RUTGERS
New Jersey Agricultural
Experiment Station

Draft

Impervious Cover Reduction Action Plan
for
Carneys Point Township, Salem County, New Jersey

Prepared for Carneys Point Township by the
Rutgers Cooperative Extension Water Resources Program

November 29, 2018

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Introduction

Located in Salem County, New Jersey, Carneys Point Township covers approximately 17.1 square miles. Figures 1 and 2 illustrate that Carneys Point Township is dominated by wetlands. A total of 25.7% of the municipality's land use is classified as urban. Of the urban land in Carneys Point Township, 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 Carneys Point Township 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 Carneys Point Township. Based upon the 2012 NJDEP land use/land cover data, approximately 8.5% of Carneys Point Township has impervious cover. This level of impervious cover suggests that the streams in Carneys Point Township are sensitive streams. [1]

Methodology

Carneys Point Township contains portions of three 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.

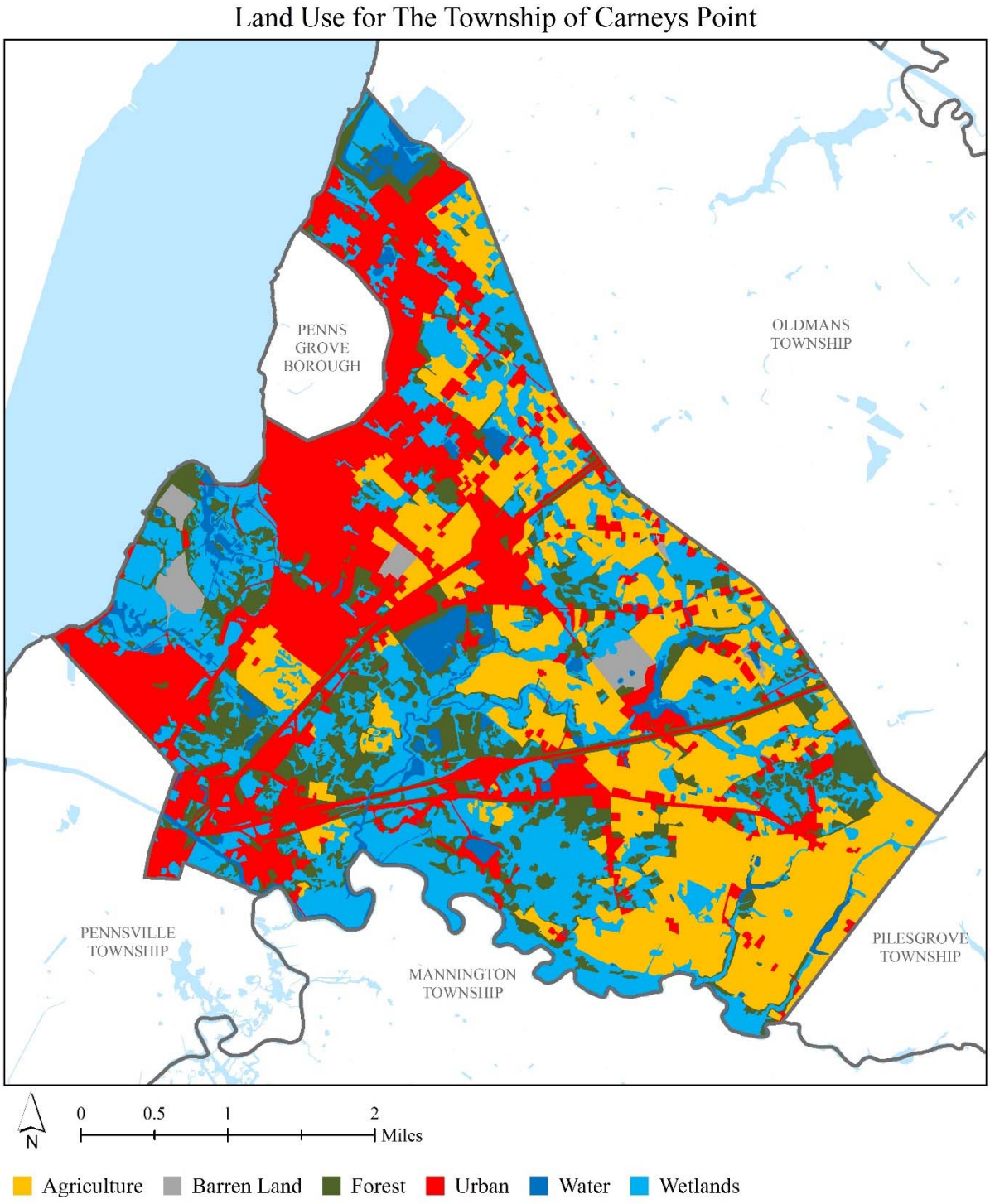


Figure 1: Map illustrating the land use in Carneys Point Township

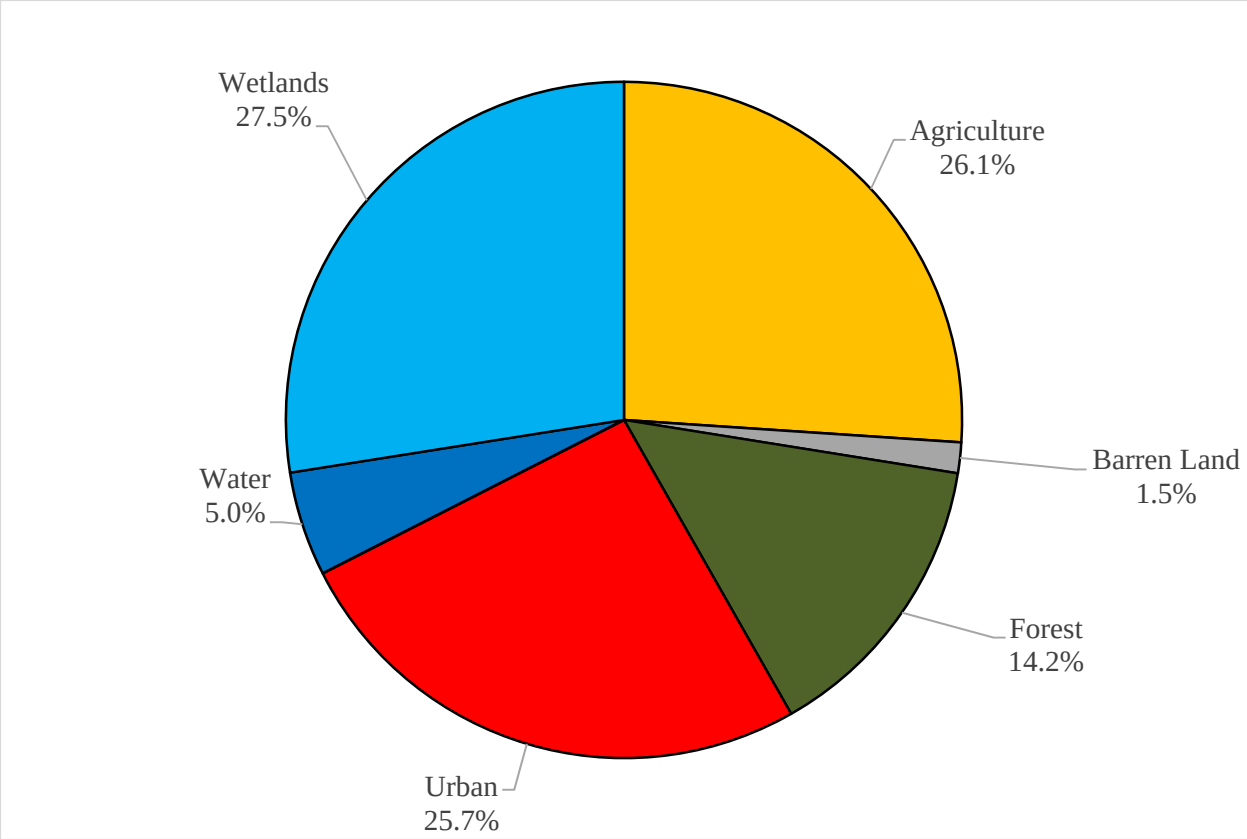


Figure 2: Pie chart illustrating the land use in Carneys Point Township

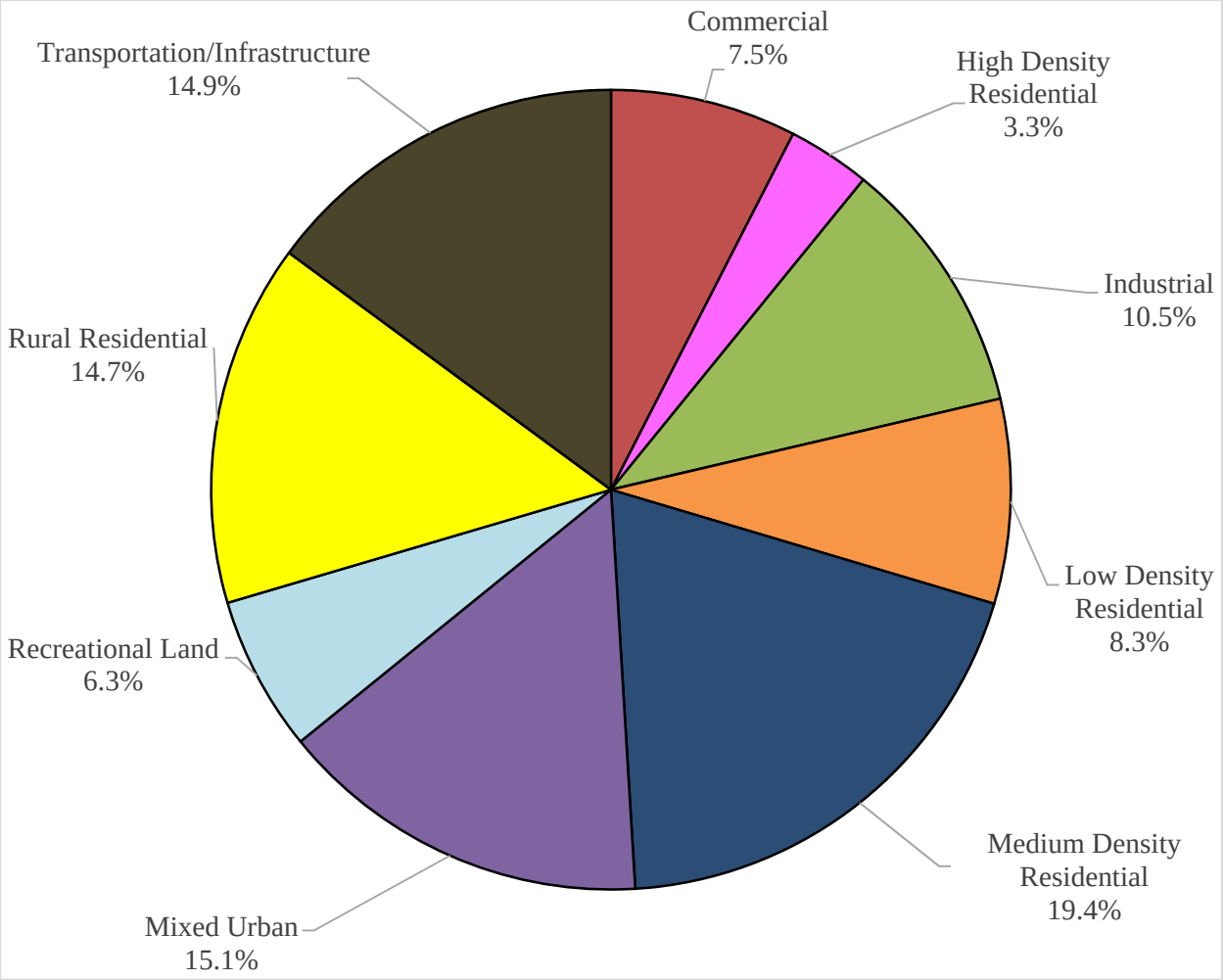


Figure 3: Pie chart illustrating the various types of urban land use in Carneys Point Township

