RUTGERS
New Jersey Agricultural
Experiment Station

Draft

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

Prepared for Alloway Township by the
Rutgers Cooperative Extension Water Resources Program

November 29, 2018

Table of Contents

Introduction

Located in Salem County, New Jersey, Alloway Township covers approximately 33.8 square miles. Figures 1 and 2 illustrate that Alloway Township is dominated by agriculture land uses. A total of 10.4% of the municipality's land use is classified as urban. Of the urban land in Alloway Township, rural 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 Alloway 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 Alloway Township. Based upon the 2012 NJDEP land use/land cover data, approximately 1.5% of Alloway Township has impervious cover. This level of impervious cover suggests that the streams in Alloway Township are likely sensitive streams. [1]

Methodology

Alloway Township 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.

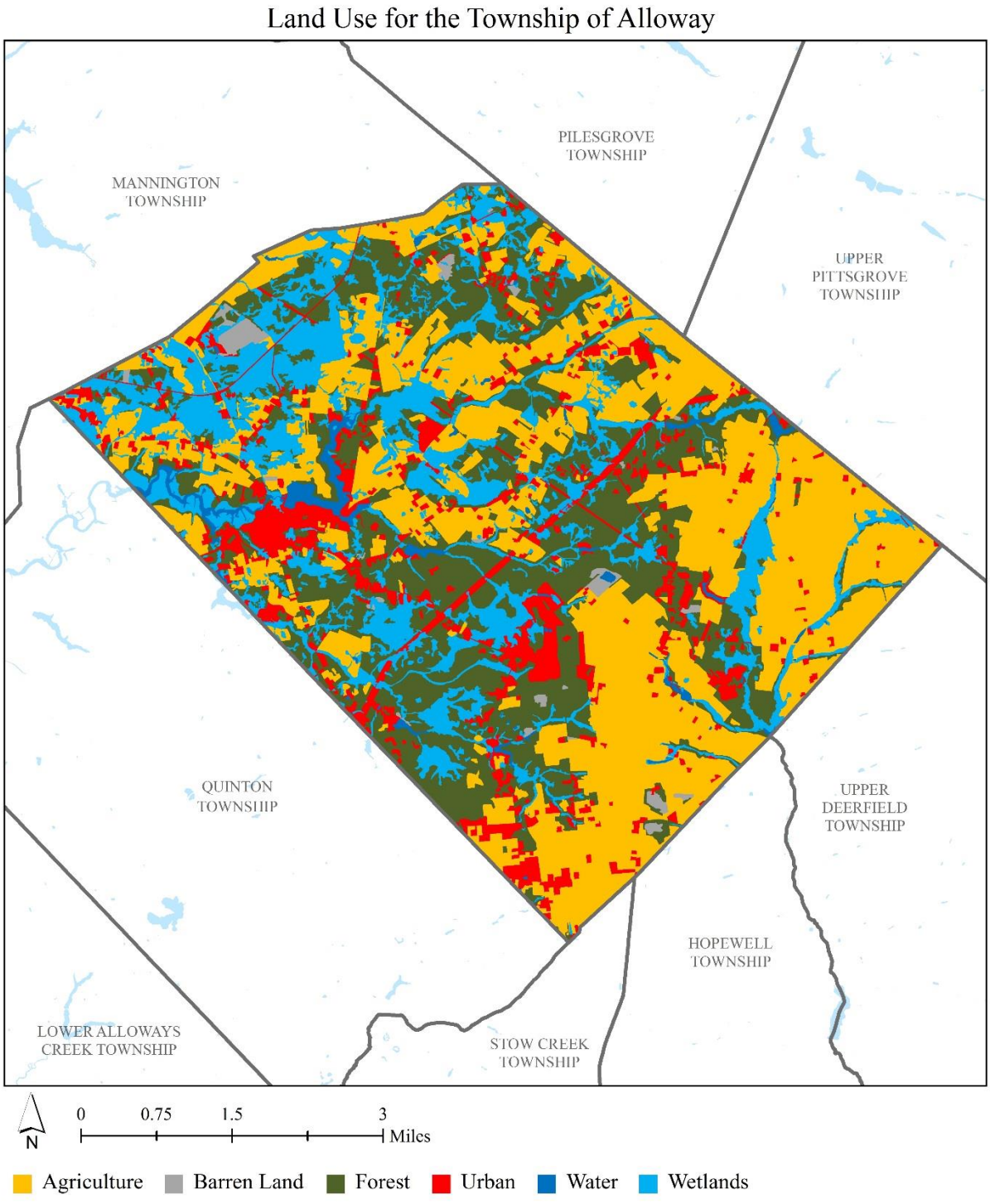


Figure 1: Map illustrating the land use in Alloway Township

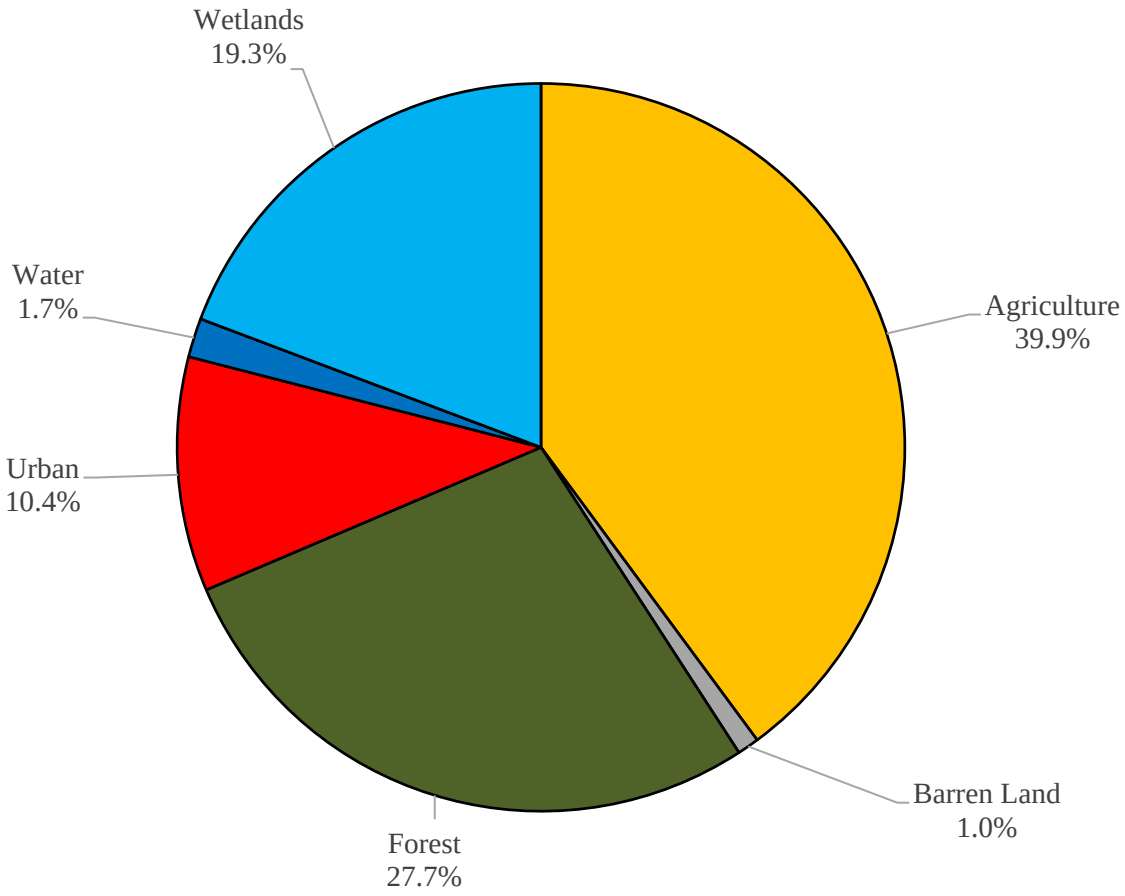


Figure 2: Pie chart illustrating the land use in Alloway Township

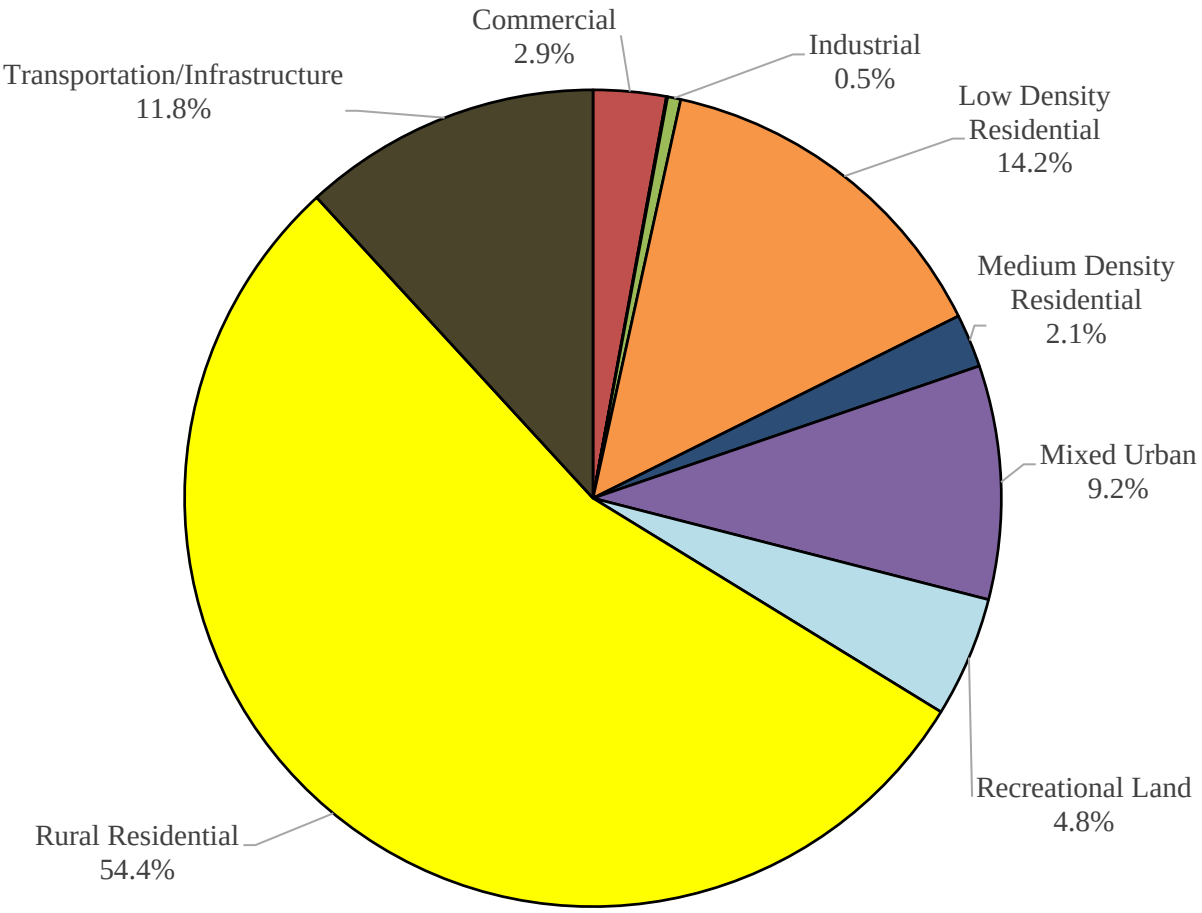


Figure 3: Pie chart illustrating the various types of urban land use in Alloway Township

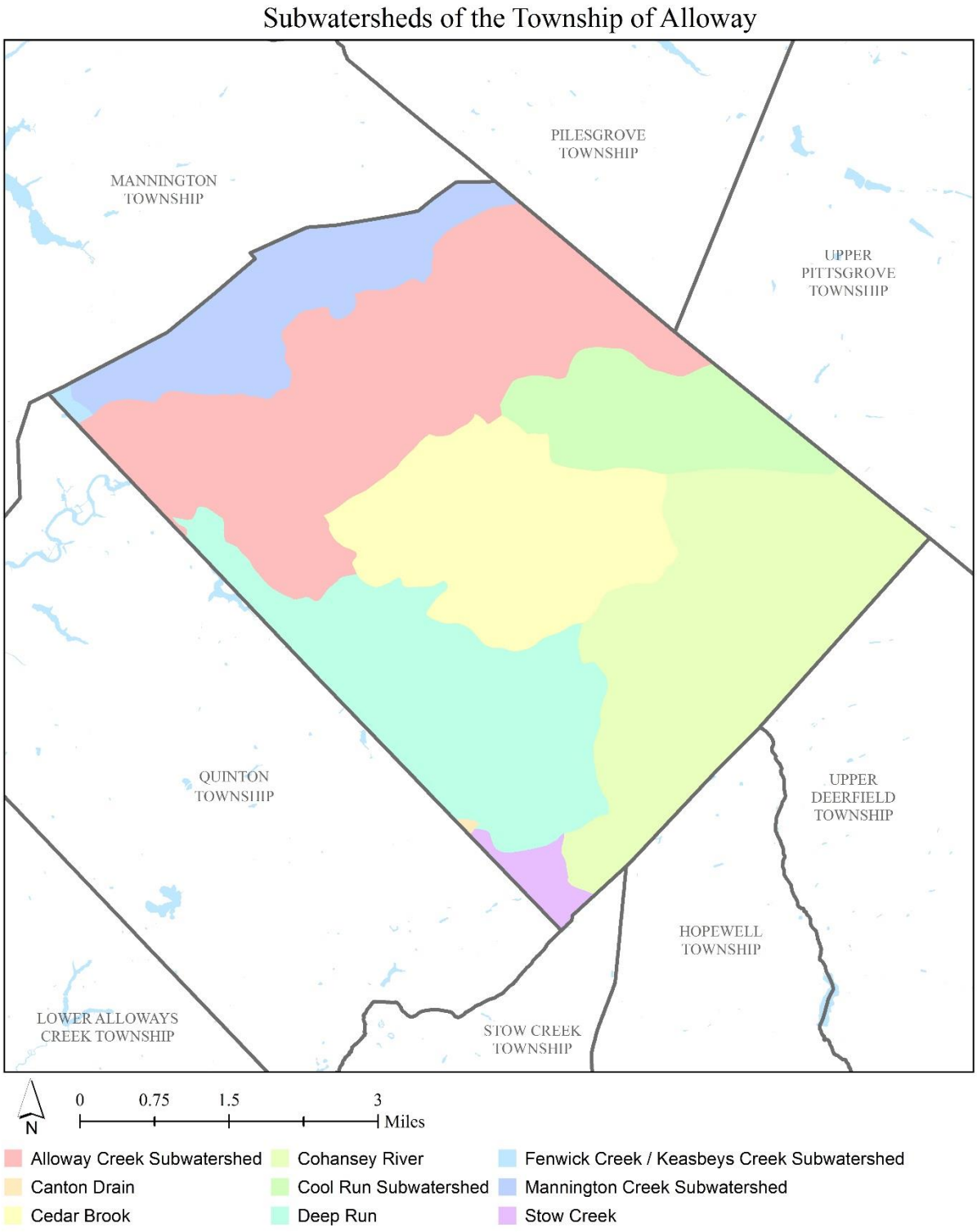


Figure 4: Map of the subwatersheds in Alloway Township

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 Alloway 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 Alloway 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*.

