RUTGERS
New Jersey Agricultural
Experiment Station

Impervious Cover Reduction Action Plan
for
Chester Township, Morris County, New Jersey

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

December 10, 2020

Highlands Council
New Jersey

ACKNOWLEDGEMENTS:

This document has been prepared by the Rutgers Cooperative Extension Water Resources Program, with funding and direction from the New Jersey Highlands Water Protection and Planning Council and the New Jersey Agricultural Experiment Station, to highlight green infrastructure opportunities within Chester Township. We would like to thank the New Jersey Highlands Water Protection and Planning Council, the New Jersey Agricultural Experiment Station, and Chester Township for their input and support in creating this document.

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New Jersey Agricultural Experiment Station

Highlands Council
New Jersey

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Introduction

Located in Morris County, New Jersey, Chester Township covers approximately 29.46 square miles. Figures 1 and 2 illustrate that Chester Township is dominated by forest land use. A total of 26.2% of the municipality's land use is classified as urban. Of the urban land in Chester Township, rural residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2015 land use/land cover geographical information system (GIS) data layer categorizes Chester 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 Chester Township. Based upon the 2015 NJDEP land use/land cover data, approximately 3.9% of Chester Township has impervious cover. This level of impervious cover suggests that the streams in Chester Township are likely sensitive streams. [1]

Methodology

Chester Township contains portions of eight subwatersheds (Figure 4). For this impervious cover reduction action plan, projects have been identified in four 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] Schuler, T.R., L. Fraley-McNeal, and K. Cappiella. 2009. Is Impervious Cover Still Important? Review of Recent Research. *Journal of Hydrologic Engineering* 14 (4): 309-315.

