Rutgers
New Jersey Agricultural
Experiment Station

Impervious Cover Reduction Action Plan
for
Voorhees Township, Camden County, New Jersey

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

October 14, 2016

William Penn Foundation

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Introduction

Located in Camden County in southern New Jersey, Voorhees Township covers approximately 11.6 square miles. Figures 1 and 2 illustrate that Voorhees Township is dominated by urban land uses. A total of 71.2% of the municipality's land use is classified as urban. Of the urban land in Voorhees 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 Voorhees 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 Voorhees Township. Based upon the 2012 NJDEP land use/land cover data, approximately 28.6% of Voorhees Township has impervious cover. This level of impervious cover suggests that the streams in Voorhees Township are likely non-supporting streams.[1]

Methodology

Voorhees Township contains portions of five 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.

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[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

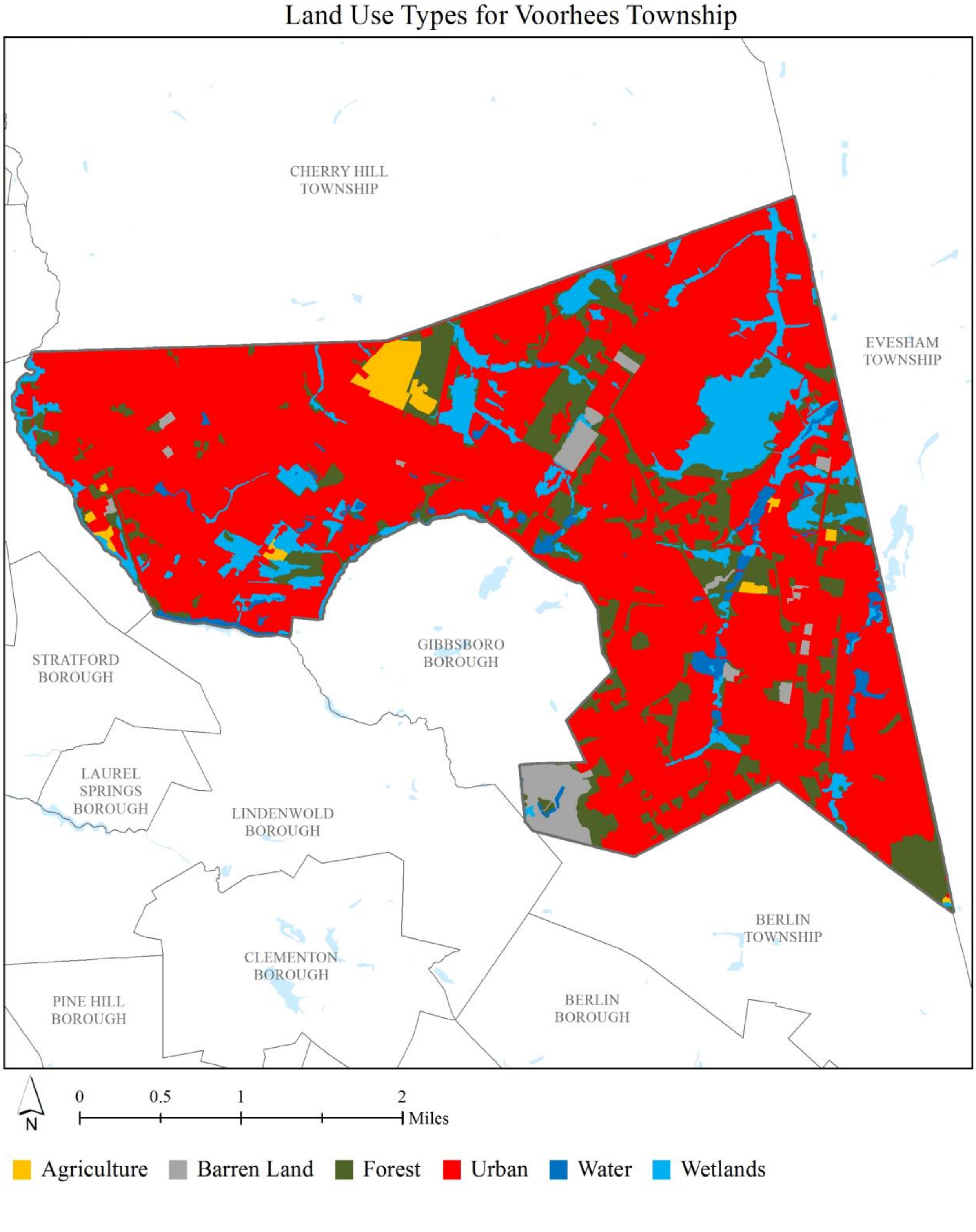


Figure 1: Map illustrating the land use in Voorhees Township

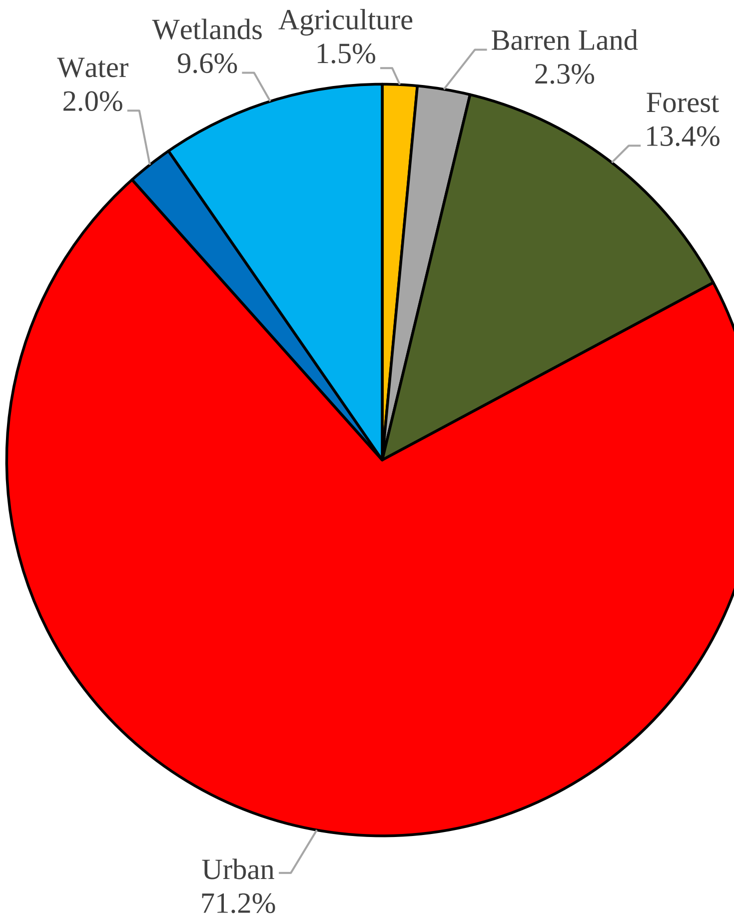


Figure 2: Pie chart illustrating the land use in Voorhees Township

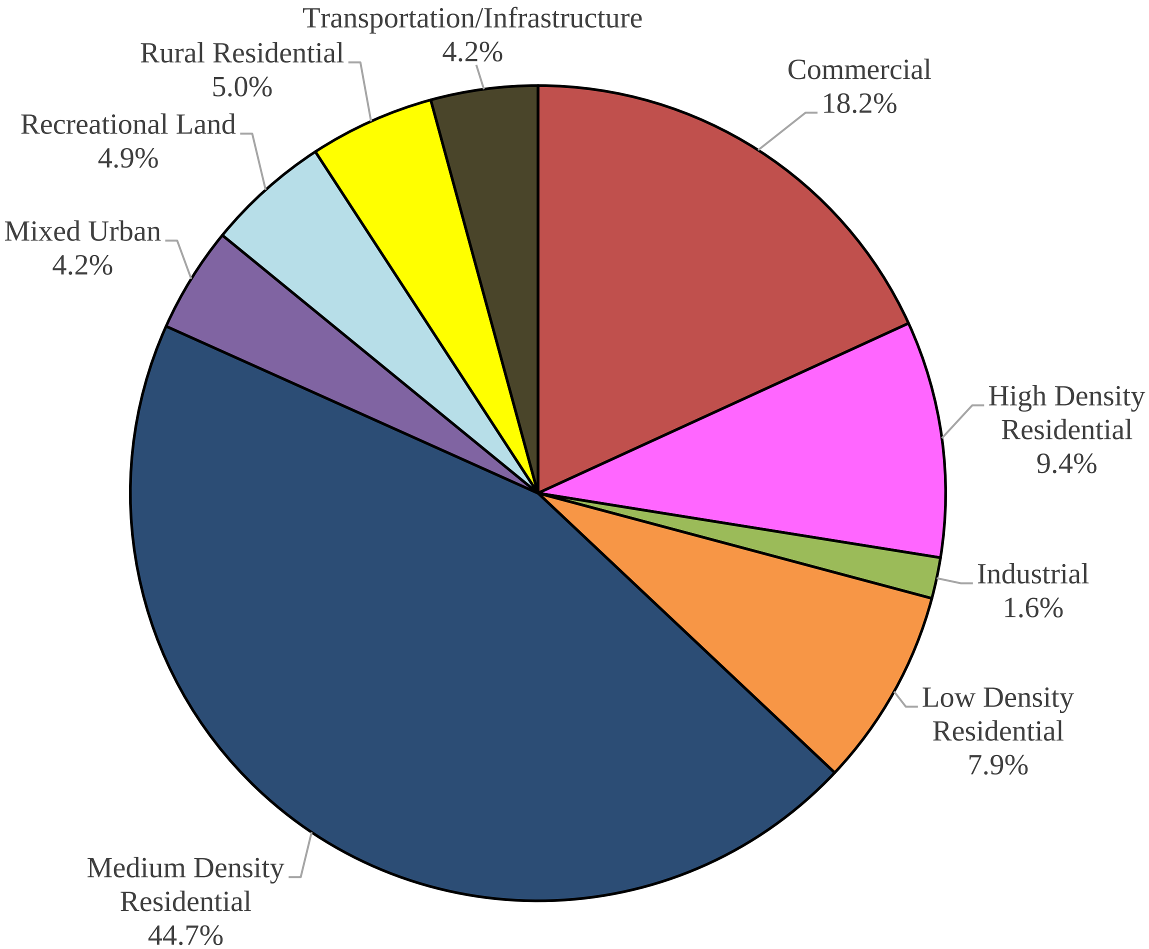


Figure 3: Pie chart illustrating the various types of urban land use in Voorhees Township

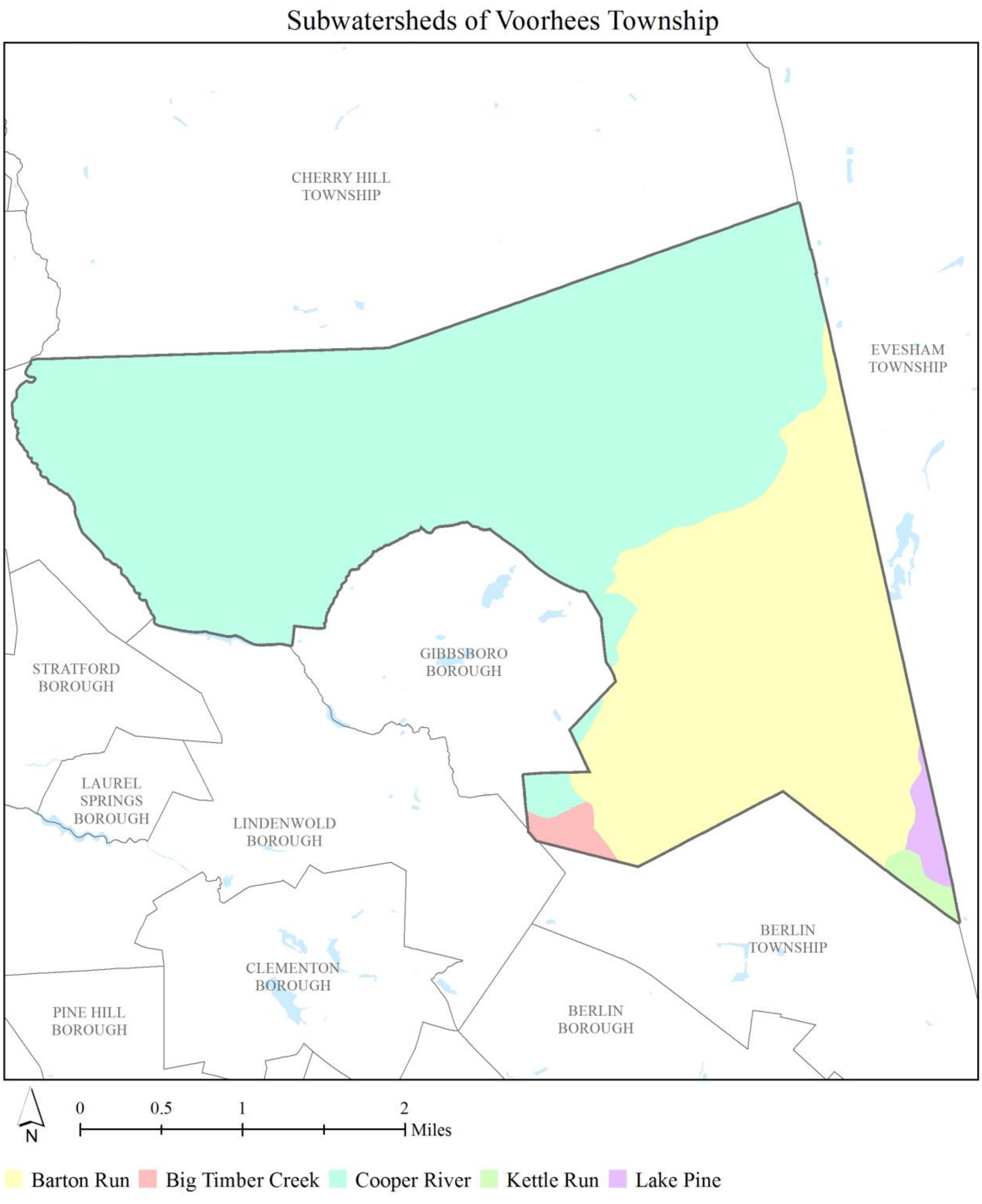


Figure 4: Map of the subwatersheds in Voorhees Township

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 Voorhees 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 Voorhees 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