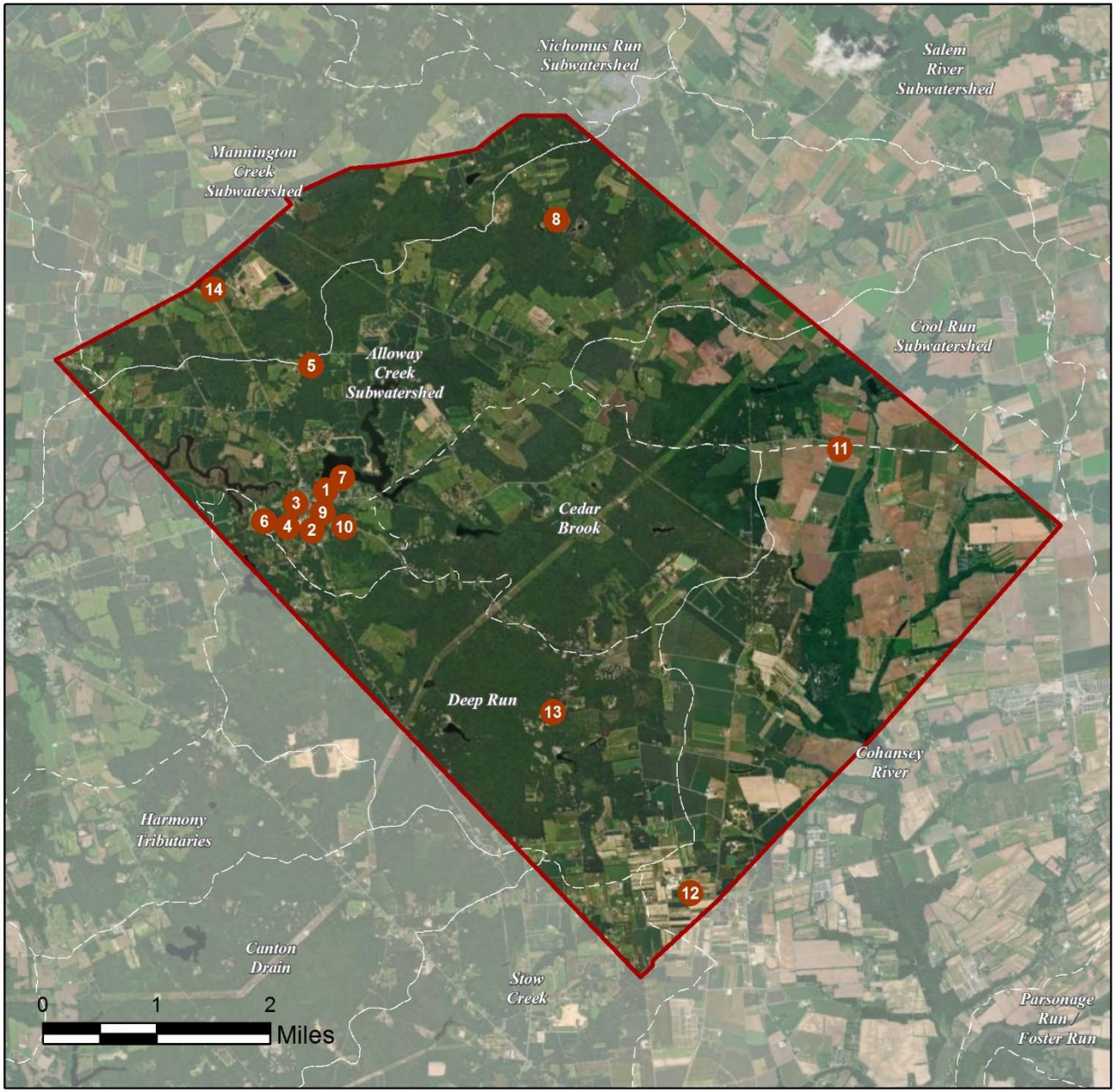
Conclusion

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

ALLOWAY TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE ALLOWAY CREEK SUBWATERSHED

1. Alloway Township Fire Company
2. Alloway Township Municipal Building
3. Alloway Township Post Office
4. Alloway Township Schools
5. Alloway Township Veterans Association
6. Alloway Township Youth League
7. Alloway United Methodist Church
8. Decktor Veterinary Hospital
9. Fulton Bank of New Jersey
10. Truth Bible Church

SITES WITHIN THE COHANSEY RIVER SUBWATERSHED

11. Aldine United Methodist Church
12. Salem County Mennonite Church

SITES WITHIN THE DEEP RUN SUBWATERSHED

13. Shiloh Baptist Church

SITES WITHIN THE MANNINGTON CREEK SUBWATERSHED

14. Salem CC Glass Center

b. Proposed Green Infrastructure Concepts

Alloway Township Fire Company

Subwatershed: Alloway Creek

Site Area: 145,962 sq. ft.

Address: 17 East Main Street
Alloway, NJ 08001

Block and Lot: Block 60, Lot 20

A rain garden can be installed to capture, treat, and infiltrate stormwater runoff from the driveway and the roof of the eastern building. Downspouts on the western building can be redirected to a cistern to collect rainwater for non-potable uses such as washing firetrucks. 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"
34	50,124	2.4	25.3	230.1	0.039	1.37

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	0.395	66	26,808	1.04	3,790	$18,950
Rainwater harvesting	0.067	11	2,000	0.18	2,000 (gal)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Alloway Township Fire Company

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

0 25' 50'

Alloway Township Municipal Building

Subwatershed: Alloway Creek

Site Area: 98,299 sq. ft.

Address: 49 South Greenwich Street
Woodstown, NJ 08098

Block and Lot: Block 53, Lot 2

A stormwater planter can be installed along the west side of the municipal building to intercept and infiltrate roof runoff and to provide an aesthetically pleasing addition to the property. Pervious asphalt can replace the parking spaces alongside the northern and southern sides of the lot to capture and infiltrate runoff from the surrounding 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"
65	63,410	3.1	32.0	291.1	0.049	1.74

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	0.453	76	32,777	1.23	3,310	$82,750
Stormwater planter	0.307	51	22,268	0.84	2,950	$1,106,250

GREEN INFRASTRUCTURE RECOMMENDATIONS

Alloway Township Municipal Building

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

0 30' 60'

Alloway Township Post Office

Subwatershed: Alloway Creek

Site Area: 17,903 sq. ft.

Address: 18 School Lane
Woodstown, NJ 08098

Block and Lot: Block 52, Lot 7

Parking spaces southwest and southeast of the post office can be replaced with pervious pavement to capture and infiltrate stormwater from the parking lot and rooftop runoff from the building. 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	17,903	0.8	8.4	76.0	0.013	0.45

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	0.190	32	13,741	0.52	1,350	$33,750

GREEN INFRASTRUCTURE RECOMMENDATIONS

Alloway Township Post Office

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

0 20' 40'

Alloway Township Schools

Subwatershed: Alloway Creek

Site Area: 537,190 sq. ft.

Address: 43 Cedar Street
Bridgeton, NJ 08302

Block and Lot: Block 53; 54, Lots 2.01, 3; 11

Pervious asphalt can be installed east of the school to infiltrate stormwater runoff from the parking lot. Parking spaces south of the school can also be converted to pervious asphalt to collect and infiltrate rooftop runoff from nearby buildings. Downspouts from the western buildings can be conveyed towards a western field where a rain garden can be installed to 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"
31	168,059	8.1	84.9	771.6	0.131	4.61

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	0.628	105	45,478	1.71	6,025	$30,125
Pervious pavement	1.182	198	85,601	3.22	9,555	$238,875

GREEN INFRASTRUCTURE RECOMMENDATIONS

Alloway Township Schools

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

0 50' 100'

Alloway Township Veterans Association

Subwatershed: Alloway Creek

Site Area: 319,054 sq. ft.