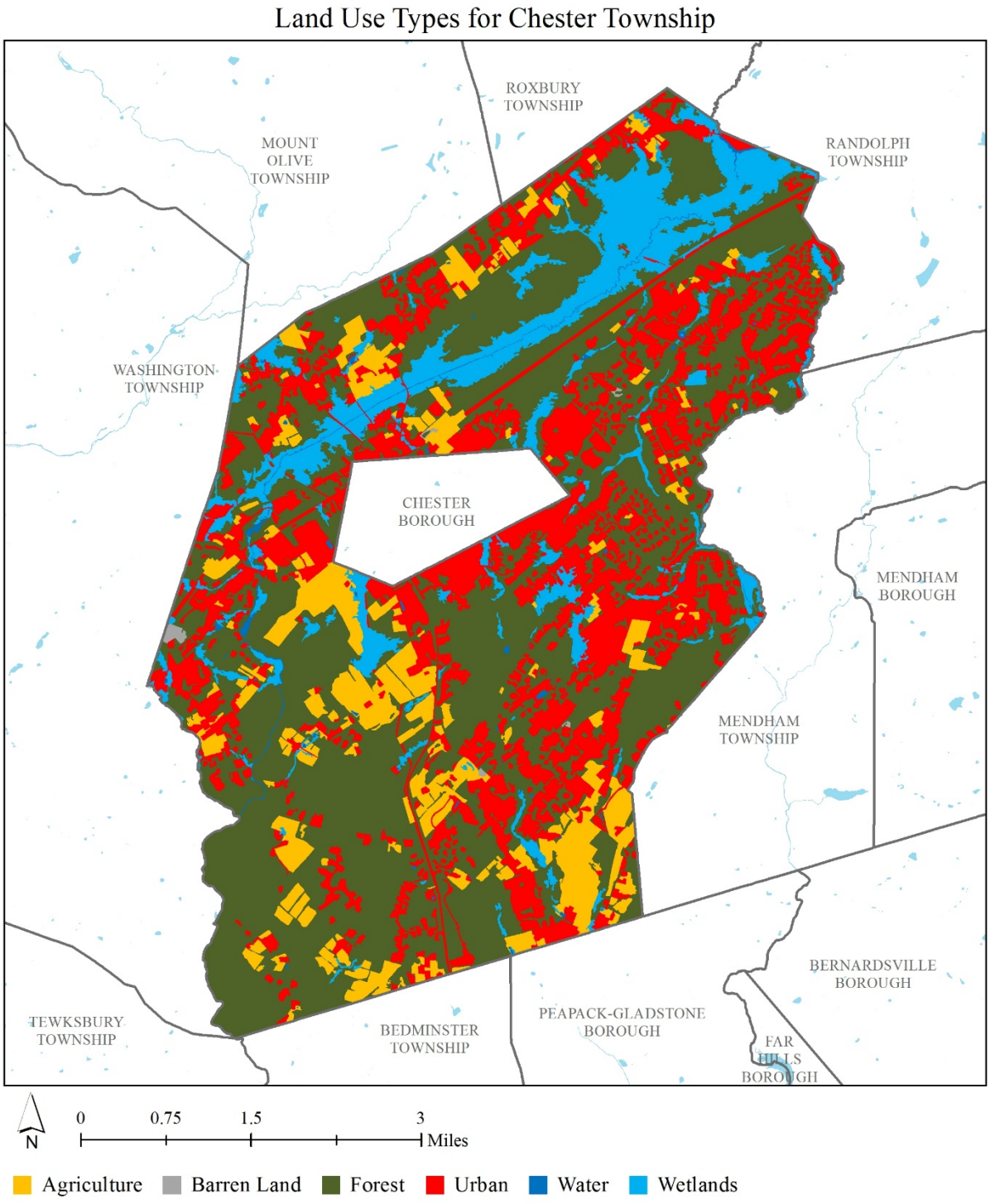


Figure 1: Map illustrating the land use in Chester Township

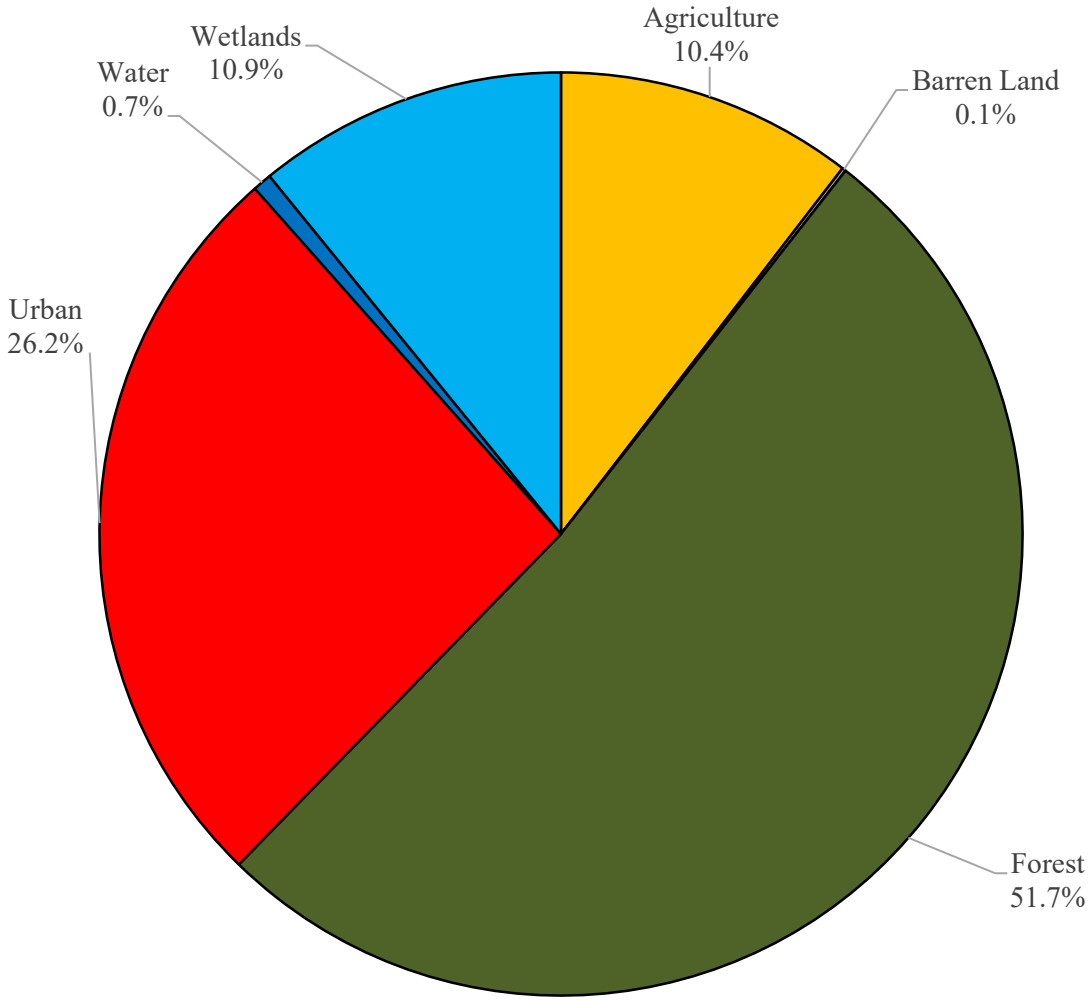


Figure 2: Pie chart illustrating the land use in Chester Township

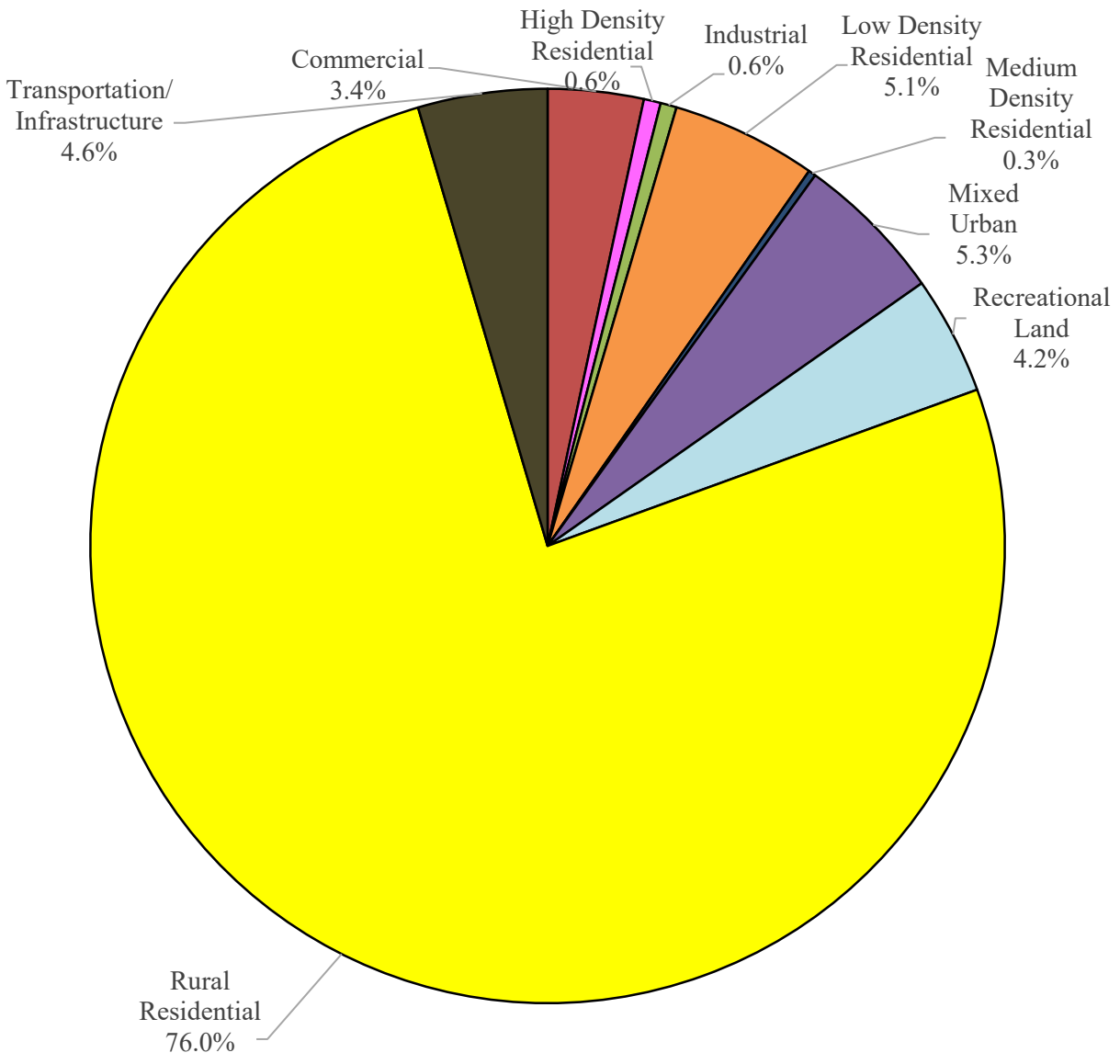


Figure 3: Pie chart illustrating the various types of urban land use in Chester Township

