow	0.000	0.000	0.000
Wet Weather Inflow	737.480	240.569	63059.724
Groundwater Inflow	0.000	0.000	0.000
RDII Inflow	0.000	0.000	0.000
External Inflow	0.000	0.000	0.000
External Outflow	735.156	239.834	62868.703
Flooding Loss	0.000	0.000	0.000
Exfiltration Loss	0.000	0.000	0.000
Mass Reacted	0.000	0.000	0.000
Initial Stored Mass	0.000	0.000	0.000
Final Stored Mass	4.561	1.455	378.707
Continuity Error (%)	-0.303	-0.299	-0.298

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal	Total Nitrates lbs	Total Phosphorus lbs	TSS lbs
OF1	36.60	0.20	2.50	16.861	120.277	40.175	10595.099
OF2	34.59	0.14	1.65	11.180	68.632	26.277	7188.770
OF3	37.68	0.41	5.23	36.256	249.520	85.993	22898.721
OF4	32.62	0.07	0.79	5.615	50.253	13.358	3274.818
OF5	33.96	0.11	1.26	8.650	71.253	20.590	5206.676
OF6	34.68	0.14	1.55	10.981	91.193	25.977	6543.693
OF7	34.42	0.14	1.78	11.503	84.027	27.464	7160.926
System	34.93	1.21	14.75	101.048	735.156	239.834	62868.702

Adding Pond:
127.2 CFS before 53.17 CFS after

Appendix B: NPDES Permitted Facilities and Permit Details

Facility Name	Permit No.	Discharge Characteristic	Permit Limit
Cambridge Inc.	16DP3149	Total Purgeable Organics	100 µg/L
		1,1,1-Trichloroethane	30 µg/L Daily Max
		1,1-Dichloroethane	30 µg/L Daily Max
		1,1-Dichloroethene	30 µg/L Daily Max
		pH	6.5-8.5 Standard Unit
		Flow	Monitor Only
	12SW3229	Nitrate+Nitrite Nitrogen	0.68 mg/L
		Total Zinc	0.12 mg/L
Cambridge International Plant 2	12SW0348	Nitrate+Nitrite Nitrogen	0.68 mg/L
		Total Zinc	0.12 mg/L
Egide USA Inc.	12SW1406	Nitrate+Nitrite Nitrogen	0.68 mg/L
		Total Zinc	0.12 mg/L
Generation III Marina	10MA9234	Flow	Monitor Only
		Lead	0.08 mg/L
		Oil and Grease	15 mg/L
		Solids, Total Suspended	50 mg/L
		Zinc	0.81 mg/L
Wise Oil & Fuel Inc.	MDG344568	Flow	Monitor Only
		Petrol hydrocarbons, total recoverable	15 mg/L Daily Max
Yacht Maintenance Company	10MA3729	Flow	Monitor Only
		Copper	Monitor Only
		Lead	Monitor Only
		Oil & Grease	10 mg/L Monthly Average Maximum, 15 mg/L Daily Max
		Solids, Total Suspended	Monitor Only
		Total Zinc	Monitor Only

Appendix C: Watershed Partners' Skills and Experience

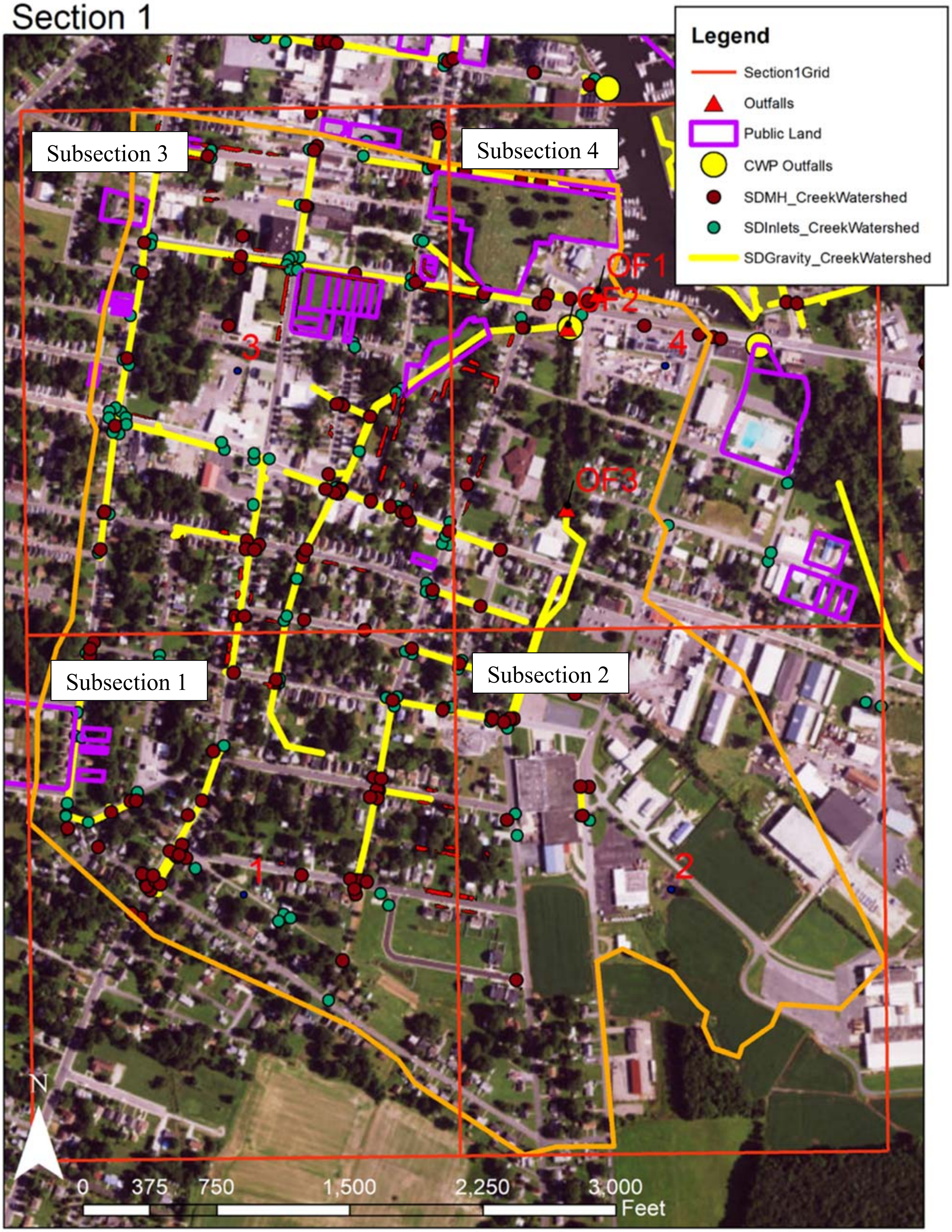
Watershed Partner*	Technical Assistance	Grant Assistance	Strategic Planning and Facilitation	Watershed Restoration Techniques	Small-scale BMP Tech. Ass.	Community Engagement	Education	Fundraising	Workshop Development	Project Design	Project Management	Advocacy	GIS	Volunteer Recruitment and Mgmt.
ShoreRivers	X	X	X	X	X	X	X	X	X		X	X	X	X
UMD SGE	X	X	X	X	X	X	X		X					
ESLC		X	X		X	X		X	X			X	X	
DCPG					X	X						X		X
CMS		X				X						X		X
CBF		X		X	X	X	X		X			X		X
Cambridge DPW	X	X		X	X					X	X		X	

*Partner Abbreviations: University of Maryland Sea Grant Extension (UMD SGE), Eastern Shore Land Conservancy (ESLC), Dorchester Citizens for Planned Growth (DCPG), Cambridge Main Street (CMS), Chesapeake Bay Foundation (CBF), Cambridge Department of Public Works (Cambridge DPW).

Sample Projects in Cambridge By Watershed Partners						
Project Name	**Location**	**Type of Project**	**Project Details**	**Metrics**	**Partners**	**Funders**
Maryland Ave Stormwater Retrofit	Maryland Ave	Green Street	Impervious surface removal, bioretention, pervious pavers for on-street parking, tree plantings, porous pavement on sidewalks	TN: 10.6 lbs/yr. TP: 10.9 lbs/yr. TSS: 2.9 tons/yr.	Cambridge DPW, UMD Sea Grant, ESLC, CMS	NFWF, DNR, CBT, MDOT
City Parking Lots	Chesapeake College, Stoked Eatery	Parking Lot Retrofits	Bioretentions, storm drain filters, tree plantings	n/a	Cambridge DPW, CMS	n/a
Long Wharf Greening	Long Wharf Marina	Parking lot and Street retrofits	Impervious surface removal, bioretentions, pervious pavers for on-street parking, pet waste station	n/a	Long Wharf Committee, Cambridge DPW	DNR
Storm Drain Stencils	City Storm Drains	Education	Messaging on storm drains	n/a	DCPG	n/a
Burger King Removal	Rt. 50 & Maryland Ave	Impervious Surface Removal	Demolished building and parking lot, and replaced with green space	n/a	Cambridge DPW	n/a
Street Tree Plantings	Corner of Race St. and Cedar St., other areas throughout City's Main Street District	Tree Planting	Increased tree coverage	n/a	CMS	n/a

Appendix D: Watershed Management Sections Broken Down

Section 1



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Public Land
CWP Outfalls
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SDInlets_CreekWatershed
SDGravity_CreekWatershed
Subsection 3
Subsection 4
Subsection 1
Subsection 2
OF1
OF2
OF3
1
2
3
4
N
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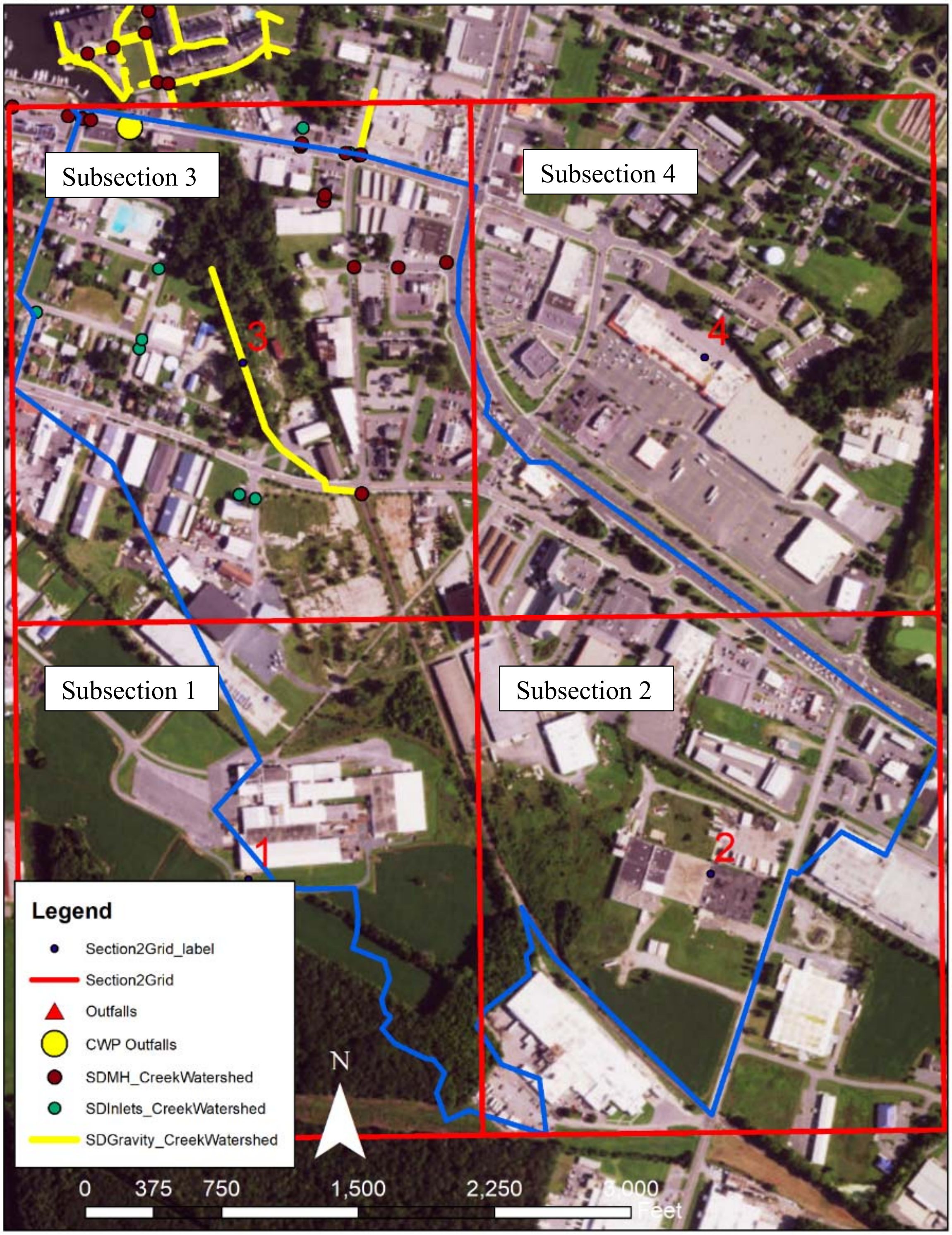
Feet

Section 2


Subsection 3
Subsection 4
Subsection 1
Subsection 2
3
4
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2
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Section2Grid
Outfalls
CWP Outfalls
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SDInlets_CreekWatershed
SDGravity_CreekWatershed
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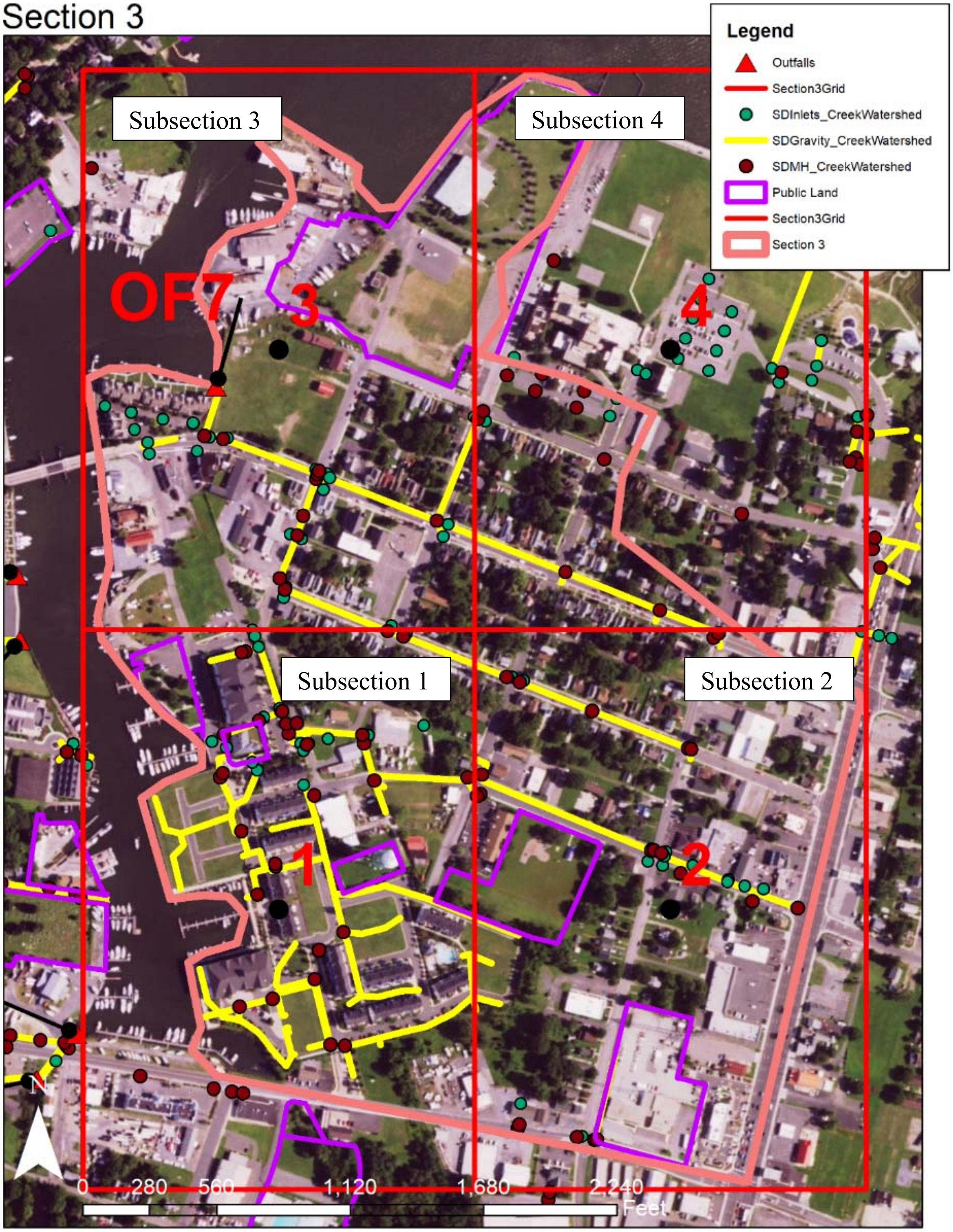
Feet

Section 3



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SDGravity_CreekWatershed
SDMH_CreekWatershed
Public Land
Section3Grid
Section 3
Subsection 3
Subsection 4
Subsection 1
Subsection 2
OF7
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4
1
2
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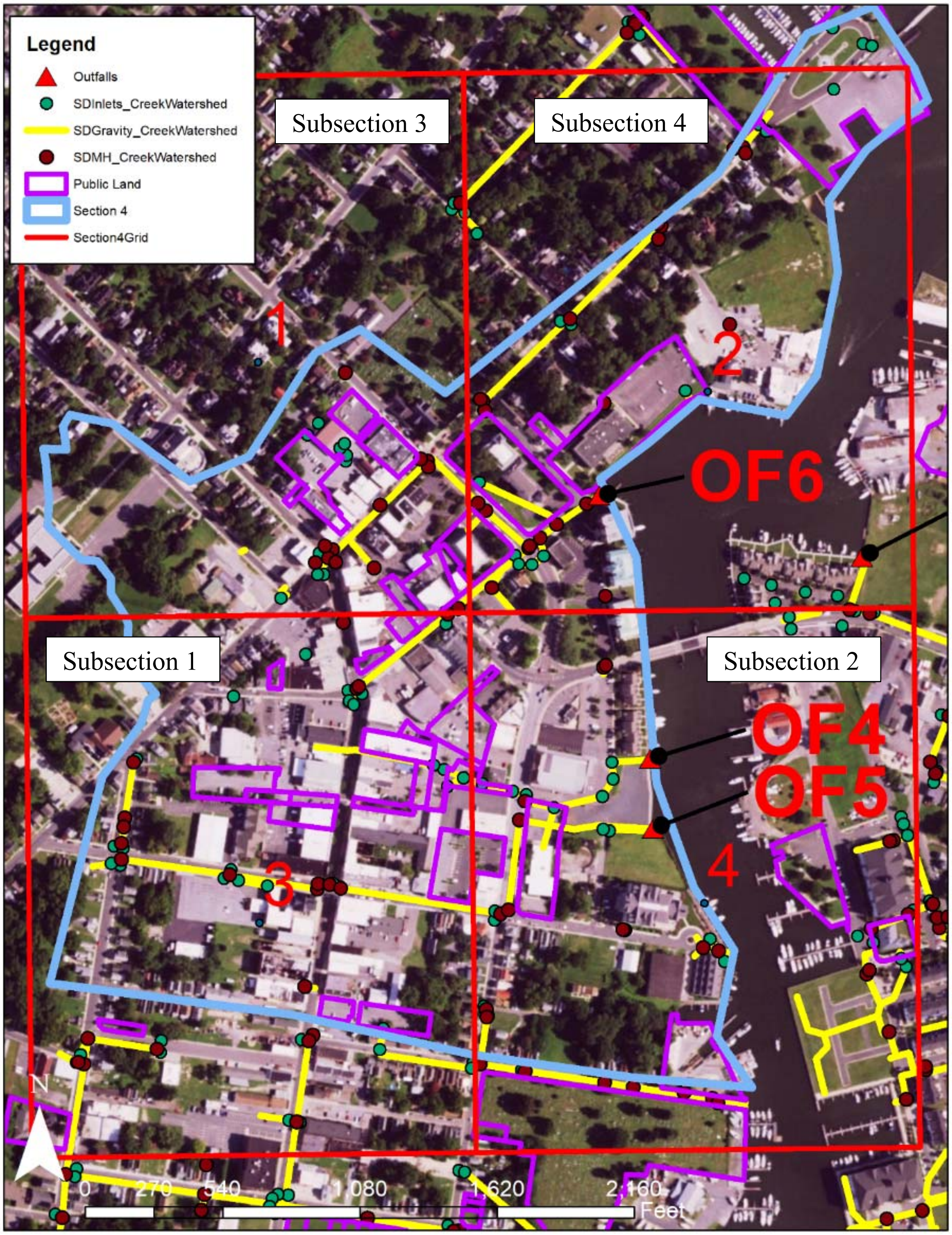
560
1,120
1,680
2,240
Feet

Section 4



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SDGravity_CreekWatershed
SDMH_CreekWatershed
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Section 4
Section4Grid
Subsection 3
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Subsection 1
Subsection 2
1
2
3
4
OF6
OF4
OF5
N
0
270
540
1,080
1,620
2,160
Feet

Appendix E: Funding Sources for Project Implementation

Funder	Grant Program	Grant Purpose	Last RFP Due Date	Grant Limit or Range	Notes
Chesapeake Bay Trust	Outreach & Restoration Grant	Supports outreach and community engagement activities that increase stewardship ethic of natural resources and on-the-ground restoration activities that demonstrate restoration techniques and engage Maryland citizens in the restoration and protection of the Chesapeake Bay and its rivers.	11-Sep-17	$5,001 – $75,000 depending on the track*	* Track 1: Outreach: $5,001 – $30,000 for projects focused on education and awareness as project outcomes $5,001 – $50,000 for behavior change projects. Track 2: Restoration: $5,001 – $50,000 for implementation projects Track 3: Outreach and Restoration: $5,001 – $75,000 for projects that combine restoration and outreach elements to measurably build knowledge within the community served.
Chesapeake Bay Trust	Green Streets, Green Jobs, Green Towns	Supports design projects, financing strategies, and/or implementation of green street projects. The goal is stormwater management retrofits such as constructing green streets, greening of urban vacant lots, and urban tree canopy projects	17-Mar-17	$20,000-$75,000 depending on the purpose*	* Up to $30,000 for design projects, up to $75,000 for implementation projects, up to $20,000 for white papers

Funder	Grant Program	Grant Purpose	Last RFP Due Date	Grant Limit or Range	Notes
Chesapeake Bay Trust & MD Dept of Natural Resources (administered by CBT)	Watershed Assistance Grant	Supports design assistance, watershed planning and programmatic development associated with protection and restoration programs and projects that lead to improved water quality in the Maryland portion of the Chesapeake Bay watershed	22-Sep-17	$5,001 – $75,000	
National Fish & Wildlife Foundation	Chesapeake Bay Stewardship Fund--Small Watershed Grant (SWG)	Supports community-based efforts to develop conservation strategies to protect and restore the diverse natural resources of the Chesapeake Bay and its watershed	9-May-17	$20,000 to $200,000	These grants require minimum non-federal matching contribution equal to one-third of the grant request. All 2017 SWG grants must be completed within two years of grant award.
National Fish & Wildlife Foundation	Chesapeake Bay Stewardship Fund--Innovative Nutrient & Sediment Reduction Grant (INSR)	Supports efforts within the Chesapeake Bay watershed to dramatically accelerate nutrient and sediment reductions by demonstrating innovative, sustainable, and cost-effective approaches.	9-May-17	$200,000 to $500,000	These grants encourage 1:1 non-federal matching contributions equal to the grant request. All 2017 INSR grants must be completed within three years of grant award.