Address: 95 Timberman Road
Woodstown, NJ 08098

Block and Lot: Block 22, Lot 27

Southwestern parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater from the street, from parts of the roof, and from the rest of the parking lot. Southeastern parking spaces can be replaced by pervious asphalt to infiltrate rooftop runoff from the remainder of the roof 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"
19	62,200	3.0	31.4	285.6	0.048	1.71

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	1.082	181	72,713	2.85	7,620	$190,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Alloway Township Veterans Association

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

0 30' 60'

Alloway Township Youth League

Subwatershed: Alloway Creek

Site Area: 1,327,127 sq. ft.

Address: Elkinton Road
Alloway, NJ 08001

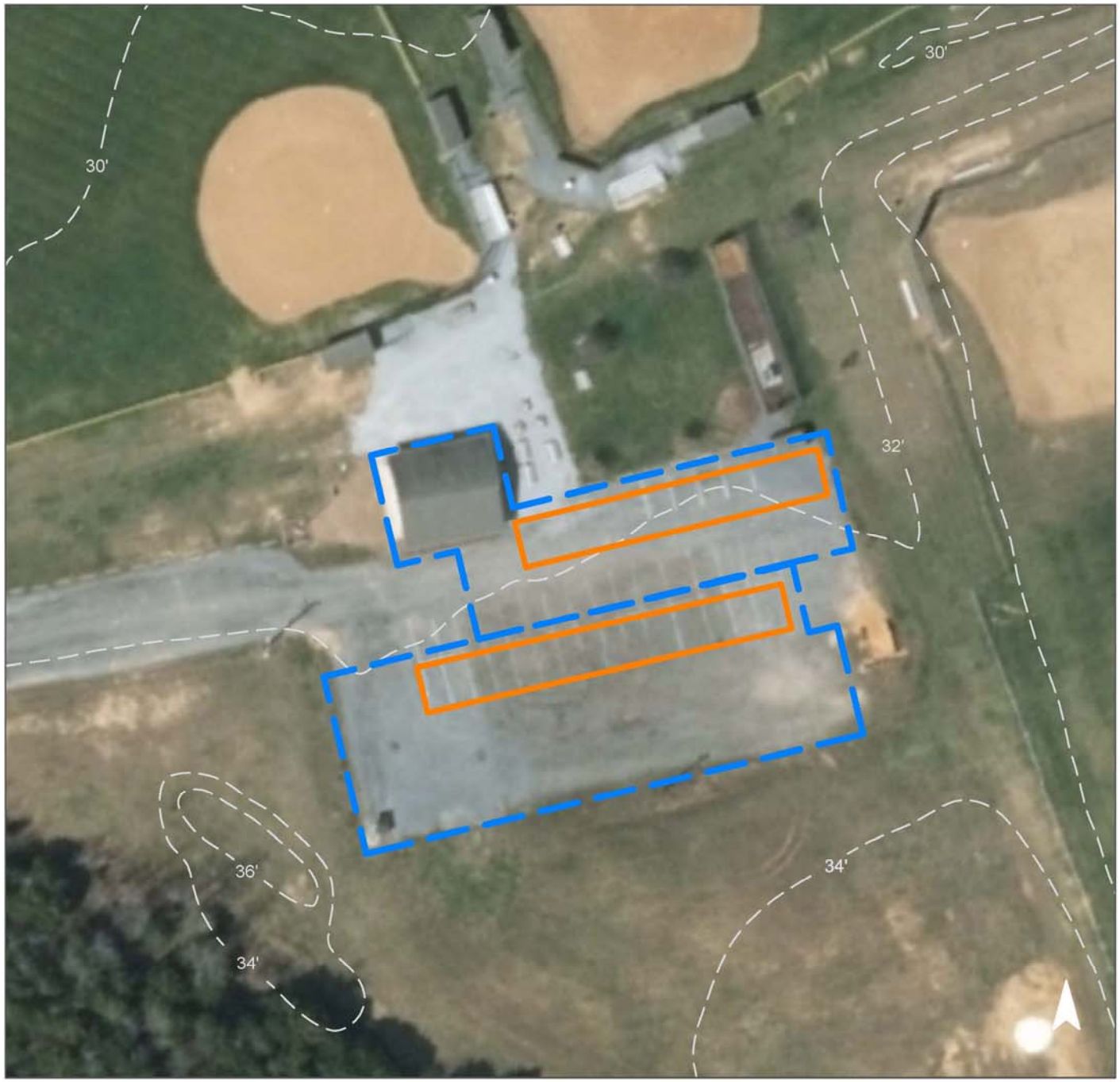
Block and Lot: Block 21, Lot 3

Parking spaces in the middle and northeastern parts of the lot can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the remainder of the lot and rooftop runoff from the nearby building. 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"
3	44,172	2.1	22.3	202.8	0.034	1.21

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	0.604	101	40,579	1.59	5,200	$130,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Alloway Township Youth League

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

0 30' 60'

Alloway United Methodist Church

Subwatershed: Alloway Creek

Site Area: 142,423 sq. ft.