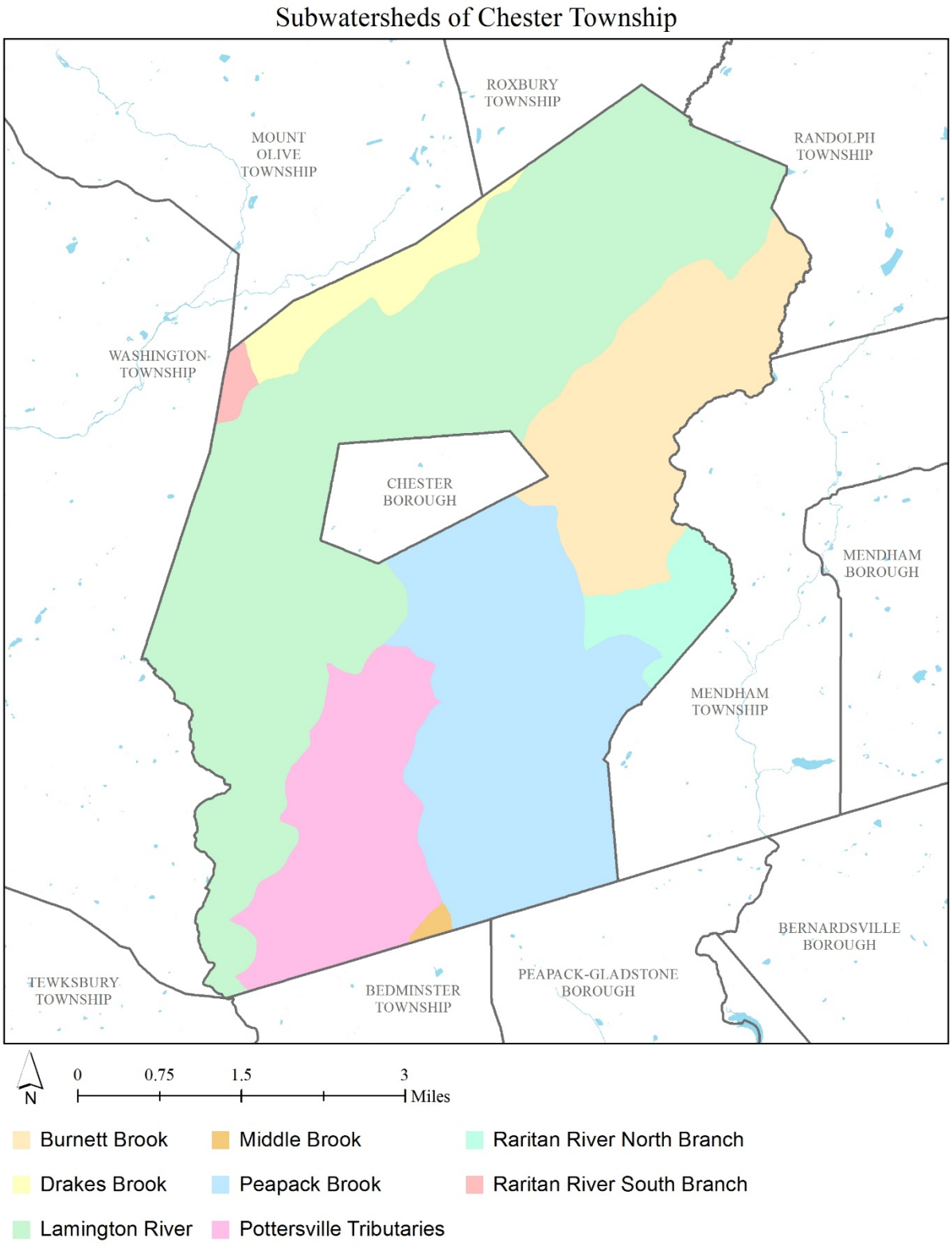


Figure 4: Map of the subwatersheds in Chester Township

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 2015 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 Chester 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 principle, 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 Chester 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.

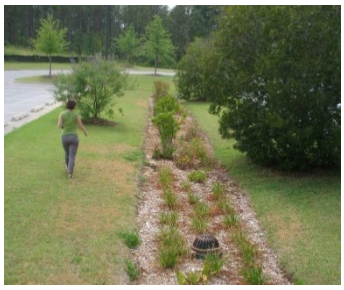
Downspout planter boxes

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

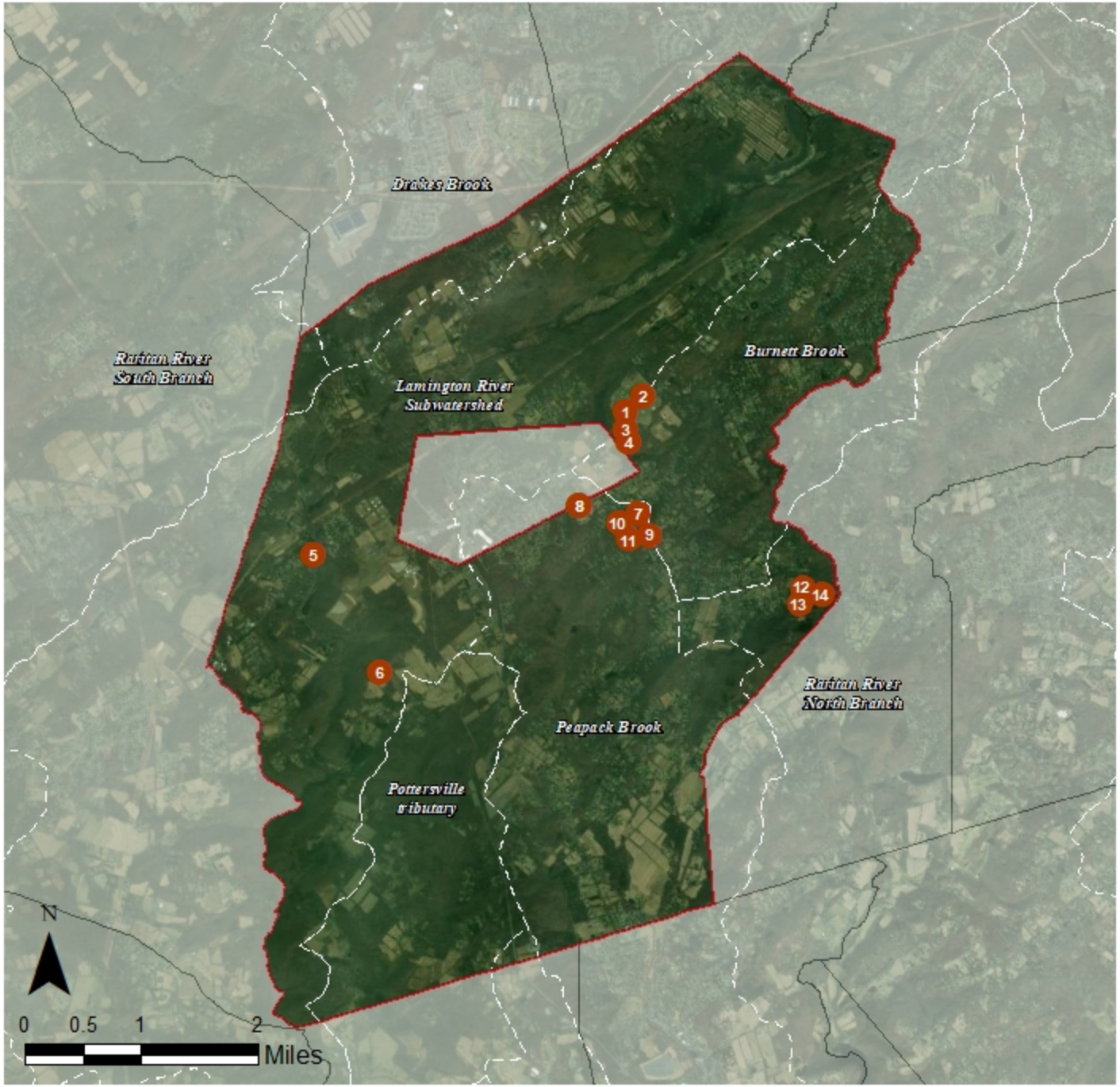
This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented by a wide variety of people such as boy scouts,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