Funder	Grant Program	Grant Purpose	Last RFP Due Date	Grant Limit or Range	Notes
National Fish & Wildlife Foundation	Technical Capacity Grants	Enhances the technical capacity of beneficiaries to implement more effective restoration through existing programs and/or future funding and project opportunities, including future INSR and SWG grant opportunities, through planning, prioritization, & design	12-Sep-17	NTE $50,000	Must be completed within 12 months following finalization of the grant agreement. There is no match requirement
Maryland Department of the Environment	319 Nonpoint Source Program	Provides financial assistance to local & state entities for the implementation of nonpoint source best management practices and program enhancements as a means of controlling the loads of pollutants entering the state's waterways	every summer		§319(h) Grant funds can pay for planning, design, construction, monitoring and analysis. However, the majority of §319(h) Grant funding in Maryland is intended for implementation of projects that will: reduce or eliminate water quality impairments listed in the Maryland's List of Impaired Water (303(d) List), particularly in watersheds where Total Maximum Daily Loads (TMDLs) have been approved; and result in quantifiable or measurable improvements in water quality and habitat, including, pollutant load reductions for impairments addressed in TMDLs or identified in the 303(d) List. A prerequisite for §319(h) funding of implementation projects (any project involving in-the-ground construction) is EPA acceptance of a watershed plan.

Funder	Grant Program	Grant Purpose	Last RFP Due Date	Grant Limit or Range	Notes
Maryland Department of Natural Resources	Program Open Space	Provides financial and technical assistance to local subdivisions for the planning, acquisition, and/or development of recreation land or open space areas.	annually by July 1		http://dnr.maryland.gov/land/Pages/ProgramOpenSpace
Maryland Department of Natural Resources	Maryland's Working Waterfronts Enhancement Grant	Provides financial and technical assistance to local governments to promote and assist with the preservation of existing and historic working waterfronts in Maryland. Local governments are welcome to apply for financial assistance to complete one-year projects focused on planning or implementation..	annually by June 30	$60,000 max	http://dnr.maryland.gov/ccs/Documents/wwf/WWF_RFP.pdf

Funder	Grant Program	Grant Purpose	Last RFP Due Date	Grant Limit or Range	Notes
Maryland Department of Natural Resources	CoastSmart Communities	Provides financial assistance to local governments to encourage the incorporation of coastal hazards, sea level rise, and/ or related coastal management issues into local long-term strategic planning, new or modified codes and ordinances, permitting processes, education and outreach campaigns, and other relevant programs. Funded by NOAA & EPA.	Grants run from Oct 1 through Sept 30. RFP released early Dec and due late February.		http://dnr.maryland.gov/ccs/coastsmart/Pages/grants.aspx
Maryland Department of Natural Resources	Chesapeake & Atlantic Coastal Bays Trust Fund	Funds the most cost-effective, efficient nonpoint nutrient and sediment reduction project proposals in geographic targeted areas of the State. The Trust Fund encourages multi-year, multi-partner projects that will achieve the greatest reduction per dollar invested.	Letter of Intent: January 20, 2017; Final Proposals: March 31, 2017	typically $100,000-$750,000	

Appendix F: Project Details

Project ID	Project Type	Public, Private or Both	Reduction in nutrients (lbs./year)			Number of Acres Treated	2011 Cost/Acre Treated			Total 2018 Price	Cost of Nutrients (lbs.) and Sediment (tons) Reduction			Cost Efficiency Ratio		
			Nitrogen	Phosph.	Sediment (tons/yr.)		Pre-Construction cost	Construction Cost	Total Cost		Nitrogen ($/lb.)	Phosph. ($/lb.)	Sediment ($/ton)	Nitrogen	Phosph.	Sediment
111	Bioretention	Both	6.82	0.86	0.28	0.8	$9,375	$37,500	$38,375	$41,638	$6,105	$48,416	$148,708	0.15	1.16	3.57
112	Wetland (Creation)	Private	19.44	3.29	1.29	4.0	$5,565	$18,550	$96,178	$104,356	$5,368	$31,719	$80,896	0.05	0.30	0.78
113	Bioswale with Bump Outs	Both	19.03	2.4	0.79	2.3	$12,000	$30,000	$95,937	$104,095	$5,470	$43,373	$131,765	0.05	0.42	1.27
114 A	Bioretention (Retrofit - Highly Urban)	Both	17.22	2.17	0.72	2.1	$52,500	$131,250	$379,649	$411,933	$23,922	$189,831	$572,129	0.06	0.46	1.39
114 B	Bioretention (Retrofit - Highly Urban)	Both	1.83	0.23	0.08	0.3	$8,750	$87,500	$28,725	$31,167	$17,031	$135,510	$389,592	0.55	4.35	12.50
115 A	Bioretention	Private	13.18	1.42	0.44	0.9	$9,375	$37,500	$44,303	$48,070	$3,647	$33,852	$109,251	0.08	0.70	2.27
115 B	Tree Planting	Private	2.49	0.31	0.1	0.3	$3,000	$30,000	$9,848	$10,686	$4,292	$34,471	$106,860	0.40	3.23	10.00
116 A	Tree Planting	Public	5.18	0.65	0.22	0.6	$3,000	$30,000	$20,508	$22,251	$4,296	$34,233	$101,143	0.19	1.54	4.55
116 B	Green Space (Urban Forest Buffer)	Public	13.96	1.76	0.58	1.7	$3,000	$30,000	$55,275	$59,975	$4,296	$34,077	$103,406	0.07	0.57	1.72
117	Bioretention	Private	23.4	2.95	0.98	2.8	$9,375	$37,500	$131,661	$142,857	$6,105	$48,426	$145,772	0.04	0.34	1.02
121	Bioretention	Private	21.65	2.73	0.9	2.6	$9,375	$37,500	$121,815	$132,173	$6,105	$48,415	$146,859	0.05	0.37	1.11
122	Bioswale	Both	47.82	6.02	1.99	5.7	$12,000	$30,000	$241,047	$261,544	$5,469	$43,446	$131,429	0.02	0.17	0.50
123 A	Wetland (Creation)	Private	179.02	30.27	11.9	36.7	$5,565	$18,550	$885,767	$961,089	$5,369	$31,751	$80,764	0.01	0.03	0.08
123 B	Tree Planting (Urban Forest Buffer)	Private	1.85	0.23	0.08	0.2	$3,000	$30,000	$7,330	$7,953	$4,299	$34,577	$99,410	0.54	4.35	12.50
124	Bioretention	Public	56.43	7.1	2.35	6.8	$9,375	$37,500	$317,450	$344,445	$6,104	$48,513	$146,572	0.02	0.14	0.43
125 A	Impervious Surface Reduction and Urban Forest Buffer	Private	94.04	11.84	3.92	11.3	$11,750	$117,500	$1,458,774	$1,582,823	$16,831	$133,684	$403,781	0.01	0.08	0.26
125 B	Wetland (Retrofit)	Private	153.51	25.96	10.21	31.5	$21,333	$42,665	$2,015,731	$2,187,141	$14,248	$84,250	$214,216	0.01	0.04	0.10
126 A	Tree Planting (Urban Forest Buffer)	Private	84.59	10.56	3.53	10.2	$3,000	$30,000	$335,039	$363,530	$4,298	$34,425	$102,983	0.01	0.09	0.28
126 B	Wetland (Retrofit)	Private	64.46	10.9	4.29	13.2	$21,333	$42,665	$846,438	$918,416	$14,248	$84,258	$214,083	0.02	0.09	0.23
127 A	Tree Planting	Private	68.14	8.58	2.84	8.2	$3,000	$30,000	$269,871	$292,820	$4,297	$34,128	$103,106	0.01	0.12	0.35
127 B	Bioretention	Private	63.36	7.98	2.64	7.6	$9,375	$37,500	$356,462	$386,774	$6,104	$48,468	$146,505	0.02	0.13	0.38
127 C	Green Roof	Private	16.02	2.02	0.67	1.9	$5	$15	$1,675,520	$1,818,000	$113,483	$900,000	$2,713,432	0.06	0.50	1.49
131 A	Green Street	Public	38.38	4.83	1.6	4.6	$37,400	$187,000	$1,033,652	$1,051,075	$27,386	$217,614	$656,922	0.03	0.21	0.63
131 B	Bioretention	Both	12.59	1.59	0.52	1.5	$9,375	$37,500	$70,847	$76,872	$6,106	$48,347	$147,831	0.08	0.63	1.92
1310	Bioretention	Public	19.4	2.44	0.81	2.3	$9,375	$37,500	$109,151	$118,433	$6,105	$48,538	$146,214	0.05	0.41	1.23
1311 A	Bioretention	Public	25.95	3.27	1.08	3.1	$9,375	$37,500	$145,990	$158,405	$6,104	$48,442	$146,671	0.04	0.31	0.93
1311 B	Tree Planting (Urban Forest Buffer)	Public	8.58	1.08	0.36	1.0	$3,000	$30,000	$33,963	$36,851	$4,295	$34,121	$102,364	0.12	0.93	2.78
1312	Bioretention and Tree Planting (Urban Forest Buffer)	Private	9.76	1.23	0.41	1.2	$12,375	$67,500	$93,518	$101,470	$10,397	$82,496	$247,488	0.10	0.81	2.44
1313	Bioretention and Tree Planting	Both	4.74	0.6	0.2	0.6	$12,375	$67,500	$45,475	$49,342	$10,410	$82,237	$246,711	0.21	1.67	5.00
132	Downspout Disconnection, Bioretention	Public	4.96	0.62	0.21	0.6	$9,375	$37,500	$27,882	$30,253	$6,099	$48,795	$144,061	0.20	1.61	4.76
133	Green Space (Urban Forest Buffer)	Private	1.27	0.16	0.05	0.2	$3,000	$30,000	$5,032	$5,460	$4,299	$34,123	$109,194	0.79	6.25	20.00
134	Green Space (Urban Forest Buffer)	Private	9.25	1.16	0.39	1.1	$3,000	$30,000	$36,633	$39,748	$4,297	$34,265	$101,917	0.11	0.86	2.56
135	Downspout Disconnection and Bioretention	Private	7.42	0.93	0.31	0.9	$9,375	$37,500	$41,768	$45,320	$6,108	$48,731	$146,192	0.13	1.08	3.23

Project ID	Project Type	Public, Private or Both	Reduction in nutrients (lbs./year) Nitrogen	Phosph.	Sediment (tons/yr.)	Number of Acres Treated	2011 Cost/Acre Treated Pre-Construction cost	Construction Cost	Total Cost	Total 2018 Price	Cost of Nutrients (lbs.) and Sediment (tons) Reduction Nitrogen ($/lb.)	Phosph. ($/lb.)	Sediment ($/ton)	Cost Efficiency Ratio Nitrogen	Phosph.	Sediment
136	Bioretention	Private	2.22	0.28	0.09	0.0	$9,375	$37,500	$1,173	$1,273	$573	$4,545	$14,141	0.45	3.57	11.11
137 A	Bioretention (Retrofit - Highly Urban)	Private	19.84	2.5	0.83	2.4	$52,500	$131,250	$437,625	$474,839	$23,933	$189,936	$572,095	0.05	0.40	1.20
137 B	Tree Planting	Private	4.81	0.61	0.2	0.6	$3,000	$30,000	$19,063	$20,684	$4,300	$33,908	$103,420	0.21	1.64	5.00
138 A	Green Roof	Private	2.56	0.32	0.11	0.3	$5	$15	$267,400	$290,139	$113,335	$906,683	$2,637,624	0.39	3.13	9.09
138 B	Bioretention	Private	11.3	1.42	0.47	1.4	$9,375	$37,500	$63,555	$68,959	$6,103	$48,563	$146,721	0.09	0.70	2.13
139 A	Bioretention (Retrofit - Highly Urban)	Public	4.33	0.55	0.18	0.5	$52,500	$131,250	$95,553	$103,679	$23,944	$188,507	$575,994	0.23	1.82	5.56
139 B	Tree Planting	Public	13.83	1.74	0.58	1.7	$3,000	$30,000	$54,787	$59,446	$4,298	$34,164	$102,493	0.07	0.57	1.72
141	Bioretention	Private	19.48	2.45	0.81	2.3	$9,375	$37,500	$109,612	$118,933	$6,105	$48,544	$146,830	0.05	0.41	1.23
142 A	Downspout Disconnection	Private	3.9	0.49	0.16	0.5	$0	$3,000	$1,405	$1,525	$391	$3,112	$9,530	0.26	2.04	6.25
142 B	Rain Garden/Bioretention	Private	18.78	2.36	0.78	2.3	$9,375	$37,500	$105,643	$114,627	$6,104	$48,571	$146,957	0.05	0.42	1.28
142 C	Tree Planting (Urban Forest Buffer)	Private	39.25	4.94	1.64	4.7	$3,000	$30,000	$155,439	$168,657	$4,297	$34,141	$102,840	0.03	0.20	0.61
221 A	Green Roof	Private	6.28	0.79	0.26	0.8	$5	$15	$656,860	$712,717	$113,490	$902,173	$2,741,218	0.16	1.27	3.85
221 B	Bioretention (Retrofit - Highly Urban)	Private	18.17	2.29	0.76	2.2	$52,500	$131,250	$400,740	$434,818	$23,931	$189,877	$572,129	0.06	0.44	1.32
221 C	Wetlands (Creation)	Private	24.91	4.21	1.66	0.5	$5,565	$18,550	$12,525	$13,590	$546	$3,228	$8,187	0.04	0.24	0.60
222	Vegetated Open Channels	Private	24.44	3.45	1.14	3.3	$4,000	$20,000	$79,046	$85,767	$3,509	$24,860	$75,235	0.04	0.29	0.88
223	Green Space (Urban Forest Buffer)	Private	33.82	4.26	1.41	4.1	$3,000	$30,000	$133,955	$145,346	$4,298	$34,119	$103,082	0.03	0.23	0.71
224	Bioswale	Private	49.52	6.23	2.06	5.9	$12,000	$30,000	$249,628	$270,855	$5,470	$43,476	$131,483	0.02	0.16	0.49
231	Bioretention and Bioswale	Both	87.85	11.06	3.66	10.5	$9,375	$37,500	$494,250	$536,279	$6,104	$48,488	$146,524	0.01	0.09	0.27
2310	Rain Garden/Bioretention	Private	6.66	0.84	0.28	0.8	$9,375	$37,500	$37,448	$40,633	$6,101	$48,372	$145,117	0.15	1.19	3.57
232	Tree Planting	Private	0.92	0.12	0.04	0.1	$3,000	$30,000	$3,652	$3,962	$4,307	$33,017	$99,051	1.09	8.33	25.00
233	Vegetated Open Channels	Private	8.19	1.03	0.34	1.0	$4,000	$20,000	$23,583	$25,588	$3,124	$24,843	$75,260	0.12	0.97	2.94
234	Vegetated Open Channels	Private	26.48	3.33	1.1	3.2	$4,000	$20,000	$76,288	$82,775	$3,126	$24,857	$75,250	0.04	0.30	0.91
235	Downspout Disconnection/Rain Barrels	Private	3.99	0.49	0	0.4	$0	$750	$750	$750	$188	$1,531	0	0.25	2.04	0.00
236	Tree Planting	Private	1.88	0.24	0.08	0.2	$3,000	$30,000	$7,430	$8,062	$4,288	$33,592	$100,777	0.53	4.17	12.50
237	Impervious Surface Removal and Tree Planting	Private	3.63	0.46	0.15	0.4	$11,750	$117,500	$56,376	$61,170	$16,851	$132,979	$407,802	0.28	2.17	6.67
238 A	Impervious Surface Removal and Urban Forest Buffer	Private	245.04	30.55	10.21	29.4	$11,750	$117,500	$3,801,223	$4,124,464	$16,832	$135,007	$403,963	0.00	0.03	0.10
238 B	Wetland (Creation)	Private	31.1	5.26	2.07	6.4	$5,565	$18,550	$153,902	$166,989	$5,369	$31,747	$80,671	0.03	0.19	0.48
239	Wetland (Retrofit)	Public	15.9	2.69	1.06	3.3	$21,333	$42,665	$208,813	$226,570	$14,250	$84,227	$213,745	0.06	0.37	0.94
241	Bioretention	Public	42.67	5.37	1.78	0.5	$9,375	$37,500	$23,732	$25,750	$603	$4,795	$14,467	0.02	0.19	0.56
311	Bioretention	Both	17.17	1.83	0.58	2.0	$9,375	$37,500	$95,749	$103,892	$6,051	$56,771	$179,123	0.06	0.55	1.72
312	Bioretention w. Downspout disconnection	Private	7.67	1	0.33	0.9	$9,375	$37,500	$40,569	$44,019	$5,739	$44,019	$133,391	0.13	1.00	3.03
313	Bioswale w. Downspout disconnection	Private	3.99	0.49	0.16	0.4	$12,000	$30,000	$18,320	$19,877	$4,982	$40,566	$124,234	0.25	2.04	6.25
314	Low Impact Development	Private	11.44	1.32	0.42	2.2	$9,375	$37,500	$105,458	$114,426	$10,002	$86,686	$272,442	0.09	0.76	2.38
315	Bioswale	Private	9.49	1.18	39	1.1	$12,000	$30,000	$48,209	$52,309	$5,512	$44,330	$1,341	0.11	0.85	0.03
316	Bioretention w. Downspout disconnection	Private	8.9	1.07	0.35	1.1	$9,375	$37,500	$51,653	$56,045	$6,297	$52,379	$160,129	0.11	0.93	2.86
317	Bioretention (Retrofit - Highly Urban)	Private	6.85	0.86	0.29	0.7	$52,500	$131,250	$134,986	$146,465	$21,382	$170,308	$505,051	0.15	1.16	3.45
318	Bioswale w. Downspout disconnection	Private	1.99	0.25	0.08	0.2	$12,000	$30,000	$10,028	$10,880	$5,467	$43,521	$136,003	0.50	4.00	12.50

Project ID	Project Type	Public, Private or Both	Reduction in nutrients (lbs./year)			Number of Acres Treated	2011 Cost/Acre Treated			Total 2018 Price	Cost of Nutrients (lbs.) and Sediment (tons) Reduction			Cost Efficiency Ratio		
			Nitrogen	Phosph.	Sediment (tons/yr.)		Pre-Construction cost	Construction Cost	Total Cost		Nitrogen ($/lb.)	Phosph. ($/lb.)	Sediment ($/ton)	Nitrogen	Phosph.	Sediment
321 A	Bioretention	Public	22.23	2.8	0.93	2.4	$9,375	$37,500	$111,752	$121,255	$5,455	$43,305	$130,382	0.04	0.36	1.08
321 B	Bioswale	Public	7.75	0.98	0.32	0.9	$12,000	$30,000	$39,050	$42,370	$5,467	$43,235	$132,407	0.13	1.02	3.13
321 C	Green Roof	Public	3.08	0.39	0.13	0.3	$5	$15	$262,260	$284,562	$92,390	$729,645	$2,188,935	0.32	2.56	7.69
321 D	Tree Planting	Public	12.32	1.55	0.51	1.5	$3,000	$30,000	$48,570	$52,701	$4,278	$34,000	$103,335	0.08	0.65	1.96
322	Tree Planting	Public	7.26	0.5	0.13	1.1	$3,000	$30,000	$37,879	$41,100	$5,661	$82,200	$316,153	0.14	2.00	7.69
323	Downspout Disconnection	Private	1.66	0.21	0	0.2	$0	$3,000	$3,000	$3,000	$1,807	$14,286	0	0.60	4.76	0.00
324	Green Street	Public	43.94	5.53	2.44	5.3	$37,400	$187,000	$1,183,159	$1,203,102	$27,381	$217,559	$493,075	0.02	0.18	0.41
325	Vegetated Open Channels	Public	15.02	1.89	0.63	1.8	$4,000	$20,000	$43,266	$46,945	$3,125	$24,838	$74,515	0.07	0.53	1.59
326	Green Street	Public	172.7	21.74	7.2	20.7	$37,400	$187,000	$4,651,231	$4,729,632	$27,386	$217,554	$656,893	0.01	0.05	0.14
331 A	Bioretention	Public	39.38	4.96	1.64	4.7	$9,375	$37,500	$221,550	$240,390	$6,104	$48,466	$146,579	0.03	0.20	0.61
331 B	Parking Lot Restoration and Tree Planting	Public	36.71	4.62	1.53	4.4	$33,492	$334,920	$1,623,034	$1,761,050	$47,972	$381,180	$1,151,013	0.03	0.22	0.65
332 A	Wetland (Creation)	Private	212.36	35.91	14.12	43.6	$5,565	$18,550	$1,050,726	$1,140,075	$5,369	$31,748	$80,742	0.00	0.03	0.07
332 B	Tree Planting (Urban Forest Buffer)	Private	17.6	2.22	0.73	2.1	$3,000	$30,000	$69,697	$75,624	$4,297	$34,065	$103,594	0.06	0.45	1.37
333	Downspout Disconnection/Rain Barrels	Private	4.82	0.59	0	0.4	$0	$8,400	$3,571	$8,400	$1,743	$14,237	0	0.21	1.69	0.00
341	Tree Planting	Public	13.95	1.76	0.58	1.7	$3,000	$30,000	$55,270	$59,970	$4,299	$34,074	$103,396	0.07	0.57	1.72
342	Tree Planting	Private	2	0.25	0.08	0.2	$3,000	$30,000	$7,931	$8,605	$4,303	$34,422	$107,569	0.50	4.00	12.50
411 A	Bioretention (Retrofit - Highly Urban)	Public	9.66	1.27	0.4	1.2	$52,500	$131,250	$212,953	$231,062	$23,919	$181,939	$577,655	0.10	0.79	2.50
411 B	Impervious Surface Reduction and Urban Forest Buffer	Public	9.66	1.22	0.4	1.2	$11,750	$117,500	$149,792	$162,529	$16,825	$133,221	$406,324	0.10	0.82	2.50
412	Green Roof	Public	2.18	0.27	0.09	0.3	$5	$15	$228,100	$247,497	$113,531	$916,654	$2,749,963	0.46	3.70	11.11
413	Bioretention	Public	1.29	0.16	0.05	0.2	$9,375	$37,500	$7,285	$7,905	$6,128	$49,404	$158,094	0.78	6.25	20.00
414	Bioretention (Retrofit - Highly Urban)	Public	74.1	7.97	2.46	5.3	$52,500	$131,250	$976,385	$1,059,413	$14,297	$132,925	$430,656	0.01	0.13	0.41
421	Green Street	Public	43.21	5.44	1.8	5.2	$37,400	$187,000	$1,163,727	$1,183,343	$27,386	$217,526	$657,413	0.02	0.18	0.56
422	Bioretention	Public	12.13	1.53	0.51	1.5	$9,375	$37,500	$68,236	$74,038	$6,104	$48,391	$145,173	0.08	0.65	1.96
423	Bioretention	Public	47.82	6.02	1.99	5.7	$9,375	$37,500	$269,025	$291,902	$6,104	$48,489	$146,685	0.02	0.17	0.50
424	Bioretention	Public	18.05	2.27	0.75	2.2	$9,375	$37,500	$101,552	$110,187	$6,105	$48,541	$146,916	0.06	0.44	1.33
425	Urban Forest and Grass Buffer	Private	39.89	5.02	1.66	4.8	$5,150	$51,500	$271,194	$294,256	$7,377	$58,617	$177,262	0.03	0.20	0.60
431	Urban Forest and Grass Buffer	Public	0.44	0.06	0.02	0.1	$5,150	$51,500	$2,998	$3,253	$7,392	$54,210	$162,629	2.27	16.67	50.00
432	Parking Lot Restoration and Tree Planting	Public	15.89	2	0.66	1.9	$33,492	$334,920	$702,605	$762,351	$47,977	$381,176	$1,155,078	0.06	0.50	1.52
433	Tree Planting	Public	7.39	0.93	0.31	0.9	$3,000	$30,000	$29,272	$31,761	$4,298	$34,152	$102,455	0.14	1.08	3.23
434	Bioretention	Private	5.87	0.74	0.24	0.7	$9,375	$37,500	$33,036	$35,846	$6,107	$48,440	$149,357	0.17	1.35	4.17
435	Green Roof	Public	1.16	0.15	0.05	0.1	$5	$15	$841	$912	$787	$6,083	$18,250	0.86	6.67	20.00
436 A	Impervious Surface Reduction	Public	1.23	0.15	0.05	0.1	$8,750	$87,500	$14,159	$15,363	$12,490	$102,421	$307,262	0.81	6.67	20.00
436 B	Tree Planting	Public	2.11	0.27	0.09	0.3	$3,000	$30,000	$8,360	$9,071	$4,299	$33,595	$100,786	0.47	3.70	11.11
437 A	Bioretention (Retrofit - Highly Urban)	Public	3.49	0.44	0.15	0.4	$52,500	$131,250	$76,858	$83,393	$23,895	$189,531	$555,956	0.29	2.27	6.67
437 B	Tree Planting	Public	0.57	0.07	0.02	0.1	$3,000	$30,000	$2,250	$2,441	$4,283	$34,876	$122,067	1.75	14.29	50.00
441	Wetland (Retrofit)	Private	163.78	27.69	10.89	33.6	$21,333	$42,665	$2,150,612	$2,333,491	$14,248	$84,272	$214,278	0.01	0.04	0.09
442	Green Street	Public	71.57	9.01	2.98	8.6	$37,400	$187,000	$1,927,615	$1,960,106	$27,387	$217,548	$657,754	0.01	0.11	0.34
443	Bioretention	Both	58.95	7.42	2.46	7.1	$9,375	$37,500	$331,638	$359,840	$6,104	$48,496	$146,276	0.02	0.13	0.41
444	Bioretention	Private	2.22	0.28	0.09	0.3	$9,375	$37,500	$12,504	$13,568	$6,112	$48,456	$150,751	0.45	3.57	11.11