Address: 9 Church Street
Alloway, NJ 08001

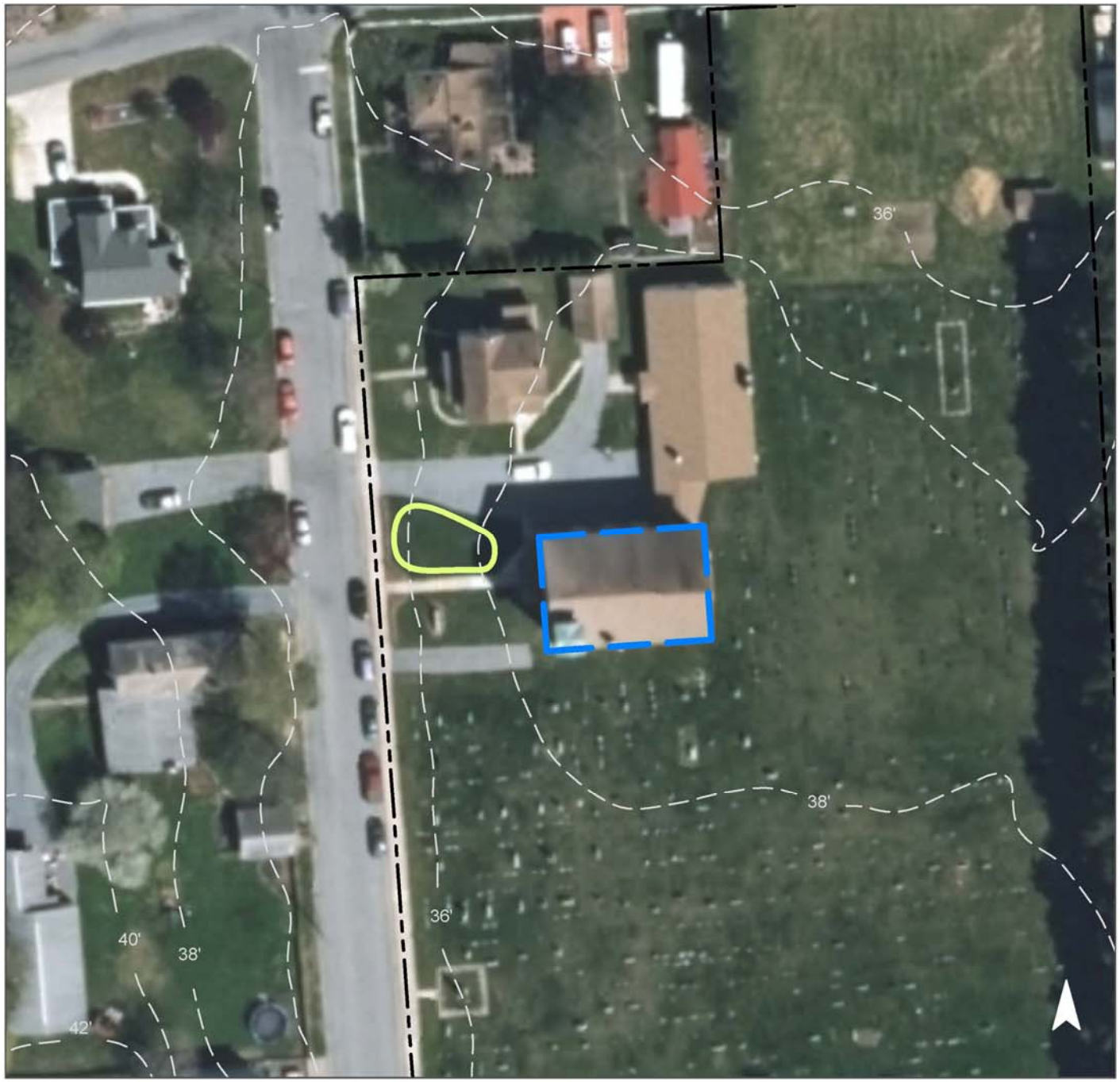
Block and Lot: Block 58, Lot 2

A rain garden can be installed west of the church, in front of the building, to capture, treat, and infiltrate rooftop runoff. Not only will the rain garden mitigate rooftop runoff, but it will also improve the aesthetics of the front of the church and provide educational opportunities to parishioners. 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"
14	0.45	0.9	9.8	89.4	0.015	0.53

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	0.076	13	5,520	0.21	750	$3,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Alloway United Methodist Church

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

0 30' 60'

Decktor Veterinary Hospital

Subwatershed: Alloway Creek

Site Area: 160,355 sq. ft.

Address: 174 Pierson Road
Woodstown, NJ 08098

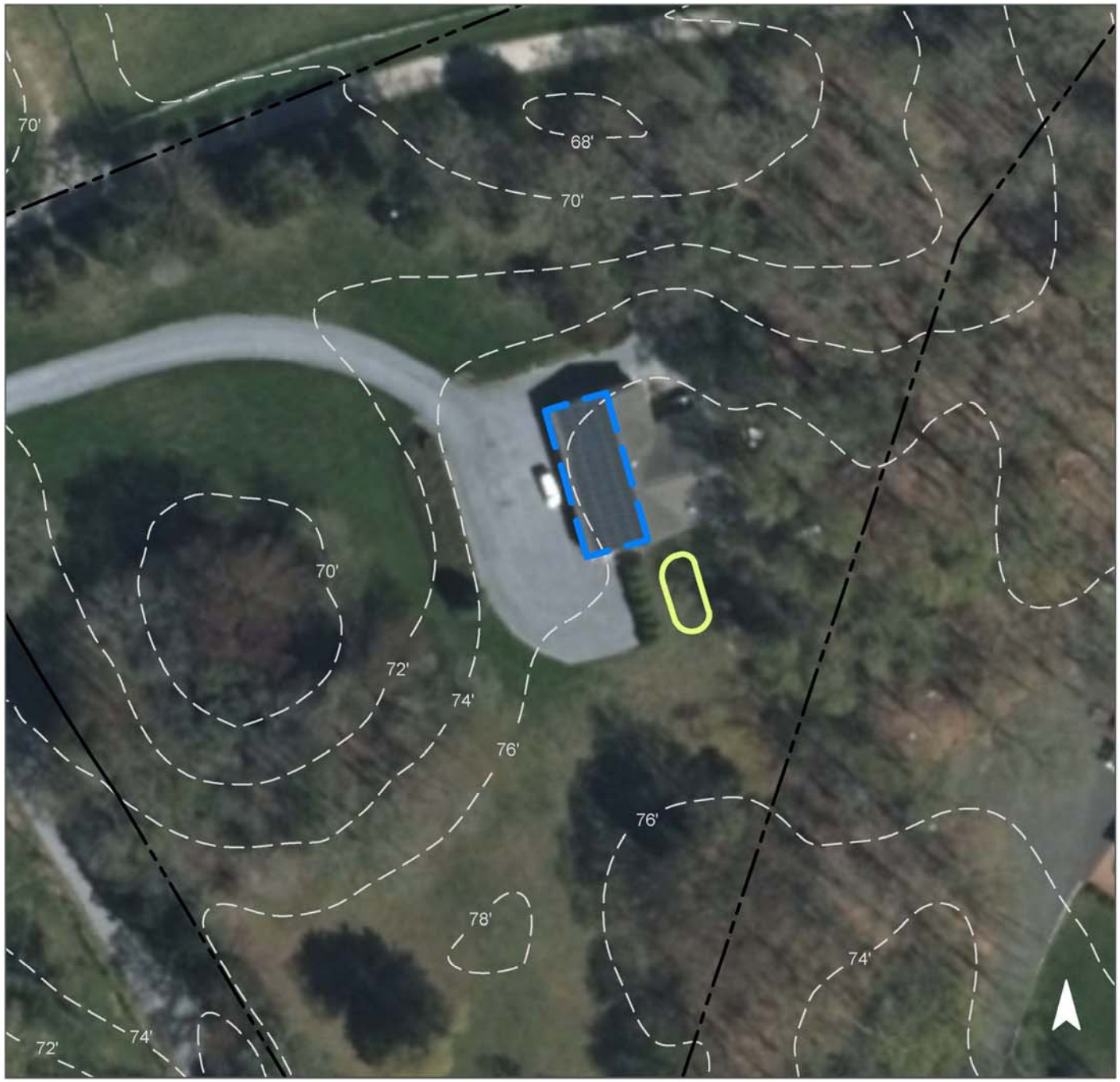
Block and Lot: Block 15, Lot 7.01

A rain garden can be installed in a clearing southeast of the building to capture, treat, and infiltrate rooftop runoff and to enable the disconnection of a downspout. An ancillary benefit of installing a rain garden is that it will improve the aesthetics of the property. 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	14,044	0.7	7.1	64.5	0.011	0.39

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	0.039	7	2,827	0.11	375	$1,875

GREEN INFRASTRUCTURE RECOMMENDATIONS



Decktor Veterinary Hospital

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

0 30' 60'

Fulton Bank of New Jersey

Subwatershed: Alloway Creek

Site Area: 103,612 sq. ft.