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

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

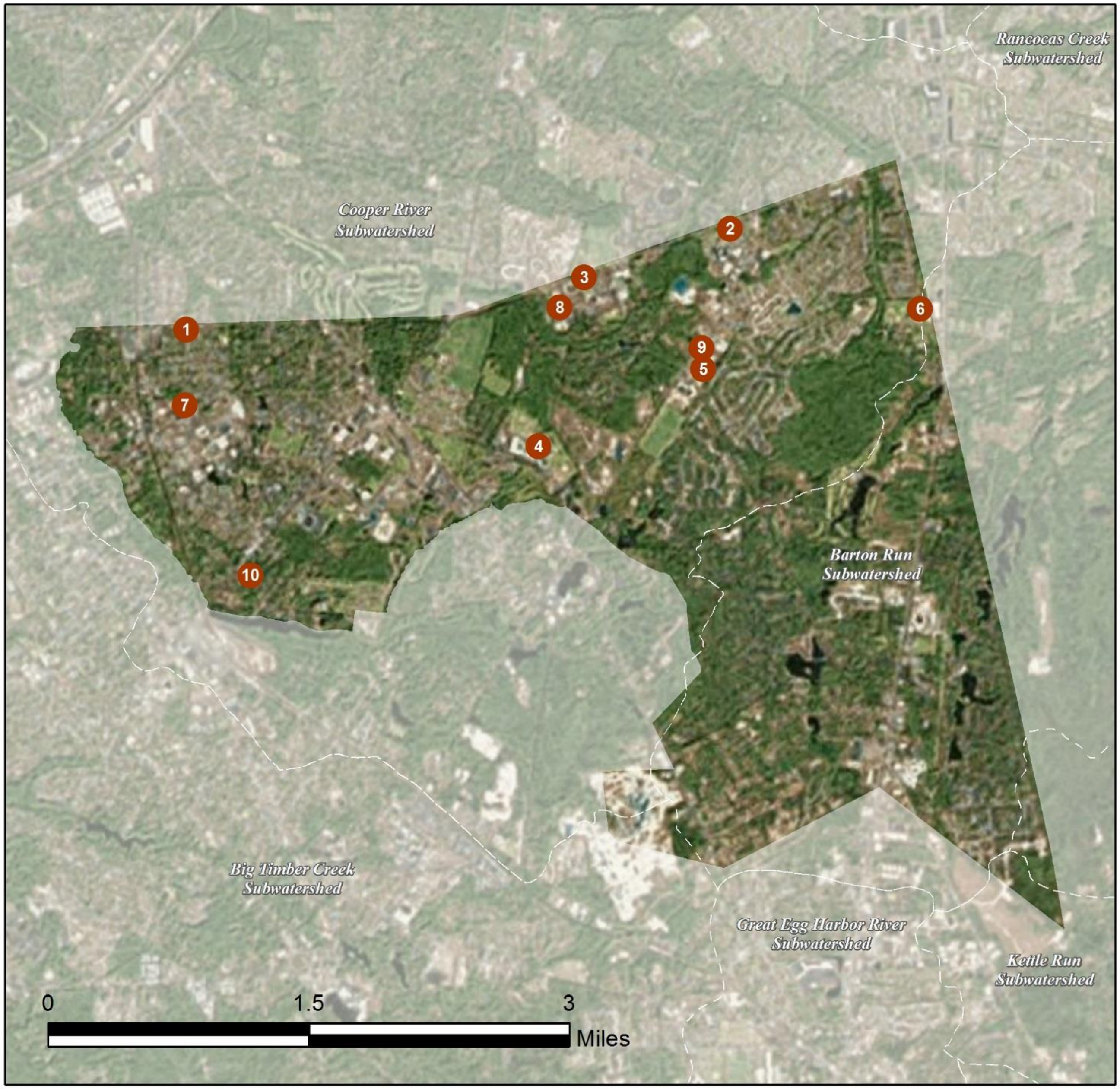
Conclusion

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

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

a. Green Infrastructure Sites

VOORHEES TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE COOPER RIVER SUBWATERSHED:

1. Ashland Church
2. Congregation Beth El
3. Cultivate Church
4. Eastern Regional High School
5. Hope United Methodist Church
6. Kresson Elementary School
7. Osage Elementary School
8. The Church in Acts
9. Voorhees Middle School
10. Voorhees Post Office

b. Proposed Green Infrastructure Concepts

ASHLAND CHURCH

Subwatershed: Cooper River

Site Area: 121,068 sq. ft.