Notes:

- Using Nitrogen as a key indicator, the nitrogen ratios are ranked with colors using this scale: 90% more effective than other projects, 50-89% more effective than other projects, 1-49% more effective than other projects, <1% more effective than other projects.
- When calculating the cost for a *green roof* the total construction cost is per square foot and not per acre.
- When calculating the cost for a *green street* the pre-construction and construction rates were determined from the average of several projects implemented in 2015, therefore a 4.4% increase in prices was used in the calculations to determine the 2018 rates. The 4.4% increase was determined by calculating the percent difference in the RSMean Index between 2015 and 2018.
- A parking lot restoration project is considered to be the installation of porous pavers with a sand filter.
- Downspout disconnection with a rain barrel installation is calculated using the cost of $150/installation. ($100 for the barrel, $20 for downspout material, $10-$30 for labor.)

Appendix G: Projects Descriptions

Project 111

Project Type	Bioretentions
Latitude	38.558477
Longitude	-76.077111
Land Ownership (Parcel No.)	Private (3681, 3887) and Public Road
Estimated Size	0.04 acres
Area Treated	35,661 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,105/lb., 6.82 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,416/lb., 0.86 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$148,708/ton, 0.28 tons/yr.
Cost	$41,638
CWAC Goal	Stormwater Facility

Description

This residential area has roadside ditches that help move stormwater off the road and away from the residences. Converting the ditches into bioretentions would help infiltrate water to reduce peak storm flow as well as reduce nutrient and sediment loading. In addition the ditches are currently in poor shape and may not be effective at moving stormwater, thus a retrofit to bioretentions could be beneficial to the community.


STOP

Project 112

Project Type	Wetland Creation
Latitude	38.557954
Longitude	-76.076815
Land Ownership	Private
Estimated Size	0.018 acres
Area Treated	173,730 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,368/lb., 19.44 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$31,719/lb., 3.29 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$80,896/ton, 1.29 tons/yr.
Cost	$104,356
CWAC Goal	Stormwater Facility

Description

Gemcraft homes development is still under construction and provides a unique opportunity to install runoff reduction and stormwater best management practices without having to remove a lot of existing infrastructure. At the entrance of the development is a gravel wetland that could be retrofitted into a much more aesthetically pleasing and environmentally useful wetland. Stormwater runoff could be routed from the existing road and future houses to this wetland. In comparison to other potential best management practices, wetlands provide better habitat.

Project 113

Project Type	Bioswale with Bump Outs
Latitude	38.558067
Longitude	-76.076052
Land Ownership (Parcel No.)	Private (3680, 3679, 3678, 3677, 3676, 3675), Public Road
Estimated Size	0.046 acres
Area Treated	99,500 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,470/lb., 19.03 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$43,373lb, 2.40 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$131,765/ton, 0.79 tons/yr.
Cost	$104,095
CWAC Goal	Stormwater Facility

Description

This section of Shepard Ave. is ditch drained and is wide. This provides an excellent opportunity to install a bioswale with small treatment bump out cells. The impact on parking would be minimal and the bioswale will provide treatment to runoff from the street and local residences. A bioswale was chosen for this location because of the need to move water away from the houses due to the lack of curbs and storm drains along the road.


Shepherd

Project 114 A

Project Type	Bioretention
Latitude	38.559466
Longitude	-76.080387
Land Ownership (Parcel No.)	Private (2803), Public Road
Estimated Size	0.066 acres
Area Treated	90,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$23,922/lb., 17.22 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$189,831/lb., 2.17 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$572,129/ton, 0.72 tons/yr.
Cost	$411,933
CWAC Goal	Impervious, Stormwater Facility

Description

This no longer functioning gas station is a unique opportunity to not only remediate a potentially hazardous installation, but also reduce impervious surface and beautify the community. The basic premise of the project is to have bioretentions along the road and parking areas to intercept runoff from the paved surfaces, while removing the existing infrastructure and putting in a green space that could be planted out or changed into a local community garden.

Project 114 B

Project Type	Depave
Latitude	38.559466
Longitude	-76.080387
Land Ownership (Parcel No.)	Private (2803), Public Road
Estimated Size	0.072 acres
Area Treated	13,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$17,031/lb., 1.83 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$135,510/lb., 0.23 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$389,592/ton, 0.08 tons/yr.
Cost	$31,167
CWAC Goal	Impervious, Storm-water Facility

Description

This no longer functioning gas station is a unique opportunity to not only remediate a potentially hazardous installation, but also reduce impervious surface and beautify the community. The basic premise of the project is to have bioretentions along the road and parking areas to intercept runoff from the paved surfaces, while removing the existing infrastructure and putting in a green space that could be planted out or changed into a local community garden.

Project 115 A

Project Type	Bioretention
Latitude	38.561003
Longitude	-76.08014
Land Ownership (Parcel No.)	Private (2810)
Estimated Size	0.022 acres
Area Treated	41,170 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$3,647/lb., 13.18 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$33,852/lb., 1.42 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$109,251/ton, 0.44 tons/yr.
Cost	$48,070
CWAC Goal	Stormwater Facility

Description

This project site is at the corner of Central Ave. and Boundary Ave. At present the site is a vacant green space. A small bioretention could be installed along the roads to intercept runoff before it gets to the sewer inlet at the intersection. Also, there is enough room to plant trees along the road sides to provide shade, intercept rainfall, and help beautify the area.

Project 115 B

Project Type	Tree Planting
Latitude	38.561003
Longitude	-76.08014
Land Ownership (Parcel No.)	Private (2810)
Estimated Size	0.072 acres
Area Treated	13,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,292/lb., 2.49 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,471/lb., 0.31 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$106,860/ton, 0.10 tons/yr.
Cost	$10.686
CWAC Goal	Urban Trees

Description

This project site is at the corner of Central Ave. and Boundary Ave. At present the site is a vacant green space. A small bioretention could be installed along the roads to intercept runoff before it gets to the sewer inlet at the intersection. Also, there is enough room to plant trees along the road sides to provide shade, intercept rainfall, and help beautify the area.


Central Ave
Boundary Ave
Central Ave
Boundary Ave
Boundary Ave

Project 116 A

Project Type	Tree Planting
Latitude	38.559831
Longitude	-76.081612
Land Ownership (Parcel No.)	Public (3091)
Estimated Size	0.62 acres
Area Treated	27,070 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,296/lb., 5.18 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,233/lb., 0.65 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$101,143/ton, 0.22 tons/yr.
Cost	$22,251
CWAC Goal	Urban Trees

Description

The public housing on Pine St. has the potential for numerous residential best management practices that could substantially reduce stormwater. Throughout the green spaces tree plantings with restoration landscaping could help infiltrate water, be aesthetically pleasing, and provide wildlife habitat. All of the gutter and downspout systems are directly connected into the stormwater system moving large volumes of runoff directly into the system without treatment. Disconnecting the downspouts and allowing them to discharge into rain gardens will allow for infiltration of the stormwater, reducing runoff volume and also create the opportunity to plant native flowering plant species.

Project 116 B

Project Type	Green Space/Rain Gardens
Latitude	38.559858
Longitude	-76.081612
Land Ownership (Parcel No.)	Public (3091)
Estimated Size	1.675 acres
Area Treated	72,963 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,296/lb., 13.96 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,077/lb., 1.76 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$103,406/ton, 0.58 tons/yr.
Cost	$59,975
CWAC Goal	Rain Barrels

Description

The public housing on Pine St. has the potential for numerous residential best management practices that could substantially reduce stormwater. Throughout the green spaces tree plantings with restoration landscaping could help infiltrate water, be aesthetically pleasing, and provide wildlife habitat. All of the gutter and downspout systems are directly connected into the stormwater system moving large volumes of runoff directly into the system without treatment. Disconnecting the downspouts and allowing them to discharge into rain gardens will allow for infiltration of the stormwater, reducing runoff volume and also create the opportunity to plant native flowering plant species.


Phillips St
Phillips St
North Dr
North Dr
North Dr
Pine St
Pine St
Pine St
Bradley Ave
Bradley Ave
Bayly Rd
Bayly Rd

Project 117

Project Type	Bioretention
Latitude	38.560061
Longitude	-76.077951
Land Ownership (Parcel No.)	Private (3741, 3742, 3743, 3744)
Estimated Size	0.043 acres
Area Treated	122,350 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,105/lb., 23.40 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,426/lb., 2.95 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$145,772/tons, 0.98 tons/yr.
Cost	$142,857
CWAC Goal	Stormwater Facility

Description

Between the row of homes on Boundary Ave. and Bayly Ave. is a small swale and green space that conveys water to the stormwater sewer system. This area can be retrofitted to a bioretention facility that is able to infiltrate stormwater to reduce the amount reaching the stormwater sewer system. The existing stormwater sewer system could be used for overflow or be connected to the bioretention via an underdrain system.

Project 121

Project Type	Bioretention
Latitude	38.560090
Longitude	-76.074969
Land Ownership (Parcel No.)	Private (3753)
Estimated Size	0.013 acres
Area Treated	113,200 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,105/lb., 21.65 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,415/lb., 2.73 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,859/ton, 0.90 tons/yr.
Cost	$132,173
CWAC Goal	Stormwater Facility

Description

At the corner of Boundary Ave. and Stone Boundary Rd. is a depression that collects water from the roadway and the substation. The green area could be converted into a bioretention that intercepts the road and substation runoff before entering the stormwater sewer system. A vertically integrated (deeper than normal) bioretention that allows for storage could enhance the volume of water that could be infiltrated and stored in such a small location.

Project 122

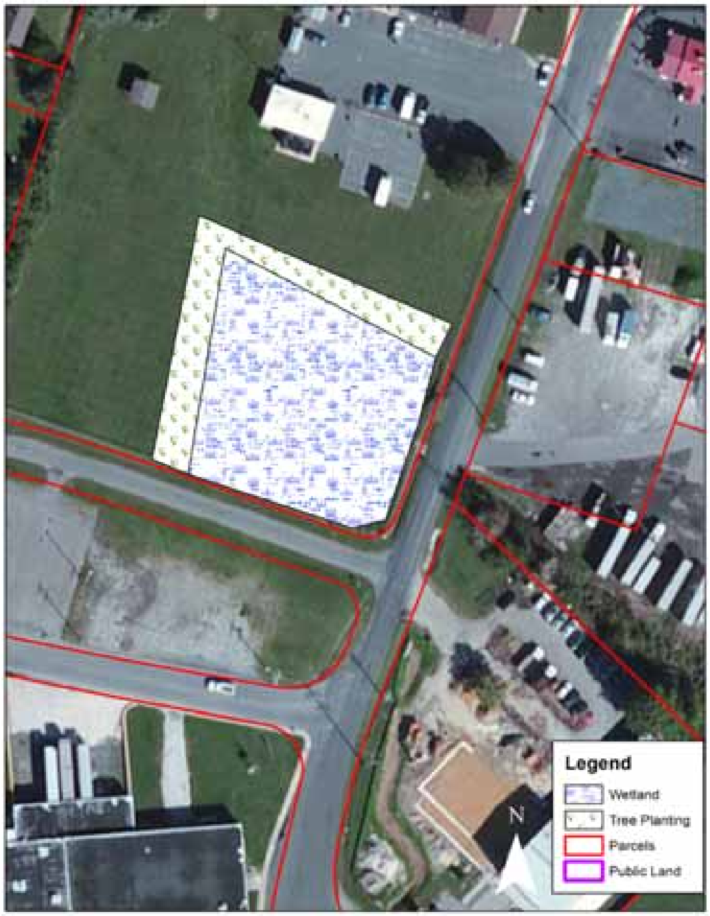
Project Type	Bioswale
Latitude	38.560543
Longitude	-76.074066
Land Ownership (Parcel No.)	Public Road, Private (3925, 3781)
Estimated Size	0.33 acres
Area Treated	250,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,469/lb., 47.82 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$43,446/lb., 6.02 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$131,429/ton, 1.99 tons/yr.
Cost	$261,544
CWAC Goal	Stormwater Facility

Description

The road side ditches along Boundary Ave., Goodwill Ave., and Phillips Ave. have the potential to be retrofitted into bioswales to convey and treat stormwater. There is also a small ditch that goes along the houses that could be converted into a bioswale. At present the ditches are in poor shape and are only grassed. The ditch adjacent to the houses is overgrown.




Project 123 A

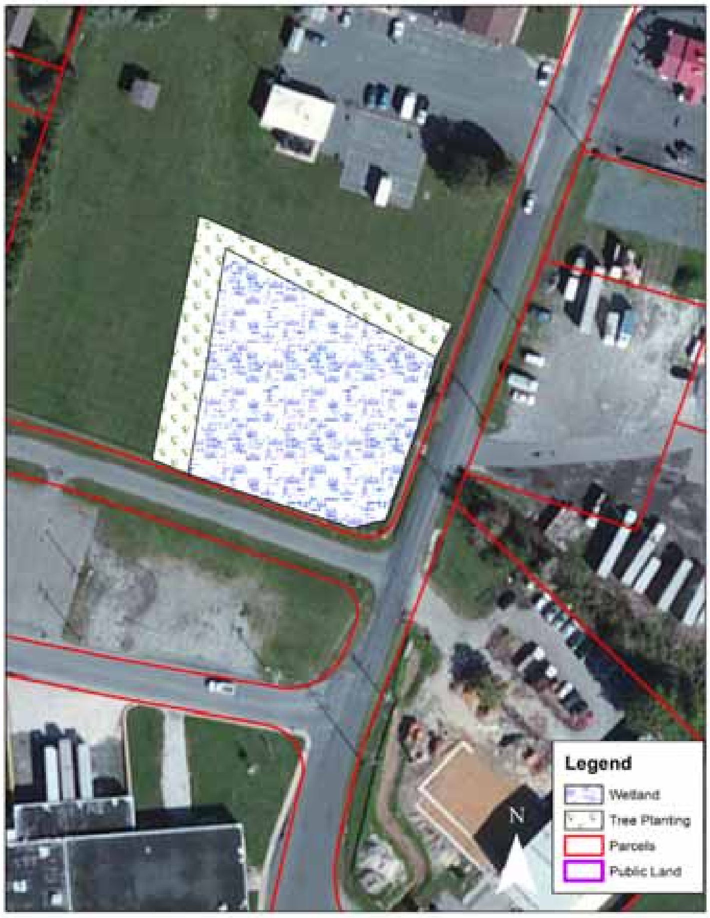


Project Type	Wetland Creation
Latitude	38.560682
Longitude	-76.073573
Land Ownership (Parcel No.)	Private (3925)
Estimated Size	0.65 acres
Area Treated	1,600,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,369/lb., 179.02 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$31,751/lb., 30.27 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$80,764/ton, 11.90 tons/yr.
Cost	$961,089
CWAC Goal	Stormwater Facility

Description

This proposed wetland creation would daylight two existing stormwater pipes that convey water directly into Peachblossom Creek. The wetland would create habitat and also treat large volumes of water that, under current conditions, are headed directly to Cambridge Creek. The wetland would also reduce peak storm flows, reducing the potential for property damage by reducing flood impacts. This project, if implemented, would be one of the keystone projects to restoring Cambridge Creek.

Project 123 B

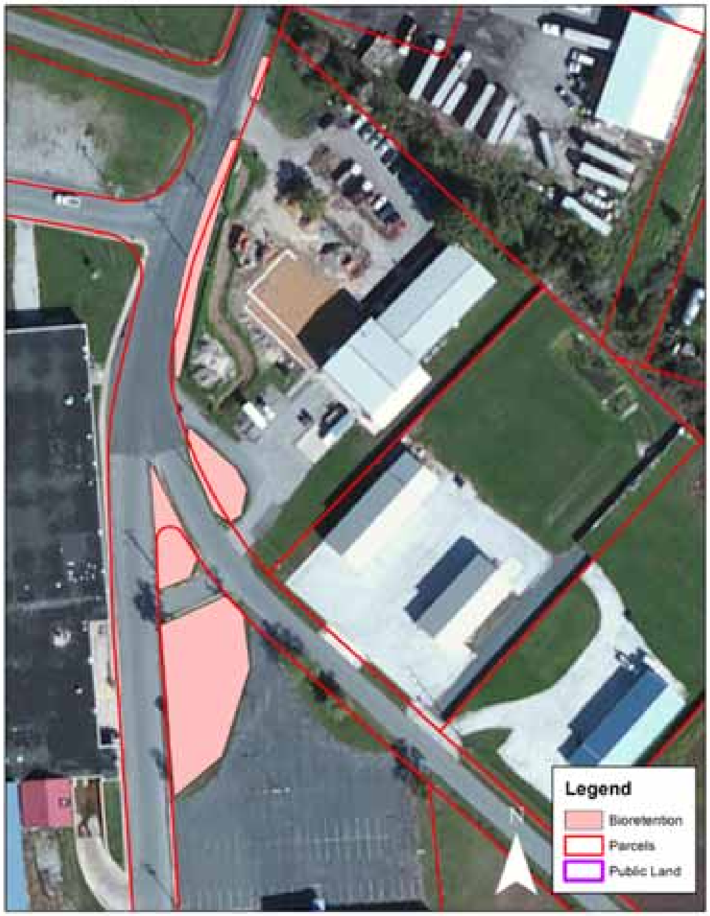


Project Type	Tree Planting
Latitude	38.560682
Longitude	-76.073573
Land Ownership (Parcel No.)	Private (3925)
Estimated Size	0.22 acres
Area Treated	9,675 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,299/lb., 1.85 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,577/lb., 0.23 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$99,410/ton, 0.08 tons/yr.
Cost	$7,953
CWAC Goal	Urban Trees

Description

This tree planting would surround the created wetland to create habitat, help with nutrient uptake, and reduce stormwater runoff.

Project 124



Project Type	Bioretentions
Latitude	38.559672
Longitude	-76.073486
Land Ownership (Parcel No.)	Private (3946, 3945), Public Road
Estimated Size	0.38 acres
Area Treated	295,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,104/lb., 56.43 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,513/lb., 7.10 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,572/ton, 2.35 tons/yr.
Cost	$344,445
CWAC Goal	Stormwater Facility

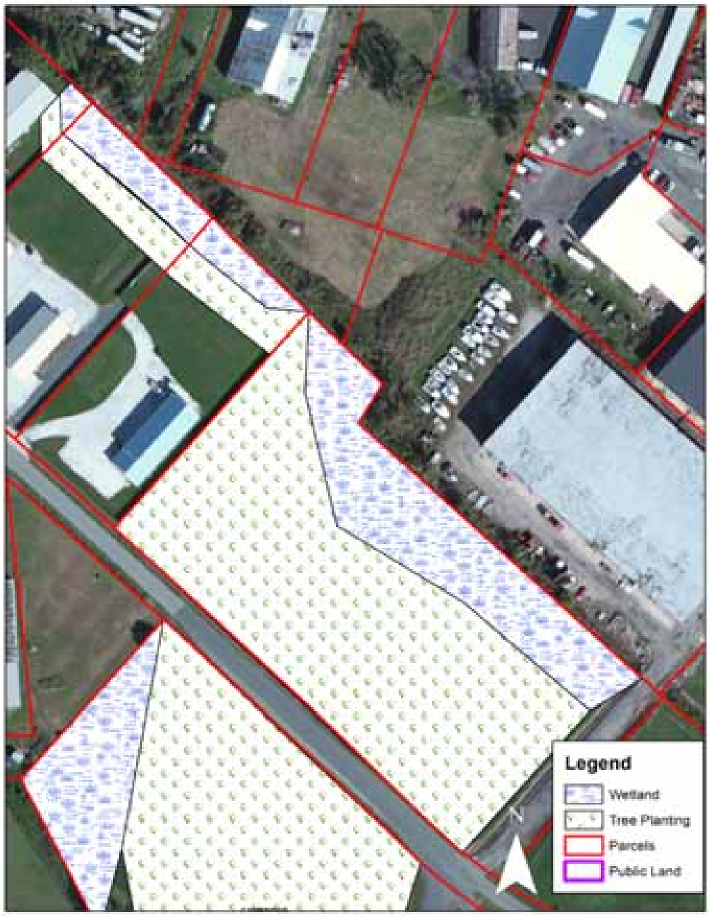
Description

Goodwill Ave. and Goodwill Rd. have a lot of industrial development and impervious road and parking surfaces. This creates a lot of stormwater runoff as well as potential pollution sources. Along the roads there are some green spaces that are currently ditches or just grassed. Converting these green spaces into bioretentions will help reduce stormwater runoff as well as reduce nutrient and sediment pollution before it reaches Peachblossom Creek and ultimately Cambridge Creek.