Address: 48 South Greenwich Street
Alloway, NJ 08001

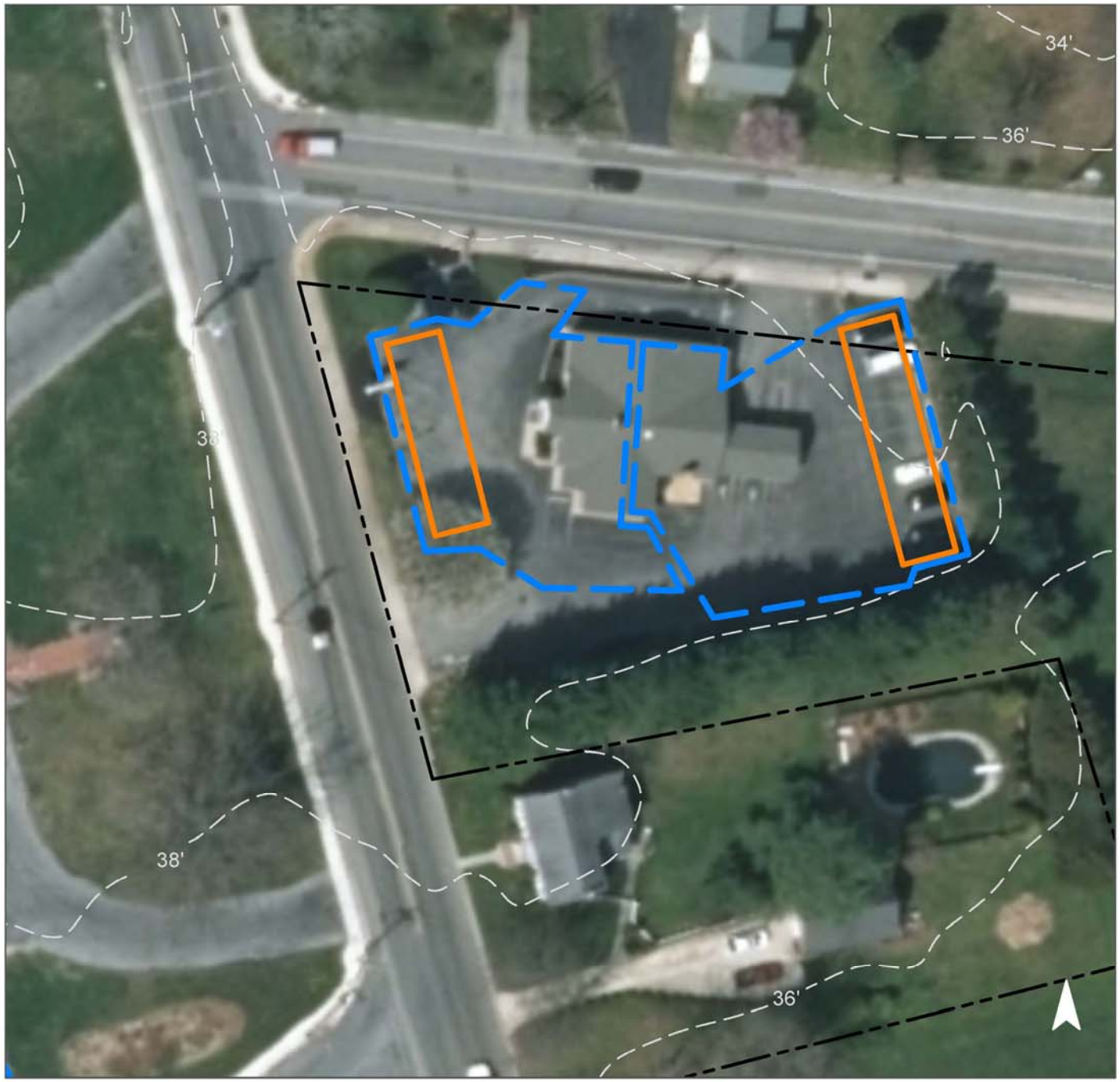
Block and Lot: Block 63, Lots 1, 2, 3

Parking spaces east and west of the bank can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the remainder of the parking lot and rooftop runoff from the bank. 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"
20	21,205	1.0	10.7	97.4	0.017	0.58

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
Pervious pavement	0.379	63	27,459	1.03	2,610	$65,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Fulton Bank of New Jersey

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

0 25' 50'

Truth Bible Church

Subwatershed: Alloway Creek

Site Area: 102,391 sq. ft.

Address: 27 Alloway Friesburg Road
Bridgeton, NJ 08302

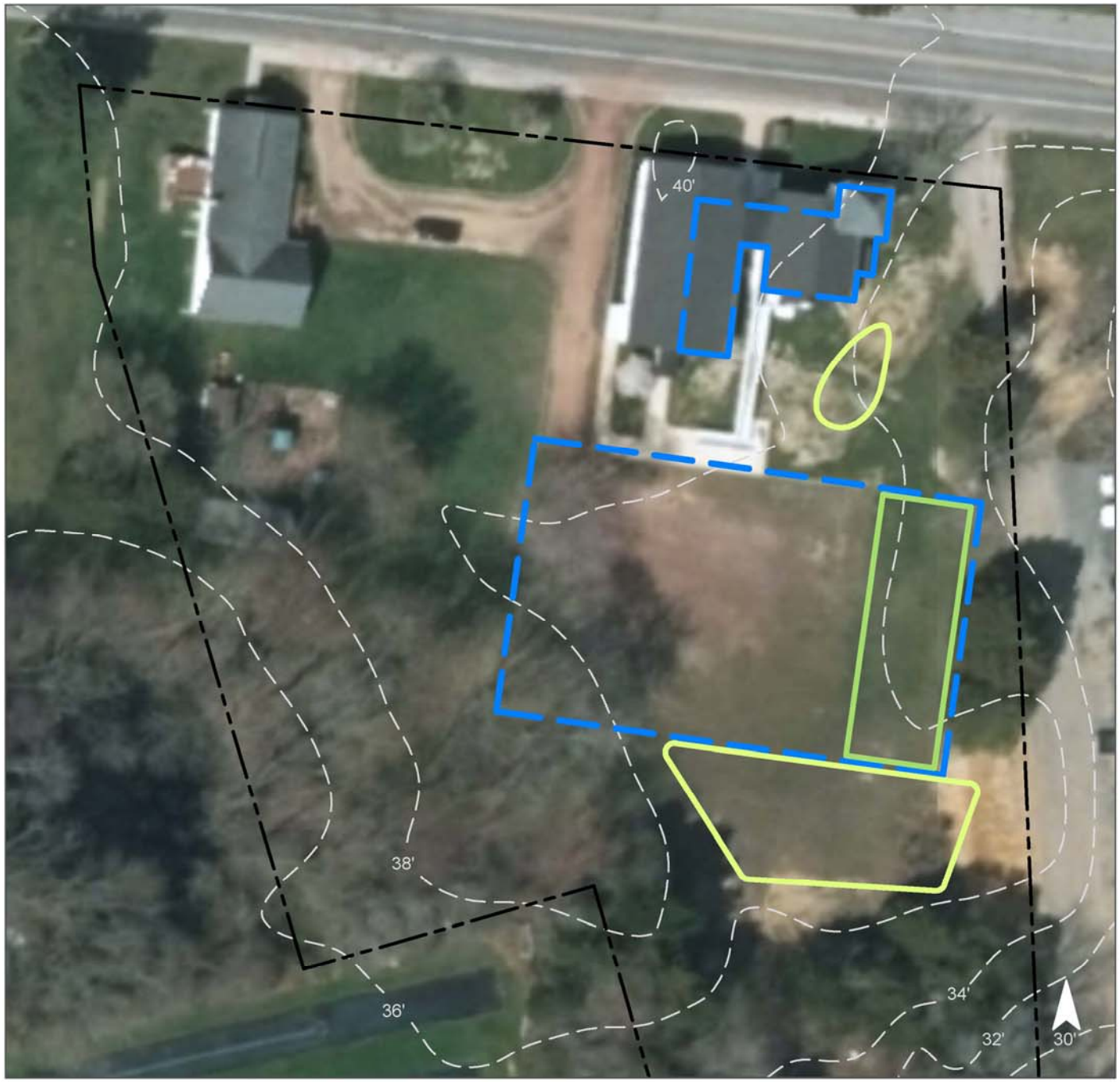
Block and Lot: Block 63, Lots 3, 4

A rain garden can be installed to capture, treat, and infiltrate rooftop runoff from the church. Southwest of the church, a shallow bioswale can be used to treat and convey runoff from the parking lot toward another rain garden, south of the lot. The rain gardens would not only treat and mitigate damage from runoff, but they would also improve the aesthetics of the landscape. 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"
15	14,889	0.7	7.5	68.4	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 systems	0.324	54	23,480	0.88	3,585	$17,925
Bioswale	0.000	0	0	0.00	2,494	$12,470

GREEN INFRASTRUCTURE RECOMMENDATIONS



Truth Bible Church

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

0 25' 50'

Aldine United Methodist Church

Subwatershed: Cohansey River

Site Area: 143,734 sq. ft.

