RUTGERS
New Jersey Agricultural
Experiment Station

Impervious Cover Reduction Action Plan
for
Millville City, Cumberland County, New Jersey

Prepared for Millville City by the
Rutgers Cooperative Extension Water Resources Program

August 10, 2016

WILLIAM PENN
FOUNDATION

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Introduction

Located in Cumberland County in southern New Jersey, Millville City covers approximately 44.5 square miles. Figures 1 and 2 illustrate that Millville City is dominated by forest land uses. A total of 27.9% of the municipality's land use is classified as urban. Of the urban land in Millville City, medium density residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2012 land use/land cover geographical information system (GIS) data layer categorizes Millville City into many unique land use areas, assigning a percent impervious cover for each delineated area. These impervious cover values were used to estimate the impervious coverage for Millville City. Based upon the 2012 NJDEP land use/land cover data, approximately 9.0% of Millville City has impervious cover. This level of impervious cover suggests that the streams in Millville City are likely sensitive streams.[1]

Methodology

Millville City contains portions of nine subwatersheds (Figure 4). For this impervious cover reduction action plan, projects have been identified in each of these watersheds. Initially, aerial imagery was used to identify potential project sites that contain extensive impervious cover. Field visits were then conducted at each of these potential project sites to determine if a viable option exists to reduce impervious cover or to disconnect impervious surfaces from draining directly to the local waterway or storm sewer system. During the site visit, appropriate green infrastructure practices for the site were determined. Sites that already had stormwater management practices in place were not considered.

[1] Caraco, D., R. Claytor, P. Hinkle, H. Kwon, T. Schueler, C. Swann, S. Vysotsky, and J. Zielinski. 1998. Rapid Watershed Planning Handbook. A Comprehensive Guide for Managing Urbanizing Watersheds. Prepared by Center For Watershed Protection, Ellicott City, MD. Prepared for U.S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds and Region V. October 1998