Project 125 A

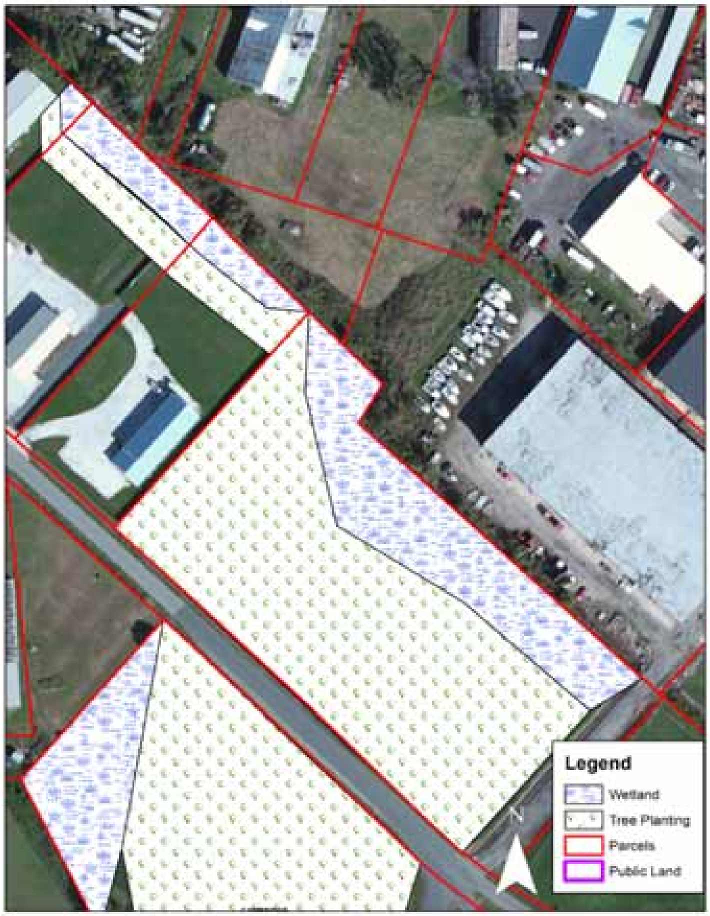


Project Type	Tree Planting/ Restoration
Latitude	38.558500
Longitude	-76.071281
Land Ownership (Parcel No.)	Private (8006, 3946)
Estimated Size	3.1 acres
Area Treated	491,638 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$16,831/lb., 94.04 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$133,684/lb., 11.84 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$403,781/ton, 3.92 tons/yr.
Cost	$1,582,823
CWAC Goal	Urban Trees

Description

Within the Goodwill Ave and Goodwill Rd. industrial area are farm fields. Farm fields provide an easy restoration opportunity in an otherwise urban environment. Most of the farm fields could be planted out with trees to create 3.1 acres of forest. Adjacent to the forest a wetland could be created along an existing ditch. The combination of the forest and wetland creates habitat, will reduce stormwater runoff, and also reduce nutrient and sediment loads.

Project 125 B



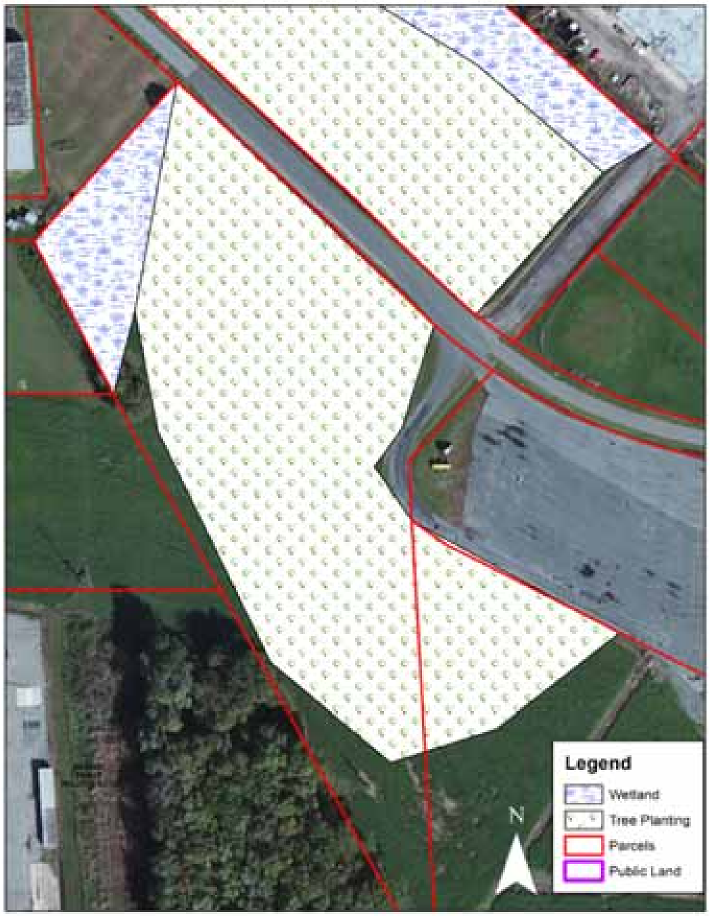
Project Type	Wetland Creation/ Restoration
Latitude	38.558500
Longitude	-76.071281
Land Ownership (Parcel No.)	Private (8006, 3946)
Estimated Size	1.3 acres
Area Treated	1,372,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$14,248/lb., 153.51 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$84,250/lb., 25.96 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$214,216/ton, 10.21 tons/yr.
Cost	$2,187,141
CWAC Goal	Stormwater Facility

Description

Within the Goodwill Ave and Goodwill Rd. industrial area are farm fields. Farm fields provide an easy restoration opportunity in an otherwise urban environment. Most of the farm fields could be planted out with trees. Adjacent to the forest a 1.3 acre wetland could be created along an existing ditch. The combination of the forest and wetland creates habitat, will reduce stormwater runoff, and also reduce nutrient and sediment loads.


Will Brown's
Truck Repair
Intercoastal Trading
Phillips Industrial Park Dr
Goodwill Rd
Goodwill Rd
Goodwill Rd
Goodwill Rd
Goodwill Rd
ATM
Choptank Bowling Center

Project 126 A

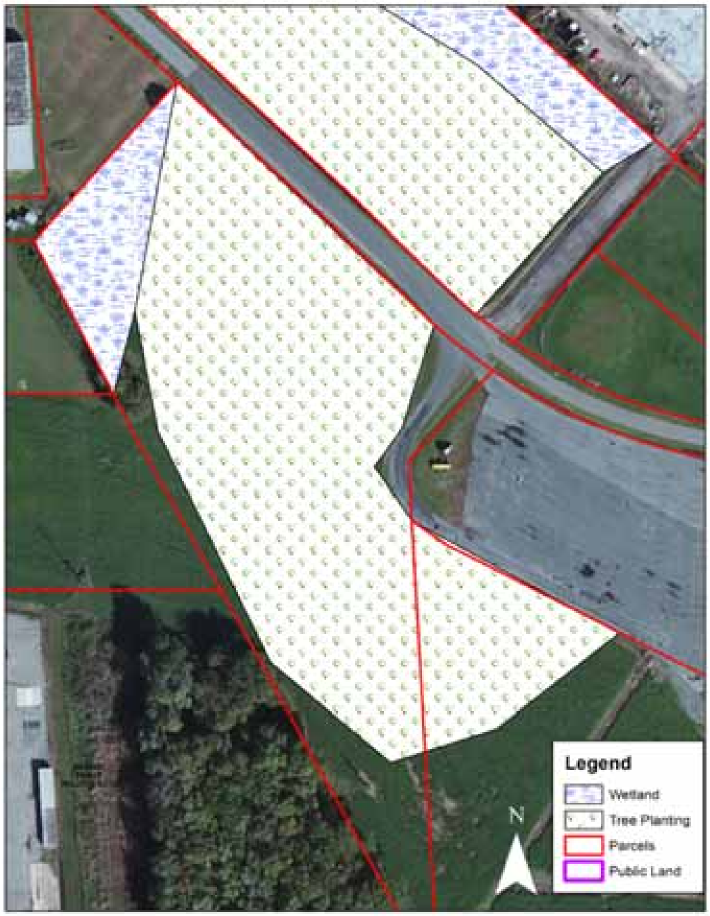


Project Type	Tree Planting/ Restoration
Latitude	38.557331
Longitude	-76.071651
Land Ownership (Parcel No.)	Private (3946, 5695)
Estimated Size	4.4 acres
Area Treated	442,252 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,298/lb., 84.59 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,425/lb., 10.56 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$102,983/ton, 3.53 tons/yr.
Cost	$363,530
CWAC Goal	Urban Trees

Description

This farm field provides an easy restoration opportunity within an otherwise urban environment. The end of Goodwill Ave. has extensive farm fields that are next to industrial areas. The farm fields could be re-forested and the roadside ditches could be re-directed into restored wetlands. Using farm fields that do not have infrastructure to remove allows for construction costs to be much cheaper.

Project 126 B



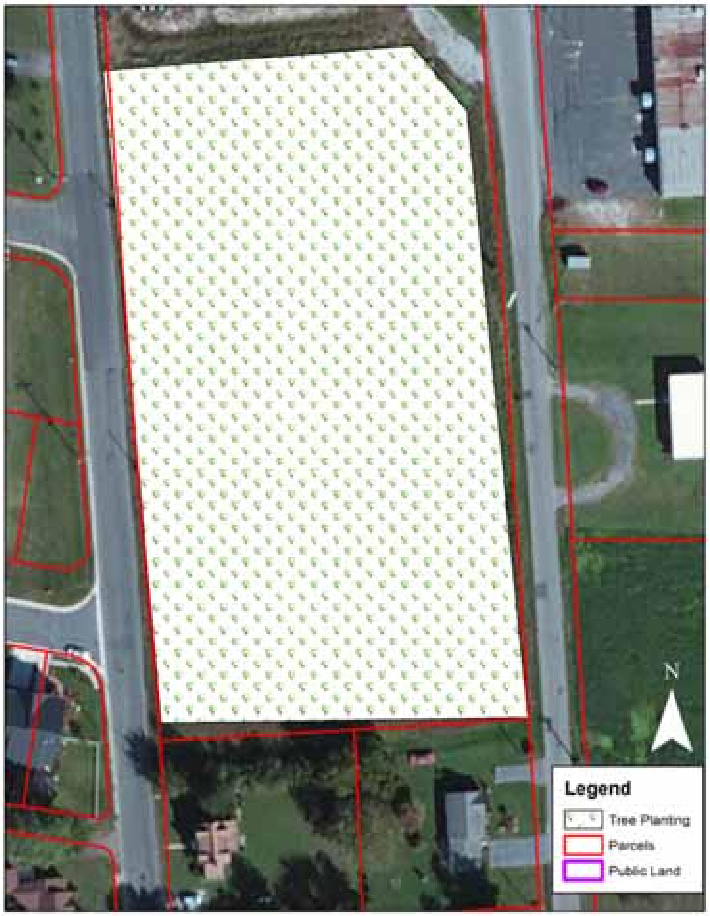
Project Type	Wetland Creation/ Restoration
Latitude	38.557331
Longitude	-76.071651
Land Ownership (Parcel No.)	Private (3946,5695)
Estimated Size	0.53 acres
Area Treated	576,125 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$14,248/lb., 64.46 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$84,258/lb., 10.90 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$214,083/ton, 4.29 tons/yr.
Cost	$918,416
CWAC Goal	Stormwater Facility

Description

This farm field provides an easy restoration opportunity within an otherwise urban environment. The end of Goodwill Ave. has extensive farm fields that are next to industrial areas. The farm fields could be re-forested and the roadside ditches could be re-directed into restored wetlands. Using farm fields that do not have infrastructure to remove allows for construction costs to be much cheaper.


enter
Goodwill Rd
Goodwill Rd
Goodwill Rd
Goodwill Rd

Project 127 A



Project Type	Tree Planting/ Restoration
Latitude	38.557574
Longitude	-76.074005
Land Ownership (Parcel No.)	Private (3780)
Estimated Size	3.1 acres
Area Treated	356,230 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,297/lb., 68.14 lbs/ yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,128/lb., 8.58 lbs/ yr.
TSS Removal ($/Ton, Tons/yr.)	$103,106/ton, 2.84 tons/yr.
Cost	$292,820
CWAC Goal	Urban Trees

Description

This farm field between Stone Boundary Rd. and Goodwill Ave. could be re-forested to create habitat, reduce stormwater runoff, and uptake nutrients. The small roadside ditches could also be directed into the field to allow for infiltration of stormwater that comes from the road and small residential area nearby.


ATM
Choptank Bowling Center
Stone Boundary Rd
Shepherd Ave
Stone Boundary Rd
Stone Boundary Rd
Goodwill Ave
Goodwill Ave
Goodwill Ave
Goodwill Ave

Project 127 B

Project Type	Bioretention
Latitude	38.558212
Longitude	-76.074183
Land Ownership (Parcel No.)	Private (3780)
Estimated Size	0.25 acres
Area Treated	331,253 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,104/lb., 63.36 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,468/lb., 7.98 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,505/ton, 2.64 tons/yr.
Cost	$386,774
CWAC Goal	Stormwater Facility

Description

There is a green space between the farm field and the industrial complex off of Stone Boundary Ave. that has an existing stormwater inlet surrounded by rock that captures water from a small swale that drains both the field, the adjacent building, and a gravel access road. The green space could be converted into a bioretention to treat the runoff from the building and adjacent road. The existing rock lined inlet could be incorporated into the bioretention as an overflow to ensure that large storms do not flood the area.

Project 127 C

Project Type	Green Roof
Latitude	38.559241
Longitude	-76.074246
Land Ownership (Parcel No.)	Private (3780)
Estimated Size	1.92 acres
Area Treated	83,776 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$113,483/lb., 16.02 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$900,000/lb., 2.02 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$2,713,432/ton, 0.67 tons/yr.
Cost	$1,818,000
CWAC Goal	Impervious Surface

Description

This building between Stone Boundary Ave. and Goodwill Ave. has a large flat roof that could be converted into a green roof. A green roof would provide some runoff reduction as well as removing some nutrients.


Stone Boundary Rd
Stone Boundary Rd
Goodwill Ave
Goodwill Ave
Goodwill Ave
Goodwill Ave
Goodwill Rd
ATM

Project 131 A

Project Type	Green Street
Latitude	38.566971
Longitude	-76.079023
Land Ownership (Parcel No.)	Public Road
Estimated Size	0.56 acres
Area Treated	200,650 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$27,386/lb., 38.38 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$217,614/lb., 4.83 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$656,922/ton, 1.60 tons/yr.
Cost	$1,051,075
CWAC Goal	Impervious Surface, Stormwater Facility, Green Space, Urban

Description

Elm St. is a very wide street that has limited residential development. The street could be retrofitted into a green street that has curb bumpout bioretentions, tree plantings, and other small plantings. The plantings would help beautify the neighborhood, while the bioretentions would provide a reduction in stormwater and also treat nutrients and sediment.

Project 131 B

Project Type	Bioretention
Latitude	38.567124
Longitude	-76.079632
Land Ownership (Parcel No.)	Public (4590), Private (4542)
Estimated Size	0.04 acres
Area Treated	65,837 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,106/lb., 12.59 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,347/lb., 1.59 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$147,831/ton, 0.52 tons/yr.
Cost	$76,872
CWAC Goal	Stormwater Facility

Description

Elm St. has the room to complete a long linear bioretention in the public right of way, but if more space is needed a vacant lot runs along the end of the street that could be used if room is needed. The property on the corner of Elm St. and Pine St. is a condemned building that could also be used if space is needed.


Elm St

Project 132

Project Type	Downspout Disconnect, Bioretention/ Rain Gardens
Latitude	38.566304
Longitude	-76.080589
Land Ownership (Parcel No.)	Public (2564)
Estimated Size	0.152 acres
Area Treated	25,910 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,099/lb., 4.96 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,795/lb., 0.62 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$144,061/ton, 0.21 tons/yr.
Cost	$30,253
CWAC Goal	Stormwater Facility, Impervious Surface

Description

The community center on Pine St. has a lot of potential to complete multiple small best management practices to reduce the stormwater leaving the facility. Rain gardens could be installed near the buildings to collect stormwater from the downspouts (downspout disconnection). The rain gardens would help infiltrate stormwater, reducing runoff, but also trap sediment and treat nutrients. The rain gardens could also be planted with flowering plants to add landscaping to the property. A small bioretention could also be built near the building to collect and treat runoff from the parking lot and the buildings. Completing all of these practices on the site would greatly reduce the stormwater leaving the community center.

Project 133

Project Type	Green Space
Latitude	38.565142
Longitude	-76.080738
Land Ownership (Parcel No.)	Private (2602, 2603, 2604, 2605)
Estimated Size	0.15 acres
Area Treated	6,642 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,299/lb., 1.27 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,123/lb., 0.16 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$109,194/ton, 0.05 tons/yr.
Cost	$5,460
CWAC Goal	Green Space

Description

These vacant lots on Pine St. could be transformed into a green space to help beautify the area and help reduce runoff through infiltration. To restore the vacant lots, removal of old infrastructure would have to occur with the demolition of old cement foundations and other infrastructure. The soils would have to be amended to reduce compaction and help infiltration. Depending on the use of the green space small gardens or trees could be planted.

Project 134

Project Type	Green Space
Latitude	38.563945
Longitude	-76.080443
Land Ownership (Parcel No.)	Private (2715, 2752)
Estimated Size	0.33 acres
Area Treated	48,335 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,297/lb., 9.25 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,265/lb., 1.16 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$101,917/ton, 0.39 tons/yr.
Cost	$39,748
CWAC Goal	Green Space, Urban Trees

Description

This is an overflow parking lot for a local funeral home. Currently, the parking lot is grass. It is assumed that the soil is highly compacted, with little ability to infiltrate water. When this happens a grassed area reacts to rainfall much like a paved area, with very little infiltration and almost all the water running off. It is proposed that this area could be converted into a green space/low impact design parking lot. Pervious pavers could be installed for parking to allow for infiltration of water, the soils could be amended to increase infiltration, and small bioretentions could be added to fit between parking spaces.


Pine St
Pine St
Washington St
Henry Funeral

Project 135

Project Type	Rain Gardens and Downspout Discon-nect
Latitude	38.563068
Longitude	-76.078866
Land Ownership (Parcel No.)	Private (2723, 2725, 2724)
Estimated Size	0.03 acres
Area Treated	38,814 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,108/lb., 7.42 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,731/lb., 0.93 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,192/ton, 0.31 tons/yr.
Cost	$45,320
CWAC Goal	Stormwater Facility

Description

The church on the corner of Race St. and Washington St. has a large impervious footprint due to the parking lot and buildings. There is not much that can be done to reduce the impacts of the parking lot, but there is room around the buildings to install rain gardens that have the downspouts disconnected to discharge into the rain gardens. This will alleviate some of the runoff from the property and the rain gardens can be planted with flowering plants to improve the landscaping. This effort can be tied into the larger stewards for streams faith based conservation initiative.


GREAT WALL

Project 136

Project Type	Downspout Discon-nection and Rain Gardens
Latitude	38.563499
Longitude	-76.079657
Land Ownership (Parcel No.)	Private (2721)
Estimated Size	0.03 acres
Area Treated	1,090 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$573/lb., 2.22 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$4,545/lb., 0.28 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$14,141/ton, 0.09 tons/yr.
Cost	$1,273
CWAC Goal	Stormwater Facility, Rain Barrels

Description

This property is adjacent to the church on Washington St. There is a small building with downspouts that discharge directly onto the pavement and a poorly maintained parking lot. The downspouts could be disconnected from discharging onto pavement and either directed into rain gardens or rain barrels. The parking lot could be upgraded to include rain gardens where appropriate. This is an industrial lot so the plants in the rain garden would need to be hardy enough to survive oils and salt.

Project 137 A

Project Type	Bioretention
Latitude	38.565066
Longitude	-76.078647
Land Ownership (Parcel No.)	Private (2700)
Estimated Size	0.17 acres
Area Treated	103,744 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$23,933/lb., 19.84 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$189,936/lb., 2.50 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$572,095/ton, 0.83 tons/yr.
Cost	$474,839
CWAC Goal	Stormwater Facility

Description

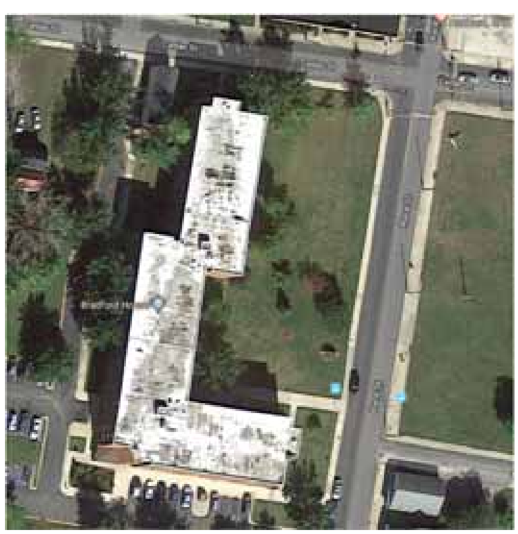
This property off of Race St. has the potential for multiple projects. The parking lot could have a bioretention built in the middle of a median that is currently just grass. Another long L-shaped bioretention could be put next to the parking lot and adjacent to the property next door that has a large impervious footprint. The bioretentions would help intercept runoff from the parking lots and industrial site to reduce stormwater runoff and reduce sediment and nutrients. Next to the L-shaped bioretention is a green space. It is suggested that this space stay green or be upgraded by completing landscaping to improve the soils and plant diversity. The front of the property has space for a rain garden as well as the potential to complete conservation landscaping to improve habitat. Both practices would intercept and infiltrate runoff to reduce the impacts of peak storm runoff, nutrients, and sediment.

