Draft

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

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

December 17, 2018

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Introduction

Located in Salem County, New Jersey, Quinton Township covers approximately 24.6 square miles. Figures 1 and 2 illustrate that Quinton Township is dominated by forest land uses. A total of 10.5% of the municipality's land use is classified as urban. Of the urban land in Quinton 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 Quinton 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 Quinton Township. Based upon the 2012 NJDEP land use/land cover data, approximately 2.2% of Quinton Township has impervious cover. This level of impervious cover suggests that the streams in Quinton Township are likely sensitive streams. [1]

Methodology

Quinton Township contains portions of seven 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.

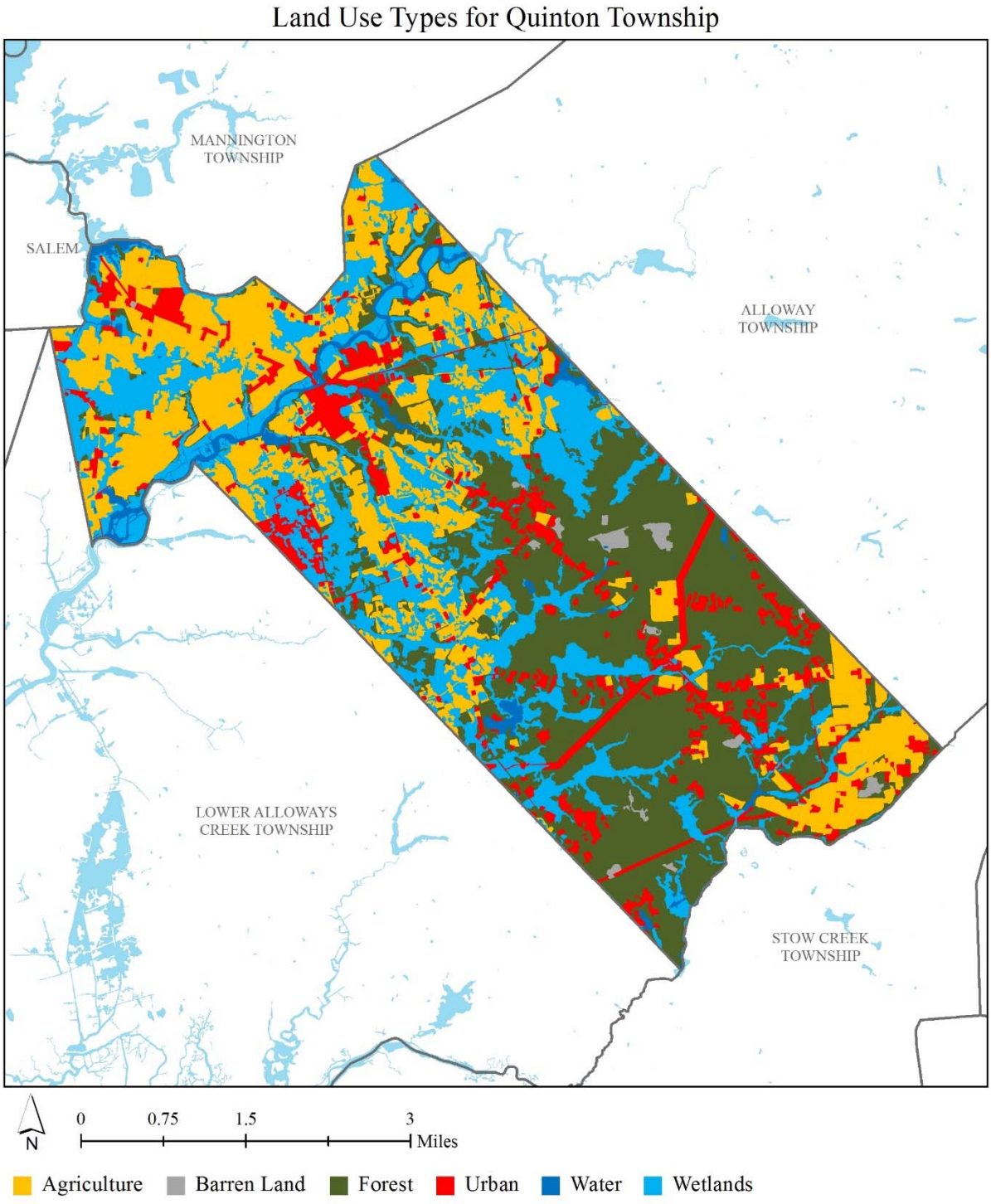


Figure 1: Map illustrating the land use in Quinton Township

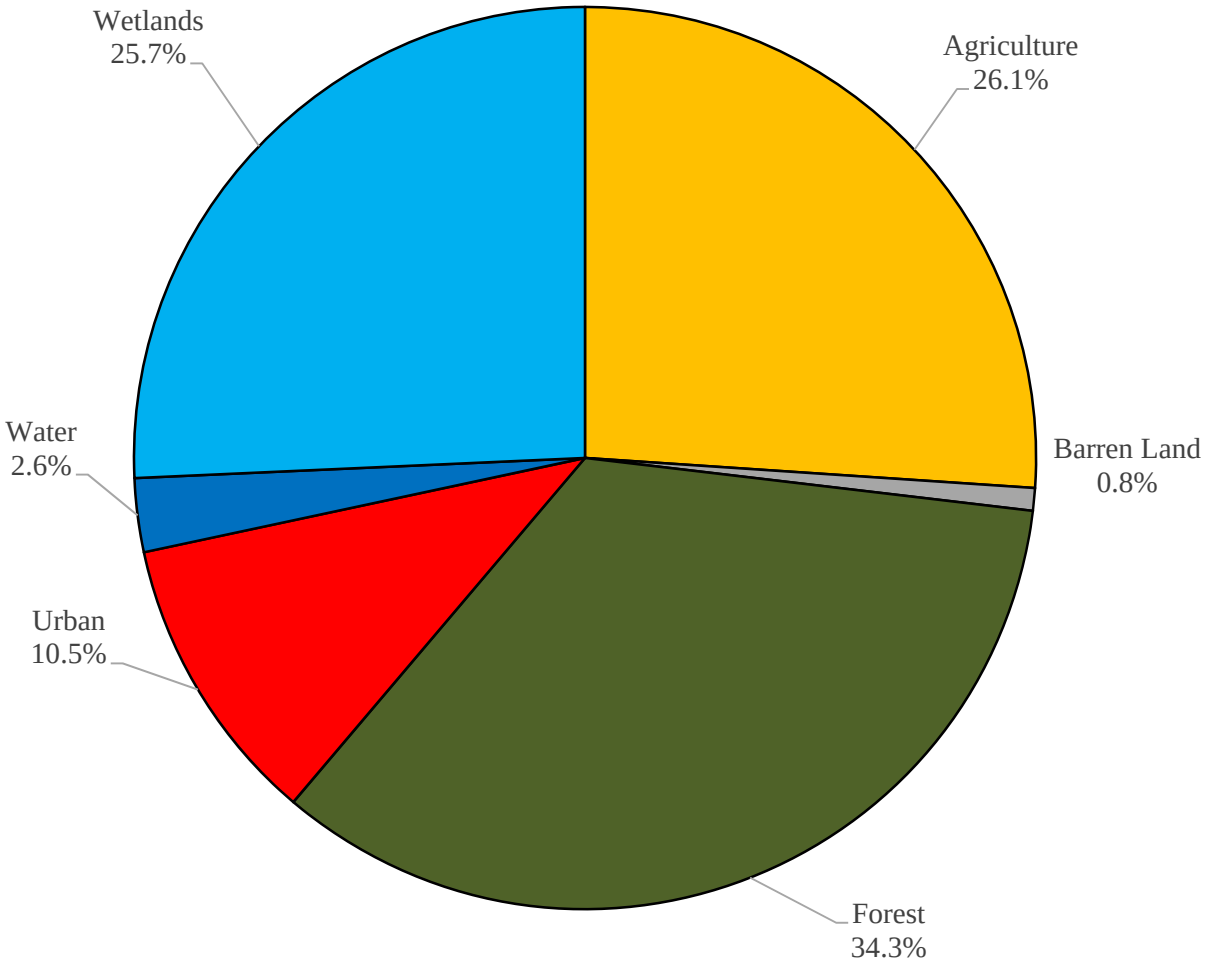


Figure 2: Pie chart illustrating the land use in Quinton Township

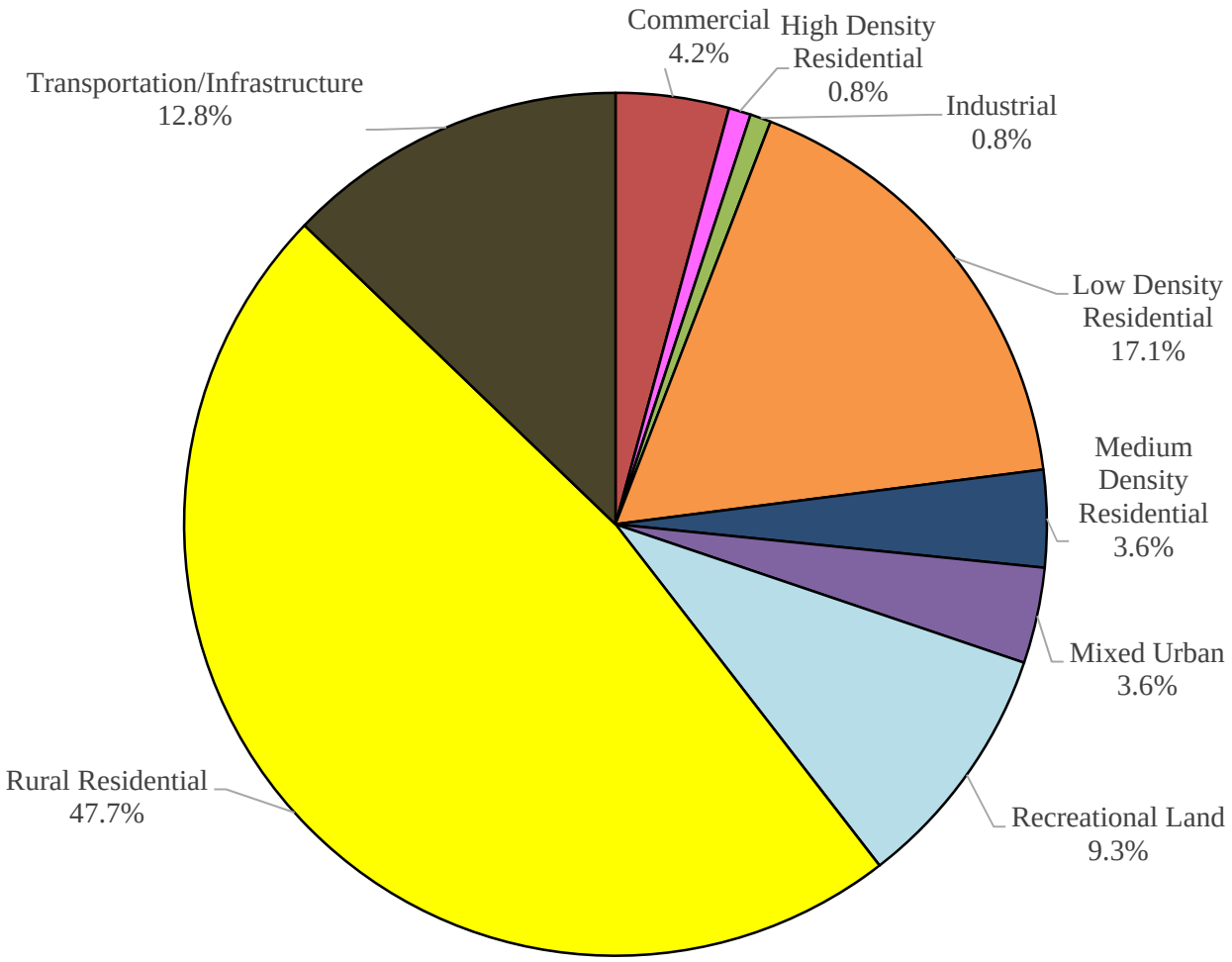


Figure 3: Pie chart illustrating the various types of urban land use in Quinton Township

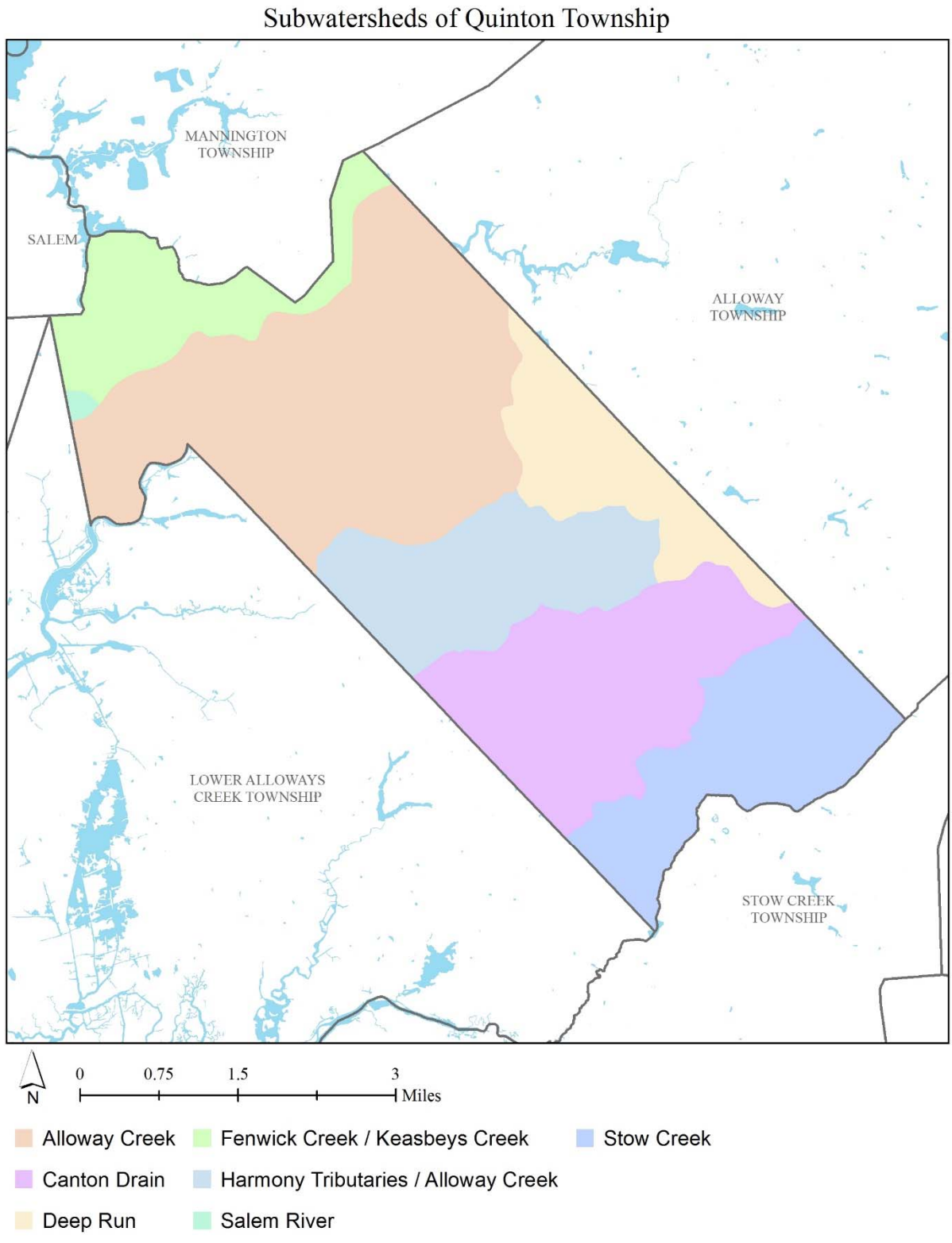


Figure 4: Map of the subwatersheds in Quinton Township

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 Quinton 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 Quinton 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*.