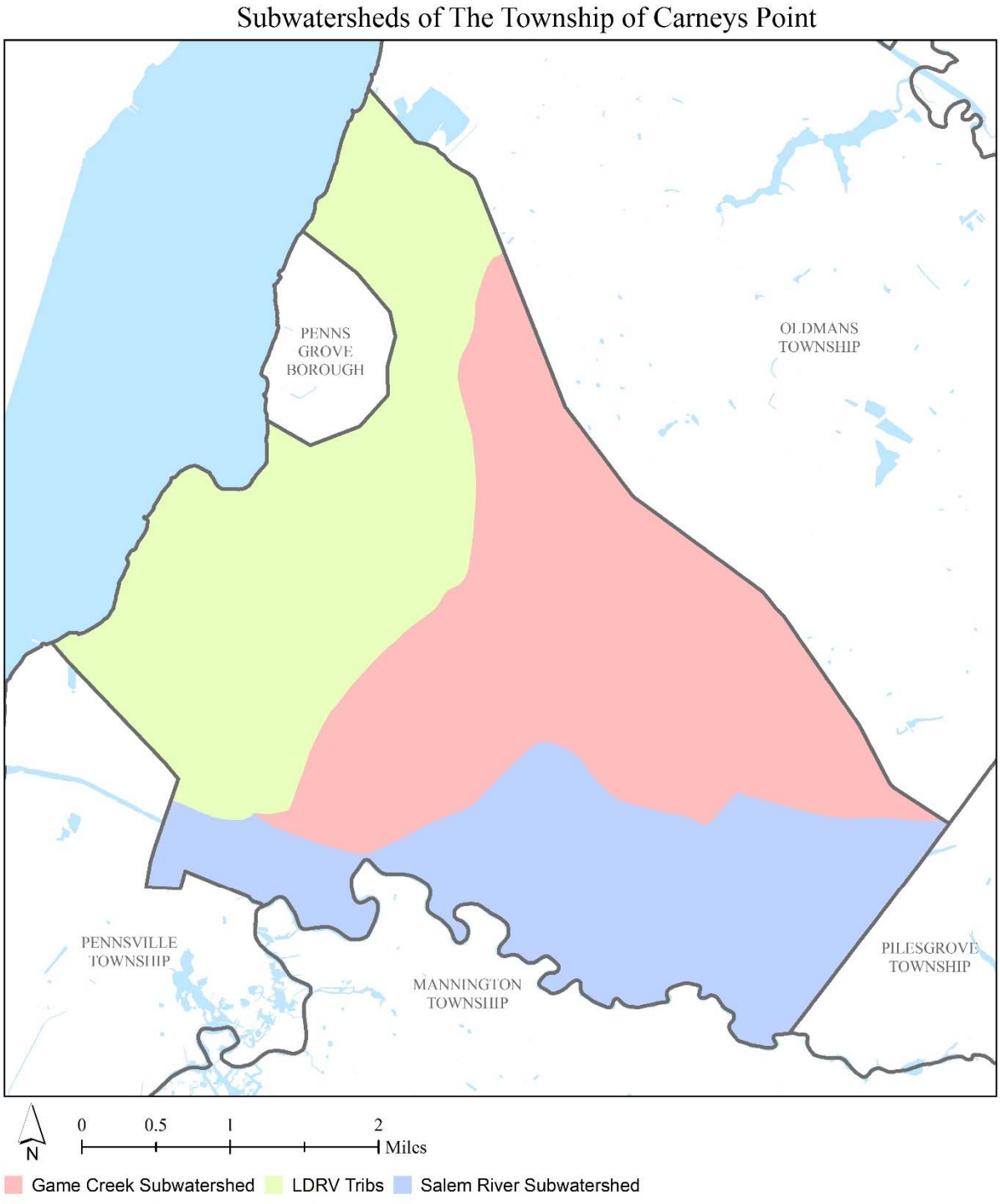


Figure 4: Map of the subwatersheds in Carneys Point Township

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 Carneys Point Township 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 Carneys Point Township. 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

Appendix A contains information on potential project sites where green infrastructure practices could be installed as well as information on existing site conditions. The recommended green infrastructure practices and the drainage area that the green infrastructure practices can treat are identified for each potential project site. For each practice, the recharge potential, TSS removal potential, maximum volume reduction potential per storm, the peak reduction potential, and estimated costs 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*.