Address: 33 East Evesham Road
Voorhees, NJ 08043

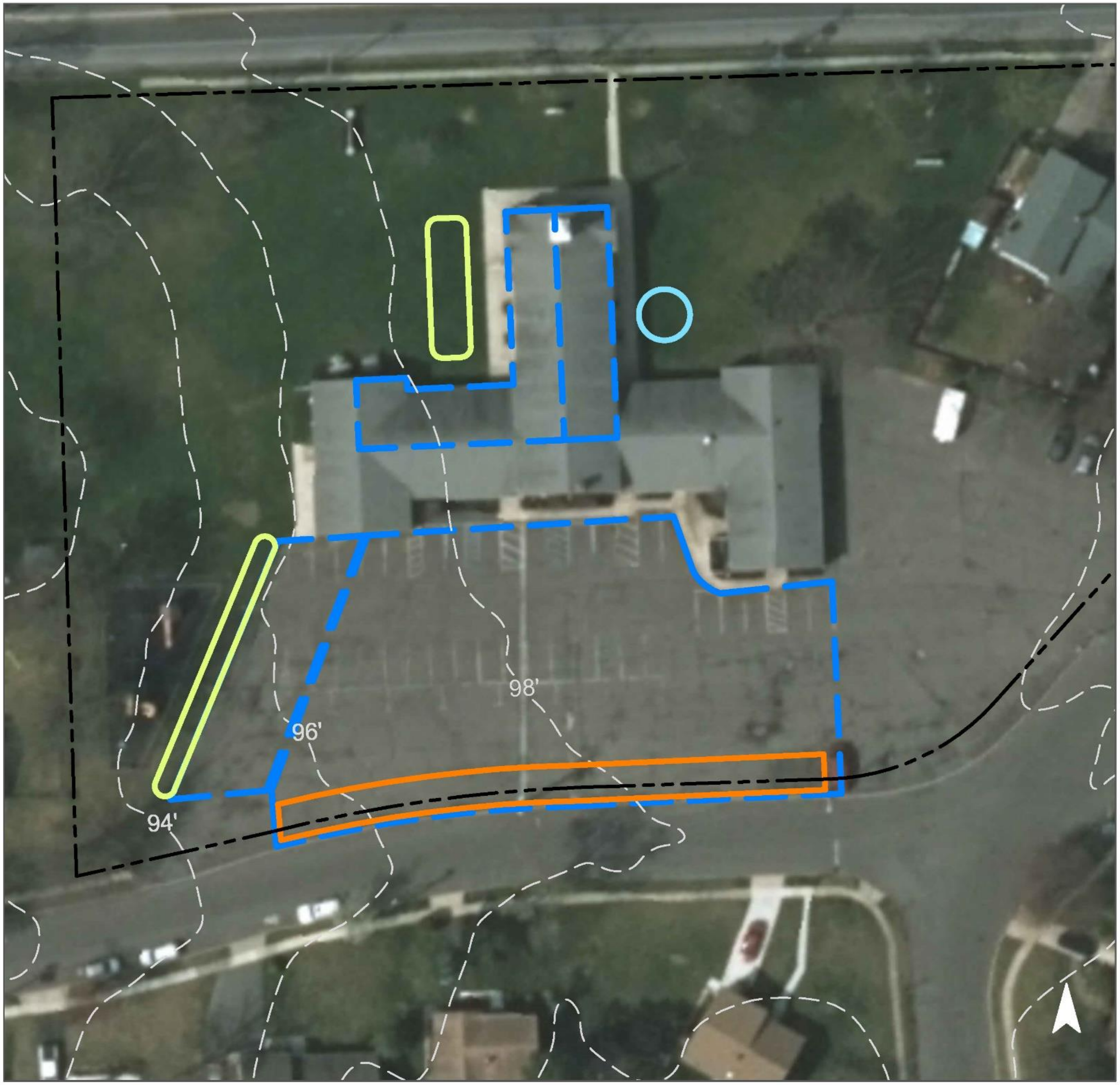
Block and Lot: Block 86, Lot 7

Stormwater runoff is currently directed to existing catch basins. Rain gardens can be installed in areas adjacent to the building and parking lot to capture, treat, and infiltrate stormwater runoff. Additional stormwater runoff can be captured and infiltrated if parking spaces are replaced with pervious pavement. A rainwater harvesting system can be installed adjacent to the building to capture stormwater for non-potable use. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
51	61,320	3.0	31.0	281.5	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
Bioretention systems	0.17	29	12,753	0.48	1,670	$8,350
Pervious pavement	0.58	96	42,225	1.59	3,950	$98,750
Rainwater harvesting	0.05	8	3,598	0.14	1,465 (gal)	$2,930

GREEN INFRASTRUCTURE RECOMMENDATIONS



Ashland Church

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

CONGREGATION BETH EL

Subwatershed: Cooper River

Site Area: 567,083 sq. ft.

Address: 8000 Main Street
Voorhees, NJ 08043

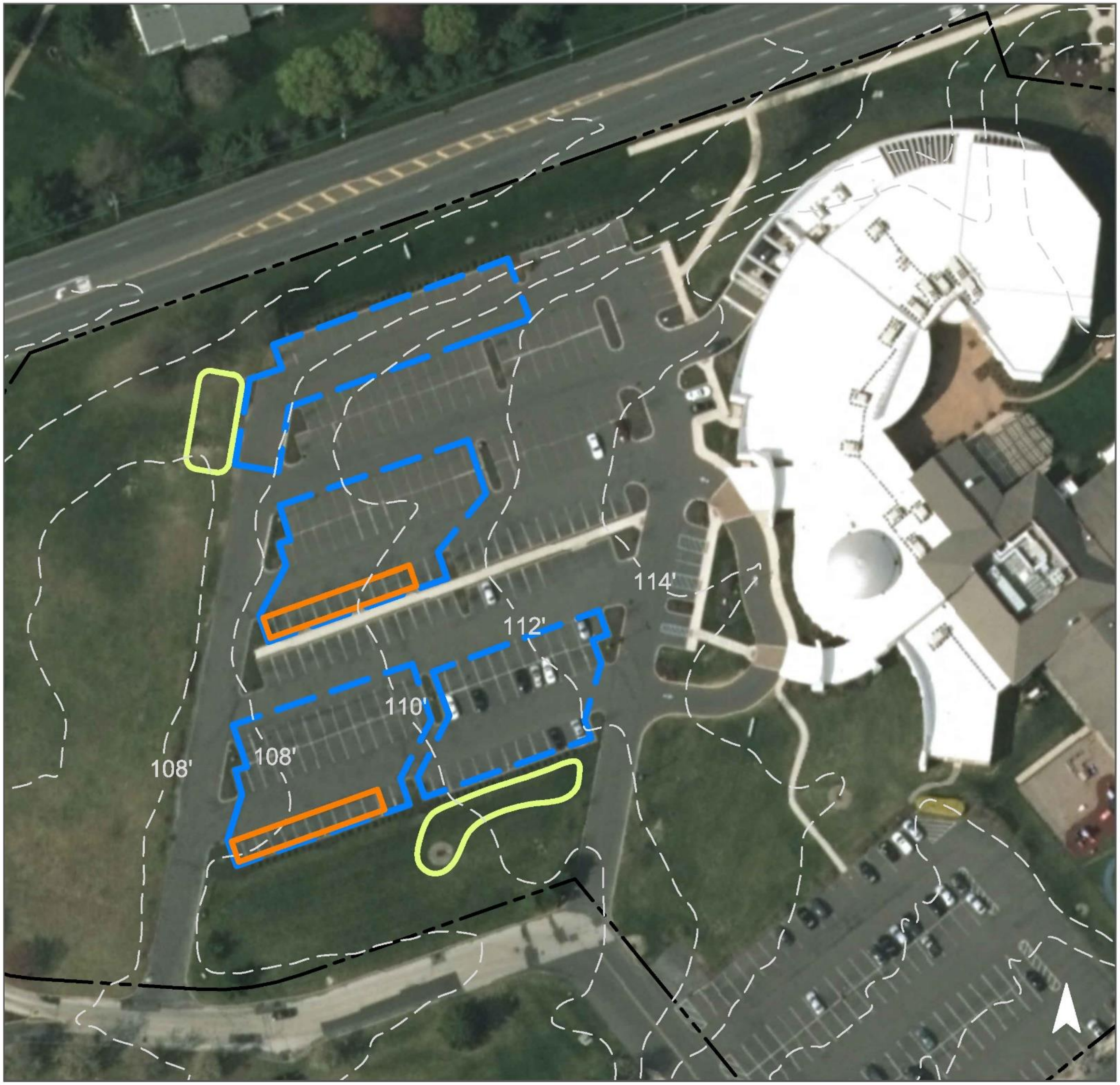
Block and Lot: Block 207, Lot 4.19

Stormwater runoff from the parking lot is currently directed to existing catch basins. Rain gardens can be installed in areas adjacent to the parking lots to capture, treat, and infiltrate stormwater runoff. Additional stormwater runoff can be captured and infiltrated if parking spaces are replaced with pervious pavement. 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"
50	286,218	13.8	144.6	1,314.1	0.223	7.85

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
Bioretention systems	0.99	167	72,997	2.74	9,545	$238,625
Pervious pavement	0.55	93	40,684	1.53	3,800	$19,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Congregation Beth El

CULTIVATE CHURCH

Subwatershed: Cooper River

Site Area: 177,790 sq. ft.