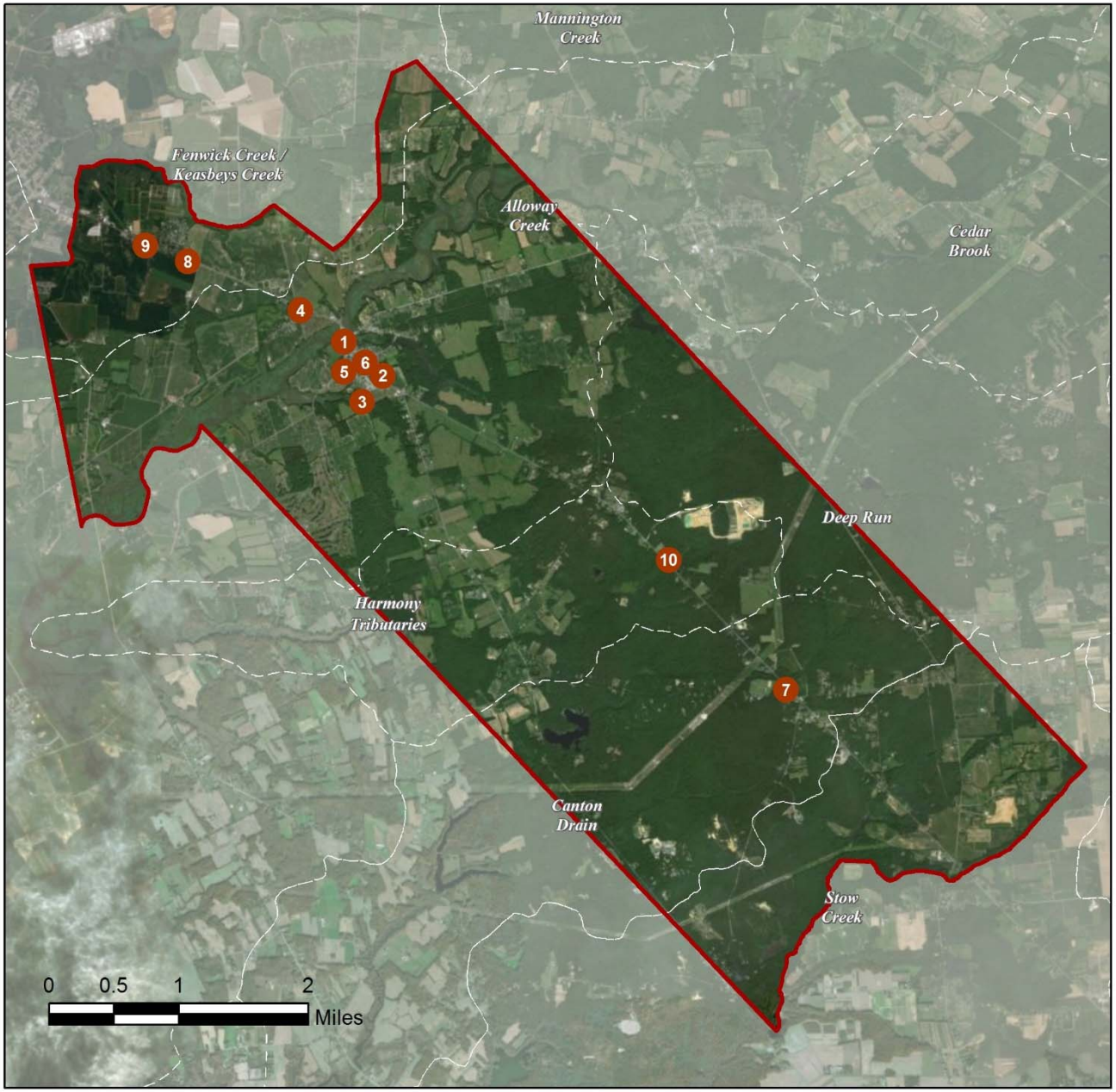
Conclusion

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

QUINTON TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE ALLOWAY CREEK SUBWATERSHED

1. I S Smick Lumber
2. Quinton Baptist Church
3. Quinton Township Elementary School
4. Quinton Township Municipal Building
5. Quinton United Methodist Church
6. Quinton Volunteer Fire Company & Ambulance Corporation

SITES WITHIN CANTON DRAIN SUBWATERSHED

7. Mount Vernon Church

SITES WITHIN FENWICK CREEK / KEASBEYS CREEK SUBWATERSHED

8. Salem Seventh Day Adventist Church
9. Woodside Funeral Home

SITES WITHIN THE HARMONY TRIBUTARIES (ALLOWAY CREEK) SUBWATERSHED

10. Haven United Methodist Church

b. Proposed Green Infrastructure Concepts

I. S. SMICK LUMBER

Subwatershed: Alloway Creek

Site Area: 290,401 sq. ft.

Address: NJ-49 & Cottage Avenue
Quinton, NJ 08072

Block and Lot: Block 19, Lot 2,3,4,5,6

Pervious pavement can be installed in a strip along the south end of the front parking lot to capture a large portion of the parking lot stormwater 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"
59	170,978	8.2	86.4	785.0	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
Pervious pavement	0.412	69	25,043	0.94	2,825	$70,625

GREEN INFRASTRUCTURE RECOMMENDATIONS

I S Smick Lumber

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

0 30' 60'

QUINTON BAPTIST CHURCH

Subwatershed: Alloway Creek

Site Area: 129,049 sq. ft.

Address: 46 East Main Street
Quinton, NJ 08072

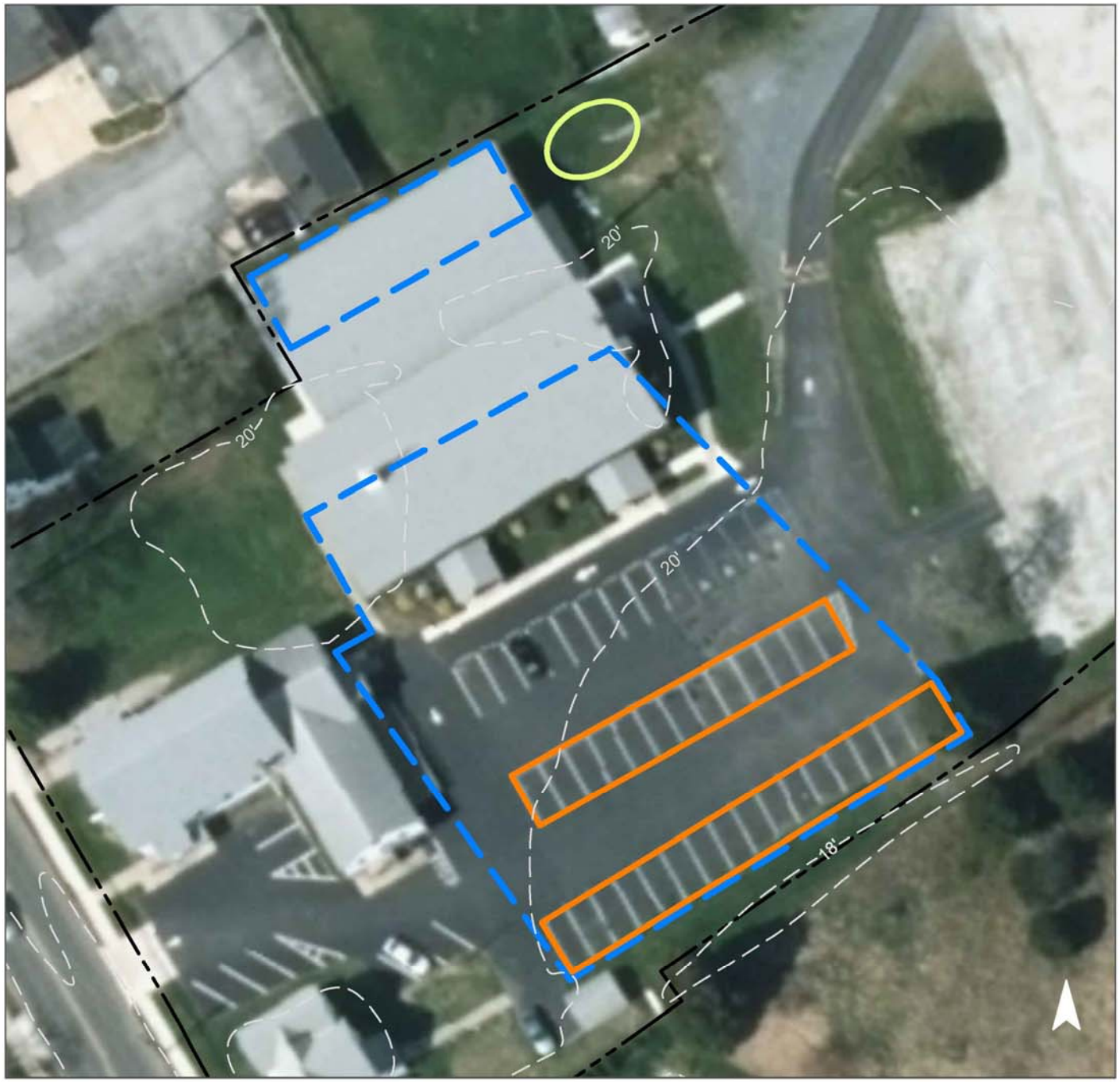
Block and Lot: Block 26, Lot 14

A rain garden can be installed next to the outlet of downspouts on the northeast side of the church. Connected downspouts at the front of the church can be disconnected so that water can flow onto pervious pavement than can be installed in the two rows in the south part 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"
46	59,200	2.8	29.9	271.8	0.046	1.62

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	0.063	11	4,563	0.17	600	$3,000
Pervious pavement	0.658	110	47,625	1.79	5,090	$127,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Quinton Baptist Church

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

0 25' 50'

QUINTON TOWNSHIP ELEMENTARY SCHOOL

Subwatershed: Alloway Creek

Site Area: 670,989 sq. ft.