Appendix A: Climate Resilient Green Infrastructure

a. Green Infrastructure Sites

CHESTER TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE BURNETT BROOK SUBWATERSHED

1. Black River Middle School
2. Black River Recreation
3. Highlands Ridge Park
4. New Jersey Highlands Council

SITES WITHIN THE LAMINGTON RIVER SUBWATERSHED

5. Chester Township Municipal Building
6. Kay Environmental Education Center

SITES WITHIN THE PEAPACK BROOK SUBWATERSHED

7. American Legion Post 342
8. Dickerson School & Bragg School
9. Hudson City Savings Bank
10. Iandoli & Edens Attorneys at Law
11. Pizza & Bagel 24

SITES WITHIN THE RARITAN RIVER NORTH SUBWATERSHED

12. Mendham Animal Hospital
13. Mendham Hills Community Church
14. Westmont Montessori School

b. Proposed Green Infrastructure Concepts

BLACK RIVER MIDDLE SCHOOL

Subwatershed: Burnett Brook

Site Area: 1,718,275 sq. ft.

Address: 133 North Road
Chester, NJ 07930

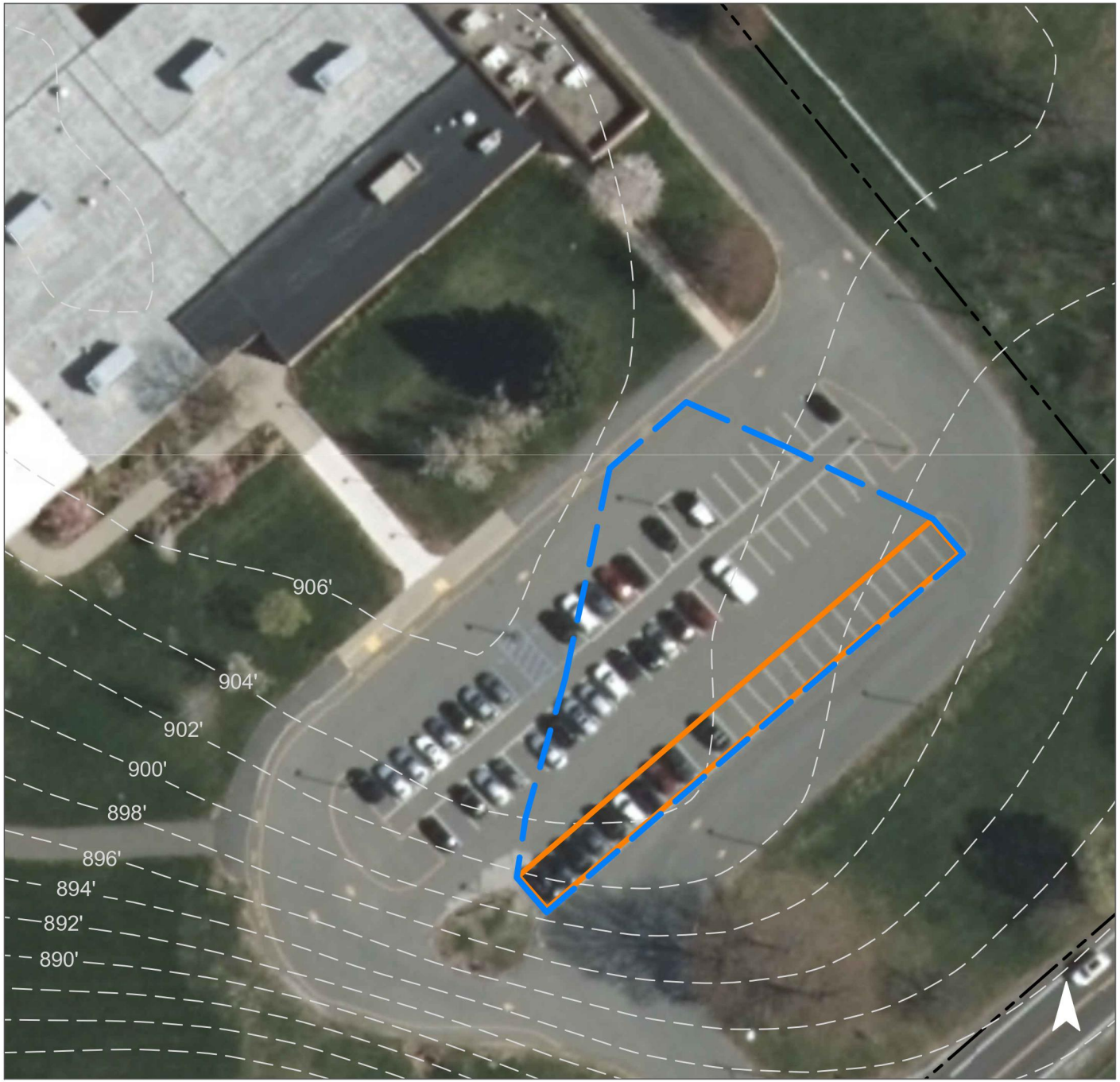
Block and Lot: Block 33, Lot 17.02

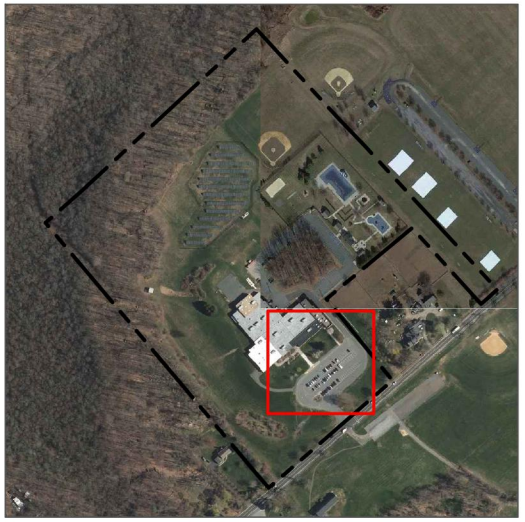
Pervious pavement can be installed in the southernmost row of the parking lot to capture, treat, and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
15	256,115	12.3	129.4	1,175.9	0.200	7.02