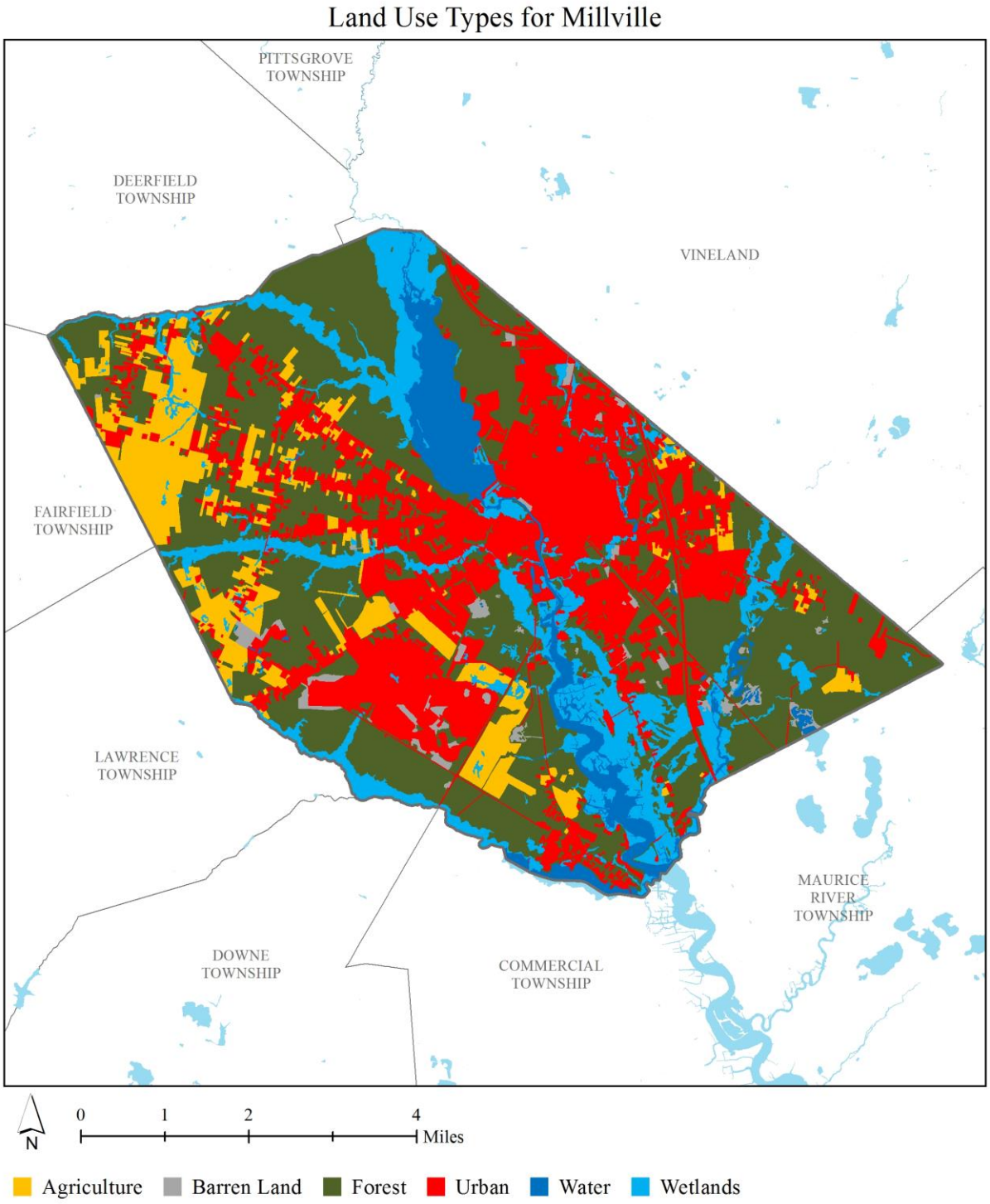


Figure 1: Map illustrating the land use in Millville City

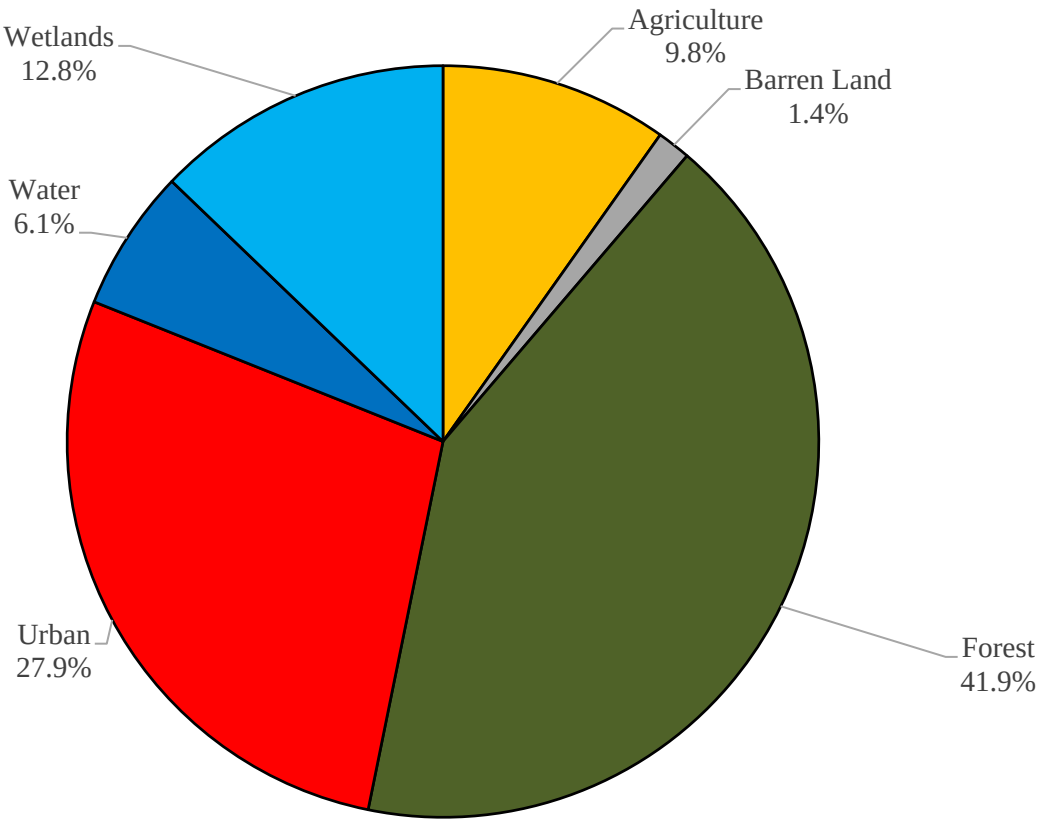


Figure 2: Pie chart illustrating the land use in Millville City

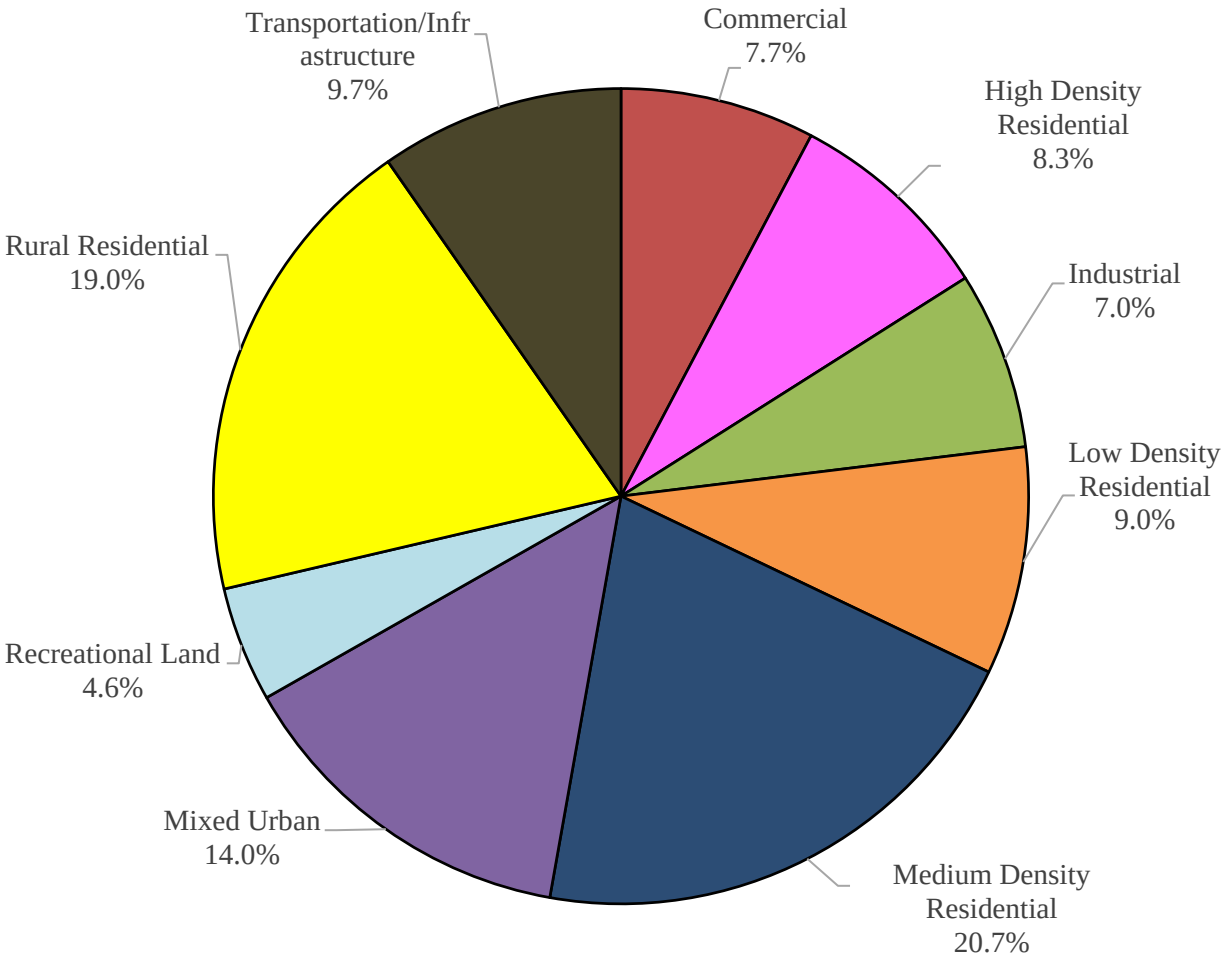


Figure 3: Pie chart illustrating the various types of urban land use in Millville City

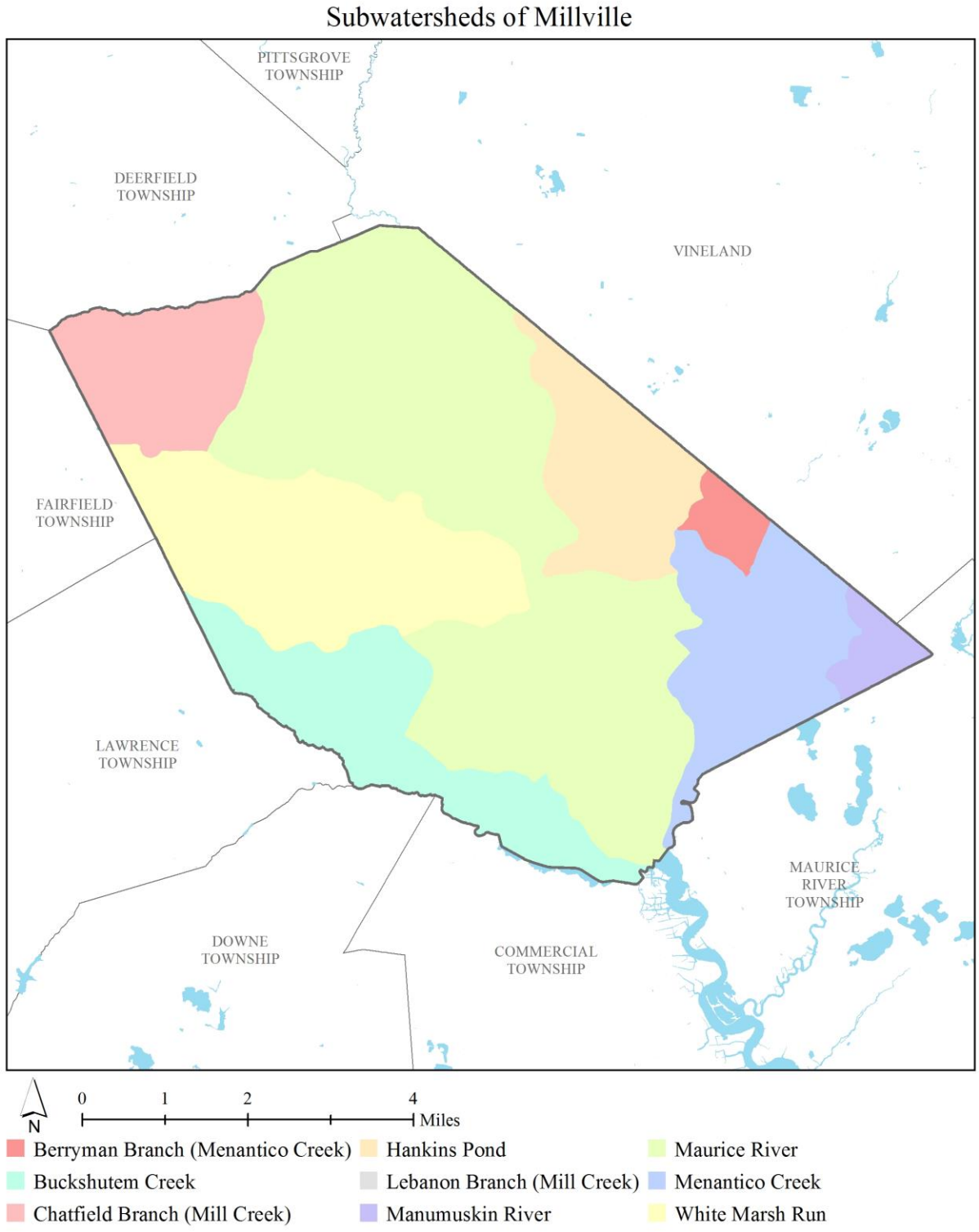


Figure 4: Map of the subwatersheds in Millville City

For each potential project site, specific aerial loading coefficients for commercial land use were used to determine the annual runoff loads for total phosphorus (TP), total nitrogen (TN), and total suspended solids (TSS) from impervious surfaces (Table 1). These are the same aerial loading coefficients that NJDEP uses in developing total maximum daily loads (TMDLs) for impaired waterways of the state. The percentage of impervious cover for each site was extracted from the 2012 NJDEP land use/land cover database. For impervious areas, runoff volumes were determined for the water quality design storm (1.25 inches of rain over two-hours) and for the annual rainfall total of 44 inches.