Project 137 B

Project Type	Tree Planting/ Landscape Restoration
Latitude	38.565066
Longitude	-76.078647
Land Ownership (Parcel No.)	Private (2700)
Estimated Size	0.58 acres
Area Treated	25,163 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,300/lb., 4.81 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$33,908/lb., 0.61 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$103,420/tons, 0.20 tons/yr.
Cost	$20,684
CWAC Goal	Urban Trees

Description

This property off of Race St. has the potential for multiple projects. The parking lot could have a bioretention built in the middle of a median that is currently just grass. Another long L-shaped bioretention could be put next to the parking lot and adjacent to the property next door that has a large impervious footprint. The bioretentions would help intercept runoff from the parking lots and industrial site to reduce stormwater runoff and reduce sediment and nutrients. Next to the L-shaped bioretention is a green space. It is suggested that this space stay green or be upgraded by completing landscaping to improve the soils and plant diversity. The front of the property has space for a rain garden as well as the potential to complete conservation landscaping to improve habitat. Both practices would intercept and infiltrate runoff to reduce the impacts of peak storm runoff, nutrients, and sediment.



Project 138 A

Project Type	Green Roof
Latitude	38.566003
Longitude	-76.078274
Land Ownership (Parcel No.)	Private (4548)
Estimated Size	0.30 acres
Area Treated	13,370 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$113,335/lb., 2.56 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$906,683/lb., 0.32 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$2,637,624/ton, 0.11 tons/yr.
Cost	$290,139
CWAC Goal	Impervious Surface

Description

The Dorchester County Department of Social Services has the potential to have retrofits completed to the building and parking lot to reduce stormwater runoff. The roof could be converted into a green roof to reduce the amount of runoff coming off of the building.

Project 138 B

Project Type	Bioretention
Latitude	38.566003
Longitude	-76.078274
Land Ownership (Parcel No.)	Private (4548)
Estimated Size	0.08 acres
Area Treated	59,060 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,103/lb., 11.30 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,563/lb., 1.42 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,721/ton, 0.47 tons/yr.
Cost	$68,959
CWAC Goal	Stormwater Facility

Description

The Dorchester County Department of Social Services has the potential to have retrofits completed to the building and parking lot to reduce stormwater runoff. The parking lot has a green space adjacent to the building that could be retrofitted into a bioretention. The parking lot slopes towards the road so to get the water from the parking lot to the bioretention a recessed linear drain would need to be cut into the parking lot that goes against grade to re-direct water to the bioretention. The bioretention could also have the downspouts from the building connected to it.


Chief Cornerstone
Dorchester County
Career Center
Cambridge
Mercado La
Race St
Mi Tierra Mex
Perkins Ln
Dorchester
Department-Social
George W.
Hubbard, RPH
Cedar St
Cedar St
Cedar St
Cedar St

Project 139 A

Project Type	Bioretention
Latitude	38.565335
Longitude	-76.077767
Land Ownership (Parcel No.)	Public (4780, 4960, 4778, 4777, 4776, 4775, 4908, 4907, 4906, 4905, 4904, 4796)
Estimated Size	0.087 acres
Area Treated	22,652 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$23,944/lb., 4.33 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$188,507/lb., 0.55 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$575,994/ton, 0.18 tons/yr.
Cost	$103,679
CWAC Goal	Stormwater Facility

Description

At the corner of Race St. and Cedar St. is a large green space that has multiple opportunities for restoration. Along Cedar St. a linear bioretention could be installed to capture runoff from the road. The curbs would need to cut and the sidewalk would need to be replaced in sections. The curb cuts would allow water from the road into the bioretention

Project 139 B

Project Type	Tree Planting/Green Space
Latitude	38.565335
Longitude	-76.077767
Land Ownership (Parcel No.)	Public (4780, 4960, 4778, 4777, 4776, 4775, 4908, 4907, 4906, 4905, 4904, 4796)
Estimated Size	1.66 acres
Area Treated	72,319 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,298/lb., 13.83 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,164/lb., 1.74 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$102,493/ton, 0.58 tons/yr.
Cost	$59,446
CWAC Goal	Urban Trees, Green Space

Description

At the corner of Race St. and Cedar St. is a large green space that has multiple opportunities for restoration. The remaining section of the green space could be re-forested and the other portion turned into a park. The soils would have to be amended to increase infiltration, which would include deep ripping to fix any compacted soils and soil amendments such as sand or manure to increase infiltration and create a better soil habitat for planting.


Race St
George W. Hubbard, BPH
Cedar St
Cedar St
Cedar St
Cedar St
Academy St
Race St
Light St
Spedden's Marine Supply
Academy St
Academy St

Project 1310

Project Type	Bioretention
Latitude	38.565606
Longitude	-76.076066
Land Ownership (Parcel No.	Public (4653, 4652, 4651)
Estimated Size	0.12 acres
Area Treated	101,432 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,105/lb., 19.40 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,538/lb., 2.44 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,214/ton, 0.81 tons/yr.
Cost	$118,433
CWAC Goal	Stormwater Facility

Description

This site is at the corner of Academy St. and Cedar St. The properties are owned by the city of Cambridge. At present the properties are vacant lots without any standing buildings. The site is proposed to be retrofitted into a bioretention to help reduce runoff, sediment, and nutrient pollution. Academy St. slopes down to this bioretention location and there are no noticeable storm drains. To get water to this project site, there would need to be curb cuts or pipes installed to usher water from the road to the bioretention area. There is existing stormwater pipes adjacent to the site that the bioretention could be connected to for either underdrain or overflow purposes.

Project 1311 A

Project Type	Bioretention
Latitude	38.564456
Longitude	-76.076047
Land Ownership (Parcel No.)	Public (4828)
Estimated Size	0.09 acres
Area Treated	135,666 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,104/lb., 25.95 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,442/lb., 3.27 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,671/ton, 1.08 tons/yr.
Cost	$158,405
CWAC Goal	Stormwater Facility

Description

This project site is located at Meadow Park off of Academy St. The park has a lot of greenspace without many tree plantings. Near the parking area is room for a bioretention cell that would intercept water coming down Academy St. Another bioretention could be installed off of Virginia Ave near the side of the park to intercept water coming down the road. The third bioretention could be installed at the edge of the park at the lowest point to capture overland flow coming off the local residences, impervious surfaces, and playground areas. Storm drain infrastructure exists under the park and could be tied into the bioretention practices for either overflow or underdrain purposes.

Project 1311 B

Project Type	Tree Planting
Latitude	38.564456
Longitude	-76.076047
Land Ownership (Parcel No.)	Public (4828)
Estimated Size	0.15 acres
Area Treated	44,831 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,295/lb., 8.58 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,121/lb., 1.08 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$102,364/ton, 0.36 tons/yr.
Cost	$36,851
CWAC Goal	Urban Trees

Description

This project site is located at Meadow Park off of Academy St. The park has a lot of greenspace without many tree plantings. It is suggested that their should be additional tree plantings near the edge of the park. Additional plantings could also occur near the basketball court and playground to provide shade to these areas. The tree plantings would help intercept rainfall, reducing runoff, as well as provide some nutrient and sediment reductions.




Project 1312

Project Type	Bioretention and Tree Planting
Latitude	38.563611
Longitude	-76.076750
Land Ownership (Parcel No.)	Private (4865)
Estimated Size	0.023 acres
Area Treated	51,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$10,397/lb., 9.76 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$82,496/lb., 1.23 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$247,488/ton, 0.41 tons/yr.
Cost	$101,470
CWAC Goal	Stormwater Facility, Urban Trees

Description

This potential project site is located near the end of Academy St. before it intersects with Washington St. At present the green space does not have any plantings and the road does not have gutters or stormwater infrastructure. This means that all of the rain water washes down the road or across properties. A bioretention along the road in this location would help with stormwater coming from the adjacent road and properties. The rest of the greenspace could be planted out with trees or have restoration landscaping to amend the soils for better infiltration and create better habitat.


cademy St

Project 1313

Project Type	Bioretention and Tree Planting
Latitude	38.562308
Longitude	-76.075947
Land Ownership (Parcel No.)	Public (3873), Private (3874)
Estimated Size	0.043 acres
Area Treated	24,800 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$10,410/lb., 4.74 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$82,237/lb., 0.60 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$246,711/ton, 0.20 tons/yr.
Cost	$49,342
CWAC Goal	Stormwater Facility, Urban Trees

Description

The city of Cambridge owns a vacant lot on Peach Blossom Ave. near the intersection with Washington St. The restaurant next door recently added a parking lot where there is grass in the picture above, without adding any additional stormwater reduction infrastructure. This provides an opportunity to retrofit the vacant lot with runoff reduction practices, in this instance, a bioretention with a small tree planting is suggested. The bioretention would intercept water from the parking lot as well as the roof of the building. The tree planting would be on the back side of the bioretention to provide landscaping and a buffer between the practice and the next door neighbor.


Thaitalian
Infusion Cuisine
Washington St
Peach Blossom Ave
Chicken Man
Emmanuel United
Church of Christ
Robbins St
Peach Blossom Ave
Springfield Ave

Project 141

Project Type	Bioretention
Latitude	38.564589
Longitude	-76.074041
Land Ownership (Parcel No.)	Private (4919, 4915)
Estimated Size	0.17 acres
Area Treated	101,860 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,105/lb., 19.48 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,544/lb., 2.45 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,830/ton, 0.81 tons/yr.
Cost	$118,933
CWAC Goal	Stormwater Facility

Description

This site might already have a bioretention cell added into the new parking lot, but, if it does exist, it has been overgrown with phragmites. Photos during construction of the parking lot show there might be bioretention cells with underdrains, but it is hard to determine functionality or presence of the practices due to the overgrown nature of the site. If it does exist it is suggested that there be maintenance of the practice to ensure that it is still functioning properly. If it does not exist it is suggested that a bioretention be added to intercept water coming off of the new parking lot (not shown in picture above).

Project 142 A

Project Type	Downspout Discon-nect
Latitude	38.563269
Longitude	-76.074558
Land Ownership (Parcel No.)	Private (4911)
Estimated Size	0.47 acres
Area Treated	20,406 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$391/lb., 3.90 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$3,112/lb., 0.49 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$9,530/ton, 0.16 tons/yr.
Cost	$1,525
CWAC goal	Rain Barrels

Description

The church near the end of Peach Blossom Ave. has extensive impervious surfaces directly next to Peachblossom Creek. An easy fix to the large building footprint is to disconnect the downspouts from any impervious surface and re-direct them into rain barrels or rain gardens.

Project 142 B

Project Type	Rain Gardens
Latitude	38.563269
Longitude	-76.074558
Land Ownership (Parcel No.)	Private (4911)
Estimated Size	0.18 acres
Area Treated	98,172 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,104/lb., 18.78 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,571/lb., 2.36 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,957/ton, 0.78 tons/yr.
Cost	$114,627
CWAC Goal	Stormwater Facility

Description

The church near the end of Peach Blossom Ave. has extensive impervious surfaces directly next to Peachblossom Creek. The church has plenty of green area adjacent to the building and parking lots that could be converted into rain gardens. Water could be directed from the roofs and parking lots into the rain gardens to reduce runoff from the impervious areas. Rain gardens would not only provide a water quality benefit, but also add landscaping value to the property.

Project 142 C

Project Type	Tree Planting
Latitude	38.563269
Longitude	-76.074558
Land Ownership (Parcel No.)	Private (4911)
Estimated Size	0.27 acres
Area Treated	205,180 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,297/lb., 39.25 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,141/lb., 4.94 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$102,840/ton, 1.64 tons/yr.
Cost	$168,657
CWAC Goal	Urban Trees

Description

The church near the end of Peach Blossom Ave. has extensive impervious surfaces directly next to Peachblossom Creek. A tree planting could be completed adjacent to the creek where there is a proposed stream restoration. Currently, this area is a just a grassed field, but it could be filled in with trees as wells as other native species to improve it has habitat and also provide water quality benefits.


Virginia Ave
Peach Blossom Ave
Souls Harbor
Church of God
Peach Blossom Ave
Anchor Point
Family Thrift Store
Peach Blossom Ave

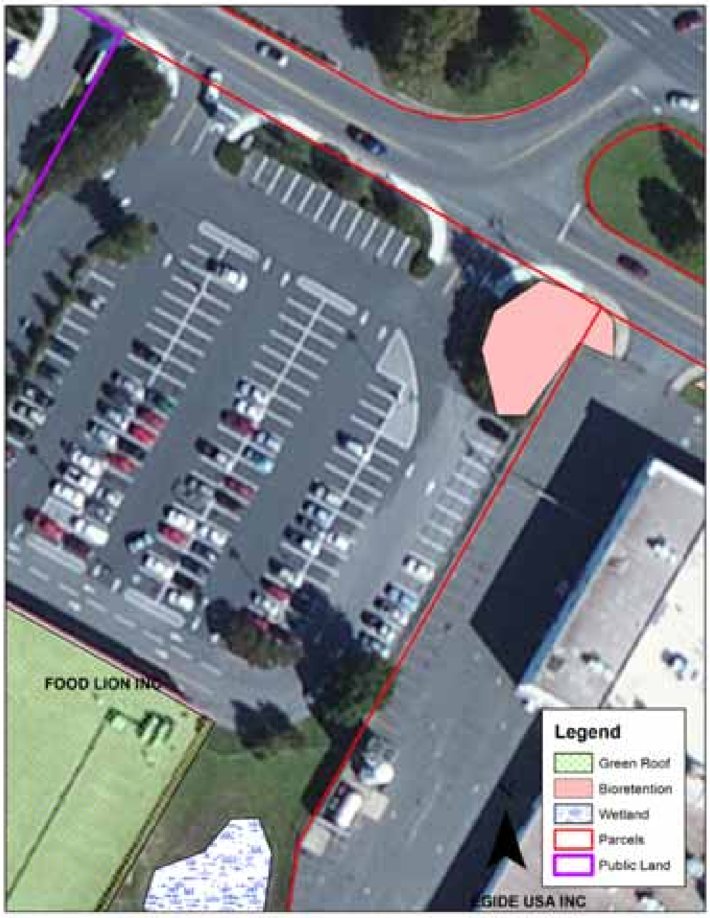
Project 221 A

Project Type	Green Roof
Latitude	38.558445
Longitude	-76.063966
Land Ownership (Parcel No.)	Private (5687)
Estimated Size	0.75 acres
Area Treated	32,843 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$113,490/lb., 6.28 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$902,173/lb., 0.79 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$2,741,218/ton, 0.26 tons/yr.
Cost	$712,717
CWAC Goal	Impervious Surface

Description

The Food Lion off of Washington St. has a very large impervious area. To work within the confines of the developed footprint a green roof could be added to the building if the structure can support the additional weight. A green roof would help with reducing runoff from the building that would otherwise go into the stormwater system.

Project 221 B



Project Type	Bioretention
Latitude	38.558445
Longitude	-76.063966
Land Ownership (Parcel No.)	Private (5687,5689)
Estimated Size	0.07 acres
Area Treated	95,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$23,931/lb., 18.17 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$189,877/lb., 2.29 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$572,129/lb., 0.76 tons/yr.
Cost	$434,818
CWAC Goal	Stormwater Facility

Description

The Food Lion off of Washington St. has a very large impervious area. There is a small green space near the corner of the parking lot where it meets Washington St. There is already a small swale through the green space, indicating that water flows through this area. A bioretention could be added the green space with curb cuts to allow water to come from Washington St. as well as the two nearby parking lots.

Project 221 C

Project Type	Wetlands
Latitude	38.558445
Longitude	-76.063966
Land Ownership (Parcel No.)	Private (5687)
Estimated Size	0.28 acres
Area Treated	222,624 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$546/lb., 24.91 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$3,228/lb., 4.21 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$8,187/ton, 1.66 tons/yr.
Cost	$13,590
CWAC Goal	Stormwater Facility

Description

The back of the Food Lion property has one overgrown wetland and another area that is overgrown and littered with trash. The existing wetland cell needs maintenance and is most likely not functioning to the original specifications. Maintenance of this cell would help with stormwater issues and provide better treatment. The other area that is overgrown could be converted into another wetland cell to intercept water from the impervious parking and delivery area.

Project 222

Project Type	Bioretention
Latitude	38.558785
Longitude	-76.062390
Land Ownership (Parcel No.)	Private (5689)
Estimated Size	0.055 acres
Area Treated	143,468 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$3,509/lb., 24.44 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$24,860/lb., 3.45 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$75,235/ton, 1.14 tons/yr.
Cost	$85,767
CWAC Goal	Stormwater Facility

Description

Near the end of Washington St. at the turn around there is a small swale that runs between the building and the sidewalk and then between two buildings. The swale can be converted into a bioretention that will treat runoff from the building and adjacent parking lots. The road could be connected to the bioretention via a curb cut. This portion of the city has limited stormwater infrastructure and a lot of industrial sites. This bioretention would significantly help with stormwater issues in this area.

Project 223

Project Type	Green Space
Latitude	38.557667
Longitude	-76.061783
Land Ownership (Parcel No.)	Private (5692)
Estimated Size	0.95 acres
Area Treated	176,820 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,298/lb., 33.82 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,119/lb., 4.26 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$103,082/ton, 1.41 tons/yr.
Cost	$145,346
CWAC Goal	Green Space, Urban Trees

Description

There is a large vacant lot on Woods Rd. that is grass and mowed periodically. In order to increase green space in the town it is suggested that the space be maintained as a green space. It would be beneficial to have the space undergo landscape restoration work, with any remaining infrastructure removed, an assessment of the soils would need to be completed to see if there is a compacted layer that needs deep ripping, and soil amendments added to increase fertility. Once the site is cleaned and soils assessed the area can be planted out in native trees and shrubs.

Project 224

Project Type	Bioswale
Latitude	38.557268
Longitude	-76.060571
Land Ownership (Parcel No.)	Private (5692, 5693, 5689)
Estimated Size	0.14 acres
Area Treated	258,900
Nitrogen Removal ($/lb., lbs/yr.)	$5,470/lb., 49.52 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$43,476/lb., 6.23 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$131,483/ton, 2.06 tons/yr.
Cost	$270,855
CWAC Goal	Stormwater Facility

Description

Along Woods Rd. there is a drainage swale that runs along the road and then goes up a private lane. The swale needs to be able to convey water and thus a bioswale is the suggested practice. The bioswale will allow water to move and not back up, but also allow infiltration and treatment of runoff.

Project 231

Project Type	Bioretention and Bioswale
Latitude	38.564467
Longitude	-76.071459
Land Ownership (Parcel No.)	Private (4973, 5033), Public (4974)
Estimated Size	0.137 acres
Area Treated	459,297 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,104/lb., 87.85 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,488/lb., 11.06 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,524/ton, 3.66 tons/yr.
Cost	$536,279
CWAC Goal	Stormwater Facility

Description

This site is off of Perimore St. near Cedar St. Perimore St. slopes down to this site and there are already existing curb cuts in the parking lot just south of the practice area. The suggested practice for this location is a bioretention that would help infiltrate and treat runoff. Stormwater from Perimore St. would be directed into the practice as well as from the existing parking lot curb cuts and the adjacent building. Overflow from this practice would be conveyed by the existing swale, which would need to be restored using either bioswale or natural channel design, to the restored Cambridge Creek stream.

Project 232

Project Type	Tree Planting
Latitude	38.564467
Longitude	-76.071459
Land Ownership (Parcel No.)	Private (4642)
Estimated Size	0.04 acres
Area Treated	4,820 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,307/lb., 0.92 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$33,017/lb., 0.12 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$99,051/ton, 0.04 tons/yr.
Cost	$3,962
CWAC Goal	Urban Trees

Description

Along Cedar St. there is a small green space that could be planted out with trees or restoration landscaping project could be completed.

Project 233

Project Type	Ditch Planting
Latitude	38.564146
Longitude	-76.068192
Land Ownership (Parcel No.)	Private (4978)
Estimated Size	0.07 acres
Area Treated	42,803 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$3,124/lb., 8.19 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$24,843/lb., 1.03 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$75,260/ton, 0.34 lbs/yr.
Cost	$25,588
CWAC Goal	Stormwater Facility

Description

This site, near the intersection of Cedar St. and Dorchester Ave., has an existing swale that connects into adjacent parking lots via curb cuts. There are also storm water pipes that enter into the swale. The swale could be converted into a bioswale with little additional infrastructure changes. The main additions would be soil amendments to increase infiltration and plantings to help with nutrient uptake and to slow down water.

Practice 234

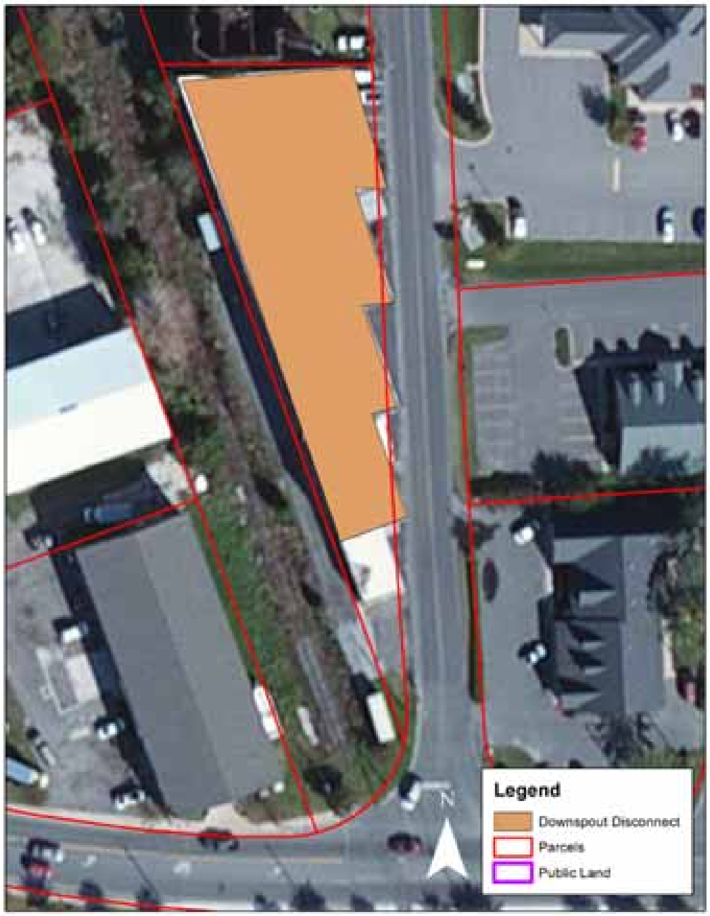
Project Type	Bioswale/Retention Planting
Latitude	38.561801
Longitude	-76.067202
Land Ownership (Parcel No.)	Private (8009)
Estimated Size	0.19 acres
Area Treated	138,462 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$3,126/lb., 26.48 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$24,857/lb., 3.33 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$75,250/ton, 1.10 tons/yr.
Cost	$82,775
CWAC Goal	Stormwater Facility

Description

This site on Dorchester Ave. has existing stormwater infrastructure. There are curb cuts that go to a swale that leads to a ponding area. This site has excellent potential to be retrofitted with native plantings and soil amendments to enhance the stormwater infrastructure already in place.