Address: 8 Robinson Street
Quinton, NJ 08072

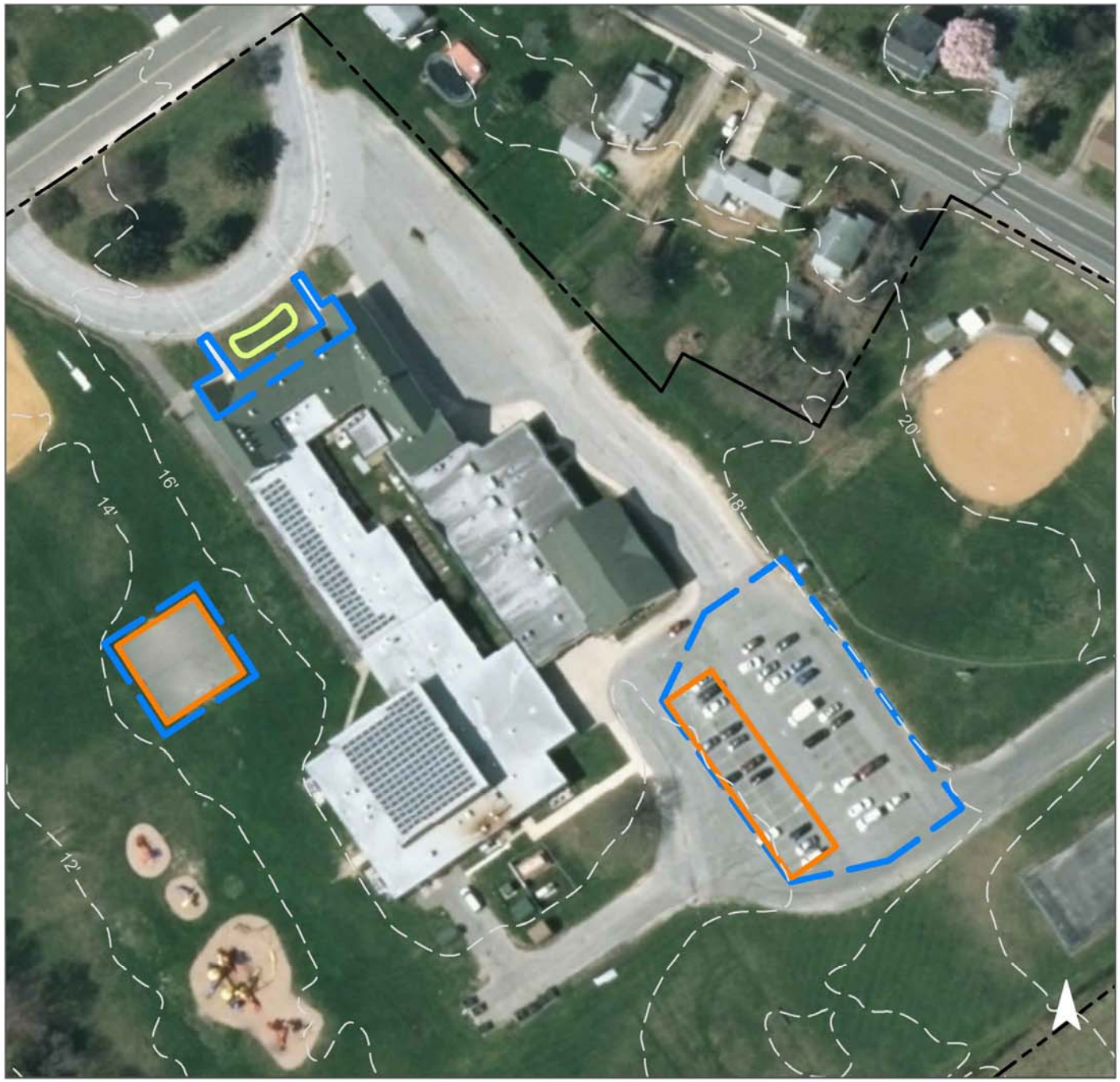
Block and Lot: Block 28, Lot 1

Pervious pavement can be installed in a strip on the west side of the parking lot to capture a large portion of the parking lot's runoff. The basketball court at the west side of the building can be replaced with pervious pavement. A rain garden can be installed at the front of the school to capture, treat, and infiltrate 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"
27	179,036	8.6	90.4	822.0	0.139	4.91

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	0.059	10	4,286	0.16	570	$2,850
Pervious pavement	0.723	121	52,330	1.97	8,710	$217,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Quinton Township Elementary School

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

0 50' 100'

QUINTON TOWNSHIP MUNICIPAL BUILDING

Subwatershed: Alloway Creek

Site Area: 73,488 sq. ft.

Address: 885 Salem Quinton Road
Salem, NJ 08079

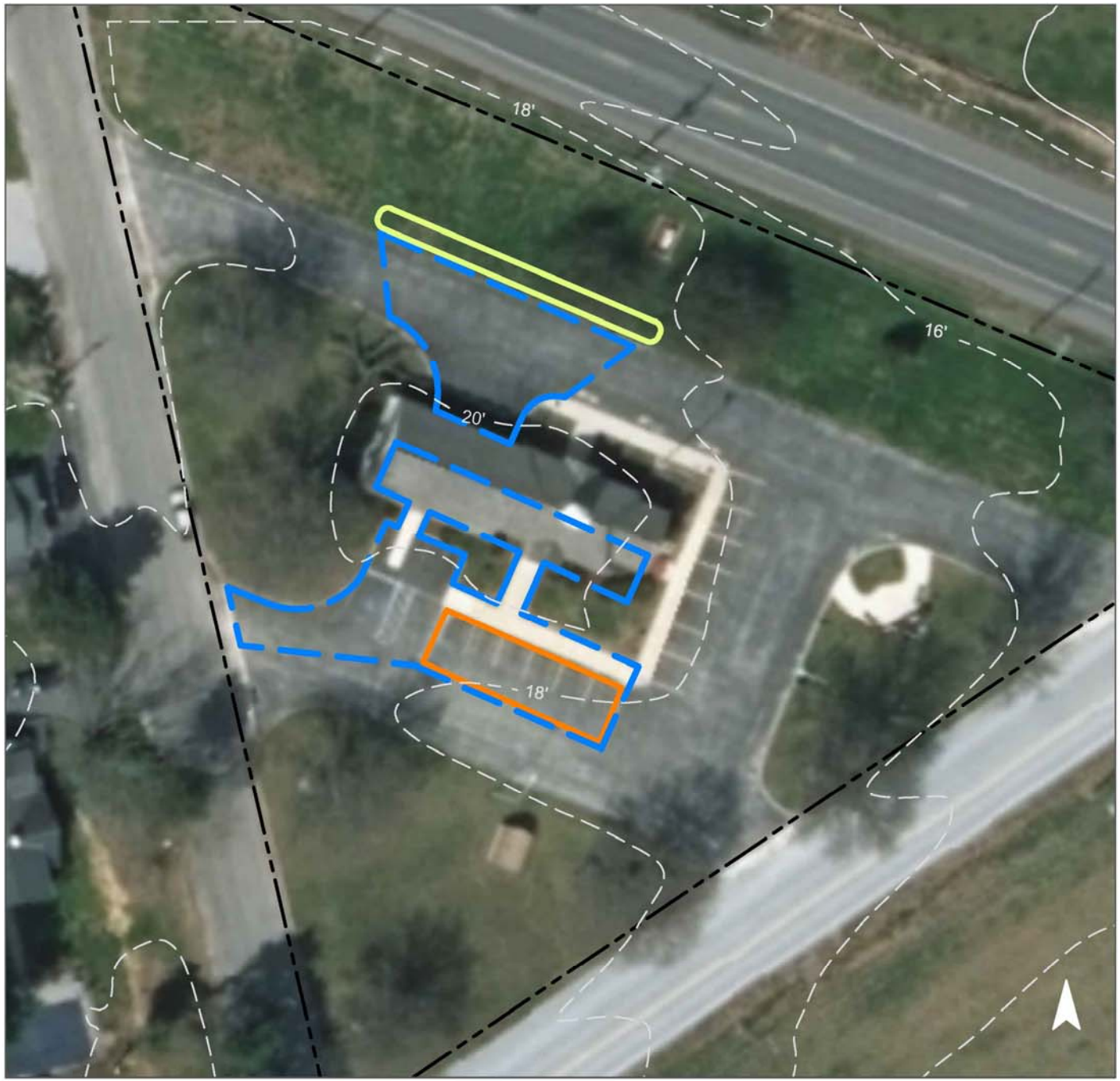
Block and Lot: Block 4, Lot 1

A rain garden can be installed in the front of the building to capture, treat, and infiltrate runoff from the driveway area. The pervious pavement can be installed on the south side of the building to capture runoff from the sidewalk, 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"
45	33,070	1.6	16.7	151.8	0.026	0.91

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	0.068	11	4,907	0.18	650	$3,250
Pervious pavement	0.143	24	10,322	0.39	1,210	$30,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Quinton Township Municipal Building

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

0 25' 50'

QUINTON UNITED METHODIST CHURCH

Subwatershed: Alloway Creek

Site Area: 53,892 sq. ft.