Preliminary soil assessments were conducted for each potential project site identified in Millville City using the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey, which utilizes regional and statewide soil data to predict soil types in an area. Several key soil parameters were examined (e.g., natural drainage class, saturated hydraulic conductivity of the most limiting soil layer (K_{sat}), depth to water table, and hydrologic soil group) to evaluate the suitability of each site's soil for green infrastructure practices. In cases where multiple soil types were encountered, the key soil parameters were examined for each soil type expected at a site.

For each potential project site, drainage areas were determined for each of the green infrastructure practices proposed at the site. These green infrastructure practices were designed to manage the 2-year design storm, enabling these practices to capture 95% of the annual rainfall. Runoff volumes were calculated for each proposed green infrastructure practice. The reduction in TSS loading was calculated for each drainage area for each proposed green infrastructure practice using the aerial loading coefficients in Table 1. The maximum volume reduction in stormwater runoff for each green infrastructure practice for a storm was determined by calculating the volume of runoff captured from the 2-year design storm. For each green infrastructure practice, peak discharge reduction potential was determined through hydrologic modeling in HydroCAD. For each green infrastructure practice, a cost estimate is provided. These costs are based upon the square footage of the green infrastructure practice and the real cost of green infrastructure practice implementation in New Jersey.

Table 1: Aerial Loading Coefficients[2]

Land Cover	TP load (lbs/acre/yr)	TN load (lbs/acre/yr)	TSS load (lbs/acre/yr)
High, Medium Density Residential	1.4	15	140
Low Density, Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1.0	10	120
Agriculture	1.3	10	300
Forest, Water, Wetlands	0.1	3	40
Barrenland/Transitional Area	0.5	5	60

[2] New Jersey Department of Environmental Protection (NJDEP), Stormwater Best Management Practice Manual, 2004.

Green Infrastructure Practices

Green infrastructure is an approach to stormwater management that is cost-effective, sustainable, and environmentally friendly. Green infrastructure projects capture, filter, absorb, and reuse stormwater to maintain or mimic natural systems and to treat runoff as a resource. As a general principal, green infrastructure practices use soil and vegetation to recycle stormwater runoff through infiltration and evapotranspiration. When used as components of a stormwater management system, green infrastructure practices such as bioretention, green roofs, porous pavement, rain gardens, and vegetated swales can produce a variety of environmental benefits. In addition to effectively retaining and infiltrating rainfall, these practices can simultaneously help filter air pollutants, reduce energy demands, mitigate urban heat islands, and sequester carbon while also providing communities with aesthetic and natural resource benefits[3]. A wide range of green infrastructure practices have been evaluated for the potential project sites in Millville City. Each practice is discussed below.

Disconnected downspouts

This is often referred to as simple disconnection. A downspout is simply disconnected, prevented from draining directly to the roadway or storm sewer system, and directed to discharge water to a pervious area (i.e., lawn).

Pervious pavements

There are several types of permeable pavement systems including porous asphalt, pervious concrete, permeable pavers, and grass pavers. These surfaces are hard and support vehicle traffic but also allow water to infiltrate through the surface. They have an underlying stone layer to store stormwater runoff and allow it to slowly seep into the ground.




[3] United States Environmental Protection Agency (USEPA), 2013. Watershed Assessment, Tracking, and Environmental Results, New Jersey Water Quality Assessment Report. http://ofmpub.epa.gov/waters10/attains_state.control?p_state=NJ

Bioretention systems/rain gardens

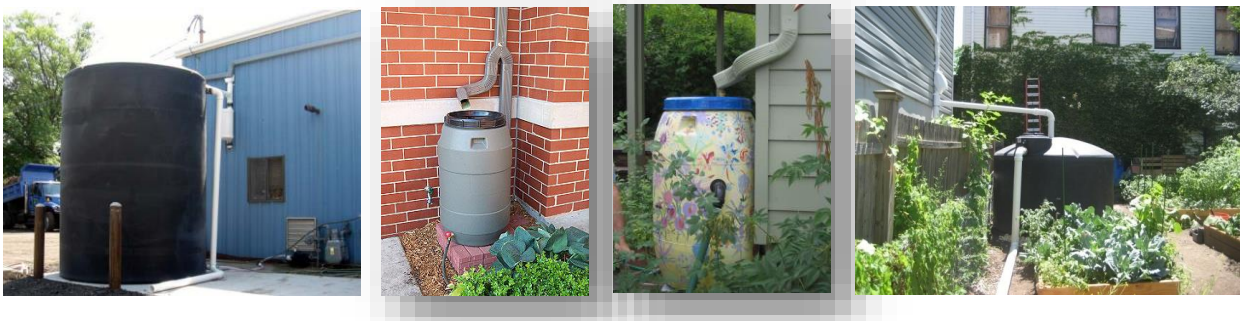
These are landscaped features that are designed to capture, treat, and infiltrate stormwater runoff. These systems can easily be incorporated into existing landscapes, improving aesthetics and creating wildlife habitat while managing stormwater runoff. Bioretention systems also can be used in soils that do not quickly infiltrate by incorporating an underdrain into the system.

Downspout planter boxes

These are wooden boxes with plants installed at the base of a downspout that provide an opportunity to beneficially reuse rooftop runoff.

Rainwater harvesting systems (cistern or rain barrel)

These systems capture rainwater, mainly from rooftops, in cisterns or rain barrels. The water can then be used for watering gardens, washing vehicles, or for other non-potable uses.



Bioswale

Bioswales are landscape features that convey stormwater from one location to another while removing pollutants and providing water an opportunity to infiltrate.

Stormwater planters

Stormwater planters are vegetated structures that are built into the sidewalk to intercept stormwater runoff from the roadway or sidewalk. Many of these planters are designed to allow the water to infiltrate into the ground while others are designed simply to filter the water and convey it back into the stormwater sewer system.

Tree filter boxes

These are pre-manufactured concrete boxes that contain a special soil mix and are planted with a tree or shrub. They filter stormwater runoff but provide little storage capacity. They are typically designed to quickly filter stormwater and then discharge it to the local sewer system.

Potential Project Sites

Attachment 1 contains information on potential project sites where green infrastructure practices could be installed. The recommended green infrastructure practice and the drainage area that the green infrastructure practice can treat are identified for each potential project site. For each practice, the recharge potential, TSS removal potential, maximum volume reduction potential per storm, and the peak reduction potential are provided. This information is also provided so that proposed development projects that cannot satisfy the New Jersey stormwater management requirements for major development can use one of the identified projects to offset a stormwater management deficit. [4]

[4] New Jersey Administrative Code, N.J.A.C. 7:8, Stormwater Management, Statutory Authority: N.J.S.A. 12:5-3, 13:1D-1 et seq., 13:9A-1 et seq., 13:19-1 et seq., 40:55D-93 to 99, 58:4-1 et seq., 58:10A-1 et seq., 58:11A-1 et seq. and 58:16A-50 et seq., *Date last amended: April 19, 2010*.