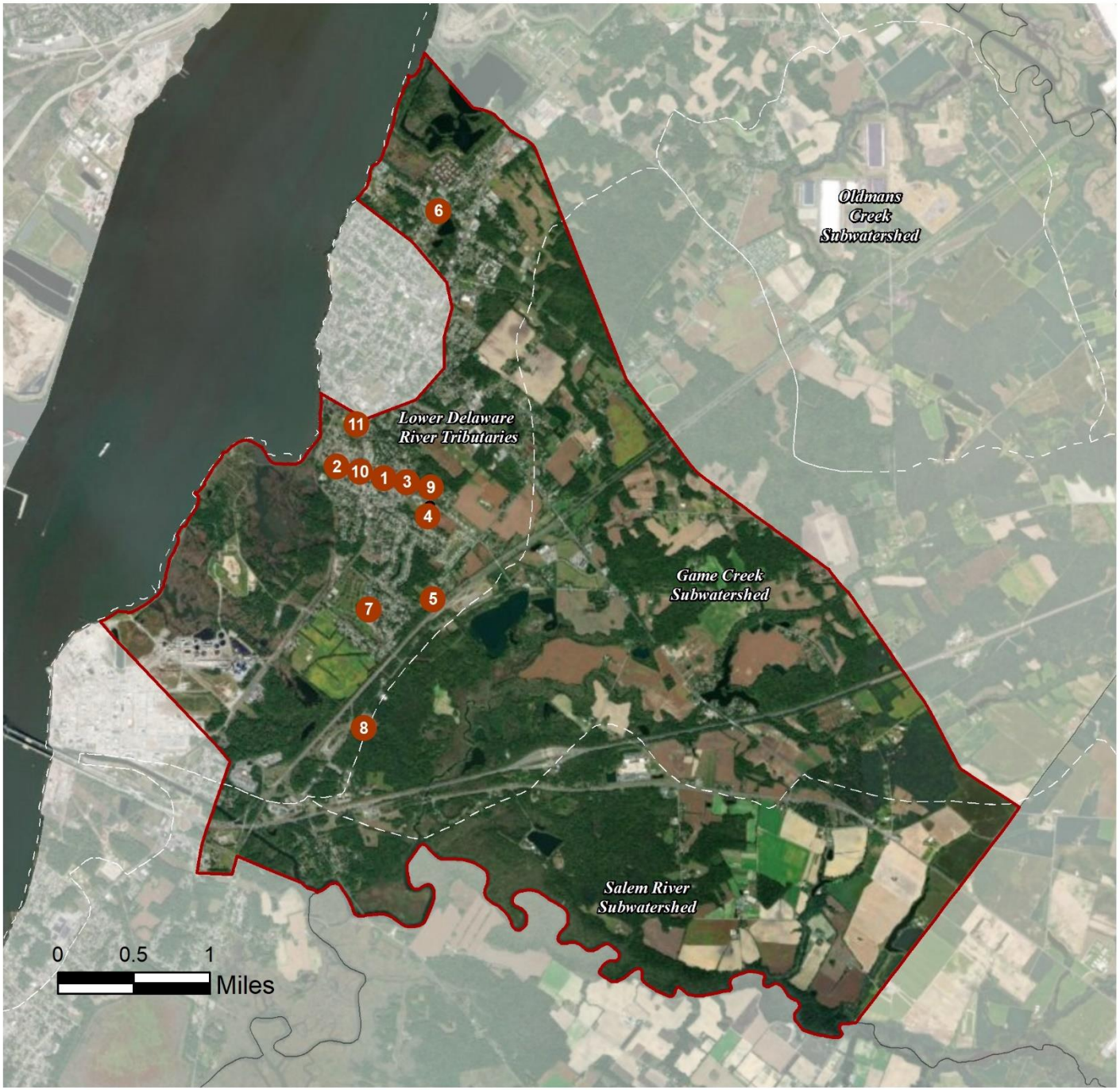
Conclusion

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

CARNEYS POINT: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE LOWER DELAWARE RIVER TRIBUTARIES SUBWATERSHED

1. Calvary Baptist Church
2. Carneys Point Fire & Rescue
3. CrossPoint Wesleyan Church
4. First Assembly of God
5. Ministerio Un Cantico Nuevo
6. Kingdom Hall of Jehovah's Witnesses
7. Salem Community College
8. Southgate Health Care Center
9. St. Gabriel the Arch Angel Parish
10. Union Presbyterian Church
11. YMCA of Salem County

b. Proposed Green Infrastructure Concepts

Calvary Baptist Church

Subwatershed: Lower Delaware River Tributaries

Site Area: 101,287 sq. ft.

Address: 300 Georgetown Road
Penns Grove, NJ 08069

Block and Lot: Block 130; 131, Lot 4; 3.01

Pervious pavement can be installed along the southeast end of the parking lot to capture runoff from the disconnected downspouts along the east side of the building. Pervious pavement allows water to infiltrate through the surface. 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"
75	75,648	3.6	38.2	347.3	0.059	2.07

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	0.184	31	13,480	0.51	3,240	$81,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Calvary Baptist Church

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

0 20' 40'

Carneys Point Fire & Rescue

Subwatershed: Lower Delaware River Tributaries

Site Area: 63,919 sq. ft.

Address: 258 D Street
Carneys Point, NJ 08069

Block and Lot: Block 117, Lot 5

A rainwater harvesting system can be installed near the west corner of the building. This system could harvest water from the roof of the building and store it in a cistern to be used to wash vehicles and water existing landscaping. Pervious pavement can be installed along the west side of the building to replace existing parking spaces. Runoff from the roof can be redirected to the pervious pavement. 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"
68	43,625	2.1	22.0	200.3	0.034	1.20

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	0.079	13	5,830	0.22	1,300	$32,500
Rainwater harvesting	0.033	6	1,000	0.04	1,000 (gal)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Carneys Point Fire & Rescue

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

0 25' 50'

CrossPoint Wesleyan Church

Subwatershed: Lower Delaware River Tributaries

Site Area: 61,872 sq. ft.

Address: 333 Georgetown Road
Penns Grove, NJ 08069

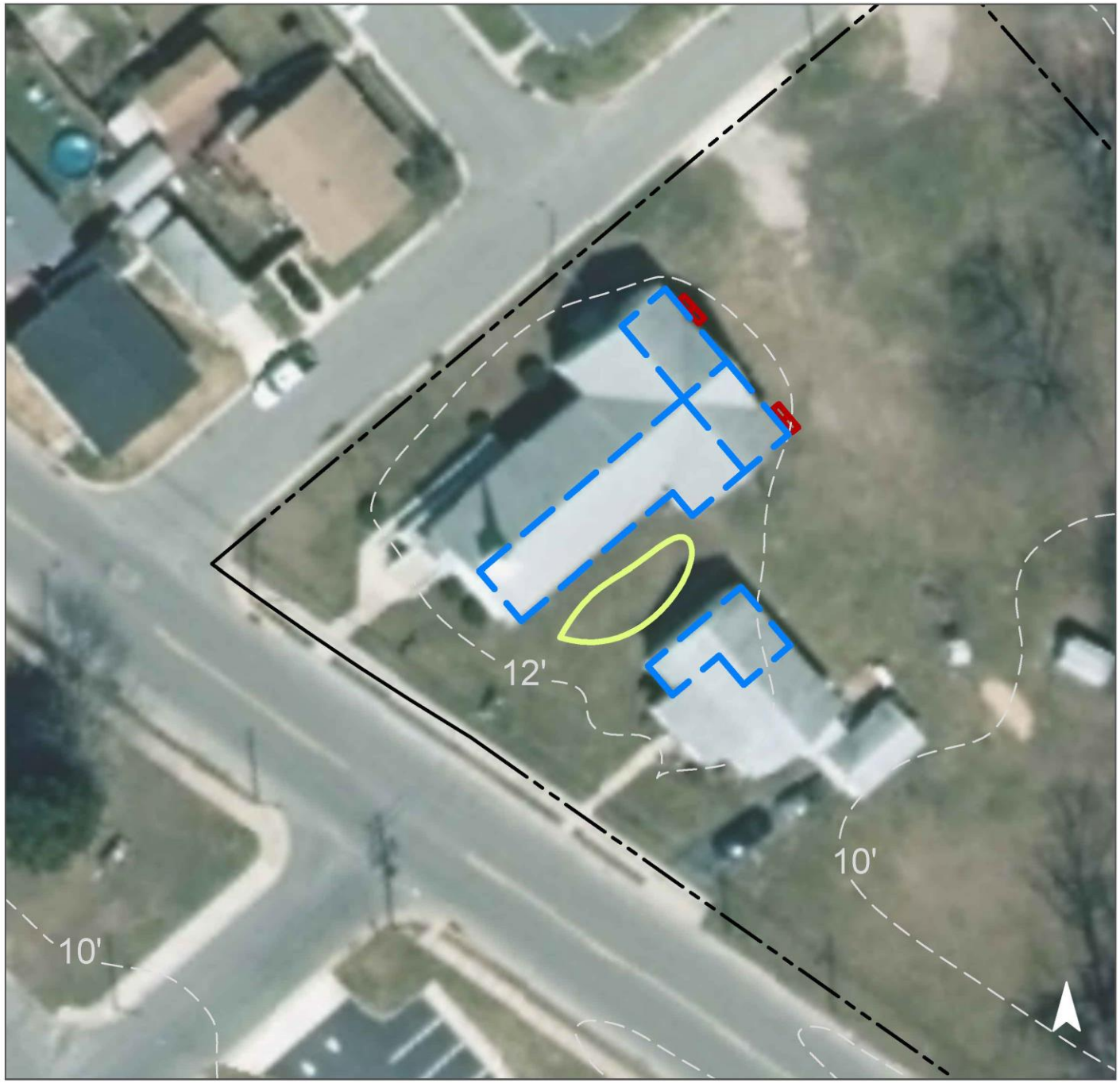
Block and Lot: Block 68, Lot 32

A bioretention system can be installed in the turfgrass area south of the main building. Rain gardens can be used to reduce sediment and nutrient loading to the local waterway and increase groundwater recharge. Downspout planter boxes can be installed to filter and slowly release stormwater runoff 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"
24	14,849	0.7	7.5	68.2	0.012	0.41

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	0.047	8	3,440	0.13	450	$2,250
Planter boxes	n/a	3	n/a	n/a	4 (boxes)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



CrossPoint Wesleyan Church

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

0 20' 40'

First Assembly of God

Subwatershed: Lower Delaware River Tributaries

Site Area: 136,064 sq. ft.