Shore
United

Project 235



Project Type	Downspout Disconnect and Rain Barrels
Latitude	38.561228
Longitude	-76.067202
Land Ownership (Parcel No.)	Private (4982)
Estimated Size	15,350 sq. ft.
Area Treated	15,350 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$188/lb., 3.99 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$1,531/lb., 0.49 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	N/A
Cost	$750
CWAC Goal	Rain Barrels

Description

This property near the end of Dorchester Ave. has downspouts that discharge directly onto a parking lot that runs off into Dorchester Ave. It is suggested that each downspout be connected to a rain barrel to store the rain water for re-use (watering plantings). The rain barrels would help reduce the amount of runoff from the building, which would be proportional to the size of the barrels used.

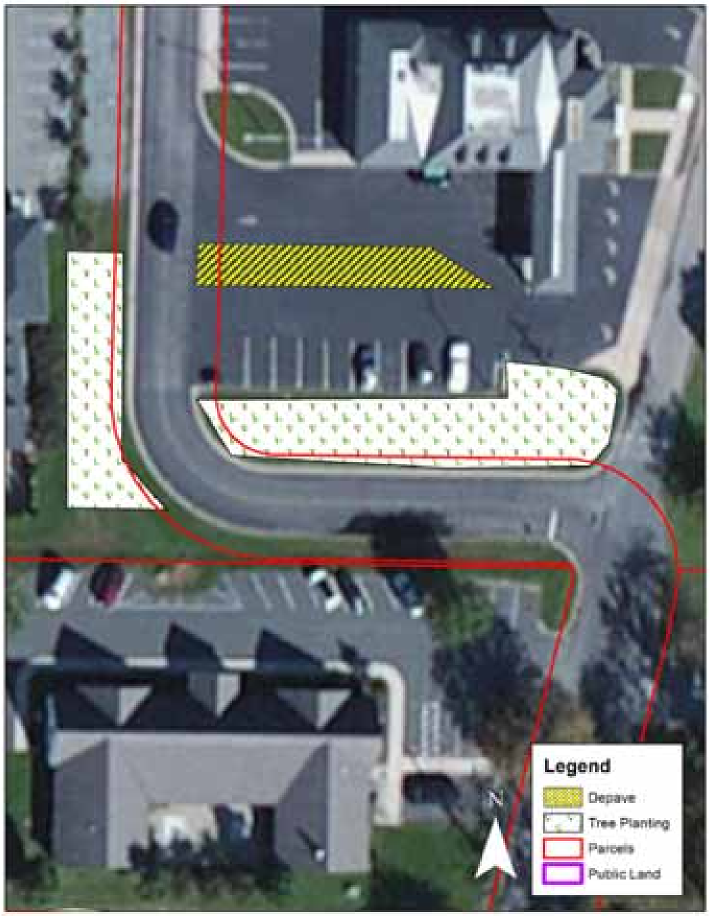
Project 236

Project Type	Tree Planting
Latitude	38.561268
Longitude	-76.066508
Land Ownership (Parcel No.)	Private (5414)
Estimated Size	0.14 acres
Area Treated	9,808 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,288/lb., 1.88 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$33,892/lb., 0.24 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$100,777/ton, 0.08 tons/yr.
Cost	$8,062
CWAC Goal	Urban Trees

Description

The WaWa near Route 50 has large areas of impervious interspaced with green space. The suggested practice for this area would be to increase the tree and native species plantings in the green space to increase canopy interception of rain water, increase plant uptake, and improve habitat. Native meadows could also be an option, which would reduce mowing and have many positive water quality and habitat benefits.

Project 237

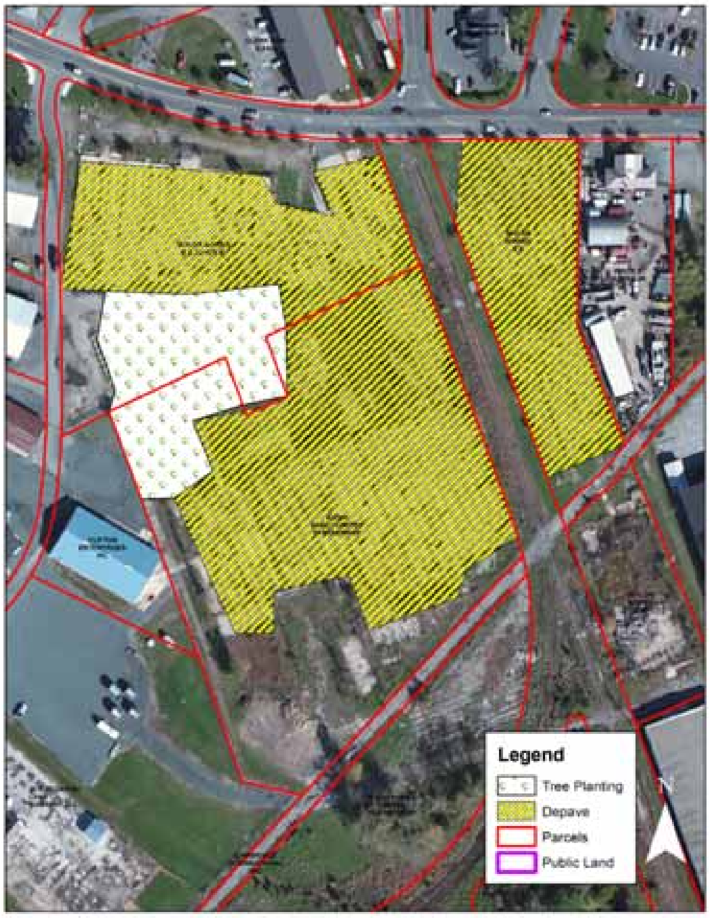


Project Type	Depave and Tree Planting
Latitude	38.562625
Longitude	-76.066703
Land Ownership (Parcel No.)	Private (5412, 8004)
Estimated Size	0.19 acres
Area Treated	19,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$16,851/yr., 3.63 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$132,979/yr., 0.46 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$407,802/yr., 0.15 tons/yr.
Cost	$61,170
CWAC Goal	Urban Trees. Impervious Surface

Description

This bank off of Bramble St. near the intersection with Route 50 has a large impervious parking area that is oversized and under utilized. It is proposed that a portion of the parking lot could be depaved to decrease the amount of impervious area. Once depaved the area could be planted out in trees or small native shrubs for water quality and landscaping value. There are also several green spaces around the property that could be planted with trees or native species to intercept rainfall and improve the landscaping.

Project 238 A

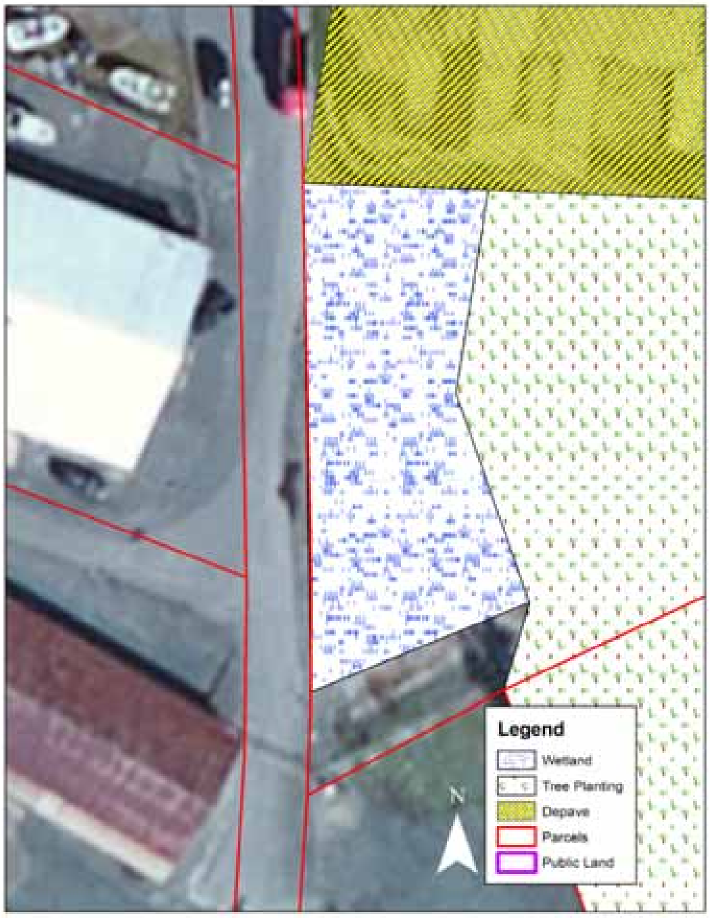


Project Type	Depave and Refor-estation
Latitude	38.559807
Longitude	-76.067408
Land Ownership (Parcel No.)	Private (3968,3969,3970)
Estimated Size	6.7 acres
Area Treated	1,281,093 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$16,832/lb., 245.04 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$135,007/lb., 30.55 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$403,963/ton, 10.21 tons/yr.
Cost	$4,124,464
CWAC Goal	Impervious Surface, Urban Trees

Description

This site off of Washington St. presents a unique opportunity to convert an old vacant industrial site into a keystone environmental restoration project in Cambridge. Much of the site is overgrown and has concrete pads where old buildings once stood. All the concrete would have to be torn out, soils tested for potential hazardous chemicals, and then amended to increase fertility. Reforestation would be the main goal of the project, but different habitat could be created, in addition to mixed use for recreational facilities if warranted in this section of the city.

Project 238-B



Project Type	Wetland Creation
Latitude	38.559602
Longitude	-76.068905
Land Ownership (Parcel No.)	Private (3968)
Estimated Size	0.18 acres
Area Treated	278,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,369/yr., 31.10 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$31,747/yr., 5.26 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$80,671/ton, 2.07 tons/yr.
Cost	$166,989
CWAC Goal	Stormwater Facility

Description

This site off of Washington St. presents a unique opportunity to convert an old vacant industrial site into a keystone environmental restoration project in Cambridge. Much of the site is overgrown and has concrete pads where old buildings once stood. This is a continuation from project 238 A that described the depave and reforestation portion of the project. This part specifically looks at a wet area within the project footprint that could be converted to a wetland. This site was wet during a July site visit, exhibiting wetland hydrology. There would need to be a greater investigation to see if hydric soils exist, but as part of the 238 A and 238 B project package, would provide a diversification of habitat and have good water quality benefits.

Project 239

Project Type	Constructed Wetland
Latitude	38.562011
Longitude	-76.069505
Land Ownership (Parcel No.)	Public (5018, 5019)
Estimated Size	0.23 acres
Area Treated	142,128 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$14,250/lb., 15.9 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$84,227/lb., 2.69 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$213,745/ton, 1.06 tons/yr.
Cost	$226,570
CWAC Goal	Stormwater Facility

Description

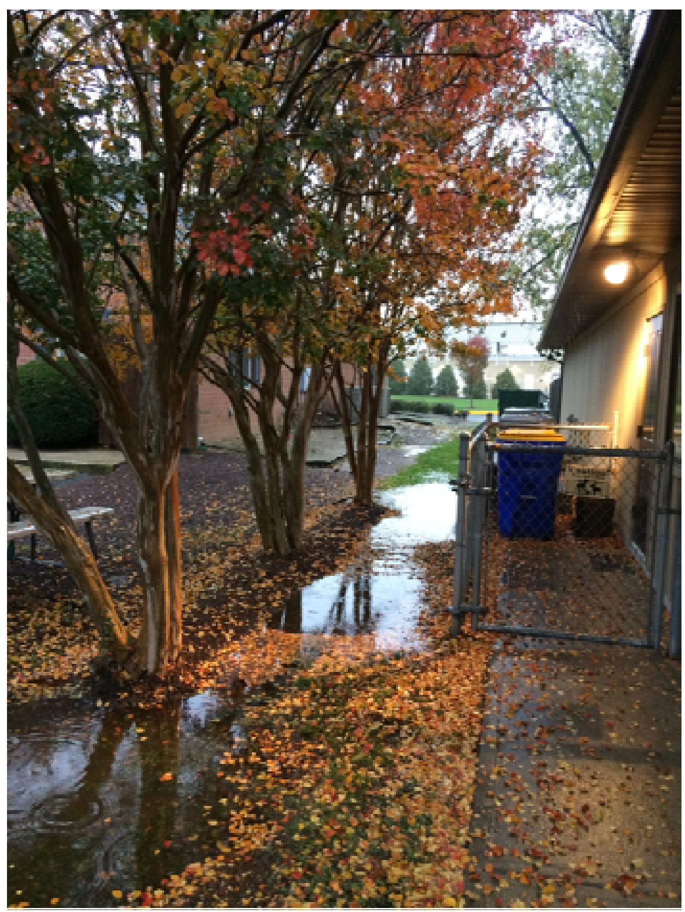
This project site is on public property adjacent to Cambridge Creek. The restoration of the creek will be occurring in this area and this project would add to the project by intercepting runoff from the public works facility. The suggested project is a linear wetland, but depending on space and the Cambridge Creek stream restoration footprint, a long linear bioretention/infiltration practice could also be installed. The main goal would be to intercept runoff from the public works facility and allow for infiltration before entering into the creek. Phosphorus sorbing material or woodchips could be added to the wetland/ infiltration practice to increase phosphorus and nitrogen removal.

Project 2310

Project Type	Rain Gardens
Latitude	38.561012
Longitude	-76.067081
Land Ownership (Parcel No.)	Private (5413)
Estimated Size	0.05 acres
Area Treated	34,800 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,101/lb., 6.66 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,372/lb., 0.84 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$145,117/ton, 0.28 tons/yr.
Cost	$40,633
CWAC Goal	Stormwater Facility

Description

This project site is between two office buildings near the end of Dorchester Ave. where it intersects with Washington St. During field investigations it was noted that the area between the buildings ponds water due to downspouts and the parking lots discharging directly to this area. The site has the potential to be changed into a rain garden to help infiltrate the rain water. The area could be well shaded so shade and water tolerant plants might be a good fit for the site.



Project 241

Project Type	Bioretentions
Latitude	38.559444
Longitude	-76.064438
Land Ownership (Parcel No.)	Public (8012)
Estimated Size	0.10 acres
Area Treated	223,054 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$603/lb., 42.67 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$4,795/lb., 5.37 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$14,467/ton, 1.78 tons/yr.
Cost	$25,750
CWAC Goal	Stormwater Facility

Description

This project site is on the property of the City of Cambridge Department of Public Safety. Around the building there is a small swale that is connected to the parking lots and has storm water drain inlets. The downspouts of the building are connected directly into the storm drain system. This project would create a long L shaped bioretention cell that follows the swale around the building. The downspouts would be disconnected and allowed to discharge into the bioretention. The existing stormwater infrastructure could be used as part of an underdrain system or overflow. The bioretention would allow for infiltration of stormwater, while reducing peak storm flow into the storm water system, and reduce nutrient and sediment loads.


POLICE

Project 311

Project Type	Bioretentions
Latitude	38.568567
Longitude	-76.072502
Land Ownership	Public (5094), Private (5093)
Estimated Size	3,330 sq. ft.
Area Treated	88,978 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,051/lb., 17.17 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$56,771/lb., 1.83 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$179,123/ton, 0.58 tons/yr.
Cost	$103,892
CWAC Goal	Stormwater Facility

Description

This project is located at the Trenton Street public boat ramp and park. The majority of the proposed bioretentions are located on public land with only one cell potentially on private property. 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.

Project 312

Project Type	Bioretentions and Downspout discon-nect
Latitude	38.567180
Longitude	-76.071027
Land Ownership	Private
Estimated Size	2,000 sq. ft.
Area Treated	37,700 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,739/lb., 7.67 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$44,019/lb., 1.00 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$133,391/ton, 0.33 tons/yr.
Cost	$44,019
CWAC Goal	Stormwater Facility

Description

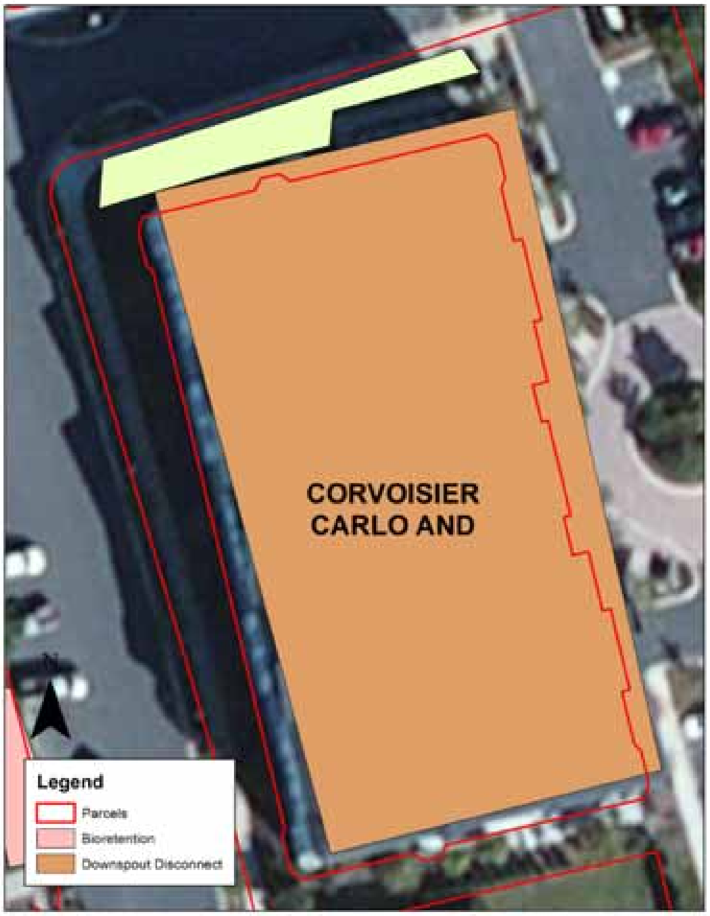
This site presents an excellent opportunity to retrofit a rectangular green space that has existing stormwater inlets into a bioretention that would intercept water coming from the adjacent roofs and impervious surface. In addition to this, the curb cut outs in the road have existing stormwater drains and would make good locations for bioretentions.







Project 313

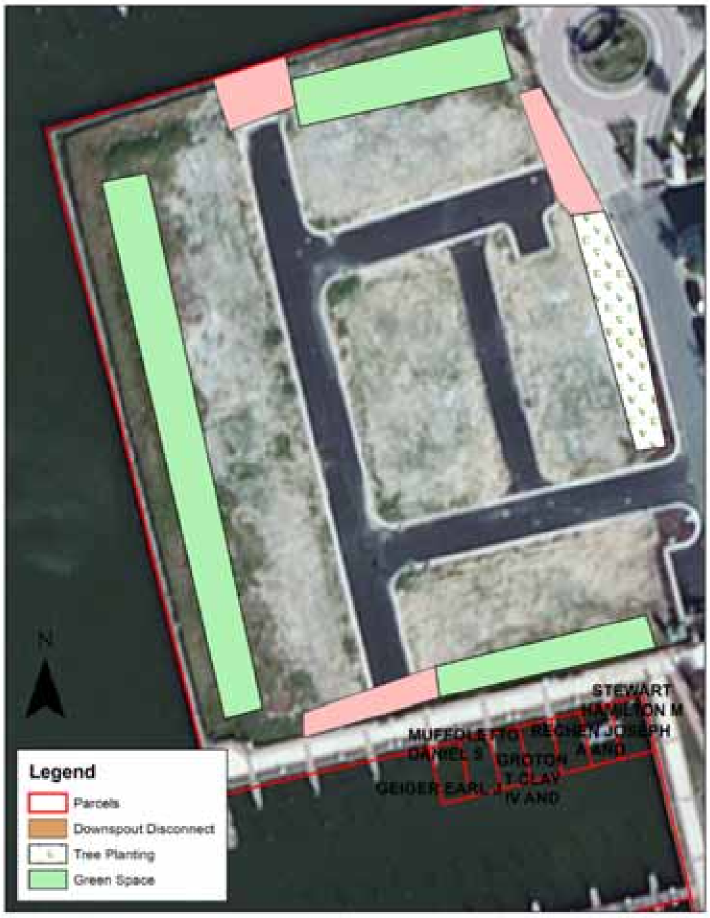


Project Type	Bioswale, Down-spout Disconnect
Latitude	38.568712
Longitude	-76.071789
Land Ownership	Private (8013)
Estimated Size	1,200 sq. ft.
Area Treated	19,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,982/lb., 3.99 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$40,566/lb., 0.49 lbs/yr.
TSS Removal ($/ton, tons/yr.)	$124,234/ton, 0.16 tons/yr.
Cost	$19,877
CWAC Goal	Stormwater Facility

Description

This development has larger areas of impervious surface, including many roofs that have downspouts that connect directly into the stormwater network. This project would disconnect the downspouts and allow them to discharge into a bioswale on the northern end of the building. The building already has good landscaping and by adding this bioswale it would enhance what is already there. Another practice that might fit within the footprint of the building is a rain garden, although this was not modeled for potential reductions.

Project 314



Project Type	Low Impact Development
Latitude	38.567157
Longitude	-76.071936
Land Ownership	Private
Estimated Size	14,250 sq. ft.
Area Treated	98,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$10,002/lb., 11.44 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$86,686/lb., 1.32 lbs/yr.
TSS Removal ($/ton, tons/yr.)	$272,442/ton, 0.42 tons/yr.
Cost	$114,423
CWAC Goal	Stormwater Facility, Urban Trees

Description

This site is not currently developed, but there is road and stormwater infrastructure already in place. It is suggested that when this site is developed that as many best management practices be added to the development as possible. This site sits directly on the water so the practices would have an immediate water quality benefit to Cambridge Creek, have an aesthetic value if native flowering plants and shrubs are used, and also create a better environment for the residents and also wildlife.

Project 315

Project Type	Bioswale
Latitude	38.565092
Longitude	-76.070742
Land Ownership	Private
Estimated Size	1,228 sq. ft.
Area Treated	50,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,512/lb., 9.49 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$44,330/lb., 1.18 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$1,341/ton, 0.39 tons/yr.
Cost	$52,309
CWAC Goal	Stormwater Facility

Description

This site at the south end of the development has a grassed swale that leads directly into a stormwater drain. Curb cuts in the parking lots allow for runoff to get to the swale. A bioswale would be the appropriate practice for this site because it will allow for increased infiltration, sediment and nutrient reduction, while not impacting drainage.