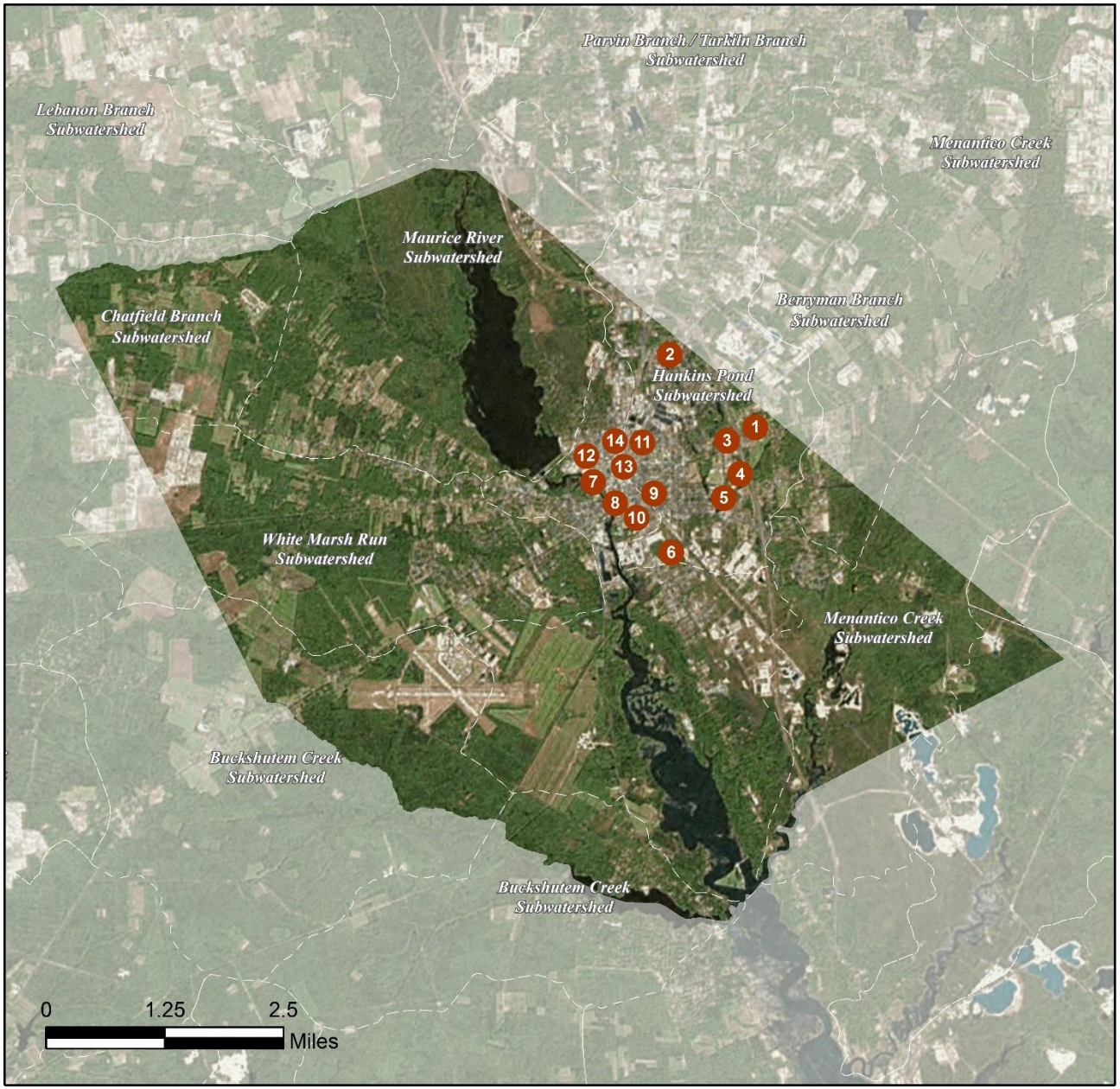
Conclusion

This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented by a wide variety of people such as boy scouts, girl scouts, school groups, faith-based groups, social groups, watershed groups, and other community groups.

Additionally, development projects that are in need of providing off-site compensation for stormwater impacts can use the projects in this plan as a starting point. The municipality can quickly convert this impervious cover reduction action plan into a stormwater mitigation plan and incorporate it into the municipal stormwater control ordinance.

a. Green Infrastructure Sites

MILLVILLE: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE HANKINS POND SUBWATERSHED:

1. Cumberland County Church
2. First Assembly of God
3. The Lighthouse Church of God
4. Millville Senior High School
5. Miracle Cogic Temple
6. R.M. Bacon Elementary School

SITES WITHIN THE MAURICE RIVER SUBWATERSHED:

7. American Legion Nabb - Leslie Post 82
8. Central Baptist Church
9. First Presbyterian Church
10. Millville City Hall and Police Department
11. Millville Fire Department
12. Millville Public Library
13. Millville Post Office
14. R.D. Wood Elementary School

b. Proposed Green Infrastructure Concepts

CUMBERLAND COUNTY CHURCH

Subwatershed: Hankins Pond

Site Area: 147,324 sq. ft.

Address: 1800 East Broad Street
Millville, NJ 08330

Block and Lot: Block 347.01, Lot 2, 1.01

Stormwater is currently directed to an existing detention basin. Rain gardens adjacent to the building can capture, treat, and infiltrate roof runoff. A water harvesting system such as a cistern can collect rainfall from rooftops as well and be put to other use. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
58	84,864	4.1	42.9	389.6	0.066	2.33

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.247	41	18,722	0.70	2,370	$11,850
Rainwater harvesting	0.119	20	9,043	0.34	3,570 (gal.)	$7,140

GREEN INFRASTRUCTURE RECOMMENDATIONS

Cumberland County Church

- bioretention system
- rainwater harvesting
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 50' 100'

THE FIRST ASSEMBLY OF GOD

Subwatershed: Hankins Pond

Site Area: 207,272 sq. ft.

Address: 1700 Wheaton Avenue
Millville, NJ 08330

Block and Lot: Block 260, Lot 16

Parking spots in the north section of the parking lot can be replaced with porous asphalt to capture and infiltrate stormwater. A rain garden adjacent to the building can capture, treat, and infiltrate roof runoff. Planter boxes and rainwater harvesting systems can collect additional runoff and beneficially reuse it. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
45	93,271	4.5	47.1	428.2	0.073	2.56

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.046	8	3,523	0.13	445	$2,225
Pervious pavement	0.649	109	49,181	1.85	4,450	$111,250
Planter boxes	0.044	7	3,359	0.13	96	$96,000
Rainwater harvesting	0.126	21	9,515	0.36	3,755 (gal.)	$7,510

GREEN INFRASTRUCTURE RECOMMENDATIONS

First Assembly of God

- bioretention system
- pervious pavement
- planter box
- rainwater harvesting
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 50' 100'

THE LIGHTHOUSE CHURCH OF GOD

Subwatershed: Hankins Pond

Site Area: 255,080 sq. ft.

Address: 1727 East Broad Street
Millville, NJ 08332

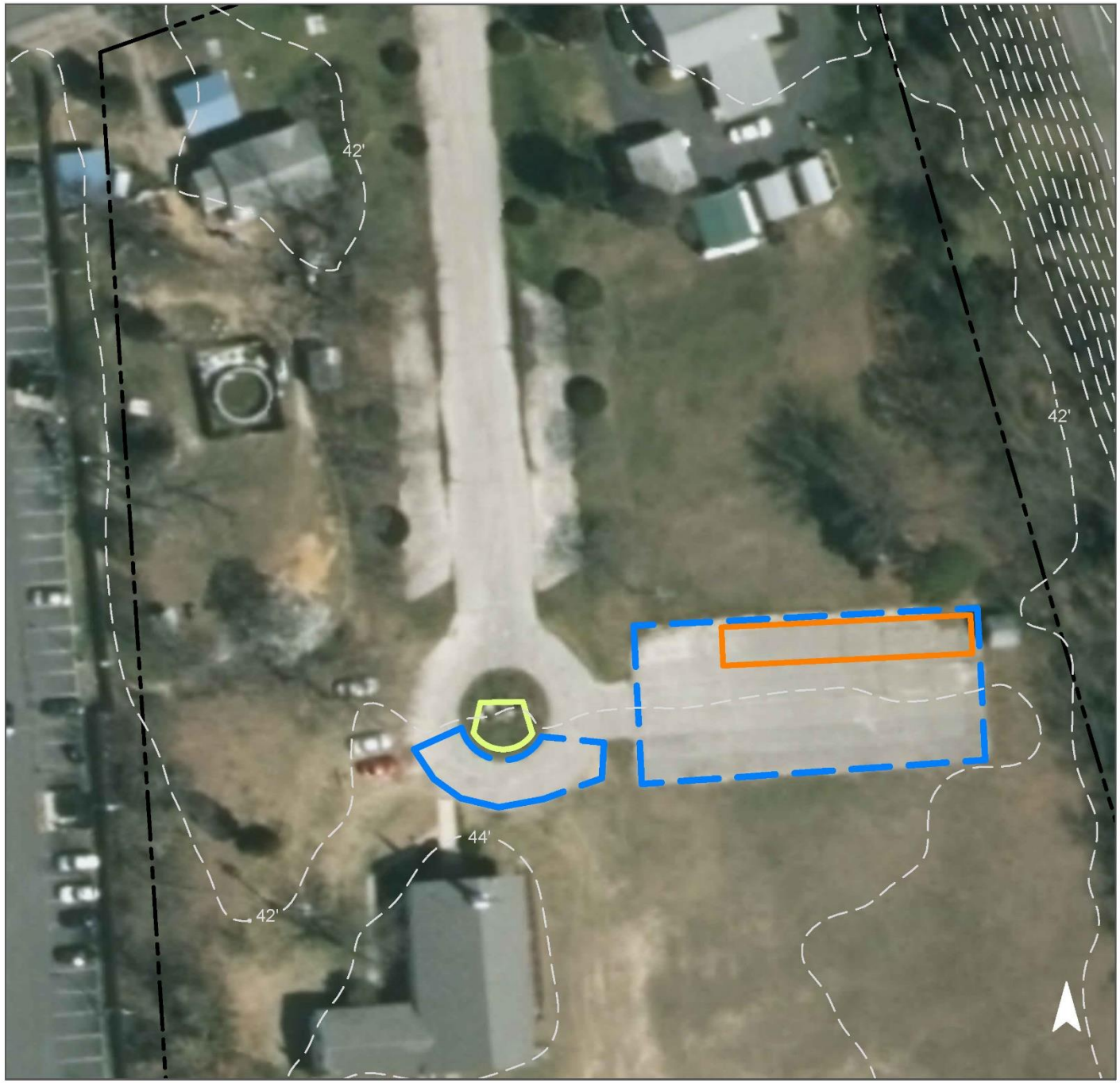
Block and Lot: Block 401, Lot 2,3,4,5,6

Parking spots to the north of the parking lot can be replaced with porous asphalt to capture and infiltrate stormwater. A rain garden in the middle of the parking circle north of the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
19	48,236	2.3	24.4	221.5	0.038	1.32

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.036	6	2,745	0.10	350	$1,750
Pervious pavement	0.217	36	16,419	0.62	1,485	$37,125

GREEN INFRASTRUCTURE RECOMMENDATIONS



The Lighthouse Church of God

- bioretention system
- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 30' 60'

MILLVILLE SENIOR HIGH SCHOOL

Subwatershed: Hankins Pond

Site Area: 2,089,515 sq. ft.