Address: 55 East Main Street
Quinton, NJ 08072

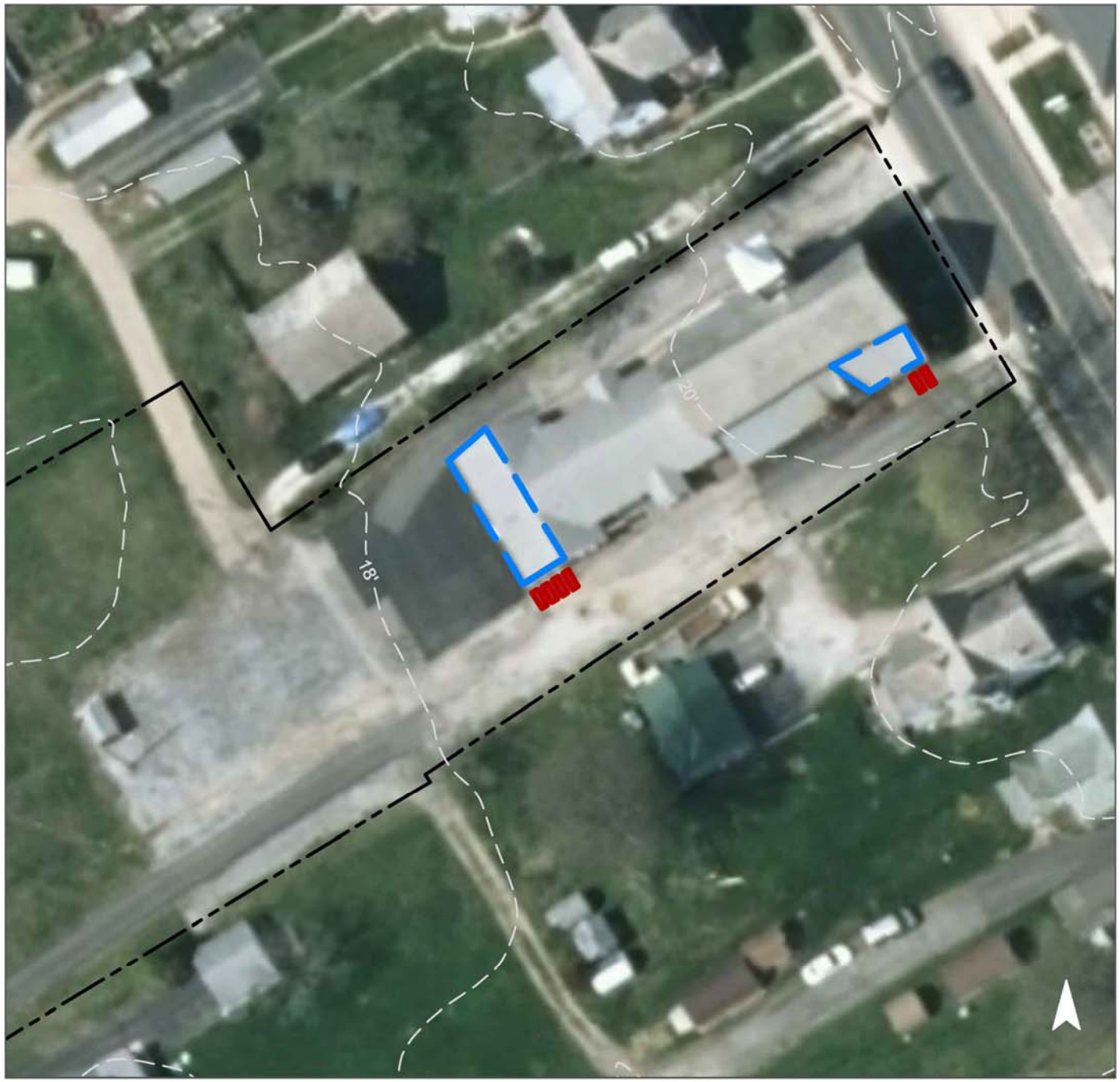
Block and Lot: Block 22, Lot 11

Planter boxes can be installed at the southwest and southeast corners of the building. Approximately four and two planter boxes, respectively, would be connected together to receive runoff from each downspout. These are wooden boxes that provide an opportunity to beneficially reuse rooftop runoff while removing pollutants. 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"
57	30,891	1.5	15.6	141.8	0.024	0.85

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
Planter boxes	n/a	4	n/a	n/a	6 (boxes)	$6,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Quinton United Methodist Church

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

0 25' 50'

QUINTON VOLUNTEER FIRE COMPANY & AMBULANCE CORPORATION

Subwatershed: Alloway Creek

Site Area: 33,268 sq. ft.

Address: 42 East Main Street
Quinton, NJ 08072

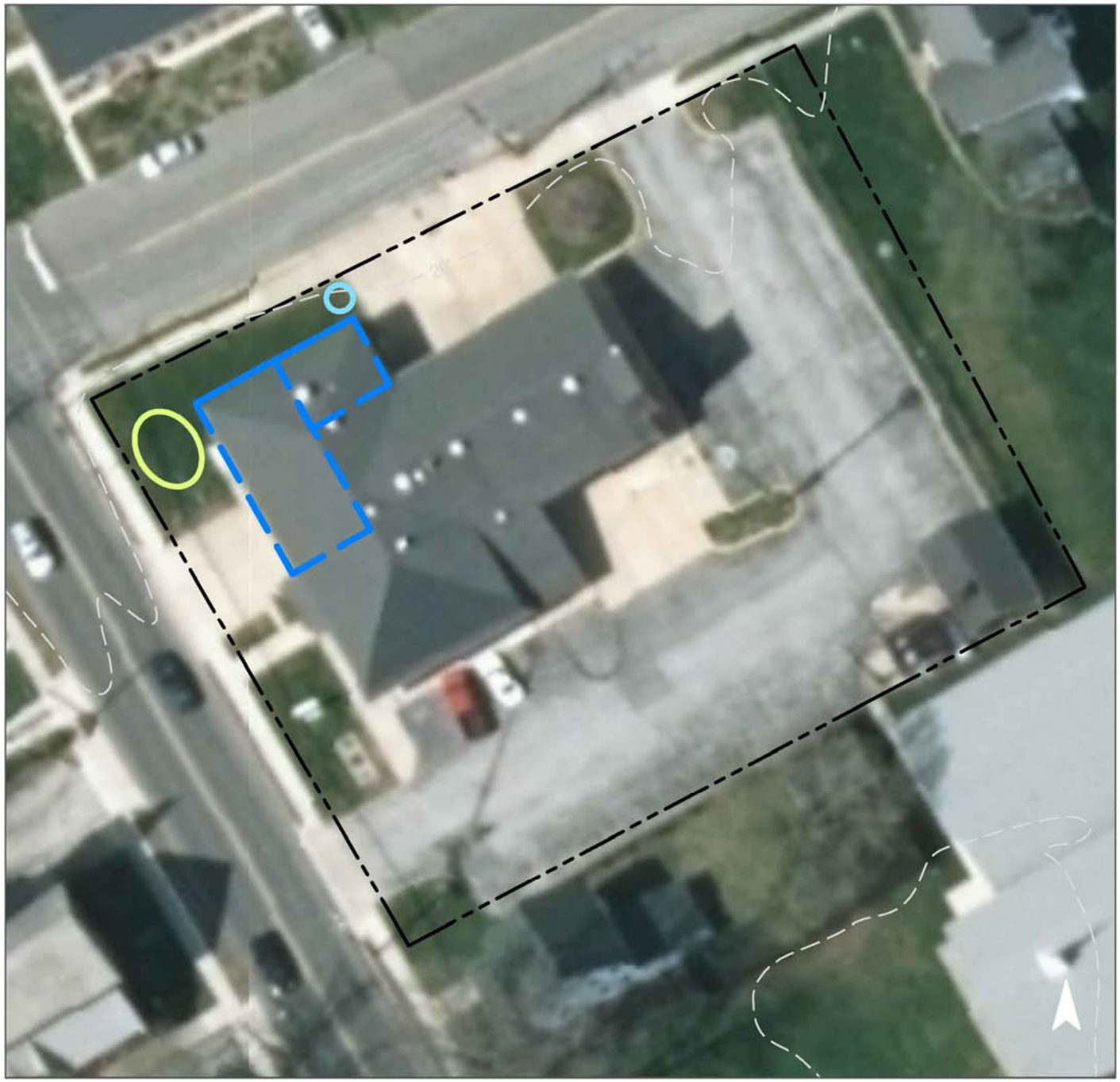
Block and Lot: Block 26, Lot 1

The downspout at the garage door at the north side of the building can be redirected to a cistern. The collected water can be used to wash vehicles or water the existing landscape. A rain garden can be installed at the northwest corner of the building, and the two downspouts in the front of the building can be redirected to the rain garden. 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"
88	29,281	1.4	14.8	134.4	0.023	0.80

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	0.031	5	2,266	0.09	300	$1,500
Rainwater harvesting	0.012	2	400	0.03	400 (gal)	$800

GREEN INFRASTRUCTURE RECOMMENDATIONS



Quinton Volunteer Fire Company & Ambulance Corporation

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

0 20' 40'

MOUNT VERNON CHURCH

Subwatershed: Canton Drain

Site Area: 59,028 sq. ft.