Address: 380 Georgetown Road
Penns Grove, NJ 08069

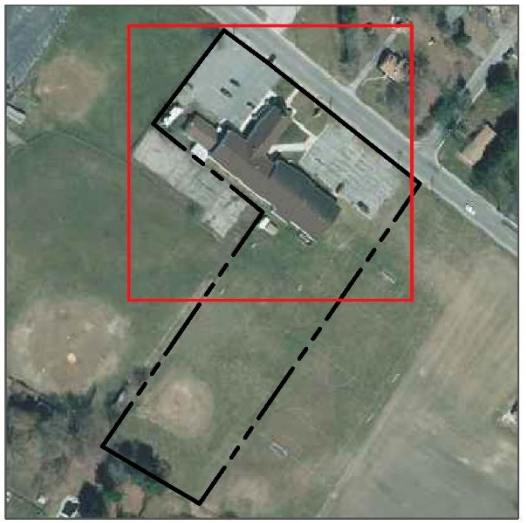
Block and Lot: Block 160, Lot 2, 3.01

Pervious pavement can be installed at the north end of the parking lot to capture runoff from downspouts and the sidewalk. Three bioretention systems can be built around the building by redirecting downspouts into them to capture rooftop runoff. 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"
37	49,738	2.4	25.1	228.4	0.039	1.36

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	0.107	18	7,840	0.29	1,050	$5,250
Pervious pavement	0.092	15	6,780	0.26	1,780	$44,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



First Assembly of God

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

0 30' 60'

Kingdom Hall of Jehovah's Witnesses

Subwatershed: Lower Delaware River Tributaries

Site Area: 77,188 sq. ft.

Address: 269 South Golfwood Avenue
Penns Grove, NJ 08069

Block and Lot: Block 187, Lot 5

A strip of pervious pavement can be installed along the southeast side of the building where a large volume of stormwater runoff from the site is directed. 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"
79	61,335	3.0	31.0	281.6	0.048	1.68

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	0.534	89	39,200	1.47	4,950	$123,750

GREEN INFRASTRUCTURE RECOMMENDATIONS

Kingdom Hall of Jehovah's Witnesses

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

0 30' 60'

Ministerio Un Cantico Nuevo

Subwatershed: Lower Delaware River Tributaries

Site Area: 159,151 sq. ft.

Address: 235 Broad Street
Carneys Point, NJ 08069

Block and Lot: Block 41, Lot 3

On the north and south side of the building, a bioretention system can be installed in the turfgrass area. Bioretention systems can be installed to capture, treat, and infiltrate rooftop runoff. Bioretention systems add aesthetic value to a location while also managing 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"
21	33,573	1.6	17.0	154.1	0.026	0.92

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	0.128	21	9,360	0.35	1,230	$6,150

GREEN INFRASTRUCTURE RECOMMENDATIONS

Ministerio Un Cantico Nuevo

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

0 30' 60'

Salem Community College

Subwatershed: Lower Delaware River Tributaries

Site Area: 818,456 sq. ft.

Address: 460 Hollywood Avenue
Carneys Point, NJ 08069

Block and Lot: Block 170, Lot 2, 2.01, 5

Parking spaces in the parking lot to the north and south of the building can be converted to pervious pavement to capture and infiltrate stormwater runoff from the parking lot and nearby disconnected downspouts. A bioretention system can be installed to capture, treat, and infiltrate rooftop 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"
54	439,193	21.2	221.8	2,016.5	0.342	12.05

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 system	0.100	17	7,360	0.28	965	$4,825
Pervious pavement	1.115	187	81,820	3.07	10,350	$258,750

GREEN INFRASTRUCTURE RECOMMENDATIONS

Salem Community College

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

0 75' 150'

Southgate Health Care Center

Subwatershed: Lower Delaware River Tributaries

Site Area: 308,583 sq. ft.

Address: 449 South Pennsville Auburn Road
Carneys Point, NJ 08069

Block and Lot: Block 246, Lot 3

Bioretention systems can be installed in the turfgrass areas east and west of the building. Bioretention systems can be installed to capture, treat, and infiltrate rooftop runoff. A strip of pervious pavement can be installed in the front parking lot to capture and infiltrate stormwater from the nearby downspouts and parking lot. 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"
54	166,845	8.0	84.3	766.0	0.130	4.58

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	0.196	33	14,400	0.54	1,900	$9,500
Pervious pavement	0.726	122	53,300	2.00	5,185	$129,625

GREEN INFRASTRUCTURE RECOMMENDATIONS

Southgate Health Care Center

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

0 50' 100'

St. Gabriel the Arch Angel Parish

Subwatershed: Lower Delaware River Tributaries

Site Area: 1,378,617 sq. ft.