Address: 200 North Wade Boulevard
Millville, NJ 08330

Block and Lot: Block 400, Lot 5

Parking spots can be replaced with porous asphalt to capture and infiltrate stormwater. Rain gardens at the entrance and near the sports fields can capture, treat, and infiltrate roof runoff. Planter boxes can collect rain water from the roofs and beneficially reuse it. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
18	369,360	17.8	186.5	1,695.9	0.288	10.13

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.227	38	17,182	0.64	2,175	$10,875
Pervious pavement	0.433	72	32,777	1.23	2,965	$74,125
Planter boxes	0.022	4	1,676	0.06	48	$48,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Millville Senior High School

- bioretention system
- pervious pavement
- planter box
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 100' 200'

MIRACLE COGIC TEMPLE

Subwatershed: Hankins Pond

Site Area: 22,885 sq. ft.

Address: 1409 East Main Street
Millville, NJ 08330

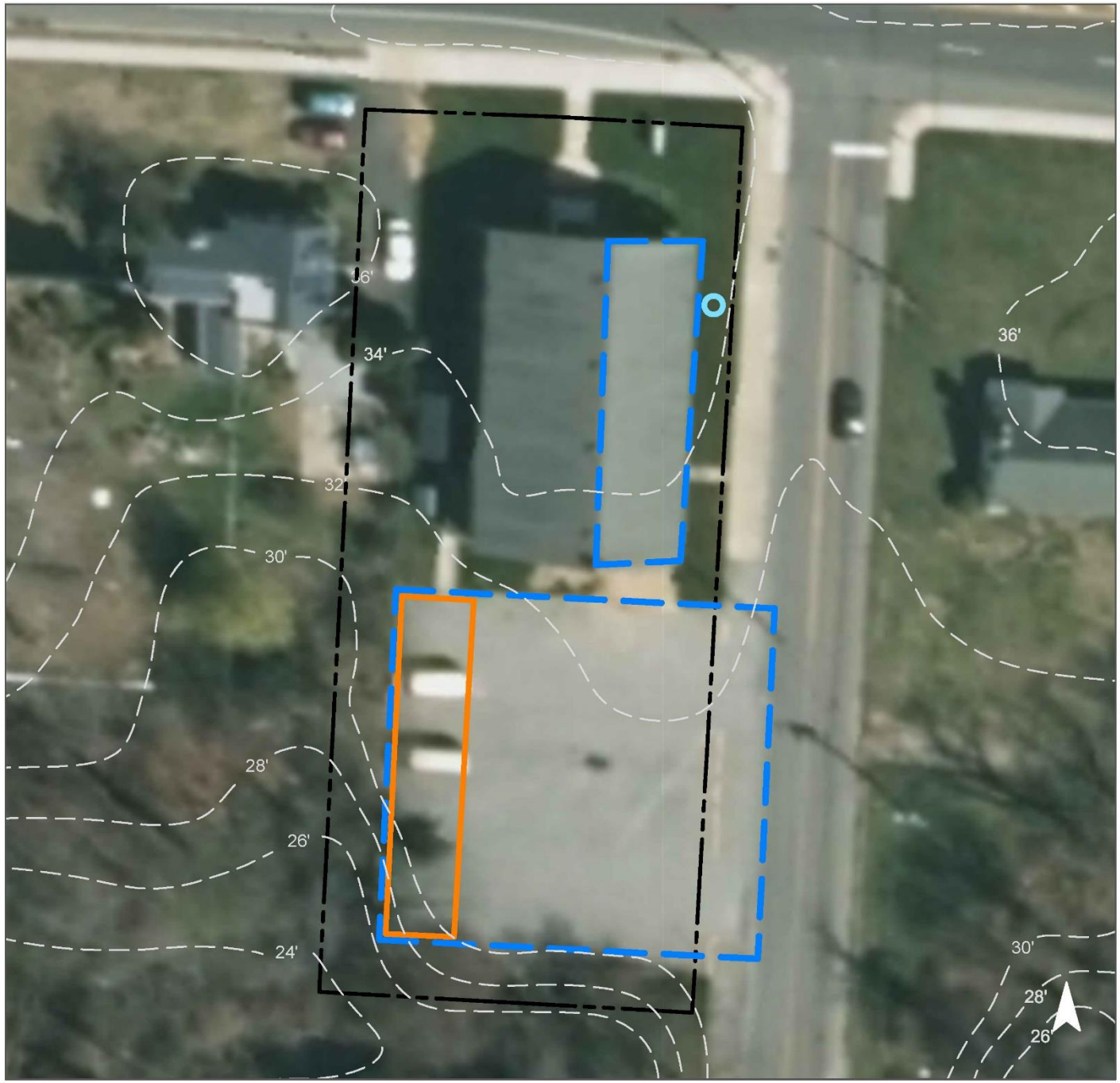
Block and Lot: Block 456, Lot 10

Parking spots in the western part of the building can be replaced with porous asphalt to capture and infiltrate stormwater. A rainwater harvesting system such as a cistern can collect rainwater from the roof. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
69	15,798	0.8	8.0	72.5	0.012	0.43

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.241	40	18,296	0.69	1,655	$41,375
Rainwater harvesting	0.052	9	3,912	0.15	1,500 (gal)	$3,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Miracle Cogic Temple

- pervious pavement
- rainwater harvesting
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 20' 40'

R.M. BACON ELEMENTARY SCHOOL

Subwatershed: Hankins Pond

Site Area: 441,305 sq. ft.

Address: 501 South 3rd Street
Millville, NJ 08330

Block and Lot: Block 536, Lot 1

Parking spots in the north parking lot can be replaced with porous asphalt to capture and infiltrate stormwater. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
26	115,490	5.6	58.3	530.3	0.090	3.17

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.578	97	43,773	1.64	3,960	$99,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

R.M. Bacon High School

- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 50' 100'

AMERICAN LEGION NABB - LESLIE POST 82

Subwatershed: Maurice River

Site Area: 51,127 sq. ft.

Address: 220 Buck Street
Millville, NJ 08332

Block and Lot: Block 410, Lot 2

Parking spots west of the building can be replaced with porous asphalt to capture and infiltrate stormwater from the parking lot and roof. Rain gardens can be put in to the east of the building which will capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
75	38,345	1.8	19.4	176.1	0.030	1.05

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.044	7	3,336	0.13	670	$3,350
Pervious pavement	0.266	45	20,189	0.76	1,826	$45,650

GREEN INFRASTRUCTURE RECOMMENDATIONS

American Legion
Nabb-Leslie Post 82

- bioretention system
- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 25' 50'

CENTRAL BAPTIST CHURCH

Subwatershed: Maurice River

Site Area: 19,560 sq. ft.