Address: 2303 East Evesham Road
Voorhees, NJ 08043

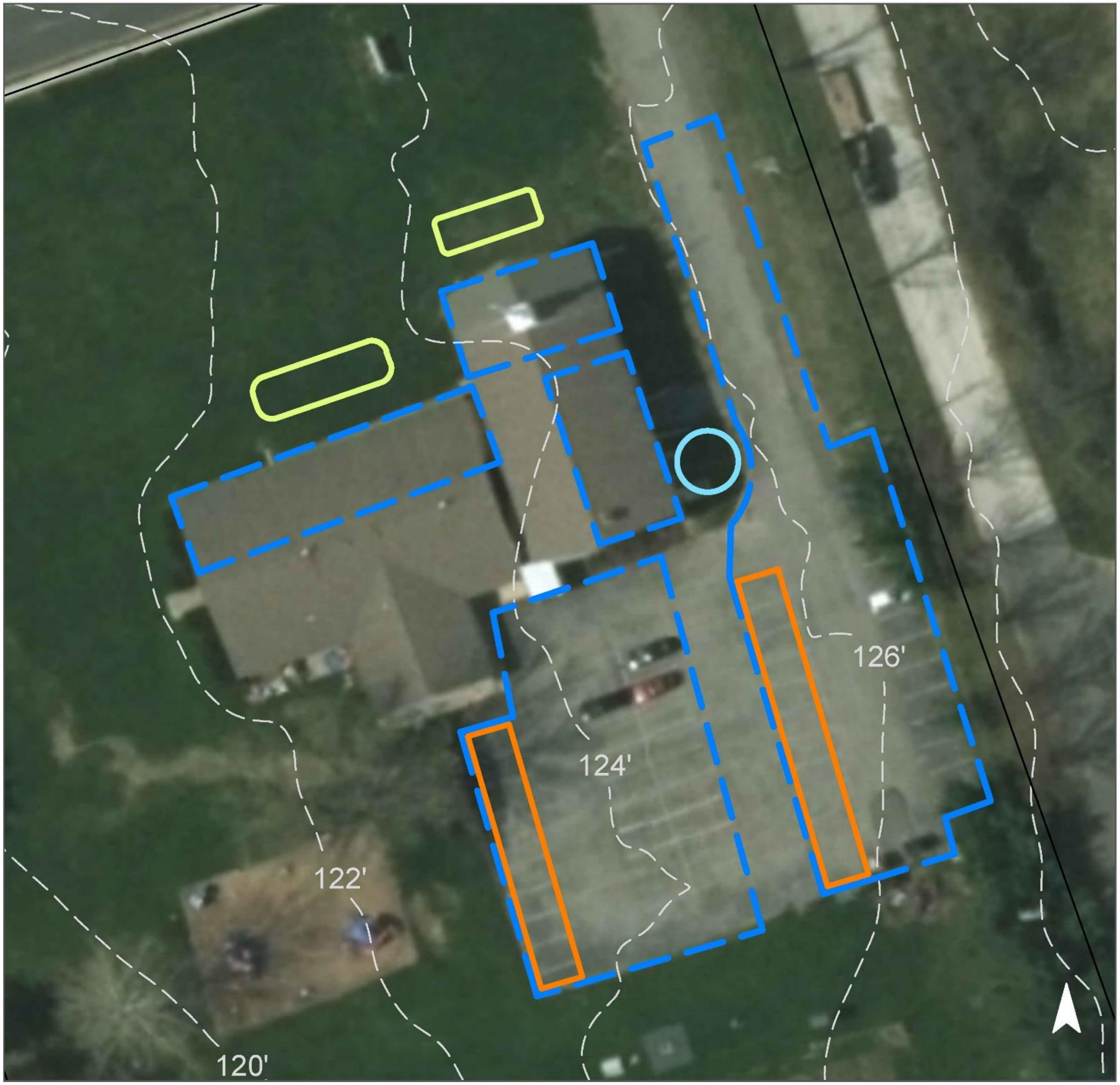
Block and Lot: Block 202.26, Lot 15

Stormwater runoff is currently directed to existing catch basins. Rain gardens can be installed adjacent to the building to capture, treat, and infiltrate stormwater runoff. Additional stormwater runoff can be captured and infiltrated if parking spaces are replaced with pervious pavement. A water harvesting system can be installed at the southeast corner of the church to capture stormwater for non-potable uses. 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"
38	68,208	3.3	34.4	313.2	0.053	1.87

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	0.027	4	1,960	0.07	4,100	$20,500
Pervious pavement	0.520	87	38,163	1.43	3,565	$89,125
Rainwater harvesting	0.043	7	3,172	0.12	1,290 (gal)	$2,580

GREEN INFRASTRUCTURE RECOMMENDATIONS



Cultivate Church

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

0 25' 50'

EASTERN REGIONAL HIGH SCHOOL

Subwatershed: Cooper River

Site Area: 3,430,456 sq. ft.