Address: 369 Georgetown Road
Penns Grove, NJ 08069

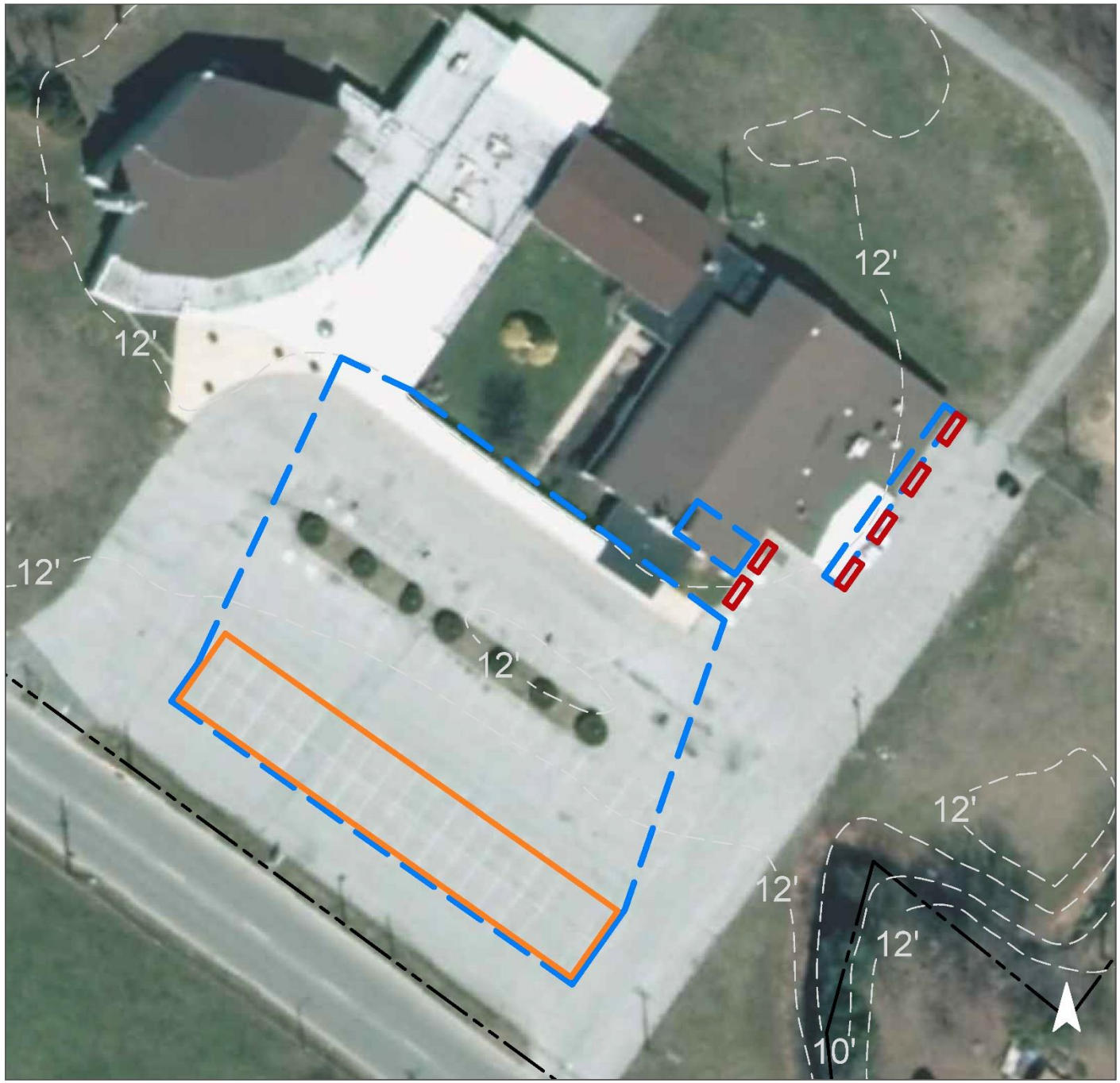
Block and Lot: Block 68, Lot 31

Planter boxes can be installed along the east side of building. These are wooden boxes that provide an opportunity to beneficially reuse rooftop runoff while filtering out pollutants. Porous pavement can also be installed in the parking spaces to capture stormwater runoff from the parking lot and sidewalks. 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"
9	128,301	6.2	64.8	589.1	0.100	3.52

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	0.758	127	55,640	2.09	6,950	$173,750
Planter boxes	n/a	3	n/a	n/a	6 (boxes)	$6,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



St. Gabriel the Arch Angel Parish

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

0 30' 60'

Union Presbyterian Church

Subwatershed: Lower Delaware River Tributaries

Site Area: 58,498 sq. ft.