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	0.429	72	31,490	1.18	3,890	$97,250

GREEN INFRASTRUCTURE RECOMMENDATIONS





Black River Middle School

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

0 30' 60'

BLACK RIVER RECREATION

Subwatershed: Burnett Brook

Site Area: 1,928,275 sq. ft.

Address: 233 North Road
Chester, NJ 07930

Block and Lot: Block 33, Lot 17.01

A rain garden can be installed along the northern edge of the parking lot area to help infiltrate the pooling stormwater in that area. 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"
0.03	535	0.0	0.3	2.5	0.000	0.01

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	0.109	18	8,030	0.30	1,050	$5,250

GREEN INFRASTRUCTURE RECOMMENDATIONS

Black River Recreation

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

0 50' 100'

HIGHLANDS RIDGE PARK

Subwatershed: Burnett Brook

Site Area: 4,518,040 sq. ft.

Address: County Road 510
Chester, NJ 07930

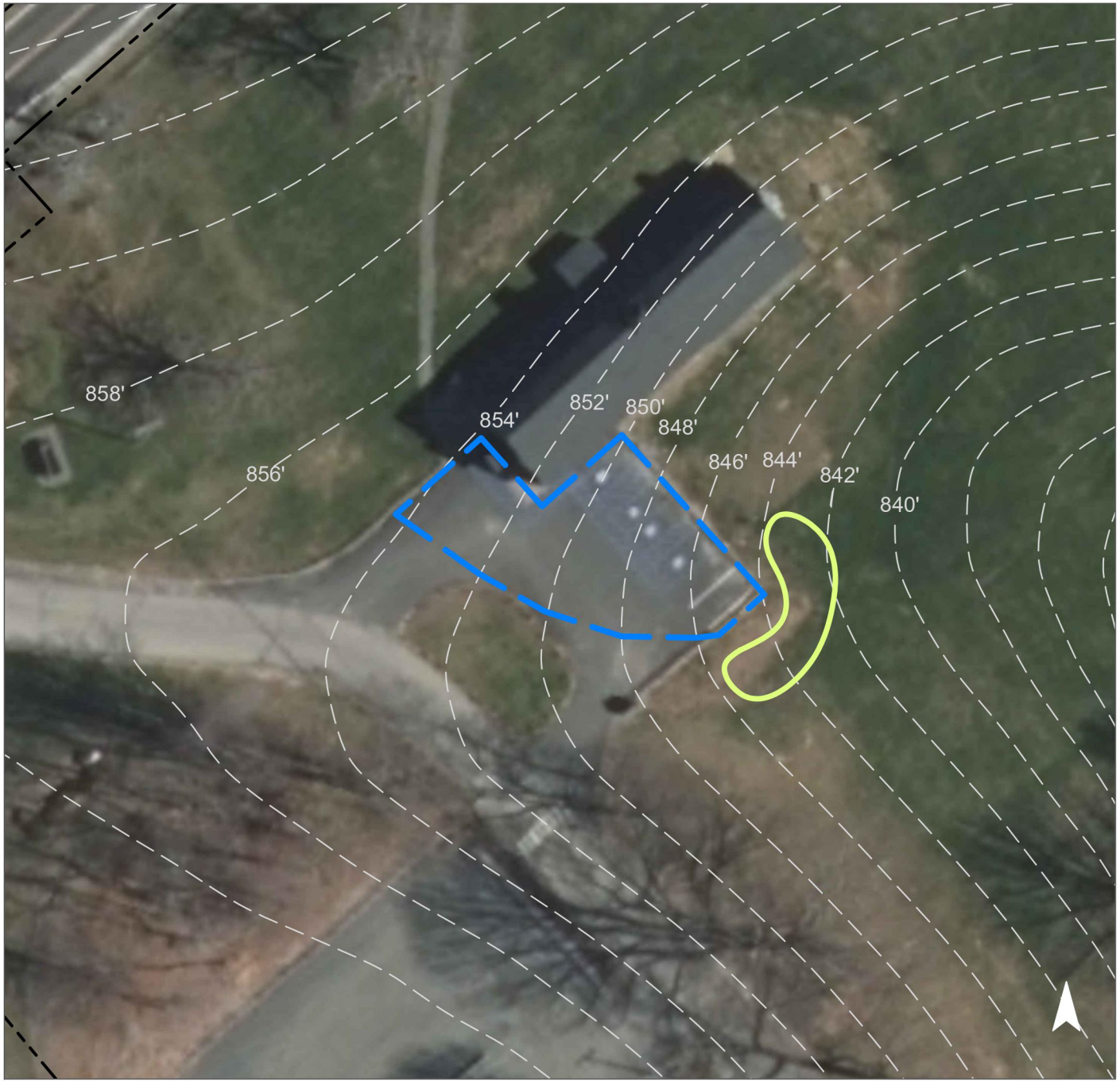
Block and Lot: Block 26, Lot 78.01

A rain garden can be installed east of the parking lot to capture and infiltrate stormwater runoff from the paved surface. 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"
0.44	19,900	1.0	10.1	91.4	0.016	0.55

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	0.117	20	8,560	0.32	1,120	$5,600

GREEN INFRASTRUCTURE RECOMMENDATIONS



Highlands Ridge Park

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

0 25' 50'

NEW JERSEY HIGHLANDS COUNCIL

Subwatershed: Burnett Brook

Site Area: 434,470 sq. ft.