Address: 9 North 2nd Street
Millville, NJ 08330

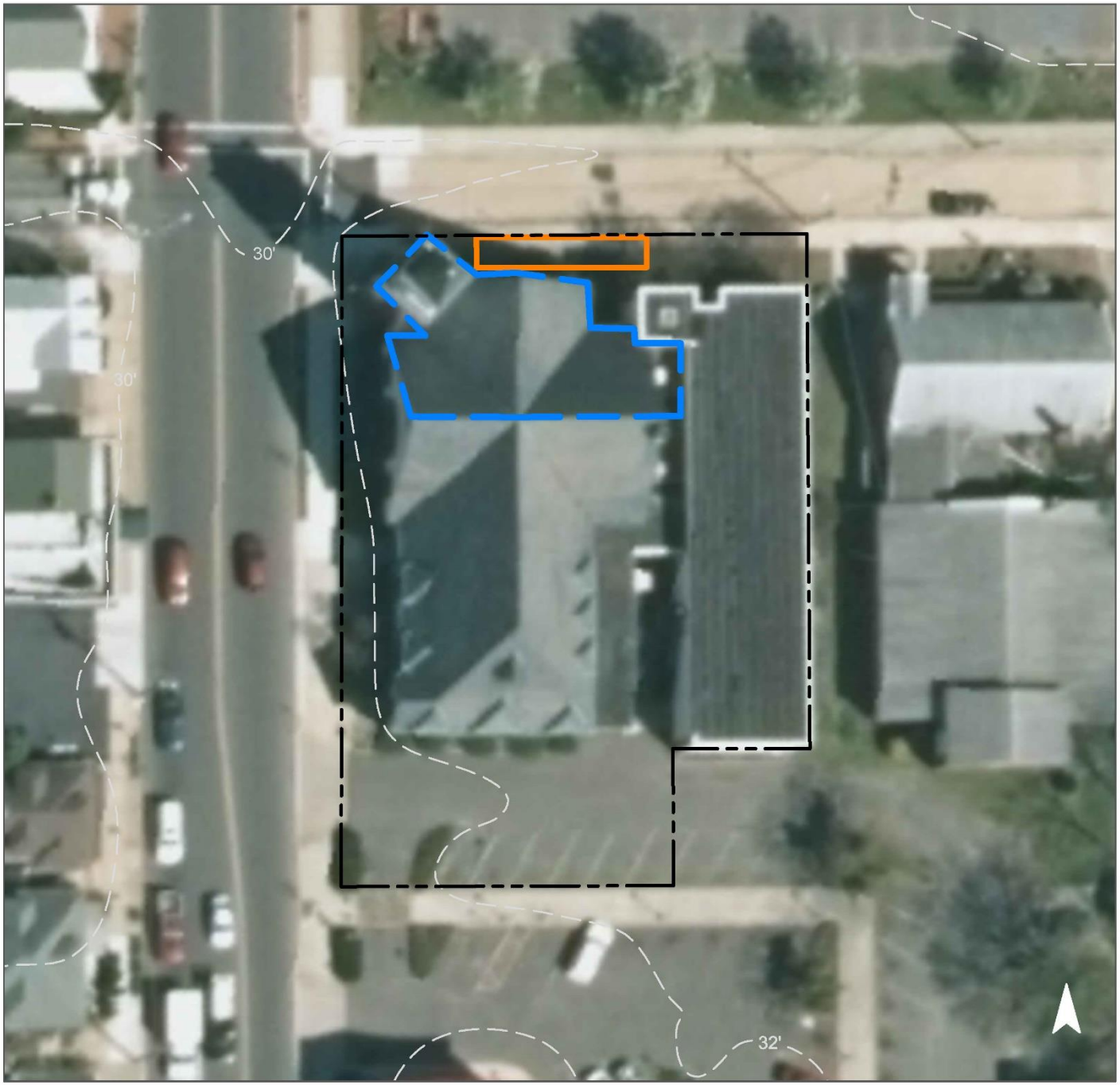
Block and Lot: Block 421, Lot 1

Pervious pavement such as pervious sidewalk can be implemented on the north side of the building which can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
95	18,582	0.9	9.4	85.3	0.014	0.51

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.064	11	4,877	0.18	440	$11,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Central Baptist Church

- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 20' 40'

FIRST PRESBYTERIAN CHURCH

Subwatershed: Maurice River

Site Area: 38,119 sq. ft.

Address: 119 North 2nd Street
Millville, NJ 08330

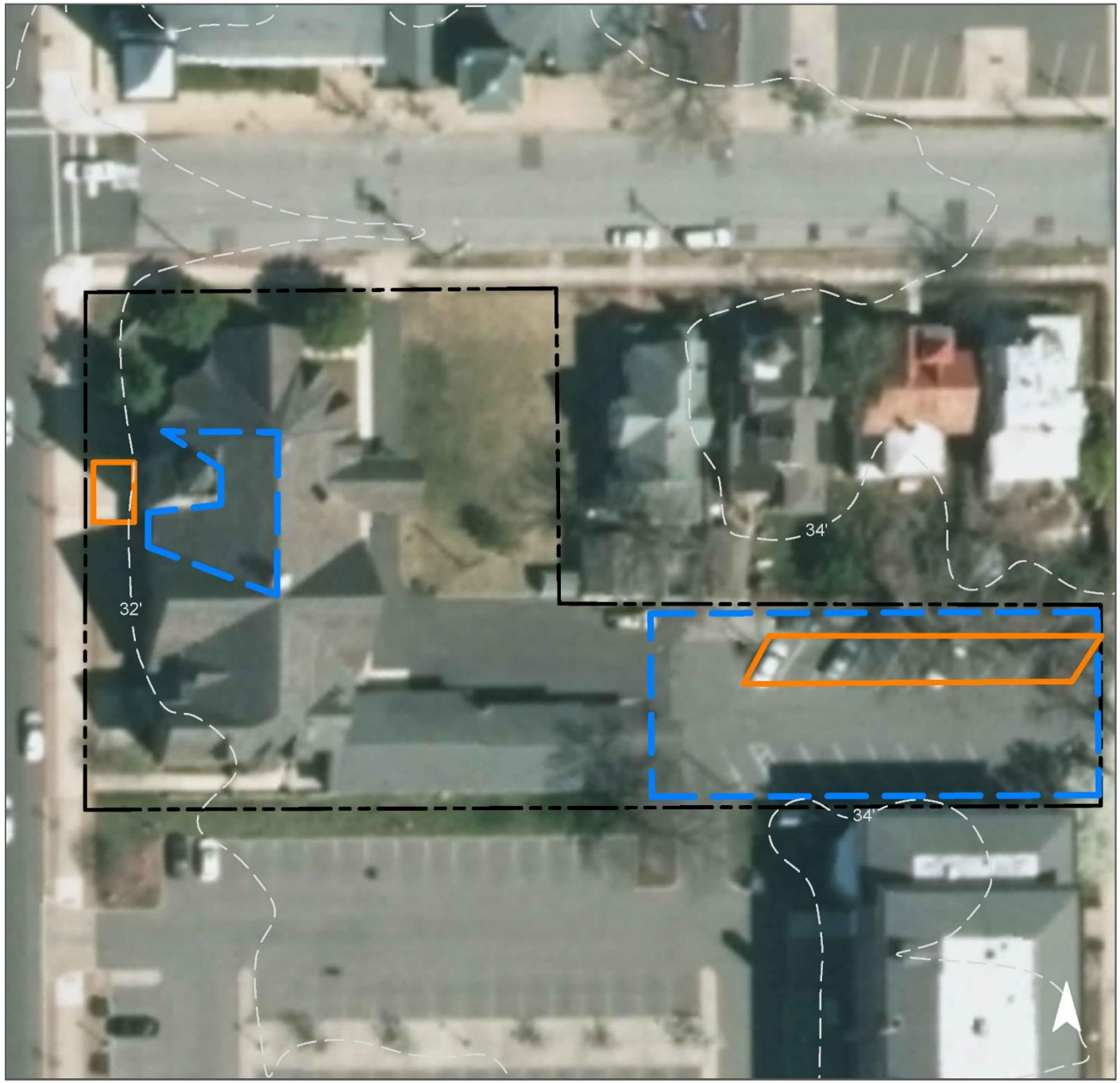
Block and Lot: Block 414, Lot 3

Parking spots east of the parking lot can be replaced with porous asphalt to capture and infiltrate stormwater. The sidewalk at the entrance of the church can be made porous to capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
79	30,271	1.5	15.3	139.0	0.024	0.83

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.280	47	21,251	0.80	1,922	$48,050

GREEN INFRASTRUCTURE RECOMMENDATIONS



First Presbyterian Church

- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 25' 50'

MILLVILLE CITY HALL AND POLICE DEPARTMENT

Subwatershed: Maurice River

Site Area: 400,488 sq. ft.