Address: 442 Quinton-Marlboro Road
Bridgeton, NJ 08302

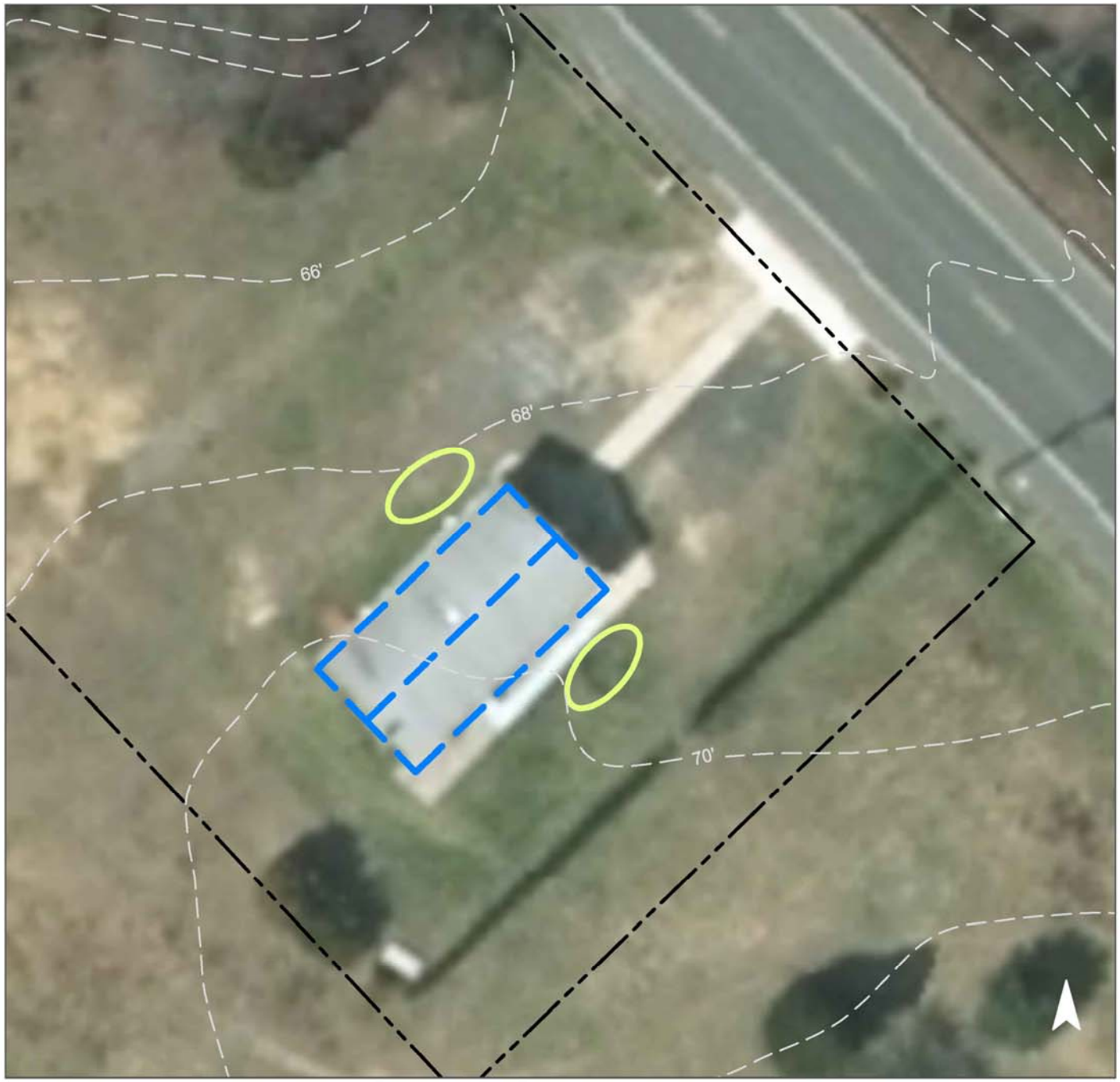
Block and Lot: Block 39, Lot 43

Rain gardens can be installed on both sides of the building next to the downspouts to capture, treat, and infiltrate the stormwater runoff 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"
15	8,875	0.4	4.5	40.7	0.007	0.24

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
Bioretention systems	0.038	6	2,753	0.10	370	$1,850

GREEN INFRASTRUCTURE RECOMMENDATIONS



Mount Vernon Church

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

0 15' 30'

SALEM SEVENTH DAY ADVENTIST CHURCH

Subwatershed: Fenwick Creek/Keasbeys Creek

Site Area: 40.442 sq. ft.

Address: 685 Salem Quinton Road Salem, NJ 08079

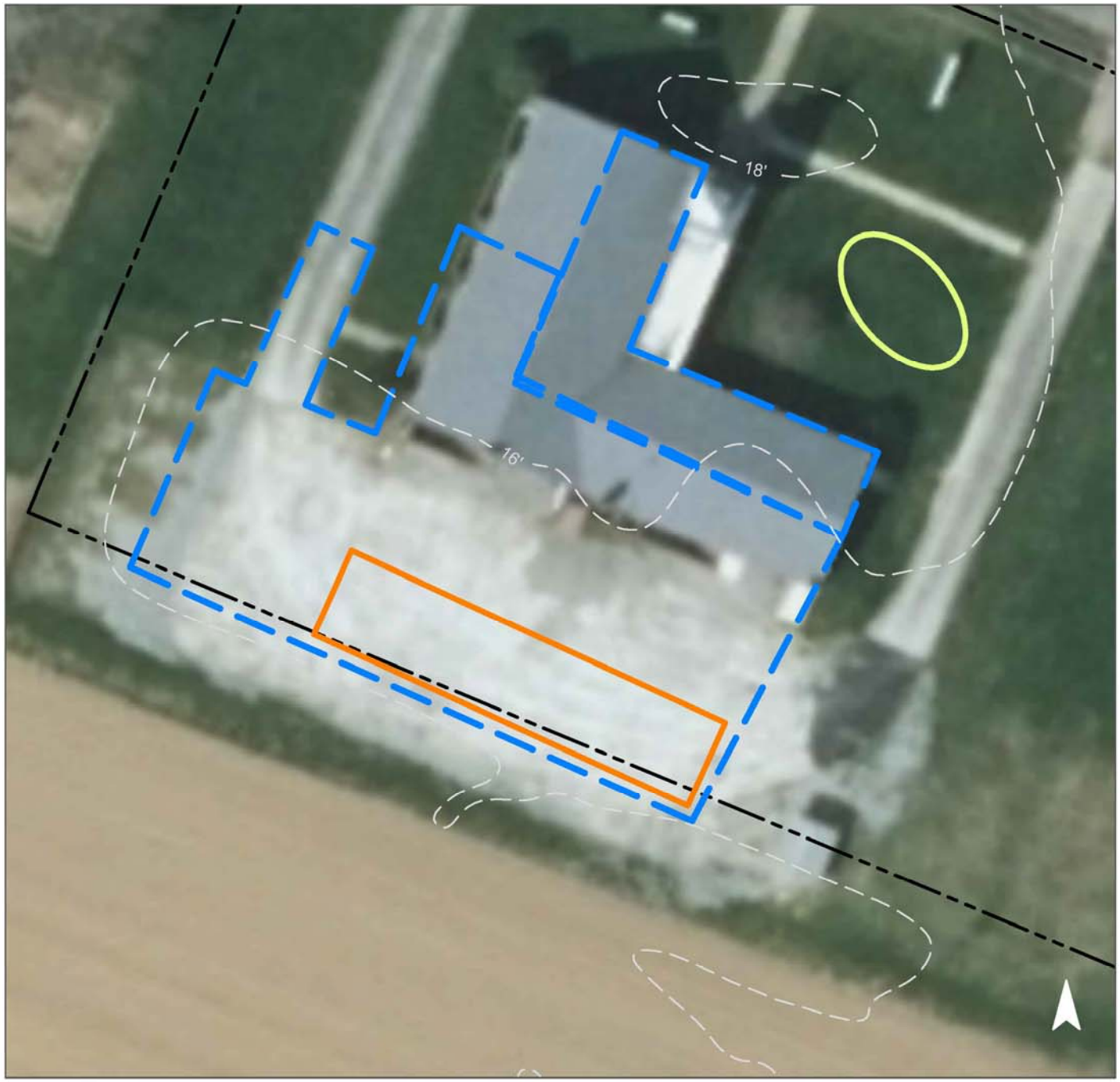
Block and Lot: Block 10, Lot 18

A rain garden can be installed at the northwest corner of the building next to the downspouts. The back half of the parking lot in the back of the building can be replaced with pervious pavement to capture runoff from the rooftop. 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"
28	11,171	0.5	5.6	51.3	0.009	0.31

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
Bioretention system	0.047	8	3,396	0.13	450	$2,250
Pervious pavement	0.213	36	15,424	0.58	1,460	$36,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Salem Seventh Day Adventist Church

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

0 15' 30'

WOODSIDE FUNERAL HOME

Subwatershed: Fenwick Creek/Keasbeys Creek

Site Area: 84,488 sq. ft.