Address: 100 North Road
Chester, NJ 07930

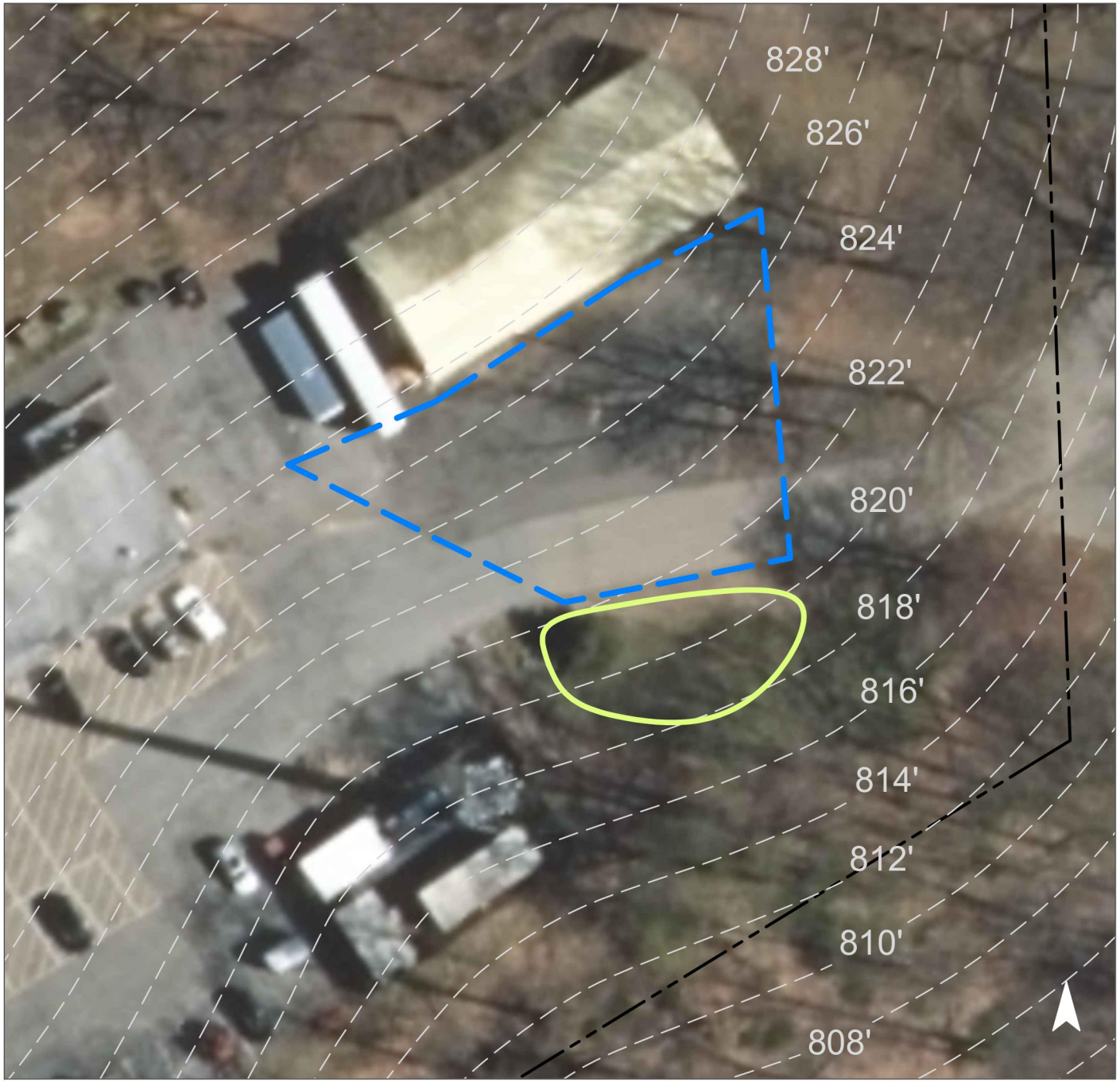
Block and Lot: Block 26, Lot 78.02

A rain garden can be installed south of the storage building to capture stormwater runoff from the parking lot and roadway. 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"
27	117,715	5.7	59.5	540.5	0.092	3.23

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	0.189	32	13,860	0.52	1,815	$9,075

GREEN INFRASTRUCTURE RECOMMENDATIONS



New Jersey Highlands Council

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

0 20' 40'

CHESTER TOWNSHIP MUNICIPAL BUILDING

Subwatershed: Lamington River

Site Area: 90,055 sq. ft.