Address: 12 South High Street
Millville, NJ 08330

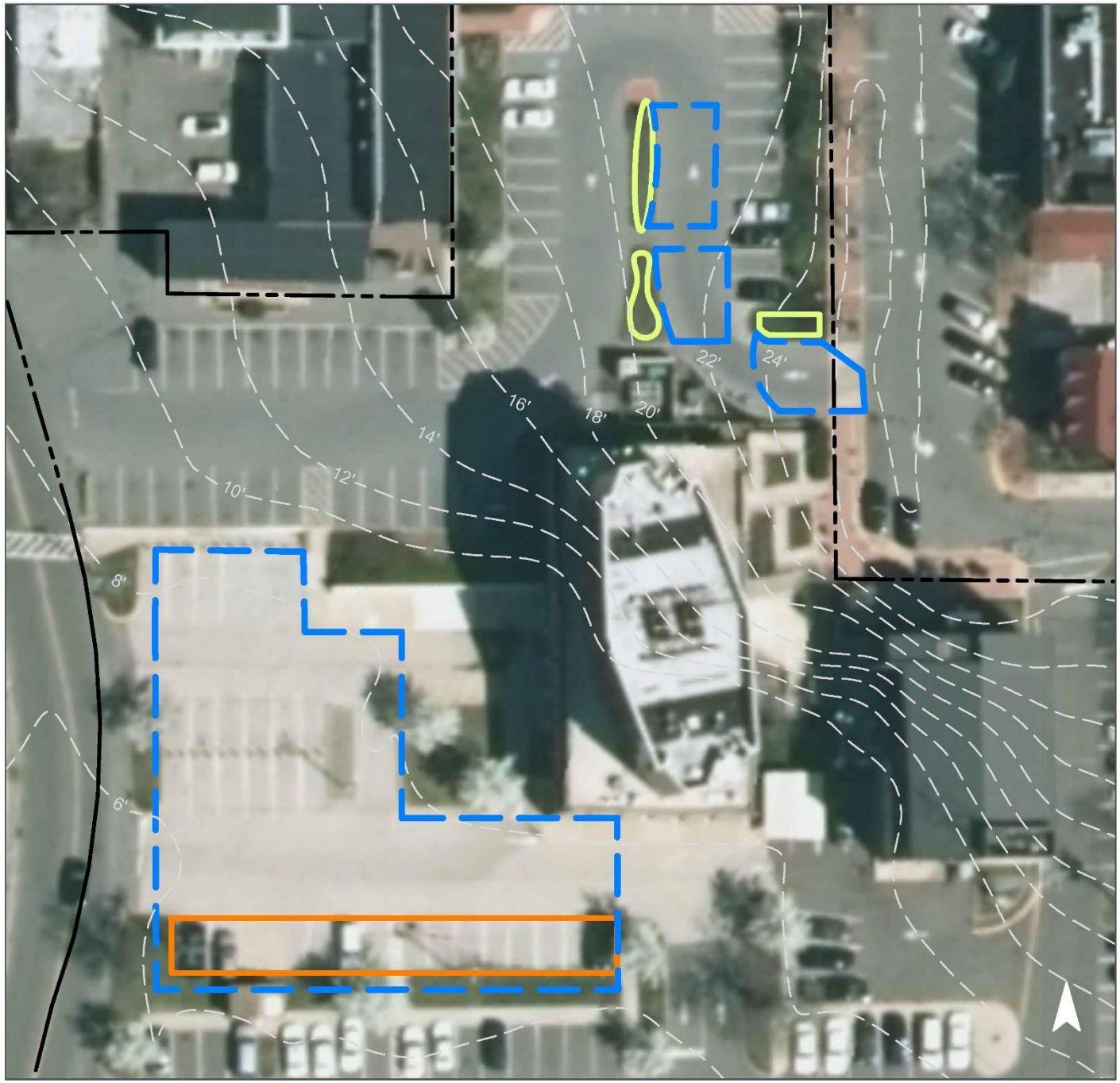
Block and Lot: Block 462, Lot 7

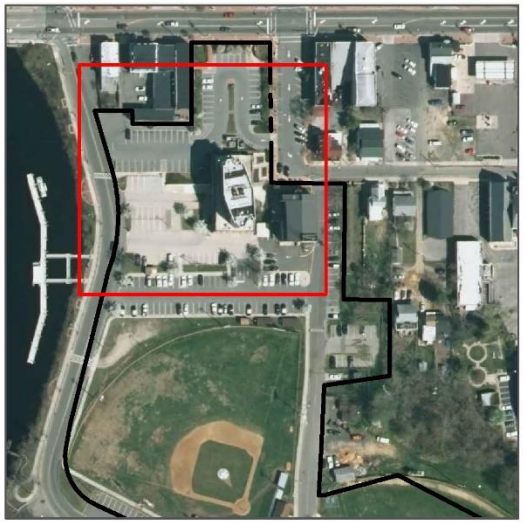
Stormwater is currently directed to an existing detention basin. Parking spots south of the building can be replaced with porous asphalt to capture and infiltrate stormwater. Rain gardens north of the building can capture, treat, and infiltrate road runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
43	170,959	8.2	86.3	784.9	0.133	4.69

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.056	9	15,947	0.16	530	$2,650
Pervious pavement	0.384	64	29,075	1.09	2,630	$65,750

GREEN INFRASTRUCTURE RECOMMENDATIONS





Millville City Hall and Police Department

- bioretention system
- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 25' 50'

MILLVILLE FIRE DEPARTMENT

Subwatershed: Maurice River

Site Area: 47,444 sq. ft.

Address: 420 Buck Street
Millville, NJ 08330

Block and Lot: Block 365, Lot 9

Parking spots west of the building can be replaced with porous asphalt to capture and infiltrate stormwater. A water harvesting system can be put in at the south end of the building to collect rainfall from the roof. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
95	45,072	2.2	22.8	206.9	0.035	1.24

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.153	26	11,601	0.44	1,050	$26,250
Rainwater harvesting	0.024	4	1,855	0.07	732 (gal)	$1,464

GREEN INFRASTRUCTURE RECOMMENDATIONS

Millville Fire Department

- pervious pavement
- rainwater harvesting
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 25' 50'

MILLVILLE PUBLIC LIBRARY

Subwatershed: Maurice River

Site Area: 247,012 sq. ft.

Address: 210 Buck Street
Millville, NJ 08330

Block and Lot: Block 410, Lot 1

Parking spots north and west of the building can be replaced with porous asphalt to capture and infiltrate stormwater. A rain garden can be installed to capture, treat, and infiltrate runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
31	77,429	3.7	39.1	355.5	0.060	2.12

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.163	27	12,320	0.46	1,560	$7,800
Pervious pavement	0.219	37	16,598	0.62	1,500	$37,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Millville Public Library

- bioretention system
- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 25' 50'

MILLVILLE POST OFFICE

Subwatershed: Maurice River

Site Area: 50,467 sq. ft.

Address: 302 North High Street
Millville, NJ 08330

Block and Lot: Block 366, Lot 7

Parking spots can be replaced with porous asphalt to capture and infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
95	47,883	2.3	24.2	219.8	0.037	1.31

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.254	42	19,224	0.72	1,740	$43,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Millville Post Office

- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 25' 50'

R.D. WOOD ELEMENTARY SCHOOL

Subwatershed: Maurice River

Site Area: 86,665 sq. ft.

Address: 700 Archer Street
Millville, NJ 08330

Block and Lot: Block 304, Lot 1

Parking spots southwest of the building can be replaced with porous asphalt to capture and infiltrate stormwater. A rain garden can be installed on the north side of the lawn to catch runoff from the parking lot and increase biodiversity. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
79	68,494	3.3	34.6	314.5	0.053	1.88

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.163	27	12,320	0.46	1,630	$8,150
Pervious pavement	0.190	32	14,369	0.54	1,300	$32,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

R.D. Wood Elementary School

- bioretention system
- pervious pavement
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 30' 60'

c. Summary of Existing Conditions

Summary of Existing Site Conditions

Subwatershed/Site Name/Total Site Info/GI Practice	Area (SF)	Block	Lot	Existing Annual Loads TP (lb/yr)	Existing Annual Loads TN (lb/yr)	Existing Annual Loads TSS (lb/yr)	I.C. %	I.C. Area (SF)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Runoff Volumes from I.C. Annual (Mgal)
HANKINS POND SUBWATERSHED	**3,163,381**			**35.0**	**367.2**	**3,338.0**		**727,019**	**0.566**	**19.94**
Cumberland County Church										
Total Site Info	147,324	347.01	2, 1.01	4.1	42.9	389.6	58	84,864	0.066	2.33
First Assembly of God										
Total Site Info	207,272	260	16	4.5	47.1	428.2	45	93,271	0.073	2.56
The Lighthouse Church of God										
Total Site Info	255,080	401	2,3,4,5,6	2.3	24.4	221.5	19	48,236	0.038	1.32
Millville Senior High School										
Total Site Info	2,089,515	400	5	17.8	186.5	1,695.9	18	369,360	0.288	10.13
Miracle Cogic Temple										
Total Site Info	22,885	456	10	0.8	8.0	72.5	69	15,798	0.012	0.43
R.M. Bacon Elementary School										
Total Site Info	441,305	536	1	5.6	58.3	530.3	26	115,490	0.090	3.17
MAURICE RIVER SUBWATERSHED	**940,882**			**24.0**	**251.0**	**2,282.1**		**497,035**	**0.387**	**13.63**
American Legion Nabb-Leslie Post 82										
Total Site Info	51,127	410	2	1.8	19.4	176.1	75	38,345	0.030	1.05
Central Baptist Church										
Total Site Info	19,560	421	1	0.9	9.4	85.3	95	18,582	0.014	0.51
First Presbyterian Church										
Total Site Info	38,119	414	3	1.5	15.3	139.0	79	30,271	0.024	0.83
Millville City Hall and Police Department										
Total Site Info	400,488	462	7	8.2	86.3	784.9	43	170,959	0.133	4.69
Millville Fire Department										
Total Site Info	47,444	365	9	2.2	22.8	206.9	95	45,072	0.035	1.24