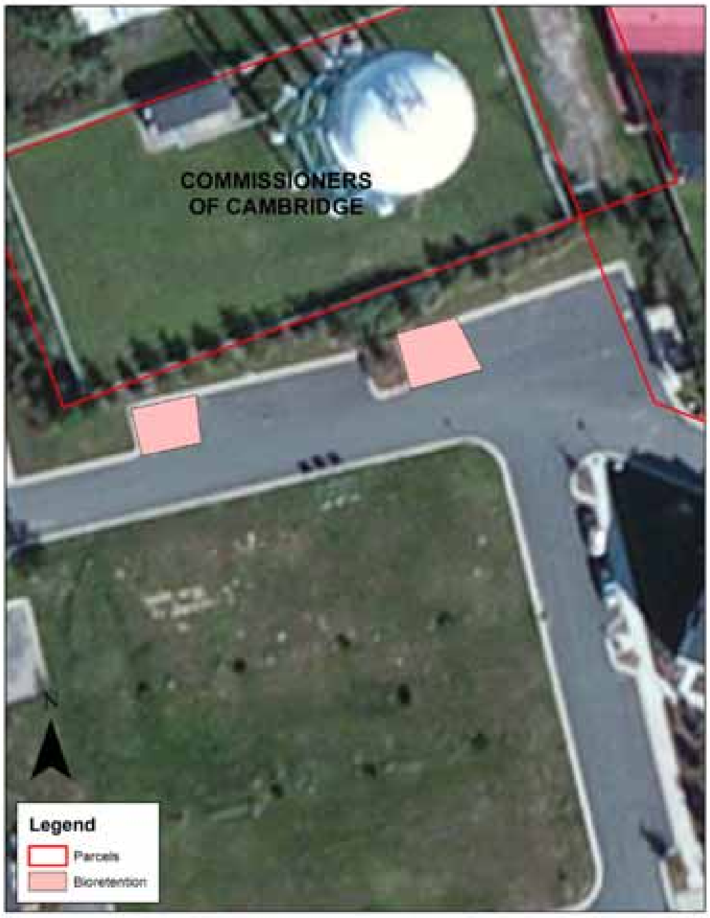
Project 316

Project Type	Bioretention, Downspout Disconnect
Latitude	38.565606
Longitude	-76.070073
Land Ownership	Private
Estimated Size	4,900 sq. ft.
Area Treated	48,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,297/lb., 8.90 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$52,379/lb., 1.07 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$160,129/ton, 0.35 tons/yr.
Cost	$56,045
CWAC Goal	Stormwater Facility

Description

In between two rows of townhouses exists a greenspace that has room for two bioretention cells. The impervious area drains to these locations and the downspouts from the townhouses can be redirected to the bioretention to help reduce runoff.

Project 317



Project Type	Bioretention
Latitude	38.566618
Longitude	-76.069865
Land Ownership	Private
Estimated Size	1,040 sq. ft.
Area Treated	32,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$21,382/lb., 6.85 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$170,308/lb., 0.86 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$505,051/ton, 0.29 tons/yr.
Cost	$146,465
CWAC Goal	Stormwater Facility, Impervious Surface

Description

Near the intersection of Shipyard Dr. and Stillwater Ln. are two parking areas that have small curb bump outs. Both of these locations are ideal for bioretentions. The additional parking space is not necessary and the need for better stormwater infrastructure is needed throughout this property. The bioretentions would help infiltrate and slow down stormwater, removing sediment while reducing nitrogen and phosphorus loads. The bioretentions could be tied into the existing stormwater network through underdrains or overflows.

Project 318

Project Type	Bioswale, Down-spout Disconnect
Latitude	38.565803
Longitude	-76.072004
Land Ownership	Private
Estimated Size	1,100 sq. ft.
Area Treated	10,400 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,467/lb., 1.99 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$43,521/lb., 0.25 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$136,003/ton, 0.08 tons/yr.
Cost	$10,880
CWAC Goal	Stormwater Facility

Description

This project is directly on Cambridge Creek. This condo has downspouts that are directly connected to the stormwater network. This project would disconnect the downspouts from the stormwater sewer and discharge them into either a bioswale or rain garden that will allow infiltration, but also be able to handle large storm events through a overflow pipe to ensure there is no flooding.

Project 321 A

Project Type	Bioretention
Latitude	38.564688
Longitude	-76.066837
Land Ownership (Parcel No.)	Public (5388)
Estimated Size	23,086 sq. ft.
Area Treated	103,849 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,455/lb., 22.23 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$43,305/lb., 2.80 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$130,382/ton, 0.93 tons/yr.
Cost	$121,255
CWAC Goal	Stormwater Facility

Description

The Dorchester County Health Department office has several opportunities to store and treat stormwater. Currently, in this location there are limited stormwater practices and very large impervious areas. On Dorchester Ave. side of the building is a green space that could be converted into a bioretention. This bioretention could store and treat stormwater coming off the road and adjacent parking areas. There is an existing storm drain at this location indicating that stormwater flows to this site. The existing stormwater infrastructure could be incorporated into the bioretention in the form of an underdrain or overflow.

Project 321 B

Project Type	Bioswale
Latitude	38.564688
Longitude	-76.066837
Land Ownership (Parcel No.)	Public (5388)
Estimated Size	23,086 sq. ft.
Area Treated	40,500 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,467/lb., 7.75 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$43,235/lb., 0.98 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$132,407/ton, 0.32 tons/yr.
Cost	$42,370
CWAC Goal	Stormwater Facility

Description

The Dorchester County Health Department office has several opportunities to store and treat stormwater. Currently, in this location there are limited stormwater practices and very large impervious areas. On Dorchester Ave., just north of the building, is a small swale that collects water from the road and parking lot. There is an existing stormwater drain in the swale. The proposed practice for this location is a bioswale, that would be able to maintain drainage, bur provide some abatement of stormwater as well as treatment of sediment and nutrients.

Project 321 C

Project Type	Green Roof
Latitude	38.564688
Longitude	-76.066837
Land Ownership (Parcel No.)	Public (5388)
Estimated Size	23,086 sq. ft.
Area Treated	103,849 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$92,390/lb., 3.08 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$729,645/lb., 0.39 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$2,188,935/ton, 0.13 tons/yr.
Cost	$284,562
CWAC Goal	Impervious Surface

Description

The Dorchester County Health Department office has several opportunities to store and treat stormwater. Currently, in this location there are limited stormwater practices and very large impervious areas. The building has a flat roof that has the potential to be converted into a green roof if the building can sustain the added weight. A green roof would reduce stormwater runoff and decrease the impervious area.

Project 321 D

Project Type	Tree Planting
Latitude	38.564688
Longitude	-76.066837
Land Ownership (Parcel No.)	Public (5388)
Estimated Size	23,086 sq. ft.
Area Treated	64,113 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,278/lb., 12.32 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,000/lb., 1.55 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$103,335/ton, 0.51 tons/yr.
Cost	$52,701
CWAC Goal	Urban Trees

Description

The Dorchester County Health Department office has several opportunities to store and treat stormwater. Currently, in this location there are limited stormwater practices and very large impervious areas. The remaining green spaces should be planted out with trees and native plants to help with intercepting rainfall and creating better habitat and landscaping.

Project 322

Project Type	Tree Planting
Latitude	38.566704
Longitude	-76.068239
Land Ownership (Parcel No.)	Commissioners of Dorchester County (5061)
Estimated Size	26,000 sq. ft.
Area Treated	50,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,661/lb., 7.26 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$82,200/lb., 0.50 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$316,153/ton, 0.13 tons/yr.
Cost	$41,100
CWAC Goal	Urban Trees

Description

McCarter Park on Lecompte St. has large grass fields. This presents an easy opportunity to complete a tree planting or landscape restoration project that incorporates soil amendments, if necessary, as well as native tree and shrub plantings.


McCarter Park
A Fun Place For Children.


McCarter Park
A Fun Place For Children.

Project 323

Project Type	Downspout Discon-nect
Latitude	38.567006
Longitude	-76.068635
Land Ownership (Parcel No.)	Private (5060)
Estimated Size	N/A
Area Treated	10,400 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$1,807/lb., 1.66 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$14,286/lb., 0.21 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	N/A
Cost	$3,000
CWAC Goal	Rain Barrels

Description

This residential site off of Lecompte St. has downspouts that discharge directly onto the parking lot. This adds directly to the runoff that flows to a nearby stormwater sewer on the corner of the parking lot. It is suggested that the downspouts be connected to rain barrels to store the rainwater. Rain barrels would help reduce the amount of stormwater, but also provide the added benefit of holding the water for later use.

Project 324

Project Type	Green Street-Lacompte St.
Latitude	38.567459
Longitude	-76.068545
Land Ownership	Public Street
Estimated Size	0.5 acres
Area Treated	229,672 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$27,381/lb., 43.94 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$217,559/lb., 5.53 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$493,075/ton, 2.44 tons/yr.
Cost	$1,203,102
CWAC Goal	Stormwater Facility, Urban Trees, Impervious Surface, Green Space

Description

Lecompte St. is a very wide street with low traffic and not many residences. This makes the street a good candidate to be transformed into a green street. This would include bioretention bump outs, pervious pavers, and additional tree plantings. Locations adjacent to the park or where there is little interference with private property are ideal locations for these practices.

Project 325

Project Type	Bioswale– Dorchester Ave.
Latitude	38.566340
Longitude	-76.066941
Land Ownership	Public Road- Dorchester Ave.
Estimated Size	0.19 acres
Area Treated	78,527 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$3,125/lb., 15.02 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$24,838/lb., 1.89 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$74,515/ton, 0.63 tons/yr.
Cost	$46,945
CWAC Goal	Stormwater Facility

Description

Dorchester Avenue has swales along the roadside to convey stormwater. The swales have the potential to be retrofitted into bioswales that are low maintenance, but are able to attenuate stormwater and reduce nutrient and sediment pollution.

Project 326

Project Type	Green Street– Henry St.
Latitude	38.568063
Longitude	-76.067061
Land Ownership	Public Road– Henry St.
Estimated Size	2.9 acres
Area Treated	902,886 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$27,386/lb., 172.7 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$217,554lb, 21.74 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$656,893/lb., 7.2 tons/yr.
Cost	$4,729,632
CWAC Goal	Stormwater Facility, Urban Trees, Impervious Surface, Green

Description

Henry St. is a very wide street that has the potential to be transformed into a green street. Considerations would have to be made for the many residences in the area, but there are some vacant lots on the street where bump out bioretention practices could be placed along the curb line. Street trees would also be good for the street due to the lack of any. The infrastructure would have beneficial landscaping value for the adjacent properties in addition to helping with stormwater.

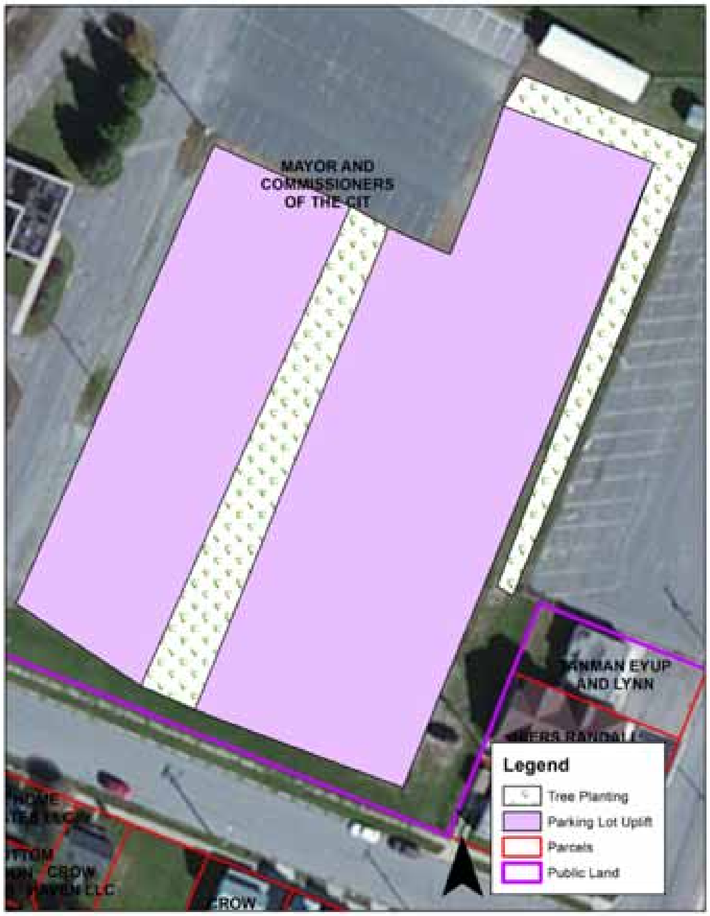
Project 331-A

Project Type	Bioretentions
Latitude	38.572706
Longitude	-76.069369
Land Ownership (Parcel No.)	Public (5150)
Estimated Size	0.08 acres
Area Treated	205,882 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,104/lb., 39.38 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,466/lb., 4.96 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,579/ton, 1.64 tons/yr.
Cost	$240,390
CWAC Goal	Stormwater Facility

Description

Governor's Hall at Sailwinds Park has green spaces adjacent to the building where runoff from the building and nearby parking lot could be directed into bioretention cells. Completing stormwater best management work on public property adjacent to Cambridge Creek provides the opportunity for good public exposure as well as making immediate water quality impacts on Cambridge Creek. It is suggested that future plans for Sailwinds park should incorporate the appropriate stormwater practices to make the area as low impact on Cambridge Creek as possible.

Project 331 B



Project Type	Parking Lot Restoration and Tree Planting
Latitude	38.571786
Longitude	-76.069318
Land Ownership (Parcel No.)	Public (5150)
Estimated Size	1.76 acres
Area Treated	191,903 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$47,972/lb., 36.71 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$381,180/lb., 4.62 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$1,151,013/ton, 1.53 tons/yr.
Cost	$1,761,050
CWAC Goal	Stormwater Facility, Urban Trees

Description

The parking lot at Sailwinds Park is predominately gravel pack and would have very poor infiltration of stormwater due to compaction. It is suggested that tree plantings or other native vegetative plantings be added to the park to reduce the impervious area and have areas where infiltration can take place. It is also suggested that infiltration be increased in the parking area by using pervious pavers or adding bioretention cells to intercept the runoff.

Project 332 A

Project Type	Wetland Creation
Latitude	38.570920
Longitude	-76.071394
Land Ownership	Private (5152, 5069)
Estimated Size	0.93 acres
Area Treated	1,897,973 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$5,369/lb., 212.36 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$31,748/lb., 35.91 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$80,742/ton, 14.12tons/yr.
Cost	$1,140,075
CWAC Goal	Stormwater Facility

Description

This vacant field off of Maryland Ave. adjacent to Cambridge Creek provides tremendous potential for stormwater best management practice installation. This site is the intersection for a lot of stormwater pipes that drain Maryland Ave., adjacent side streets and in the vacant field there are old storm drain inlets. The most important part of this project would be the wetland creation. All of the stormwater infrastructure that passes through this site would be day lighted so that the stormwater pipes discharge into the wetland rather than directly into the creek. The wetland would allow for storage of the stormwater in addition to reduction of sediment and nutrient loads. An overflow outlet pipe would then connect the wetland to Cambridge Creek. This project has the potential to make a substantial impact on the water quality in Cambridge Creek as well as changing a vacant field into a picturesque wetland that has environmental benefits.



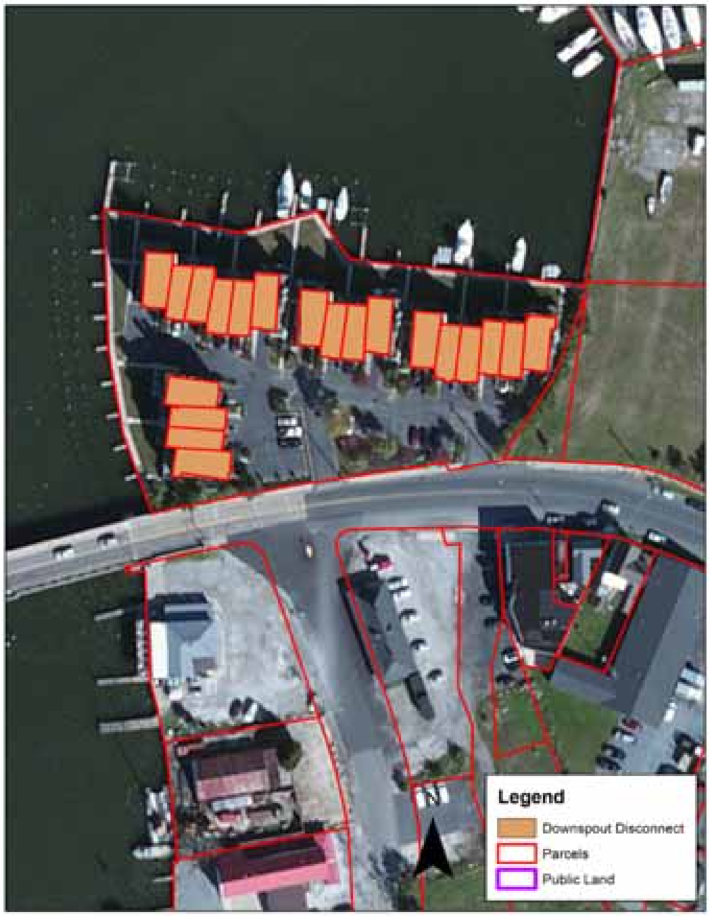

Project 332 B

Project Type	Tree Planting and Landscaping
Latitude	38.570774
Longitude	-76.070721
Land Ownership	Private (5152, 5069)
Estimated Size	0.94 acres
Area Treated	92,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,297/lb., 17.60 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,065/lb., 2.22 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$103,594/ton, 0.73 tons/yr.
Cost	$75,624
CWAC Goal	Urban Trees, Green Space

Description

This vacant field off of Maryland Ave. adjacent to Cambridge Creek provides tremendous potential for stormwater best management practice installation. This site is the intersection for a lot of stormwater pipes that drain Maryland Ave., adjacent side streets and in the vacant field there are old storm drain inlets. Outside of the wetland the remainder of the vacant field should be converted into a more natural landscape with tree plantings and native meadow buffer plantings. This creates a complete habitat with diverse plant species and would help create one of the few truly natural open spaces in the city of Cambridge.

Project 333



Project Type	Downspout Discon-nect/Rain Barrels
Latitude	38.570898
Longitude	-76.072422
Land Ownership (Parcel No.)	Multiple Private Landowners (5069)
Estimated Size	0.43 acres
Area Treated	18,517 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$1,743/lb., 4.82 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$14,237/lb., 0.59 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	N/A
Cost	$8,400
CWAC Goal	Rain Barrels

Description

This site is off Maryland Ave. adjacent to Cambridge Creek. The residences have downspouts that discharge onto pavement and into the stormwater system. Disconnecting the downspouts from the impervious area would help reduce runoff impacts on Cambridge Creek. Rain barrels are the suggested practice for this site due to the limited space.

Project 341

Project Type	Street Tree Planting
Latitude	38.570058
Longitude	-76.067650
Land Ownership	Public Road Right of Way
Estimated Size	0.19 acres
Area Treated	72,956 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,299/lb., 13.95 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,074/lb., 1.76 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$103,396/ton, 0.58 tons/yr.
Cost	$59,970
CWAC Goal	Urban Trees

Description

Aurora St. has space between the sidewalks and curbs to allow for street tree plantings. This would help to reduce the impacts of the impervious surface in the area by intercepting rainfall. It would also provide shade for the street and local residences. The only issue might be low utilities along the road.

Project 342

Project Type	Street Tree Planting
Latitude	38.568063
Longitude	-76.067650
Land Ownership (Parcel No.)	Private (5199)
Estimated Size	4,800 sq. ft.
Area Treated	10,469 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,303/lb., 2.0 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,422/lb., 0.25 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$107,569/ton, 0.08 tons/yr.
Cost	$8,605
CWAC Goal	Urban Trees

Description

There is a large median between Byrne St. and the Dorchester General Hospital Parking lot. It is recommended that additional tree plantings or other native shrub plantings be added to the median to help improve the habitat, reduce mowing maintenance, and provide water quality benefits.

Project 411 A

Project Type	Bioretention
Latitude	38.571099
Longitude	-76.076320
Land Ownership (Parcel No.)	Public (4415, 4416)
Estimated Size	0.02 acres
Area Treated	50,483 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$23,919/lb., 9.66 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$181,939/lb., 1.27 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$577,655/ton, 0.40 tons/yr.
Cost	$231,062
CWAC Goal	Stormwater Facility

Description

There is a small paved parking space next to the public library and old fire house off of Gay St. that is most likely under utilized. It is proposed that this area be depaved and green space added in addition to a bioretention that could capture the stormwater generated from the numerous impervious surfaces. If the area cannot be partially depaved, then it is suggested at minimum, a bioretention be added to address the runoff from all the impervious surfaces located in this part or Cambridge.

Project 411 B

Project Type	Depave and Planting
Latitude	38.571099
Longitude	-76.076320
Land Ownership (Parcel No.)	Public (4415, 4416)
Estimated Size	0.075 acres
Area Treated	50,483 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$16,825/lb., 9.66 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$133,221/lb., 1.22 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$406,324/ton, 0.40 tons/yr.
Cost	$162,529
CWAC Goal	Impervious Surface

Description

There is a small paved parking space next to the public library and old fire house off of Gay St. that is most likely under utilized. It is proposed that this area be depaved and green space added in addition to a bioretention that could capture the stormwater generated from the numerous impervious surfaces. If the area cannot be partially depaved, then it is suggested at minimum, a bioretention be added to address the runoff from all the impervious surfaces located in this part or Cambridge.

Project 412

Project Type	Green Roof
Latitude	38.572027
Longitude	-76.076934
Land Ownership (Parcel No.)	Public (0024)
Estimated Size	0.26 acres
Area Treated	11,405 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$113,531/lb., 2.18 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$916,654/lb., 0.27 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$2,749,963/ton, 0.09 tons/yr.
Cost	$247,497
CWAC Goal	Impervious Surface

Description

The United States Post Office on the corner of High St. and Church St. has a flat roof that could be retrofitted into a green roof. A structural integrity check would need to be made to ensure the roof can handle the additional weight. Adding any green space in this portion of the Cambridge Creek watershed is a positive because of the intense urban development and impervious spaces. The green roof would help reduce runoff and provide some nutrient and sediment benefits.