Address: 1 Parker Road
Chester, NJ 07930

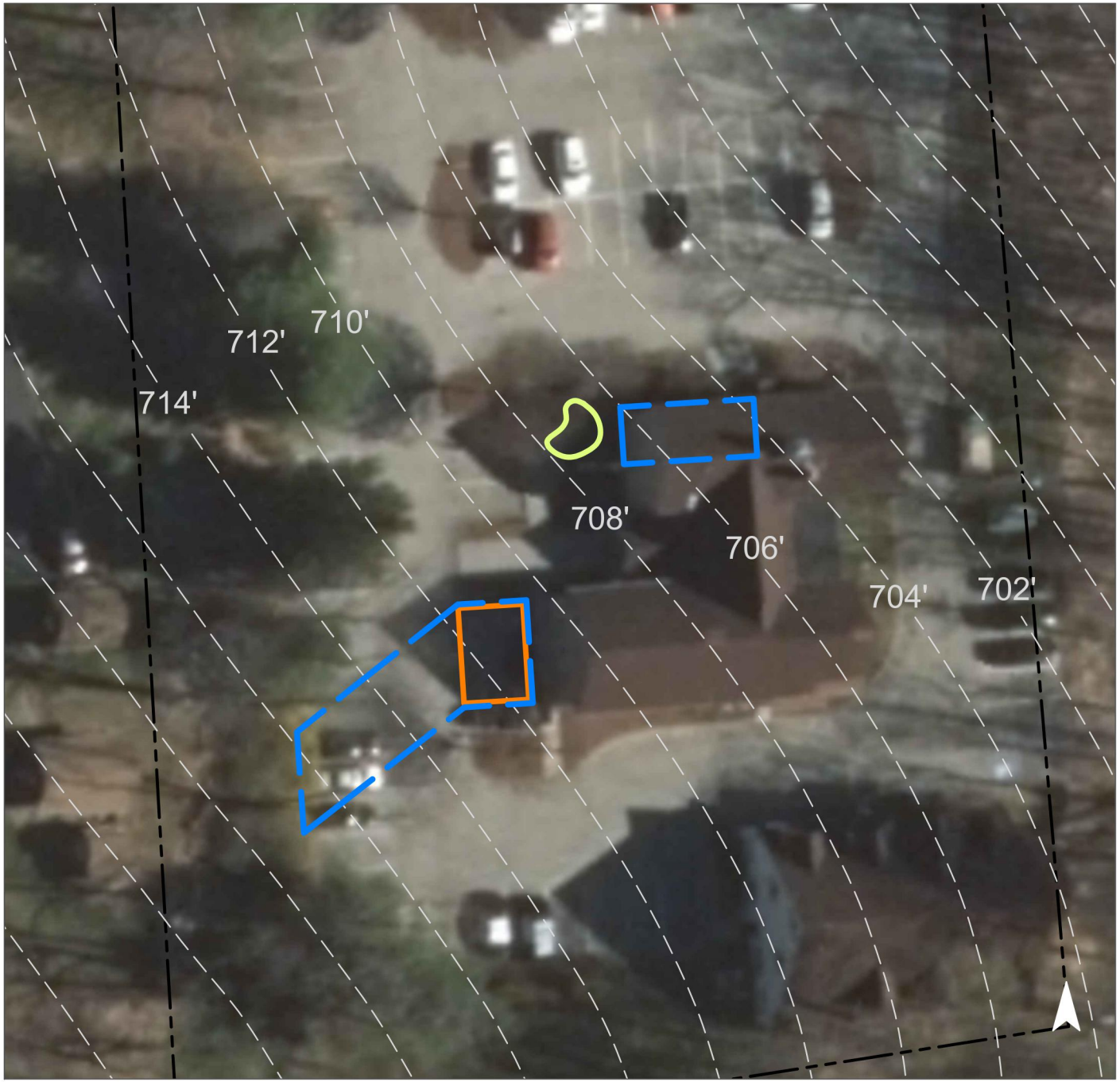
Block and Lot: Block 16, Lot 34

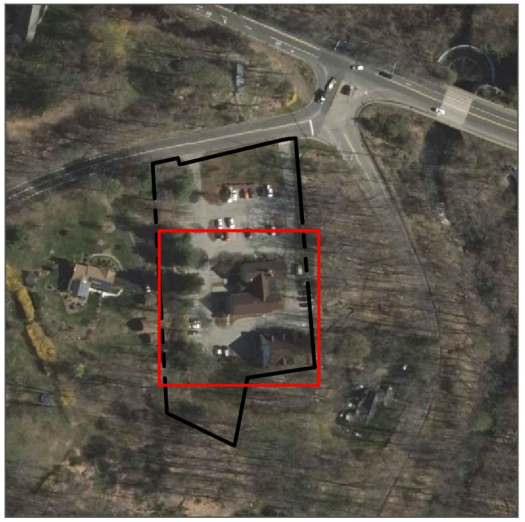
Pervious pavement can be installed in the parking spaces west of the building to capture and infiltrate stormwater. A rain garden can be installed to the northwest of the building to capture, treat, and infiltrate stormwater runoff from the roof. A preliminary soil assessment suggests that the soils 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"
53	47,320	2.3	23.9	217.3	0.037	1.30

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	0.014	2	1,000	0.04	130	$650
Pervious pavement	0.044	7	3,190	0.12	490	$12,250

GREEN INFRASTRUCTURE RECOMMENDATIONS





Chester Township Municipal Building

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

0 20' 40'

KAY ENVIRONMENTAL EDUCATION CENTER

Subwatershed: Lamington River

Site Area: 24,177,870 sq. ft.

Address: 200 Pottersville Road
Chester, NJ 07930

Block and Lot: Block 15, Lot 1

Pervious pavement can be installed in the parking spaces to capture the stormwater runoff from the pavement. A rain garden can be installed to capture and infiltrate stormwater runoff from the building's 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"
0.27	65,755	3.2	33.2	301.9	0.051	1.80

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	0.012	2	860	0.03	130	$650
Pervious pavement	0.078	13	5,740	0.22	600	$15,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Kay Environmental Education Center

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

0 25' 50'

AMERICAN LEGION POST 342

Subwatershed: Peapack Brook

Site Area: 28,925 sq. ft.

Address: 333 County Road 510
Chester, NJ 07930

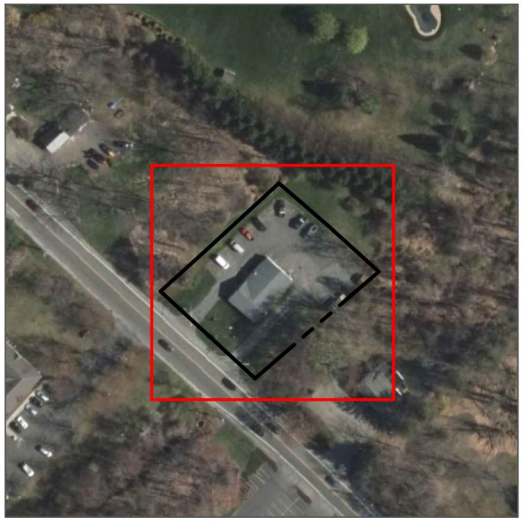
Block and Lot: Block 26.07, Lot 6

A rain garden can be installed to capture stormwater from the building's rooftop. Pervious pavement can be installed along the northwestern edge of the parking lot to capture the stormwater runoff from 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"
35	10,125	0.5	5.1	46.5	0.008	0.28

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	0.021	3	1,530	0.06	225	$1,125
Pervious pavement	0.253	42	18,570	0.70	2,000	$50,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



American Legion Post 342

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

0 20' 40'

DICKERSON SCHOOL & BRAGG SCHOOL

Subwatershed: Peapack Brook

Site Area: 1,253,070 sq. ft.

Address: 250 Route 24
Chester, NJ 07930

Block and Lot: Block 25.01, Lot 38.01

Various rain gardens can be installed around the school grounds to capture rooftop runoff from the buildings. Pervious pavement can be installed in the northeastern and southwestern parking lots to capture the stormwater runoff from the parking lots. 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"
27	338,830	16.3	171.1	1,555.7	0.264	9.29

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	0.228	38	16,760	0.63	2,195	$10,975
Pervious pavement	0.956	160	70,150	2.64	6,810	$170,250

GREEN INFRASTRUCTURE RECOMMENDATIONS

Dickerson School & Bragg School

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

0 75' 150'

HUDSON CITY SAVINGS BANK

Subwatershed: Peapack Brook

Site Area: 257,810 sq. ft.