Address: 613 Salem Quinton Road
Salem, NJ 08079

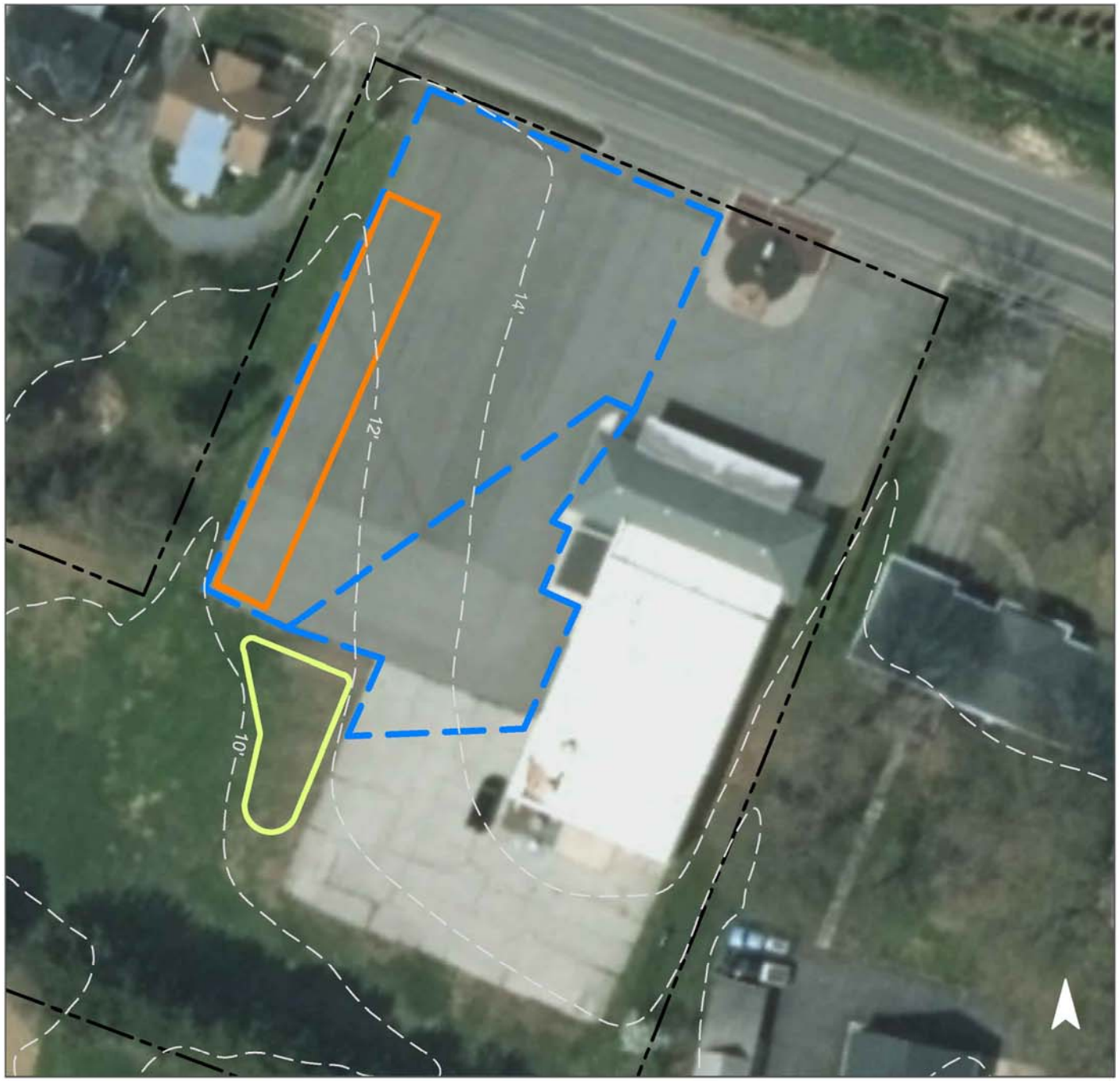
Block and Lot: Block 3, Lot 22

Pervious pavement can be installed in a strip along the west side of the parking lot to the west of the building to capture a large portion of the parking lot's runoff. A rain garden can be installed at the southwest corner of the parking lot in the turfgrass area to capture, treat, and infiltrate stormwater runoff from the parking lot as well. 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"
59	49,616	2.4	25.1	227.8	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 system	0.141	24	10,188	0.38	1,350	$6,750
Pervious pavement	0.370	62	26,816	1.01	2,540	$63,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Woodside Funeral Home

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

0 25' 50'

HAVEN UNITED METHODIST CHURCH

Subwatershed: Harmony Tributaries (Alloway Creek)

Site Area: 598,865 sq. ft.