Church St
DBC
Church St
Christ Episcopal
Church and Cemetery
High St
Church St
United States
Postal Service
High St
The High Spot
Dorchester Center
For the Arts
High St
Spring St
1880 Bank
Art Bar At Liv Again

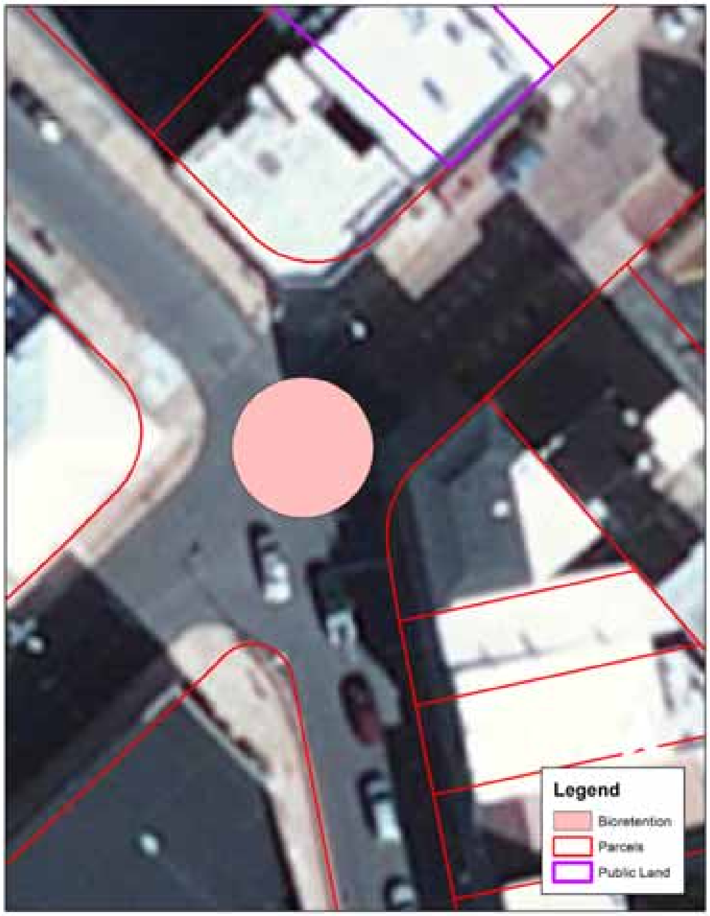
Project 413

Project Type	Rain Garden
Latitude	38.571603
Longitude	-76.077634
Land Ownership (Parcel No.)	Public (0027)
Estimated Size	0.02 acres
Area Treated	6,770 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,128/lb., 1.29 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$49,404/lb., 0.16 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$158,094/ton, 0.05 tons/yr.
Cost	$7,905
CWAC Goal	Stormwater Facility

Description

The Dorchester Center for the Arts has an impervious area next to the building. It is encouraged that rain gardens be added to this space to intercept some runoff from the roofs. This area of Cambridge has large areas of impervious surface and not a lot of room to work in so adding many small best management projects can go a long way towards reducing the runoff from this area.

Project 414



Project Type	Bioretention
Latitude	38.571117
Longitude	-76.077586
Land Ownership (Parcel No.)	Public Road
Estimated Size	0.024 acres
Area Treated	231,463 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$14,297/lb., 74.10 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$132,925/lb., 7.97 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$430,656/ton, 2.46 tons/yr.
Cost	$1,059,413
CWAC Goal	Stormwater Facility

Description

The intersection of Poplar St. and High St. presents an interesting opportunity to address stormwater in an innovative way. Working in areas that are intensely urbanized requires adapting projects to fit within the confines of the landscape. This area of Cambridge does not have a lot of flexibility in practice location so trying to fit best management practices into this impervious landscape takes innovation. This intersection has multiple stormwater drains connecting into the stormwater sewer. A potential retrofit could be to change the intersection into a roundabout that has a bioretention in the center. The existing stormwater infrastructure could either tie into the bioretention or the road reshaped to direct water to the center of the roundabout. This would add some green landscape and water quality improvements to an area that does not have much space for either.


High St

Project 421

Project Type	Green Street
Latitude	38.574181
Longitude	-76.073625
Land Ownership (Parcel No.)	Public Road
Estimated Size	0.13 acres
Area Treated	225,900 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$27,386/lb., 43.21 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$217,526/lb., 5.44 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$357,413/ton, 1.80 tons/yr.
Cost	$1,183,343
CWAC Goal	Stormwater Facility, Urban Trees, Green Space, Impervious Surface

Description

This section of High St. has street trees, is wide, and has very wide sidewalks. This section would benefit from the addition of green street best management practices, such as bioretentions. The large sidewalks could be used to add small bioretention cells to help infiltrate and reduce runoff from the road. The bioretentions could be located on or near the stormwater drains along the street.


MMERCE ST
HIGH ST

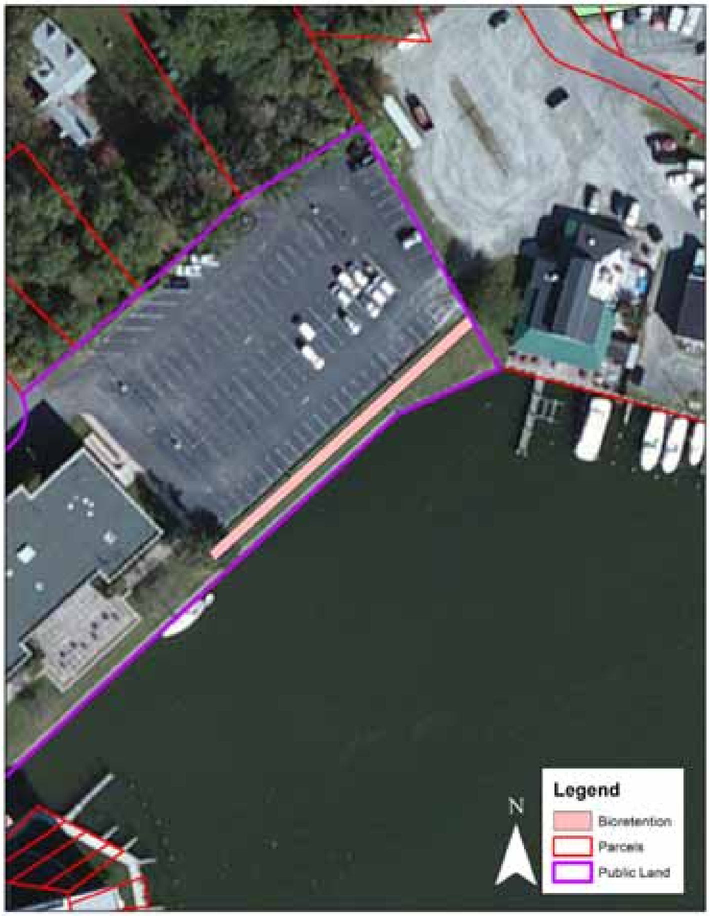
Project 422

Project Type	Bioretention
Latitude	38.571619
Longitude	-76.075715
Land Ownership (Parcel No.)	Public (0001)
Estimated Size	0.06 acres
Area Treated	63,410 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,104/lb., 12.13 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,391/lb., 1.53 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$145,173/ton, 0.51 tons/yr.
Cost	$74,038
CWAC Goal	Stormwater Facility

Description

The Dorchester County Circuit Court House has a depression with a small storm drain along Spring St. This creates the ideal location for a bioretention. Stormwater generated from the court house can be directed to the bioretention in addition to stormwater from the impervious areas and road. Curb cuts would need to be added in order for runoff from the road to enter the bioretention. This practice would have great visibility and help reduce stormwater in this highly urbanized portion of Cambridge.

Project 423



Project Type	Bioretention
Latitude	38.572397
Longitude	-76.073853
Land Ownership (Parcel No.)	Public (0002)
Estimated Size	0.04 acres
Area Treated	250,000 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,104/lb., 47.82 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,489/lb., 6.02 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,685/ton, 1.99 tons/yr.
Cost	$291,902
CWAC Goal	Stormwater Facility

Description

The Dorchester County Government building on Court Ln. has a very large parking lot next to Cambridge Creek. There is a small grass strip that separates the parking lot from creek. Within this grass strip a bioretention would be ideal to capture the runoff from the parking lot. The bioretention would allow for infiltration and slowing down of runoff before entering the creek. An underdrain could be added that outlets to the creek to ensure that the bioretention drains down in the appropriate time. This practice would make immediate benefits to the creek due to the size of the impervious area that drains to it and the proximity of the creek.

Project 424

Project Type	Bioretention
Latitude	38.571665
Longitude	-76.074755
Land Ownership (Parcel No.)	Public Road, Public (0002)
Estimated Size	0.048 acres
Area Treated	94,370 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,105/lb., 18.05 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,541/lb., 2.27 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,916/ton, 0.75 tons/yr.
Cost	$110,187
CWAC Goal	Stormwater Facility

Description

The Court Ln. 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 bioretentions would help intercept this runoff before it enters the creek, allowing for a reduction of peak flows, sediment, and phosphors from entering Cambridge Creek.

Project 425

Project Type	Landscape Restoration
Latitude	38.573559
Longitude	-76.072546
Land Ownership (Parcel No.)	Private (0056, 0057)
Estimated Size	2.25 acres
Area Treated	208,530 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$7,377/lb., 39.89 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$58,617/lb., 5.02 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$177,262/ton, 1.66 tons/yr.
Cost	$294,256
CWAC Goal	Green Space, Urban Trees

Description

Commerce St. near Clayton's Packing house has a very large vacant area that sits directly on the water. This space could be transformed into a green space that has tree plantings, small wetlands near the interface with the water, as well as native plantings. This location provides a unique opportunity to restore water front property, achieve water quality goals, and create a natural green space in Cambridge.


Commerce St
Commerce St
Commerce St

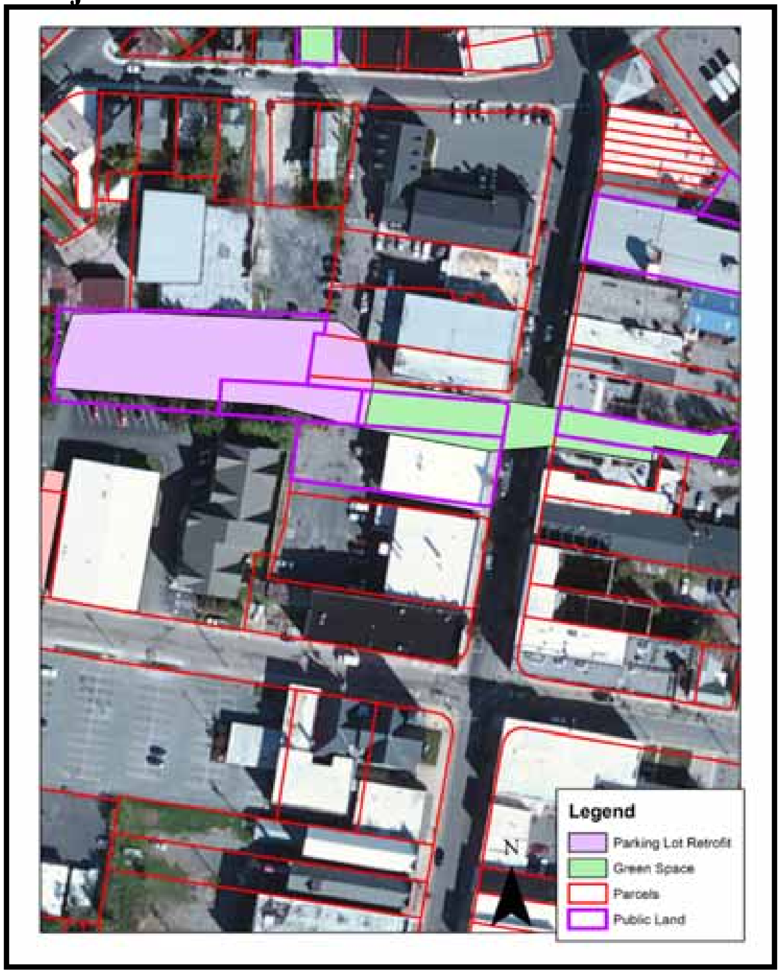
Project 431

Project Type	Green Space/ Landscape Restoration
Latitude	38.570113
Longitude	-76.078153
Land Ownership (Parcel No.)	Public (4442)
Estimated Size	0.053 acres
Area Treated	2,305 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$7,377/lb., 0.44 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$58,617/lb., 0.06 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$177,262/ton, 0.02 tons/yr.
Cost	$3,253
CWAC Goal	Green Space, Urban Trees

Description

This site is a vacant lot off of Gay St. It is proposed to keep this area as a green space and put in native plantings.

Project 432



Project Type	Parking Lot Retrofit
Latitude	38.569226
Longitude	-76.078282
Land Ownership (Parcel No.)	Public (4519, 4518, 4512, 4496)
Estimated Size	0.68 acres
Area Treated	83,074 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$47,977/lb., 15.89 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$381,176/lb., 2.00lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$1,155,078/ton, 0.66 tons/yr.
Cost	$762,351
CWAC Goal	Impervious Surface, Stormwater Facility. Green Space

Description

The alleyway and public parking corridor next to Black Water Baked Goods and Coffee lends itself to a parking lot retrofit to reduce the impacts of impervious area. This could come in the form of pervious pavers, small plantings or bioretention cells, or rain gardens. A green corridor could connect the alleyway with the green corridor across Race St. Parking can still be maintained, but small plantings and small rain garden/bioretention cells could be added to help reduce runoff within the alleyway.

Project 433

Project Type	Tree Planting
Latitude	38.568615
Longitude	-76.079424
Land Ownership	Public Road
Estimated Size	0.058 acres
Area Treated	38,639 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,298/lb., 7.39 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,152/lb., 0.93 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$102,455/ton, 0.31 tons/yr.
Cost	$31,761
CWAC Goal	Urban Trees

Description

Muir St., near the intersection with Pine St. has space for street tree plantings. At present no trees line this street so adding some trees between the sidewalk in the road would provide beneficial shade, in addition to intercepting rainfall to reduce runoff.

Project 434

Project Type	Bioretention
Latitude	38.568749
Longitude	-76.079079
Land Ownership (Parcel No.)	Private (4520, 4517)
Estimated Size	0.048 acres
Area Treated	30,700 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,107/yr., 5.87 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,440/yr., 0.74 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$149,357/ton, 0.24 tons/yr.
Cost	$35,846
CWAC Goal	Stormwater Facility

Description

Muir St. is a green space next to a health center. The roof has downspouts that discharge directly to this green space. This site lends itself to being converted into a bioretention to intercept water coming out of the downspouts. The parking lot behind the building could also have runoff directed into the bioretention. This would reduce runoff, sediment, and nutrients, as well as having landscaping value.

Project 435

Project Type	Green Roof
Latitude	38.568918
Longitude	-76.077729
Land Ownership (Parcel No.)	Public (4513)
Estimated Size	0.14 acres
Area Treated	6,050 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$787/lb., 1.16 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$6,083/lb., 0.15 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$18,250/ton, 0.05 tons/yr.
Cost	$912
CWAC Goal	Impervious Surface

Description

This publicly owned building on Race St. has a flat roof that could be converted into a green roof. This area of Cambridge has a lot of impervious surface and little space to incorporate stormwater best management practices. Adding a green roof to appropriate structures would help reduce runoff in this urban environment as well as create unique habitat and green space that is lacking within this portion of the city.

Project 436 A

Project Type	Depave/Parking Lot Retrofit
Latitude	38.567232
Longitude	-76.076721
Land Ownership (Parcel No.)	Public (4760)
Estimated Size	0.15 acres
Area Treated	6,408 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$12,490/lb., 1.23 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$102,421/lb., 0.15 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$307,262/ton, 0.05 tons/yr.
Cost	$15,363
CWAC Goal	Impervious Surface

Description

This site is a public parking lot off of Race St. near Cemetery Ave. is long and potentially underused. The back part of the parking lot could be depaved and transformed into a green space and a tree planting could occur next to the private residences or throughout the depaved area. Decreasing the amount of impervious area in an urban area is one of the better ways to decrease runoff and pollution.

Project 436 B

Project Type	Tree Planting
Latitude	38.567232
Longitude	-76.076721
Land Ownership (Parcel No.)	Public (4760)
Estimated Size	0.036 acres
Area Treated	11,035 Sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,299/lb., 2.11 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$33,595/lb., 0.27 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$100,786/ton, 0.09 tons/yr.
Cost	$9,071
CWAC Goal	Urban Trees

Description

This site is a public parking lot off of Race St. near Cemetery Ave. is long and potentially underused. The back part of the parking lot could be depaved and transformed into a green space and a tree planting could occur next to the private residences or throughout the depaved area. Decreasing the amount of impervious area in an urban area is one of the better ways to decrease runoff and pollution.

Project 437 A

Project Type	Bioretention
Latitude	38.56858
Longitude	-76.076192
Land Ownership (Parcel No.)	Public (4487)
Estimated Size	0.037 acres
Area Treated	18,220 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$23,895/lb., 3.49 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$189,531/lb., 0.44 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$555,956/ton, 0.15 tons/yr.
Cost	$83,393
CWAC Goal	Stormwater Facility

Description

The public parking area off of Muir St. and Academy St. already has some stormwater management practices installed. This project looks to add additional practices to this parking lot to reduce runoff, nutrient and sediment pollution. A bioretention is proposed to be installed between a row of parking spaces, which currently has a cement median. This bioretention would intercept the runoff from this portion of the parking lot and greatly reduce the impact of this impervious surface on stormwater flow to Cambridge Creek.

Project 437 B

Project Type	Tree Planting
Latitude	38.56858
Longitude	-76.076192
Land Ownership (Parcel No.)	Public (4487)
Estimated Size	0.068 acres
Area Treated	2,970 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,283/lb., 0.57 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,876/lb., 0.07 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$122,067/ton, 0.02 tons/yr.
Cost	$2,441
CWAC Goal	Urban Trees

Description

The public parking area off of Muir St. and Academy St. already has some stormwater management practices installed. This project looks to add additional practices to this parking lot to reduce runoff and nutrient and sediment pollution. Tree plantings are suggested for this parking lot in order to add shade and intercept rainfall. The trees would add landscaping value as well as a water quality benefit.

Project 441

Project Type	Wetland Creation
Latitude	38.56858
Longitude	-76.076192
Land Ownership	Private (4466)
Estimated Size	0.56 acres
Area Treated	1,463,806 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$4,283/lb., 163.78 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$34,876/lb., 27.69 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$122,067/ton, 10.89 tons/yr.
Cost	$2,333,491
CWAC Goal	Stormwater Facility

Description

This site is a large vacant lot off of Cherry St. and Academy St. directly on Cambridge Creek. Two stormwater pipes discharge into the creek adjacent to the site (where the booms are located in the water) and adjacent to the townhouses on the north end of the site. This site has the potential to be created into a wetland. Previous industry on this site might mean that before restoration there would need to be an environmental assessment and remediation of toxics. The stormwater infrastructure that passes near or beneath the site provides a unique opportunity to daylight the pipes and allow them to discharge into a wetland where treatment of sediment, nutrients, and other pollutants could occur before entering Cambridge Creek. The stormwater network that drains to this site covers most of Race St. between Gay St. and Muir St. This project would have a dramatic effect on nitrogen, phosphorus, and sediment loads to Cambridge Creek and create a green space along the industrial Cambridge Creek.

Project 442

Project Type	Green Street
Latitude	38.56907
Longitude	-76.075588
Land Ownership	Public Road
Estimated Size	0.70 acres
Area Treated	374,184 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$27,387/lb., 71.57 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$217,548/lb., 9.01 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$657,754/ton, 2.98 tons/yr.
Cost	$1,960,106
CWAC Goal	Stormwater Facility, Green Space, Urban Trees, Impervious Surface

Description

Academy St. between Muir St. and Market St. is a wide street with mostly commercial properties and very wide side walks. This street has the potential to be converted into a green street by using some of the side walk and road space to install small bump out bioretentions where there are storm drain inlets. The existing stormwater infrastructure can be tied into the bioretentions to ensure that there is no overflow or flooding of the street.


Academy

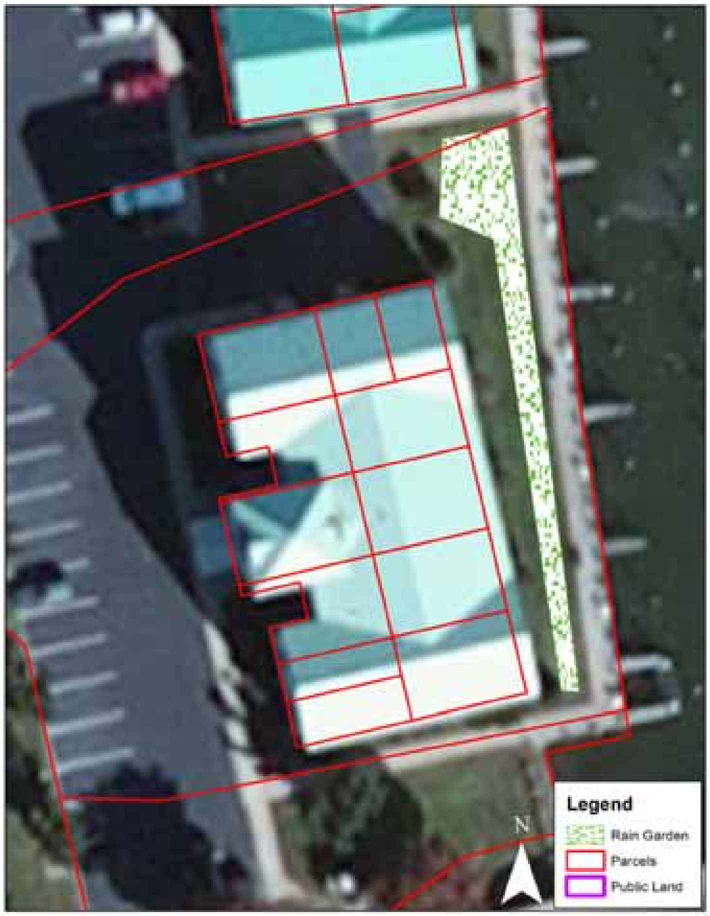
Project 443

Project Type	Bioretentions
Latitude	38.570138
Longitude	-76.075112
Land Ownership (Parcel No.)	Public Road, Private (4402)
Estimated Size	0.145 acres
Area Treated	308,185 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,104/lb., 58.95 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,496/lb., 7.42 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$146,276/ton, 2.46 tons/yr.
Cost	$359,840
CWAC Goal	Stormwater Facility

Description

The intersection of Market St. with Academy St. has three medians and some larger green spaces. The roads that intersect here slope to the intersection and then down Market St. to Cambridge Creek. Changing these medians into bioretentions would allow for the capture of runoff before it enters the creek. The bioretentions would allow for some storage and infiltration that would make runoff events from this area much less drastic in addition to reducing sediment and nutrient pollution loads.

Project 444



Project Type	Rain Garden
Latitude	38.570738
Longitude	-76.074185
Land Ownership (Parcel No.)	Private (4401)
Estimated Size	0.025 acres
Area Treated	11,620 sq. ft.
Nitrogen Removal ($/lb., lbs/yr.)	$6,112/lb., 2.22 lbs/yr.
Phosphorus Removal ($/lb., lbs/yr.)	$48,456/lb., 0.28 lbs/yr.
TSS Removal ($/Ton, Tons/yr.)	$150,751/ton, 0.09 tons/yr.
Cost	$13,568
CWAC Goal	Stormwater Facility

Description

This condo located on Cambridge Creek near Maryland Ave. has downspouts that discharge directly into the stormwater sewer. It is suggested that a rain garden be installed in the grass between the building and the dock. All the downspouts should be directed to the rain garden to allow for infiltration and runoff reduction. Being in a residential area the rain garden should be planted in native flowering species.

Project –Outfalls

Description

It is suggested that each outfall pipe located on Cambridge Creek be outfitted with a separator or filter box to help reduce solids, phosphorus, and hydrocarbons before the pipes discharge to Cambridge Creek. Many of these outfalls have limited space to work in so having an outlet treatment system that can be retrofitted to the pipe would provide treatment to the stormwater before it is discharged to the creek. There are multiple styles and manufacturers thus the cost varies greatly depending on treatment level and process.