Address: 254 Shell Road
Carney's Point, NJ 08069

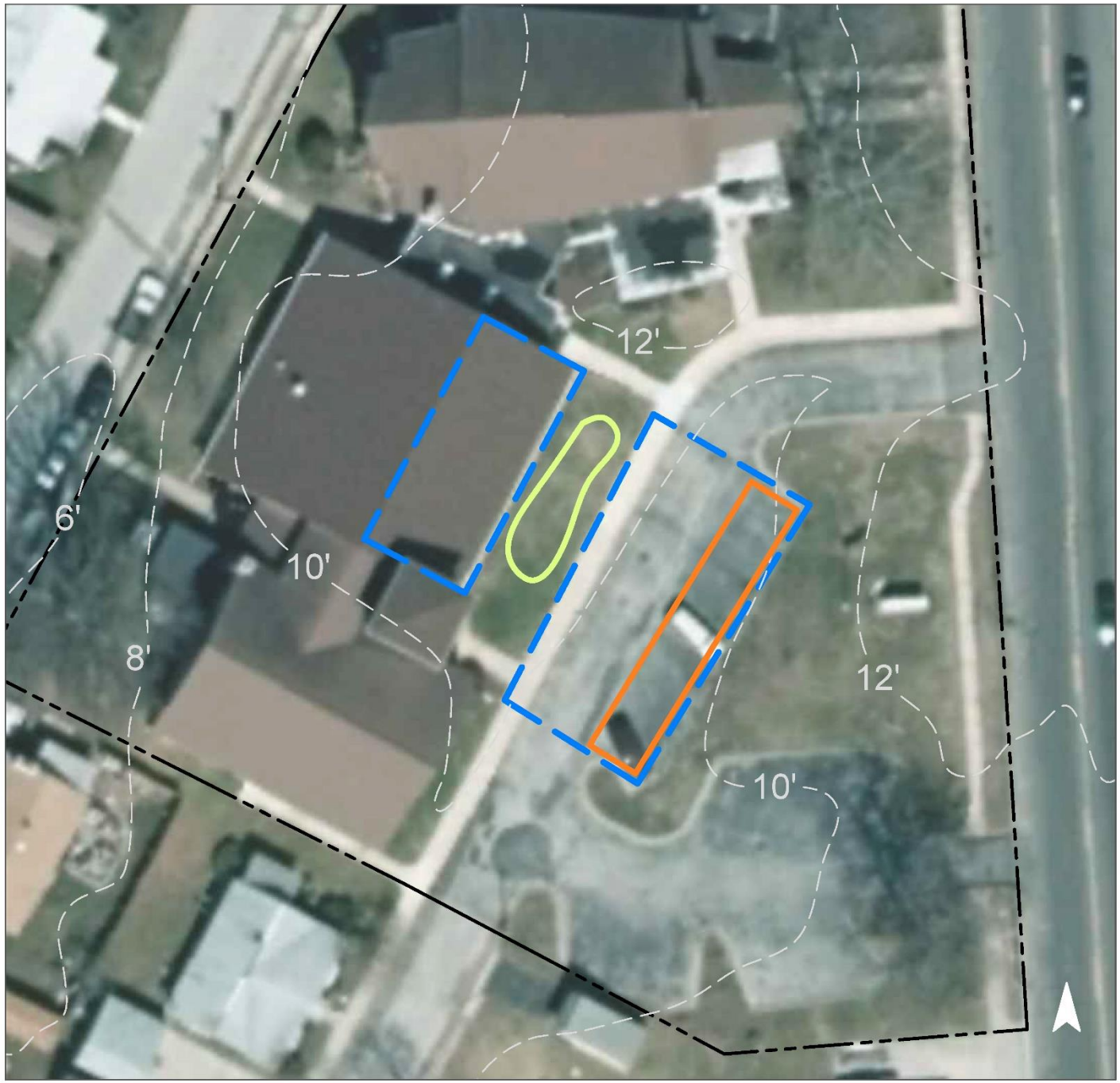
Block and Lot: Block 104; 113, Lot 7; 9

Parking spots at the entrance of the building can be replaced with pervious pavement which will capture and infiltrate stormwater from the parking lot. A bioretention system can be installed at the front of the building to capture runoff from the rooftop. 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"
65	37,794	1.8	19.1	173.5	0.029	1.04

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	0.052	9	3,820	0.14	500	$2,500
Pervious pavement	0.098	16	7,170	0.27	1,535	$38,375

GREEN INFRASTRUCTURE RECOMMENDATIONS



Union Presbyterian Church

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

0 20' 40'

YMCA of Salem County

Subwatershed: Lower Delaware River Tributaries

Site Area: 103,332 sq. ft.

Address: 204 Shell Road
Penns Grove, NJ 08069

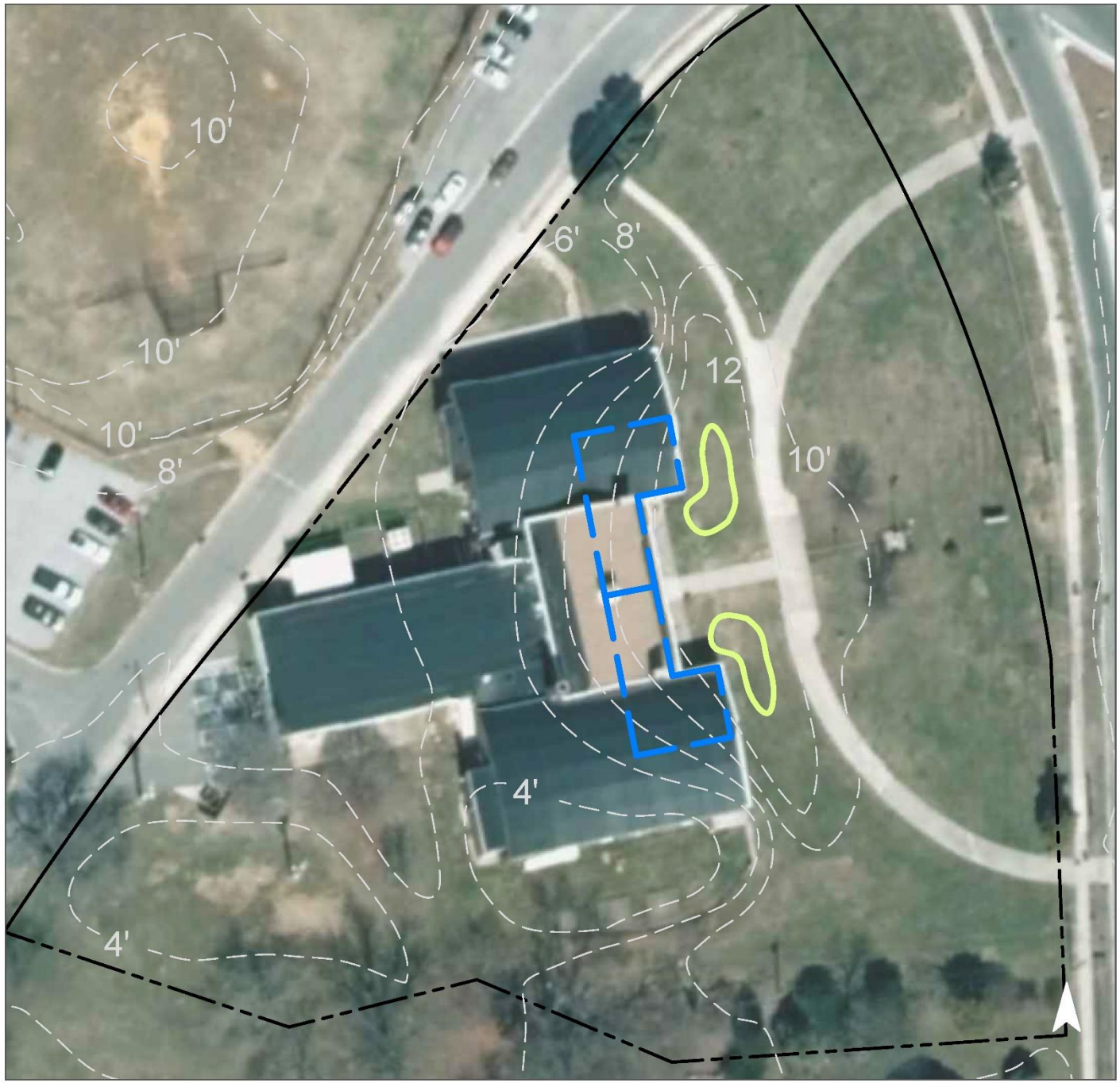
Block and Lot: Block 100, Lot 8

Bioretention systems can be installed in the turfgrass areas in the front of the building. Bioretention systems can capture, treat, and infiltrate rooftop runoff. 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"
38	39,340	1.9	19.9	180.6	0.031	1.08

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	0.094	16	6,880	0.26	900	$4,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