Address: 776 Friesburg Aldine Road
Elmer, NJ 08318

Block and Lot: Block 38, Lot 7

Parking spaces surrounding the church can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the street and from the remainder of the 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"
31	44,020	2.1	22.2	202.1	0.034	1.21

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	0.819	137	59,279	2.61	9,860	$246,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Aldine United Methodist Church

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

0 50' 100'

Salem County Mennonite Church

Subwatershed: Cohansey River

Site Area: 246,882 sq. ft.

Address: 256 Pecks Corner
Cohansey Road,
Bridgeton, NJ 08302

Block and Lot: Block 111, Lot 10

Parking spaces east of the church can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the lot and rooftop runoff from the church. 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"
10	23,869	1.2	12.1	109.6	0.019	0.65

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	0.399	67	28,903	1.09	3,270	$81,750

GREEN INFRASTRUCTURE RECOMMENDATIONS

Salem County Mennonite Church

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

0 30' 60'

Shiloh Baptist Church

Subwatershed: Deep Run

Site Area: 53,745 sq. ft.

Address: 97 Cobbs Mill Road
Bridgeton, NJ 08302

Block and Lot: Block 65, Lot 14

Parking spaces southeast of the church can be replaced with pervious pavement to capture and infiltrate stormwater from surrounding parking spaces and from the nearby street. 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"
10	5,381	0.3	2.7	24.7	0.004	0.15

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	0.112	19	8,116	0.31	1,000	$25,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Shiloh Baptist Church

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

0 30' 60'

Salem CC Glass Center

Subwatershed: Mannington Creek

Site Area: 1,215,268 sq. ft.

Address: 286 Welchville Road
Salem, NJ 08079

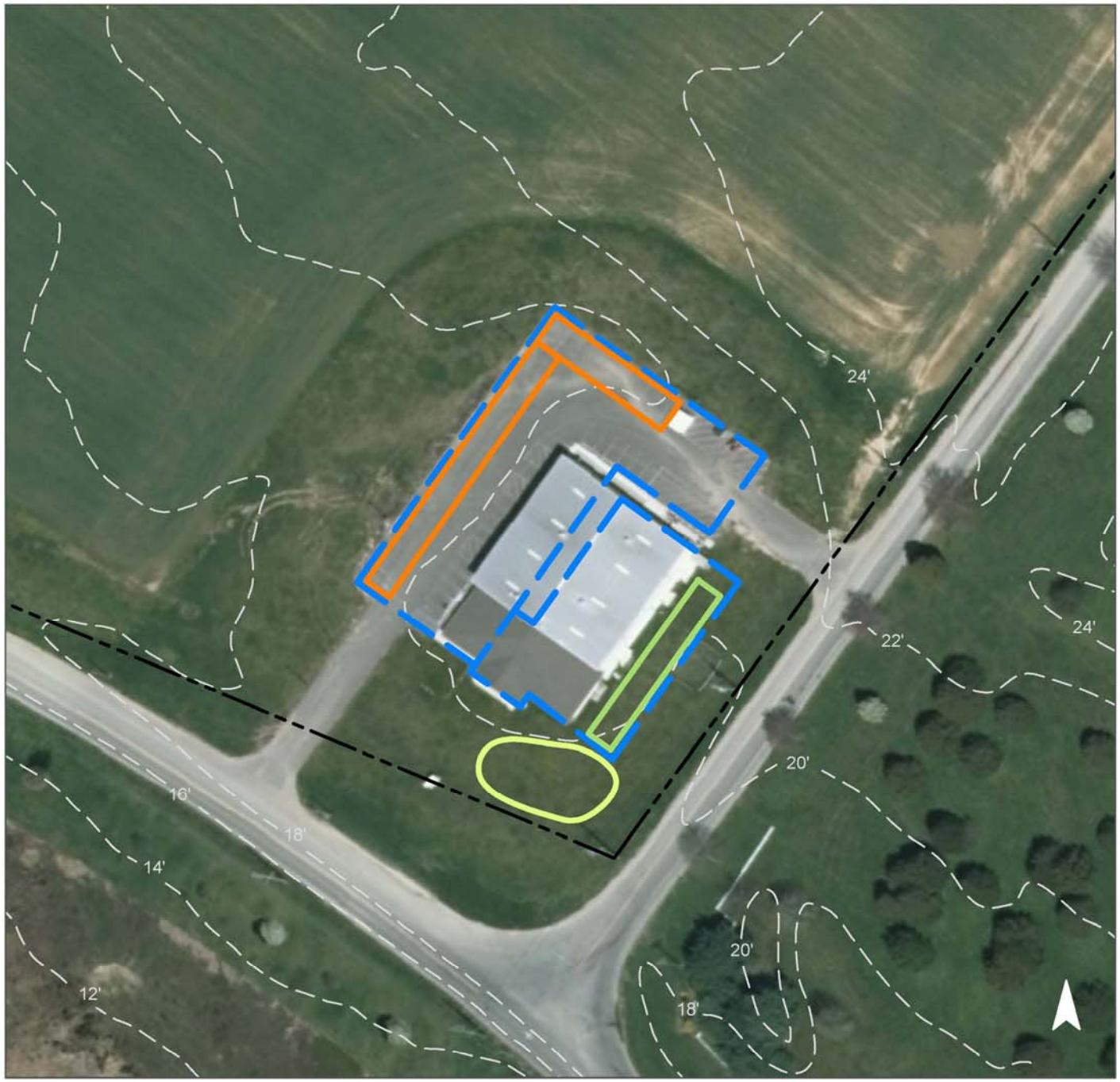
Block and Lot: Block 7, Lot 2

A rain garden can be installed southwest of the center to collect and treat rooftop runoff. A shallow bioswale can be implemented alongside the eastern side of the center to convey rooftop runoff towards the rain garden. Pervious asphalt can replace parking spaces north and northwest of the center to capture and infiltrate runoff from the remainder of the parking lot and building. 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"
3	40,349	1.9	20.4	185.3	0.031	1.11

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	0.227	38	16,419	0.82	3,570	$17,850
Bioswale	0.000	0	0	0.00	2,170	$10,850
Pervious pavement	0.672	113	48,687	1.83	5,680	$142,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Salem CC Glass Center

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

0 50' 100'

c. Summary of Existing Conditions

Summary of Existing Site 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)	Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
	ALLOWAY CREEK SUBWATERSHED	**67.82**	**2,954,316**				**10.88**	**474,125**	**22.9**	**239.5**	**2,176.9**	**0.369**	**13.00**
1	**Alloway Township Fire Company**												
	Total Site Info	3.35	145,962	60	20	34	1.15	50,124	2.4	25.3	230.1	0.039	1.37
2	**Alloway Township Municipal Building**												
	Total Site Info	2.26	98,299	53	2	65	1.46	63,410	3.1	32.0	291.1	0.049	1.74
3	**Alloway Township Post Office**												
	Total Site Info	0.41	17,903	52	7	92	0.38	16,556	0.8	8.4	76.0	0.013	0.45
4	**Alloway Township Schools**												
	Total Site Info	12.33	537,190	53; 54	2.01, 3; 11	31	3.86	168,059	8.1	84.9	771.6	0.131	4.61
5	**Alloway Township Veterans Association**												
	Total Site Info	7.32	319,054	22	27	19	1.43	62,200	3.0	31.4	285.6	0.048	1.71
6	**Alloway Township Youth League**												
	Total Site Info	30.47	1,327,127	21	3	3	1.01	44,172	2.1	22.3	202.8	0.034	1.21
7	**Alloway United Methodist Church**												
	Total Site Info	3.27	142,423	58	2	14	0.45	19,468	0.9	9.8	89.4	0.015	0.53
8	**Decktor Veterinary Hospital**												
	Total Site Info	3.68	160,355	15	7.01	9	0.32	14,044	0.7	7.1	64.5	0.011	0.39
9	**Fulton Bank of New Jersey**												
	Total Site Info	2.38	103,612	63	1, 2, 3	20	0.49	21,205	1.0	10.7	97.4	0.017	0.58
10	**Truth Bible Church**												
	Total Site Info	2.35	102,391	63	3, 4	15	0.34	14,889	0.7	7.5	68.4	0.012	0.41
	COHANSEY RIVER SUBWATERSHED	**8.97**	**390,617**				**1.56**	**67,890**	**3.3**	**34.3**	**311.7**	**0.053**	**1.86**
11	**Aldine United Methodist Church**												
	Total Site Info	3.30	143,734	38	7	31	1.01	44,020	2.1	22.2	202.1	0.034	1.21