Address: 1401 Laurel Oak Road
Voorhees, NJ 08043

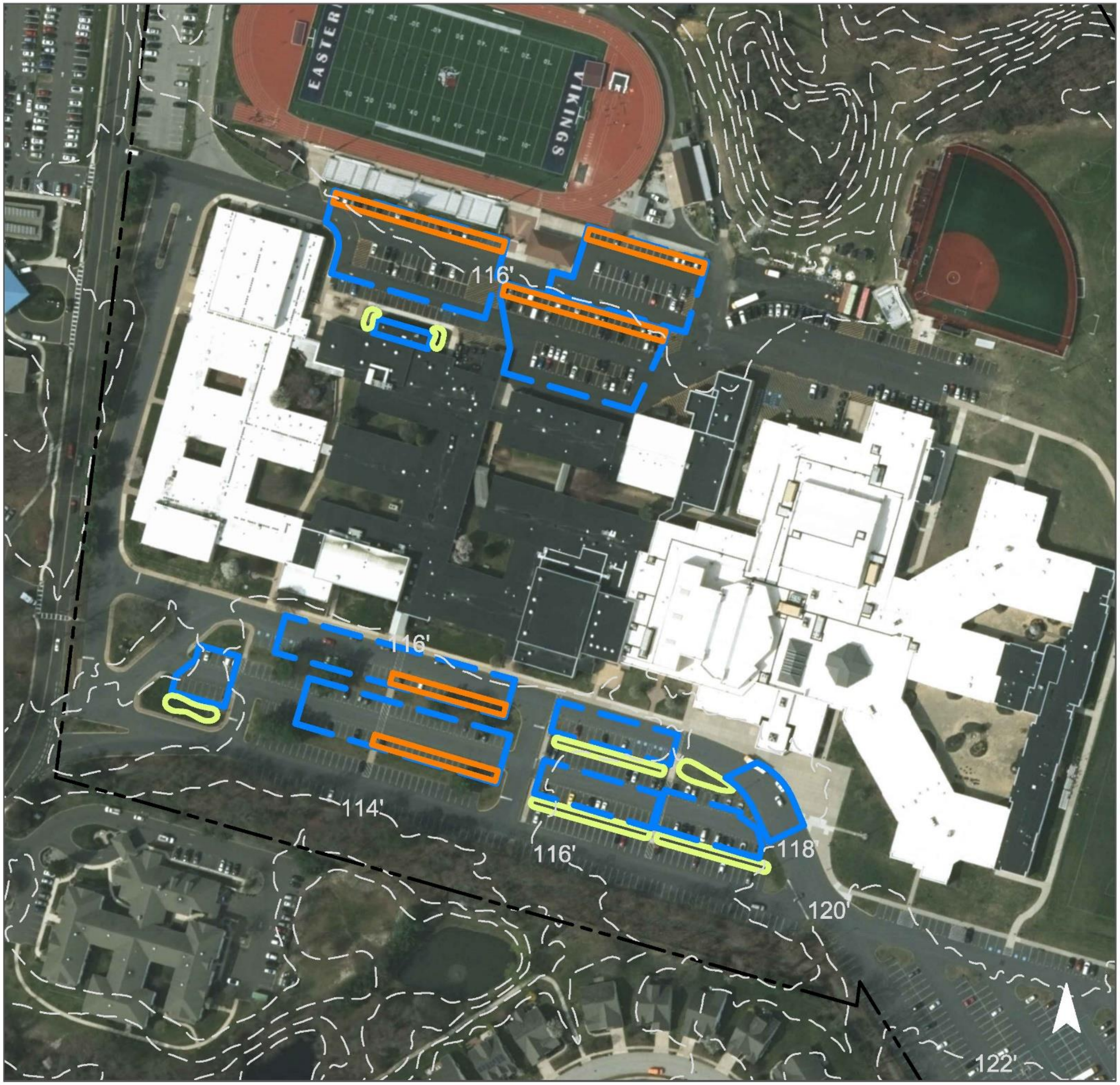
Block and Lot: Block 200, Lot 4

Stormwater runoff from the parking lot and roof is currently directed to existing catch basins. Rain gardens can be installed in areas adjacent to the main building and parking lots to capture, treat, and infiltrate stormwater runoff. Additional stormwater runoff can be captured and infiltrated if parking spaces are replaced with pervious pavement. 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	1,066,260	51.8	542.6	4,932.7	0.831	29.24

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	0.80	134	58,920	2.22	7,705	$38,525
Pervious pavement	3.41	570	249,847	9.93	3,320	$583,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Eastern Regional High School

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

0 100' 200'

HOPE UNITED METHODIST CHURCH

Subwatershed: Cooper River

Site Area: 294,998 sq. ft.

Address: 700 Cooper Road
Voorhees, NJ 08043

Block and Lot: Block 213.1, Lot 99

Stormwater runoff from the parking lot and roof is currently directed to existing catch basins. Rain gardens can be installed in areas adjacent to the main building and parking lots to capture, treat, and infiltrate stormwater runoff. Additional stormwater runoff can be captured and infiltrated if parking spaces are replaced with 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"
53	157,530	7.6	79.5	723.3	0.123	4.32

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.52	88	38,402	1.44	5,025	$25,125
Pervious pavement	1.34	81	35,523	1.34	3,320	$83,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Hope United Methodist Church

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

0 50' 100'

KRESSON ELEMENTARY SCHOOL

Subwatershed: Cooper River

Site Area: 983,888 sq. ft.

Address: 7 School Lane
Voorhees, NJ 08043

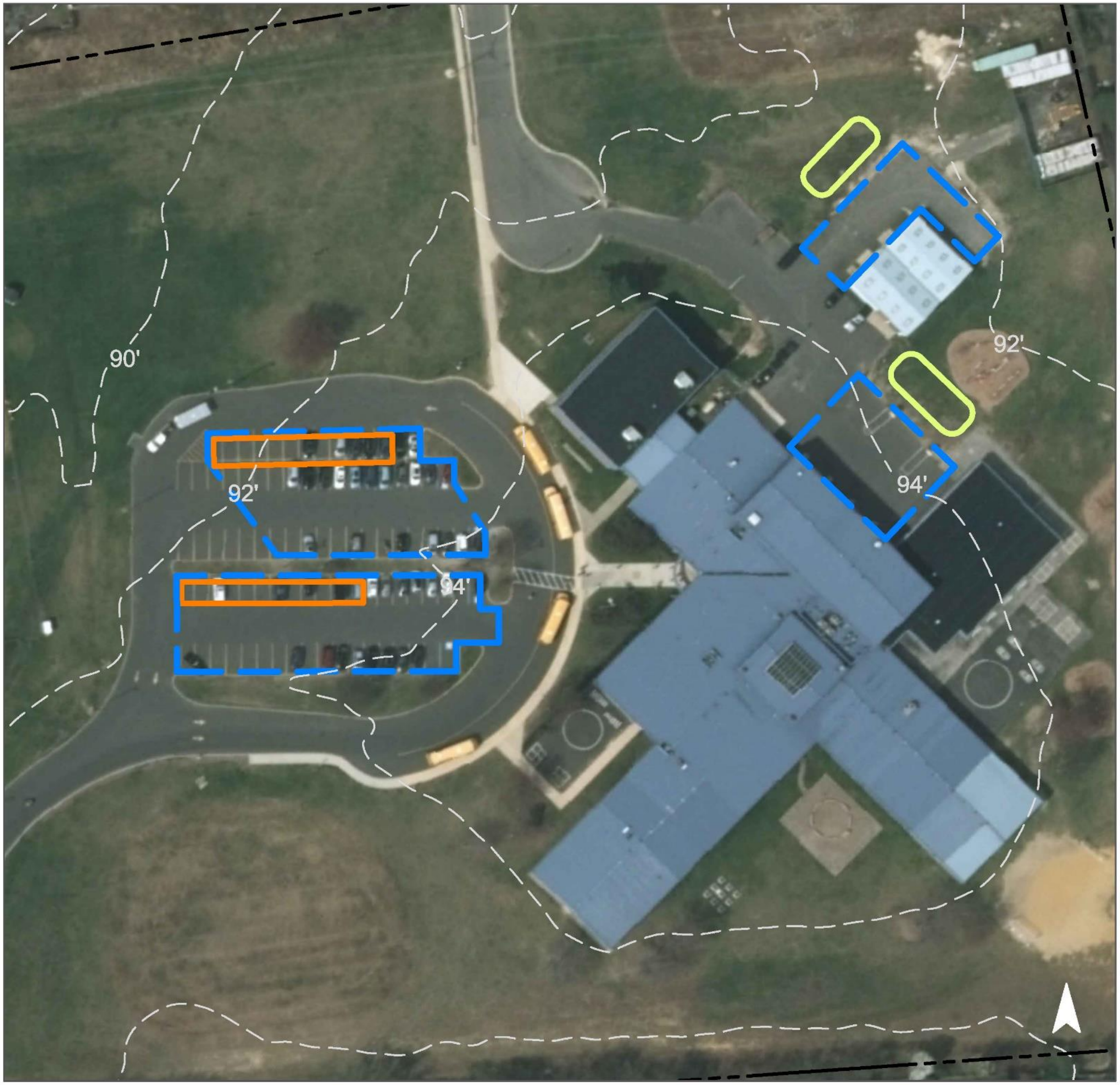
Block and Lot: Block 218, Lot 17

Stormwater runoff from the parking lot is currently directed to existing catch basins. Rain gardens can be installed in areas adjacent to the parking lots to capture, treat, and infiltrate stormwater runoff. Additional stormwater runoff can be captured and infiltrated if parking spaces and playgrounds are replaced with 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"
20	198,027	9.5	100.0	909.2	0.157	5.34

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	0.27	46	20,002	0.75	2,615	$65,375
Pervious pavement	0.63	106	46,256	1.74	4,320	$21,600

GREEN INFRASTRUCTURE RECOMMENDATIONS



Kresson Elementary School

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

0 50' 100'

OSAGE ELEMENTARY SCHOOL

Subwatershed: Cooper River

Site Area: 504,828 sq. ft.