Address: 350 Quinton-Marlboro Road
Salem, NJ 08079

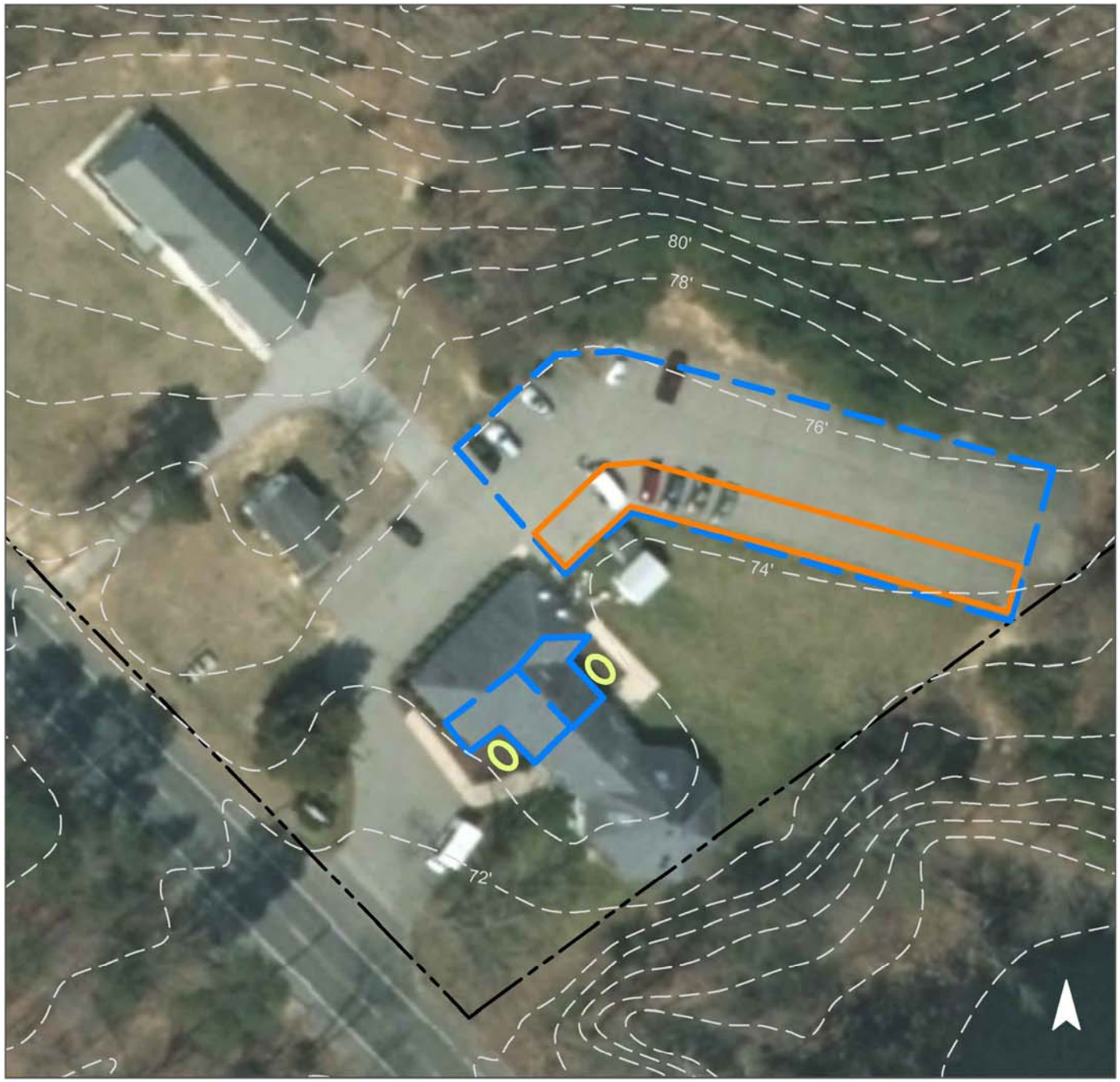
Block and Lot: Block 35, Lot 68

Rain gardens can be installed in the front and back of the building next to the downspouts. Pervious pavement can be installed in a strip along the south side of the large parking lot to capture a large portion of the parking lot's 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"
8	45,737	2.2	23.1	210.0	0.036	1.25

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	0.021	3	1,511	0.06	200	$1,000
Pervious pavement	0.347	58	25,118	0.94	3,570	$89,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Haven United Methodist Church

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

0 20' 40'

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 (SF)	Existing Annual Loads (Commercial) TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
	ALLOWAY CREEK SUBWATERSHED	**27.96**	**1,217,819**				**502,456**	**24.2**	**253.8**	**2,307.0**	**0.391**	**13.78**
1	**I S Smick Lumber**											
	Total Site Info	6.67	290,401	19	2,3,4,5,6	59	170,978	8.2	86.4	785.0	0.133	4.69
2	**Quinton Baptist Church**											
	Total Site Info	2.96	129,049	26	14	46	59,200	2.9	29.9	271.8	0.046	1.62
3	**Quinton Township Elementary School**											
	Total Site Info	15.40	670,989	28	1	27	179,036	8.6	90.4	822.0	0.139	4.91
4	**Quinton Township Municipal Building**											
	Total Site Info	1.69	73,488	4	1	45	33,070	1.6	16.7	151.8	0.026	0.91
5	**Quinton United Methodist Church**											
	Total Site Info	1.24	53,892	22	11	57	30,891	1.5	15.6	141.8	0.024	0.85
6	**Quinton Volunteer Fire Company & Ambulance Corp**											
	Total Site Info	0.76	33,268	26	1	88	29,281	1.4	14.8	134.4	0.023	0.80
	CANTON DRAIN SUBWATERSHED	**1.36**	**59,028**				**8,875**	**0.4**	**4.5**	**40.7**	**0.007**	**0.24**
7	**Mount Vernon Church**											
	Total Site Info	1.36	59,028	39	43	15	8,875	0.4	4.5	40.7	0.007	0.24
	FENWICK CREEK/ KEASBEYS CREEK SUBWATERSHED	**2.87**	**124,930**				**60,788**	**2.9**	**30.7**	**279.1**	**0.047**	**1.67**
8	**Salem Seventh Day Adventist Church**											
	Total Site Info	0.93	40,442	10	18	28	11,171	0.5	5.6	51.3	0.009	0.31
9	**Woodside Funeral Home**											
	Total Site Info	1.94	84,488	3	22	59	49,616	2.4	25.1	227.8	0.039	1.36

Summary of Existing Site Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (SF)	Existing Annual Loads (Commercial) TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
	HARMONY TRIBUTARIES (ALLOWAY CREEK) SUBWATERSHED	**13.75**	**598,865**				**45,737**	**2.2**	**23.1**	**210.0**	**0.036**	**1.25**
10	**Haven United Methodist Church**											
	Total Site Info	13.75	598,865	35	68	8	45,737	2.2	23.1	210.0	0.036	1.25

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	**82,040**	**1.88**	**2.110**	**357**	**147,457**	**5.56**				**$460,425**	**16.3%**
1	**I S Smick Lumber**											
	Pervious pavement	15,830	0.36	0.412	69	25,043	0.94	2,825	$25	SF	$70,625	9.3%
	Total Site Info	**15,830**	**0.36**	**0.412**	**69**	**25,043**	**0.94**				**$70,625**	**9.3%**
2	**Quinton Baptist Church**											
	Bioretention system	2,420	0.06	0.063	11	4,563	0.17	600	$5	SF	$3,000	4.1%
	Pervious pavement	25,240	0.58	0.658	110	47,625	1.79	5,090	$25	SF	$127,250	42.6%
	Total Site Info	**27,660**	**0.63**	**0.721**	**121**	**52,188**	**1.96**				**$130,250**	**46.7%**
3	**Quinton Township Elementary School**											
	Bioretention system	2,270	0.05	0.059	10	4,286	0.16	570	$5	SF	$2,850	1.3%
	Pervious pavement	27,730	0.64	0.723	121	52,330	1.97	8,710	$25	SF	$217,750	15.5%
	Total Site Info	**27,730**	**0.64**	**0.723**	**121**	**52,330**	**1.97**				**$217,750**	**15.5%**
4	**Quinton Township Municipal Building**											
	Bioretention system	2,600	0.06	0.068	11	4,907	0.18	650	$5	SF	$3,250	7.9%
	Pervious pavement	5,470	0.13	0.143	24	10,322	0.39	1,210	$25	SF	$30,250	16.5%
	Total Site Info	**8,070**	**0.19**	**0.210**	**35**	**15,229**	**0.57**				**$33,500**	**24.4%**
5	**Quinton United Methodist Church**											
	Planter boxes	1,075	0.02	n/a	4	n/a	n/a	6	$1,000	box	$6,000	3.5%
	Total Site Info	**1,075**	**0.02**	**n/a**	**4**	**n/a**	**n/a**				**$6,000**	**3.5%**
6	**Quinton Volunteer Fire Company & Ambulance Corporation**											
	Bioretention system	1,200	0.03	0.031	5	2,266	0.09	300	$5	SF	$1,500	4.1%
	Rainwater harvesting	475	0.01	0.012	2	400	0.03	400	$2	gal	$800	1.6%
	Total Site Info	**1,675**	**0.04**	**0.044**	**7**	**2,666**	**0.12**				**$2,300**	**5.7%**

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 %
	CANTON DRAIN SUBWATERSHED	**1,460**	**0.03**	**0.038**	**6**	**2,753**	**0.10**				**$1,850**	**16.5%**
7	**Mount Vernon Church**											
	Bioretention systems	1,460	0.03	0.038	6	2,753	0.10	370	$5	SF	$1,850	16.5%
	Total Site Info	**1,460**	**0.03**	**0.038**	**6**	**2,753**	**0.10**				**$1,850**	**16.5%**
	FENWICK CREEK/ KEASBEYS CREEK SUBWATERSHED	**29,585**	**0.68**	**0.771**	**129**	**55,823**	**2.10**				**$109,000**	**48.7%**
8	**Salem Seventh Day Adventist Church**											
	Bioretention system	1,800	0.04	0.047	8	3,396	0.13	450	$5	SF	$2,250	16.1%
	Pervious pavement	8,175	0.19	0.213	36	15,424	0.58	1,460	$25	SF	$36,500	73.2%
	Total Site Info	**9,975**	**0.23**	**0.260**	**44**	**18,820**	**0.71**				**$38,750**	**89.3%**
9	**Woodside Funeral Home**											
	Bioretention system	5,400	0.12	0.141	24	10,188	0.38	1,350	$5	SF	$6,750	10.9%
	Pervious pavement	14,210	0.33	0.370	62	26,816	1.01	2,540	$25	SF	$63,500	28.6%
	Total Site Info	**19,610**	**0.45**	**0.511**	**86**	**37,004**	**1.39**				**$70,250**	**39.5%**
	HARMONY TRIBUTARIES (ALLOWAY CREEK) SUBWATERSHED	**14,110**	**0.32**	**0.368**	**62**	**26,629**	**1.00**				**$90,250**	**30.9%**
10	**Haven United Methodist Church**											
	Bioretention systems	800	0.02	0.021	3	1,511	0.06	200	$5	SF	$1,000	1.7%
	Pervious pavement	13,310	0.31	0.347	58	25,118	0.94	3,570	$25	SF	$89,250	29.1%
	Total Site Info	**14,110**	**0.32**	**0.368**	**62**	**26,629**	**1.00**				**$90,250**	**30.9%**