Summary of Existing Site 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)	Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
12	**Salem County Mennonite Church**												
	Total Site Info	5.67	246,882	111	10	10	0.55	23,869	1.2	12.1	109.6	0.019	0.65
	DEEP RUN SUBWATERSHED	**1.23**	**53,745**				**0.12**	**5,381**	**0.3**	**2.7**	**24.7**	**0.004**	**0.15**
13	**Shiloh Baptist Church**												
	Total Site Info	1.23	53,745	65	14	10	0.12	5,381	0.3	2.7	24.7	0.004	0.15
	MANNINGTON CREEK SUBWATERSHED	**27.90**	**1,215,268**				**0.93**	**40,349**	**1.9**	**20.4**	**185.3**	**0.031**	**1.11**
14	**Salem CC Glass Center**												
	Total Site Info	27.90	1,215,268	7	2	3	0.93	40,349	1.9	20.4	185.3	0.031	1.11

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 %
	ALLOWAY CREEK SUBWATERSHED	**219,783**	**5.05**	**5.727**	**959**	**401,252**	**15.41**				**$1,936,470**	**46.4%**
1	**Alloway Township Fire Company**											
	Bioretention system	15,160	0.35	0.395	66	26,808	1.04	3,790	$5	SF	$18,950	30.2%
	Rainwater harvesting	2,570	0.06	0.067	11	2,000	0.18	2,000	$2	gal	$4,000	5.1%
	Total Site Info	**17,730**	**0.41**	**0.462**	**77**	**28,808**	**1.22**				**$22,950**	**35.4%**
2	**Alloway Township Municipal Building**											
	Pervious pavement	17,370	0.40	0.453	76	32,777	1.23	3,310	$25	SF	$82,750	27.4%
	Stormwater planter	11,800	0.27	0.307	51	22,268	0.84	2,950	$375	SF	$1,106,250	18.6%
	Total Site Info	**29,170**	**0.67**	**0.760**	**127**	**55,045**	**2.07**				**$1,189,000**	**46.0%**
3	**Alloway Township Post Office**											
	Pervious pavement	7,280	0.17	0.190	32	13,741	0.52	1,350	$25	SF	$33,750	44.0%
	Total Site Info	**7,280**	**0.17**	**0.190**	**32**	**13,741**	**0.52**				**$33,750**	**44.0%**
4	**Alloway Township Schools**											
	Bioretention system	24,100	0.55	0.628	105	45,478	1.71	6,025	$5	SF	$30,125	14.3%
	Pervious pavement	45,365	1.04	1.182	198	85,601	3.22	9,555	$25	SF	$238,875	27.0%
	Total Site Info	**69,465**	**1.59**	**1.810**	**303**	**131,080**	**4.93**				**$269,000**	**41.3%**
5	**Alloway Township Veterans Association**											
	Pervious pavement	41,540	0.95	1.082	181	72,713	2.85	7,620	$25	SF	$190,500	66.8%
	Total Site Info	**41,540**	**0.95**	**1.082**	**181**	**72,713**	**2.85**				**$190,500**	**66.8%**
6	**Alloway Township Youth League**											
	Pervious pavement	23,180	0.53	0.604	101	40,579	1.59	5,200	$25	SF	$130,000	52.5%
	Total Site Info	**23,180**	**0.53**	**0.604**	**101**	**40,579**	**1.59**				**$130,000**	**52.5%**
7	**Alloway United Methodist Church**											
	Bioretention system	2,925	0.07	0.076	13	5,520	0.21	750	$5	SF	$3,750	15.0%
	Total Site Info	**2,925**	**0.07**	**0.076**	**13**	**5,520**	**0.21**				**$3,750**	**15.0%**
8	**Decktor Veterinary Hospital**											
	Bioretention system	1,500	0.03	0.039	7	2,827	0.11	375	$5	SF	$1,875	10.7%
	Total Site Info	**1,500**	**0.03**	**0.039**	**7**	**2,827**	**0.11**				**$1,875**	**10.7%**

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 %
9	**Fulton Bank of New Jersey**											
	Pervious pavement	14,550	0.33	0.379	63	27,459	1.03	2,610	$25	SF	$65,250	68.6%
	Total Site Info	**14,550**	**0.33**	**0.379**	**63**	**27,459**	**1.03**				**$65,250**	**68.6%**
10	**Truth Bible Church**											
	Bioretention systems	12,443	0.29	0.324	54	23,480	0.88	3,585	$5	SF	$17,925	83.6%
	Bioswale	0	0.00	0.000	0	n/a		2,494	$5	SF	$12,470	0.0%
	Total Site Info	**12,443**	**0.29**	**0.324**	**54**	**23,480**	**0.88**				**$30,395**	**83.6%**
	COHANSEY RIVER SUBWATERSHED	**46,730**	**1.07**	**1.218**	**204**	**88,182**	**3.70**				**$328,250**	**68.8%**
11	**Aldine United Methodist Church**											
	Pervious pavement	31,415	0.72	0.819	137	59,279	2.61	9,860	$25	SF	$246,500	71.4%
	Total Site Info	**31,415**	**0.72**	**0.819**	**137**	**59,279**	**2.61**				**$246,500**	**71.4%**
12	**Salem County Mennonite Church**											
	Pervious pavement	15,315	0.35	0.399	67	28,903	1.09	3,270	$25	SF	$81,750	64.2%
	Total Site Info	**15,315**	**0.35**	**0.399**	**67**	**28,903**	**1.09**				**$81,750**	**64.2%**
	DEEP RUN SUBWATERSHED	**4,300**	**0.10**	**0.112**	**19**	**8,116**	**0.31**				**$25,000**	**79.9%**
13	**Shiloh Baptist Church**											
	Pervious pavement	4,300	0.10	0.112	19	8,116	0.31	1,000	$25	SF	$25,000	79.9%
	Total Site Info	**4,300**	**0.10**	**0.112**	**19**	**8,116**	**0.31**				**$25,000**	**79.9%**
	MANNINGTON CREEK SUBWATERSHED	**34,500**	**0.79**	**0.899**	**150**	**65,106**	**2.45**				**$170,700**	**85.5%**
14	**Salem CC Glass Center**											
	Bioretention system	8,700	0.20	0.227	38	16,419	0.62	3,570	$5	SF	$17,850	21.6%
	Bioswale	0	0.00	0.000	0			2,170	$5	SF	$10,850	0.0%
	Pervious pavement	25,800	0.59	0.672	113	48,687	1.83	5,680	$25	SF	$142,000	63.9%
	Total Site Info	**34,500**	**0.79**	**0.899**	**150**	**65,106**	**2.45**				**$170,700**	**85.5%**