YMCA of Salem County

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

0 30' 60'

c. Summary of Existing Conditions

Summary of Existing Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Existing Annual Loads (Commercial)			Runoff Volumes from I.C.	
									TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Storm hours) (Mgal)	Annual (Mgal)
	LOWER DELAWARE RIVER TRIBUTARIES SUBWATERSHED	**5.21**	**227,079**				**3.08**	**134,122**	**6.5**	**67.7**	**615.8**	**0.105**	**3.68**
1	**Calvary Baptist Church**												
	Total Site Info	2.33	101,287	130;131	4; 3.01	75	1.74	75,648	3.6	38.2	347.3	0.059	2.07
2	**Carneys Point Fire & Rescue**												
	Total Site Info	1.47	63,919	117	5	68	1.00	43,625	2.1	22.0	200.3	0.034	1.20
3	**CrossPoint Wesleyan Church**												
	Total Site Info	1.42	61,872	68	32	24	0.34	14,849	0.7	7.5	68.2	0.012	0.41
4	**First Assembly of God**												
	Total Site Info	3.12	136,064	160	2, 3.01	37	1.14	49,738	2.4	25.1	228.4	0.039	1.36
5	**Kingdom Hall of Jehovah's Witnesses**												
	Total Site Info	1.77	77,188	187	5	79	1.41	61,335	3.0	31.0	281.6	0.048	1.68
6	**Ministerio Un Cantico Nuevo**												
	Total Site Info	3.65	159,151	41	3	21	0.77	33,573	1.6	17.0	154.1	0.026	0.92
7	**Salem Community College**												
	Total Site Info	18.79	818,456	170	2, 2.01, 5	54	10.08	439,193	21.2	221.8	2,016.5	0.342	12.05
8	**Southgate Health Care Center**												
	Total Site Info	7.08	308,583	246	3	54	3.83	166,845	8.0	84.3	766.0	0.130	4.58
9	**St. Gabriel the Arch Angel Parish**												
	Total Site Info	31.65	1,378,617	68	31	9	2.95	128,301	6.2	64.8	589.1	0.100	3.52
10	**Union Presbyterian Church**												
	Total Site Info	1.34	58,498	104; 113	7; 9	65	0.87	37,794	1.8	19.1	173.5	0.029	1.04
11	**YMCA of Salem County**												
	Total Site Info	2.37	103,332	100	8	38	0.90	39,340	1.9	19.9	180.6	0.031	1.08

d. Summary of Proposed Green Infrastructure Practices

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	Unit Cost ($/unit)	Unit	Total Cost ($)	I.C. Treated %
	LOWER DELAWARE RIVER TRIBUTARIES SUBWATERSHED	**13,935**	**0.32**	**0.344**	**60**	**23,750**	**0.90**				**$121,750**	**10.4%**
1	**Calvary Baptist Church**											
	Pervious pavement	7,050	0.16	0.184	31	13,480	0.51	3,240	$25	SF	$81,000	9.3%
	Total Site Info	**7,050**	**0.16**	**0.184**	**31**	**13,480**	**0.51**				**$81,000**	**9.3%**
2	**Carneys Point Fire & Rescue**											
	Pervious pavement	3,050	0.07	0.079	13	5,830	0.22	1,300	$25	SF	$32,500	7.0%
	Rainwater harvesting	1,285	0.03	0.033	6	1,000	0.04	1,000	$2	gal	$2,000	2.9%
	Total Site Info	**4,335**	**0.10**	**0.113**	**19**	**6,830**	**0.26**				**$34,500**	**9.9%**
3	**CrossPoint Wesleyan Church**											
	Bioretention system	1,800	0.04	0.047	8	3,440	0.13	450	$5	SF	$2,250	12.1%
	Planter boxes	750	0.02	n/a	3	n/a	n/a	4	$1,000	box	$4,000	5.1%
	Total Site Info	**2,550**	**0.06**	**0.047**	**11**	**3,440**	**0.13**				**$6,250**	**17.2%**
4	**First Assembly of God**											
	Bioretention systems	4,100	0.09	0.107	18	7,840	0.29	1,050	$5	SF	$5,250	8.2%
	Pervious pavement	3,550	0.08	0.092	15	6,780	0.26	1,780	$25	SF	$44,500	7.1%
	Total Site Info	**7,650**	**0.18**	**0.199**	**33**	**14,620**	**0.55**				**$49,750**	**15.4%**
5	**Kingdom Hall of Jehovah's Witnesses**											
	Pervious pavement	20,500	0.47	0.534	89	39,200	1.47	4,950	$25	SF	$123,750	33.4%
	Total Site Info	**20,500**	**0.47**	**0.534**	**89**	**39,200**	**1.47**				**$123,750**	**33.4%**
6	**Ministerio Un Cantico Nuevo**											
	Bioretention systems	4,900	0.11	0.128	21	9,360	0.35	1,230	$5	SF	$6,150	14.6%
	Total Site Info	**4,900**	**0.11**	**0.128**	**21**	**9,360**	**0.35**				**$6,150**	**14.6%**
7	**Salem Community College**											
	Bioretention system	3,850	0.09	0.100	17	7,360	0.28	965	$5	SF	$4,825	0.9%
	Pervious pavement	42,800	0.98	1.115	187	81,820	3.07	10,350	$25	SF	$258,750	9.7%
	Total Site Info	**46,650**	**1.07**	**1.215**	**203**	**89,180**	**3.35**				**$263,575**	**10.6%**

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	Unit Cost ($/unit)	Unit	Total Cost ($)	I.C. Treated %
8	**Southgate Health Care Center**											
	Bioretention systems	7,530	0.17	0.196	33	14,400	0.54	1,900	$5	SF	$9,500	4.5%
	Pervious pavement	27,875	0.64	0.726	122	53,300	2.00	5,185	$25	SF	$129,625	16.7%
	Total Site Info	**35,405**	**0.81**	**0.922**	**154**	**67,700**	**2.54**				**$139,125**	**21.2%**
9	**St. Gabriel the Arch Angel Parish**											
	Pervious pavement	29,100	0.67	0.758	127	55,640	2.09	6,950	$25	SF	$173,750	22.7%
	Planter boxes	860	0.02	n/a	3	n/a	n/a	6	$1,000	box	$6,000	0.7%
	Total Site Info	**29,960**	**0.69**	**0.758**	**130**	**55,640**	**2.09**				**$179,750**	**23.4%**
10	**Union Presbyterian Church**											
	Bioretention system	2,000	0.05	0.052	9	3,820	0.14	500	$5	SF	$2,500	5.3%
	Pervious pavement	3,750	0.09	0.098	16	7,170	0.27	1,535	$25	SF	$38,375	9.9%
	Total Site Info	**5,750**	**0.13**	**0.150**	**25**	**10,990**	**0.41**				**$40,875**	**15.2%**
11	**YMCA of Salem County**											
	Bioretention systems	3,600	0.08	0.094	16	6,880	0.26	900	$5	SF	$4,500	9.2%
	Total Site Info	**3,600**	**0.08**	**0.094**	**16**	**6,880**	**0.26**				**$4,500**	**9.2%**