Address: 112 Somerdale Road
Voorhees, NJ 08043

Block and Lot: Block 100, Lot 32

Stormwater runoff from the parking lots, paths, and roof is currently directed to an existing catch basin. A rain garden can be installed adjacent to the northeast side of the school to capture, treat, and infiltrate stormwater runoff. Additional stormwater runoff can be captured and infiltrated if parking spaces are replaced with 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"
50	254,858	12.3	128.7	1,170.1	0.199	6.99

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	0.12	20	8,677	0.33	1,135	$5,675
Pervious pavement	0.56	93	40,893	1.54	3,820	$95,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Osage Elementary School

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

0 50' 100'

THE CHURCH IN ACTS

Subwatershed: Cooper River

Site Area: 37,412 sq. ft.

Address: 1801 South Burnt Mill Road
Voorhees, NJ 08043

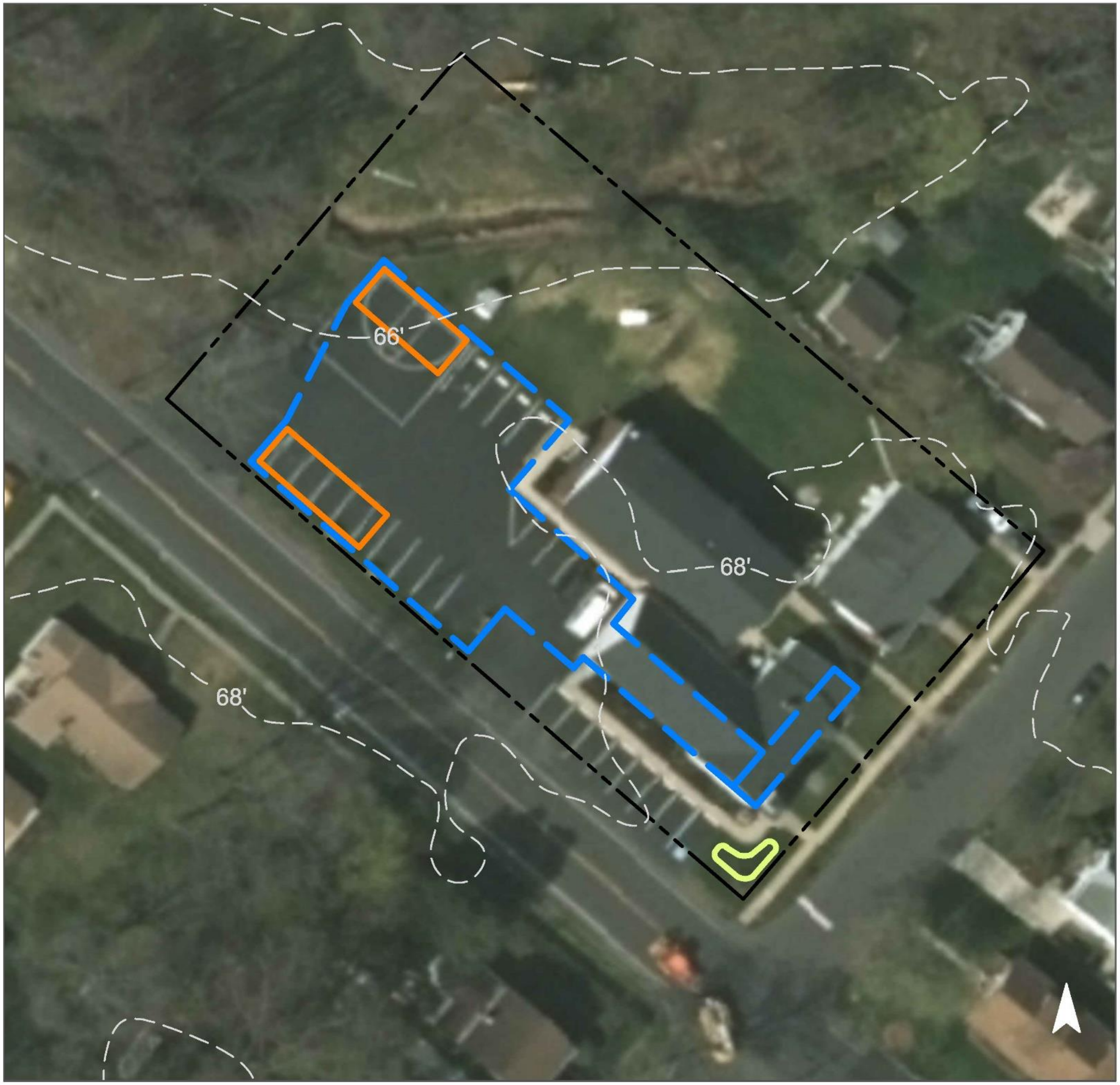
Block and Lot: Block 183, Lot 5

Stormwater is currently directed to an existing catch basin. A rain garden can be built in an area adjacent to the southeastern most parking lot to capture, treat, and infiltrate stormwater runoff. Parking spaces and the half basketball court can be replaced with pervious pavement to provide runoff an opportunity to infiltrate. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
58	21,882	1.1	11.1	100.5	0.017	0.60

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	0.01	2	957	0.04	125	$625
Pervious pavement	0.23	39	17,069	0.64	1,120	$28,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



The Church in Acts

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

VOORHEES MIDDLE SCHOOL

Subwatershed: Cooper River

Site Area: 1,856,776 sq. ft.

Address: 1000 Holly Oak Drive
Voorhees, NJ 08043

Block and Lot: Block 202, Lot 1

Stormwater runoff from the parking lots and roof is currently directed to existing catch basins. Rain gardens can be installed adjacent to the school to capture, treat, and infiltrate stormwater runoff. Additional stormwater runoff can be captured and infiltrated if sections of parking lots are replaced with 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"
26	481,915	23.2	243.4	2,212.6	0.375	13.22

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	0.35	59	25,926	0.97	3,390	$16,950
Pervious pavement	0.92	154	67,552	2.54	6,310	$157,750

GREEN INFRASTRUCTURE RECOMMENDATIONS

Voorhees Middle School

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

0 100' 200'

VOORHEES POST OFFICE

Subwatershed: Cooper River

Site Area: 178,386 sq. ft.