Summary of Existing Site Conditions

Subwatershed/Site Name/Total Site Info/GI Practice	Area (SF)	Block	Lot	Existing Annual Loads TP (lb/yr)	Existing Annual Loads TN (lb/yr)	Existing Annual Loads TSS (lb/yr)	I.C. %	I.C. Area (SF)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Runoff Volumes from I.C. Annual (Mgal)
Millville Public Library										
Total Site Info	247,012	410	1	3.7	39.1	355.5	31	77,429	0.060	2.12
Millville Post Office										
Total Site Info	50,467	366	7	2.3	24.2	219.8	95	47,883	0.037	1.31
R.D. Wood Elementary School										
Total Site Info	86,665	304	1	3.3	34.6	314.5	79	68,494	0.053	1.88

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area		Recharge Potential	TSS Removal Potential	Max Volume Reduction Potential	Peak Discharge Reduction Potential	Size of BMP	Unit Cost	Unit	Total Cost	I.C. Treated
		Area (SF)	Area (ac)	(Mgal/yr)	(lbs/yr)	(gal/storm)	(cfs)	(SF)	($)		($)	%
	HANKINS POND SUBWATERSHED	**116,577**	**2.68**	**3.037**	**508**	**230,122**	**8.64**	**28,824**			**$551,225**	**3.7%**
1	**Cumberland County Church**											
	Bioretention systems	9,485	0.22	0.247	41	18,722	0.70	2,370	5	SF	$11,850	11.2%
	Rainwater harvesting	4,583	0.11	0.119	20	9,043	0.34	3,570	2	SF	$7,140	5.4%
	Total Site Info	**14,068**	**0.32**	**0.367**	**61**	**27,766**	**1.04**	**5,940**			**$18,990**	**16.6%**
2	**The First Assembly of God**											
	Bioretention system	1,784	0.04	0.046	8	3,523	0.13	445	5	SF	$2,225	1.9%
	Pervious pavement	24,915	0.57	0.649	109	49,181	1.85	4,450	25	SF	$111,250	26.7%
	Planter boxes	1,700	0.04	0.044	7	3,359	0.13	96	1,000	SF	$96,000	1.8%
	Rainwater harvesting	4,820	0.11	0.126	21	9,515	0.36	3,755	2	gal	$7,510	5.2%
	Total Site Info	**33,219**	**0.76**	**0.866**	**145**	**65,577**	**2.47**	**8,746**			**$216,985**	**35.6%**
3	**The Lighthouse Church of God**											
	Bioretention system	1,390	0.03	0.036	6	2,745	0.10	350	5	SF	$1,750	2.9%
	Pervious pavement	8,316	0.19	0.217	36	16,419	0.62	1,485	25	SF	$37,125	17.2%
	Total Site Info	**9,706**	**0.22**	**0.253**	**42**	**19,164**	**0.72**	**1,835**			**$38,875**	**20.1%**
4	**Millville Senior High School**											
	Bioretention systems	8,704	0.20	0.227	38	17,182	0.64	2,175	5	SF	$10,875	2.4%
	Pervious pavement	16,604	0.38	0.433	72	32,777	1.23	2,965	25	SF	$74,125	4.5%
	Planter boxes	850	0.02	0.022	4	1,676	0.06	48	1,000	SF	$48,000	0.2%
	Total Site Info	**26,158**	**0.60**	**0.682**	**114**	**51,634**	**1.93**	**5,188**			**$133,000**	**7.1%**
5	**Miracle Cogic Temple**											
	Pervious pavement	9,268	0.21	0.241	40	18,296	0.69	1,655	25	SF	$41,375	58.7%
	Rainwater harvesting	1,982	0.05	0.052	9	3,912	0.15	1,500	2	gal	$3,000	12.5%
	Total Site Info	**11,250**	**0.26**	**0.293**	**49**	**22,208**	**0.84**	**3,155**			**$44,375**	**71.2%**
6	**R.M. Bacon Elementary School**											
	Pervious pavement	22,176	0.51	0.578	97	43,773	1.64	3,960	25	SF	$99,000	19.2%
	Total Site Info	**22,176**	**0.51**	**0.578**	**97**	**43,773**	**1.64**	**3,960**			**$99,000**	**19.2%**

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP (SF)	Unit Cost ($)	Unit	Total Cost ($)	I.C. Treated %
	MAURICE RIVER SUBWATERSHED	**86,731**	**1.99**	**2.260**	**378**	**182,961**	**6.43**	**17,530**			**$333,614**	**9.2%**
7	**American Legion Nabb-Leslie Post 82**											
	Bioretention systems	1,690	0.04	0.044	7	3,336	0.13	670	5	SF	$3,350	4.4%
	Pervious pavement	10,226	0.23	0.266	45	20,189	0.76	1,826	25	SF	$45,650	26.7%
	Total Site Info	**11,916**	**0.27**	**0.310**	**52**	**23,525**	**0.89**	**2,496**			**$49,000**	**31.1%**
8	**Central Baptist Church**											
	Pervious pavement	2,470	0.06	0.064	11	4,877	0.18	440	25	SF	$11,000	13.3%
	Total Site Info	**2,470**	**0.06**	**0.064**	**11**	**4,877**	**0.18**	**440**			**$11,000**	**13.3%**
9	**First Presbyterian Church**											
	Pervious pavement	10,764	0.25	0.280	47	21,251	0.80	1,922	25	SF	$48,050	35.6%
	Total Site Info	**10,764**	**0.25**	**0.280**	**47**	**21,251**	**0.80**	**1,922**			**$48,050**	**35.6%**
10	**Millville City Hall and Police Department**											
	Bioretention systems	2,132	0.05	0.056	9	15,947	0.16	530	5	SF	$2,650	1.2%
	Pervious pavement	14,728	0.34	0.384	64	29,075	1.09	2,630	25	SF	$65,750	8.6%
	Total Site Info	**16,860**	**0.39**	**0.439**	**74**	**45,022**	**1.25**	**3,160**			**$68,400**	**9.9%**
11	**Millville Fire Department**											
	Pervious pavement	5,878	0.13	0.153	26	11,601	0.44	1,050	25	SF	$26,250	13.0%
	Rainwater harvesting	940	0.02	0.024	4	1,855	0.07	732	2	gal	$1,464	2.1%
	Total Site Info	**6,818**	**0.16**	**0.178**	**30**	**13,457**	**0.51**	**1,782**			**$27,714**	**15.1%**
12	**Millville Public Library**											
	Bioretention system	6,240	0.14	0.163	27	12,320	0.46	1,560	5	SF	$7,800	8.1%
	Pervious pavement	8,410	0.19	0.219	37	16,598	0.62	1,500	25	SF	$37,500	10.9%
	Total Site Info	**14,650**	**0.34**	**0.382**	**64**	**28,918**	**1.08**	**3,060**			**$45,300**	**18.9%**
13	**Millville Post Office**											
	Pervious pavement	9,733	0.22	0.254	42	19,224	0.72	1,740	25	SF	$43,500	20.3%
	Total Site Info	**9,733**	**0.22**	**0.254**	**42**	**19,224**	**0.72**	**1,740**			**$43,500**	**20.3%**
14	**R.D. Wood Elementary School**											
	Bioretention system	6,240	0.14	0.163	27	12,320	0.46	1,630	5	SF	$8,150	9.1%
	Pervious pavement	7,280	0.17	0.190	32	14,369	0.54	1,300	25	SF	$32,500	10.6%
	Total Site Info	**13,520**	**0.31**	**0.352**	**59**	**26,689**	**1.00**	**2,930**			**$40,650**	**19.7%**