Address: 504 Centennial Boulevard
Voorhees, NJ 08043

Block and Lot: Block 213.01, Lot 98

Stormwater runoff from the parking lot and roof is currently directed to existing catch basins. A rain garden can be installed south of the southern most parking lot to capture, treat, and infiltrate stormwater runoff. Additional stormwater runoff can be captured and infiltrated if parking spaces are replaced with 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"
80	142,865	6.9	72.1	655.2	0.111	3.91

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	0.23	39	17,054	0.64	2,230	$11,150
Pervious pavement	0.46	77	33,914	1.27	3,170	$79,250

GREEN INFRASTRUCTURE RECOMMENDATIONS

Voorhees Post Office

- bioretention system
- 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	Existing Annual Loads TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
COOPER RIVER SUBWATERSHED	**182.66**	**7,930,688**			**119.9**	**1,255.7**	**11,415.4**		**57.08**	**2,478,186**	**1.931**	**67.97**
Ashland Church												
Total Site Info	2.78	121,068	86	7	3.0	31.0	281.5	51	1.41	61,320	0.048	1.68
Congregation Beth El												
Total Site Info	11.42	497,405	207	4.19	6.6	69.0	626.9	27	3.13	136,542	0.106	3.74
Cultivated Church												
Total Site Info	4.08	177,790	202.26	15	3.3	34.4	313.2	38	1.57	68,208	0.053	1.87
Eastern Regional High School												
Total Site Info	79.35	3,430,456	200	4	51.8	542.6	4,932.7	31	24.66	1,066,260	0.831	29.24
Hope United Methodist Church												
Total Site Info	6.75	293,920	213.01	99	7.6	79.5	722.9	54	3.61	157,457	0.123	4.32
Kresson Elementary School												
Total Site Info	22.51	980,582	218	17	9.5	99.3	902.4	20	4.51	196,539	0.153	5.39
Osage Elementary School												
Total Site Info	11.59	504,827	100	32	12.3	128.7	1,170.1	50	5.85	254,857	0.199	6.99
The Church in Acts												
Total Site Info	0.86	37,412	183	5	1.1	11.1	100.5	58	0.50	21,882	0.017	0.60
Voorhees Middle School												
Total Site Info	39.23	1,708,842	202	1	18.0	188.1	1,709.9	22	8.55	372,411	0.290	10.21
Voorhees Post Office												
Total Site Info	4.10	178,386	213.01	98	6.9	72.1	655.2	80	3.28	142,709	0.111	3.91

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 (SF)	Unit Cost ($)	Unit	Total Cost ($)	I.C. Treated %
	COOPER RIVER SUBWATERSHED	**458,540**	**10.53**	**11.947**	**2,000**	**876,544**	**32.95**	**97,010**			**$1,691,885**	**5.6%**
1	**Ashland Church**											
	Bioretention systems	6,670	0.15	0.174	29	12,753	0.48	1,670	5	SF	$8,350	10.9%
	Pervious pavement	22,120	0.51	0.576	96	42,225	1.59	3,950	25	SF	$98,750	36.1%
	Rainwater harvesting	1,880	0.04	0.049	8	3,598	0.14	1,465	2	gal	$2,930	3.1%
	Total Site Info	**30,670**	**0.70**	**0.799**	**134**	**58,576**	**2.21**	**7,085**			**$110,030**	**50.0%**
2	**Congregation Beth El**											
	Bioretention systems	38,180	0.88	0.995	167	72,997	2.74	9,545	25	SF	$238,625	13.3%
	Pervious pavement	21,280	0.49	0.554	93	40,684	1.53	3,800	5	SF	$19,000	7.4%
	Total Site Info	**59,460**	**1.37**	**1.549**	**259**	**113,681**	**4.27**	**13,345**			**$257,625**	**20.8%**
3	**Cultivate Church**											
	Bioretention systems	1,025	0.02	0.027	4	1,960	0.07	4,100	5	SF	$20,500	1.5%
	Pervious pavement	19,960	0.46	0.520	87	38,163	1.43	3,565	25	SF	$89,125	29.3%
	Rainwater harvesting	1,660	0.04	0.043	7	3,172	0.12	1,290	2	gal	$2,580	2.4%
	Total Site Info	**22,645**	**0.52**	**0.590**	**99**	**43,294**	**1.62**	**8,955**			**$112,205**	**33.2%**
4	**Eastern Regional High School**											
	Bioretention systems	30,820	0.71	0.803	134	58,920	2.22	7,705	5	SF	$38,525	2.9%
	Pervious pavement	130,685	3.00	3.405	570	249,847	9.39	23,340	25	SF	$583,500	12.3%
	Total Site Info	**161,505**	**3.71**	**4.208**	**704**	**308,767**	**11.61**	**31,045**			**$622,025**	**15.1%**
5	**Hope United Methodist Church**											
	Bioretention systems	20,100	0.46	0.524	88	38,402	1.44	5,025	5	SF	$25,125	12.8%
	Pervious pavement	18,590	0.43	0.484	81	35,523	1.34	3,320	25	SF	$83,000	11.8%
	Total Site Info	**38,690**	**0.89**	**1.008**	**169**	**73,925**	**2.78**	**8,345**			**$108,125**	**24.6%**
6	**Kresson Elementary School**											
	Bioretention systems	10,460	0.24	0.273	46	20,002	0.75	2,615	25	SF	$65,375	5.3%
	Pervious pavement	24,195	0.56	0.630	106	46,256	1.74	4,320	5	SF	$21,600	12.2%
	Total Site Info	**34,655**	**0.80**	**0.903**	**151**	**66,258**	**2.49**	**6,935**			**$86,975**	**17.5%**
7	**Osage Elementary School**											
	Bioretention systems	4,540	0.10	0.118	20	8,677	0.33	1,135	5	SF	$5,675	1.8%
	Pervious pavement	21,390	0.49	0.557	93	40,893	1.54	3,820	25	SF	$95,500	8.4%
	Total Site Info	**25,930**	**0.60**	**0.676**	**113**	**49,570**	**1.87**	**4,955**			**$101,175**	**10.2%**

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP (SF)	Unit Cost ($)	Unit	Total Cost ($)	I.C. Treated %
8	**The Church in Acts**											
	Bioretention system	500	0.01	0.013	2	957	0.04	125	5	SF	$625	2.3%
	Pervious pavement	8,930	0.21	0.233	39	17,069	0.64	1,120	25	SF	$28,000	40.8%
	Total Site Info	**9,430**	**0.22**	**0.246**	**41**	**18,027**	**0.68**	**1,245**			**$28,625**	**43.1%**
9	**Voorhees Middle School**											
	Bioretention systems	13,560	0.31	0.353	59	25,926	0.97	3,390	5	SF	$16,950	2.8%
	Pervious pavement	35,335	0.81	0.921	154	67,552	2.54	6,310	25	SF	$157,750	7.3%
	Total Site Info	**48,895**	**1.12**	**1.274**	**213**	**93,478**	**3.51**	**9,700**			**$174,700**	**10.1%**
10	**Voorhees Post Office**											
	Bioretention system	8,920	0.20	0.232	39	17,054	0.64	2,230	5	SF	$11,150	6.3%
	Pervious pavement	17,740	0.41	0.462	77	33,914	1.27	3,170	25	SF	$79,250	12.4%
	Total Site Info	**26,660**	**0.61**	**0.695**	**116**	**50,969**	**1.91**	**5,400**			**$90,400**	**18.7%**