Address: 385 Route 24
Chester, NJ 07930

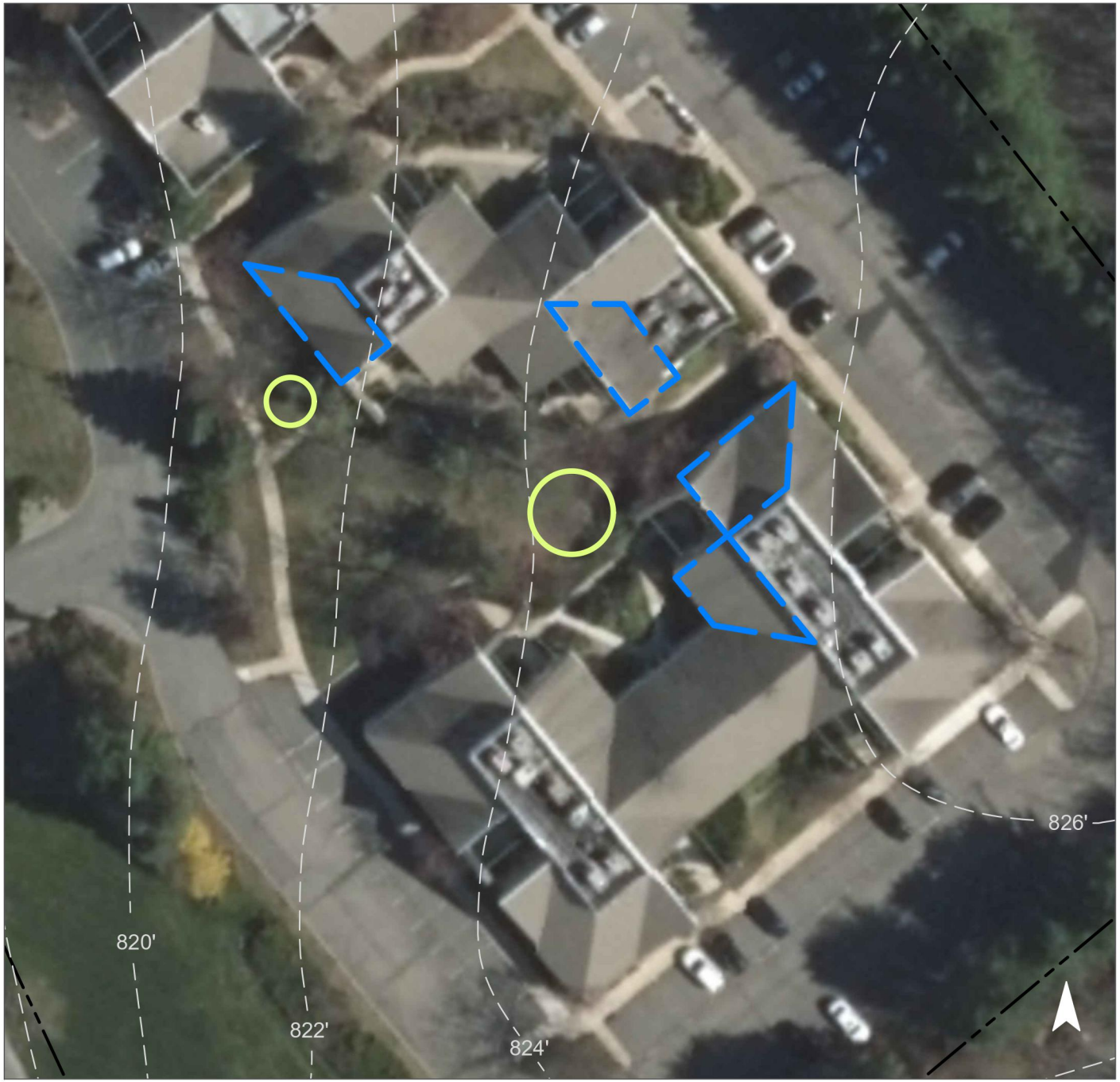
Block and Lot: Block 26.05, Lot 12

Rain gardens can be installed in the center courtyard and to the west of the building to capture rooftop runoff from multiple buildings. 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"
46	118,660	5.7	59.9	544.8	0.092	3.25

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	0.82	14	6,020	0.23	790	$3,950

GREEN INFRASTRUCTURE RECOMMENDATIONS



Hudson City Savings Bank

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

0 25' 50'

IANDOLI & EDENS ATTORNEYS AT LAW

Subwatershed: Peapack Brook

Site Area: 104,110 sq. ft.

Address: 310 Route 24
Chester, NJ 07930

Block and Lot: Block 25, Lot 37.03

A rain garden can be installed to reduce the flooding that occurs east of the parking lot. Pervious pavement can be installed in the parking lot row directly west of the building to capture stormwater runoff from both the parking lot and the rooftop. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
32	33,470	1.6	16.9	153.7	0.026	0.92

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.093	16	6,810	0.26	890	$4,450
Pervious pavement	0.093	16	6,810	0.26	650	$16,250

GREEN INFRASTRUCTURE RECOMMENDATIONS

Iandoli & Edens
Attorneys at Law

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

0 25' 50'

PIZZA & BAGELS 24

Subwatershed: Peapack Brook

Site Area: 132,295 sq. ft.

Address: 2631, 324 Route 24
Chester, NJ 07930

Block and Lot: Block 25, Lot 36

Pervious pavement can be installed in the western corner of the parking lot to capture and infiltrate stormwater runoff from the parking lot. A rain garden can be installed along the roadway south of the building to capture stormwater runoff from the 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"
16	20,800	1.0	10.5	95.5	0.016	0.57

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	0.023	4	1,660	0.06	220	$1,375
Pervious pavement	0.140	23	10,240	0.38	970	$24,250

GREEN INFRASTRUCTURE RECOMMENDATIONS

Pizza & Bagels 24

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

0 25' 50'

MENDHAM ANIMAL HOSPITAL

Subwatershed: Raritan River North Branch

Site Area: 126,630 sq. ft.

Address: 571 Route 24
Mendham, NJ 07945

Block and Lot: Block 27, Lot 3

A rain garden can be installed south of the building to capture stormwater runoff from both the rooftop of the building as well as the parking lot. Downspout planter boxes can be installed in front of the building to capture the stormwater runoff from the western 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"
14	17,580	0.8	8.9	80.7	0.014	0.48

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	0.029	5	2,090	0.08	275	$1,375
Planter boxes	N/A	2	N/A	N/A	2 (boxes)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Mendham Animal Hospital

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

0 15' 30'

MENDHAM HILLS COMMUNITY CHURCH

Subwatershed: Raritan River North Branch

Site Area: 269,785 sq. ft.

Address: 480 Route 24
Chester, NJ 07930

Block and Lot: Block 9, Lot 20.01

A rain garden can be installed southwest of the building to capture, treat, and infiltrate the stormwater coming from the top of the building. Pervious pavement can be installed in the southeastern corner of the parking lot to capture stormwater runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
24	64,060	3.1	32.4	294.1	0.050	1.76

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	0.023	4	1,680	0.06	220	$1,100
Pervious pavement	0.142	24	10,420	0.39	1,620	$40,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Mendham Hills Community Church

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

0 20' 40'

WESTMONT MONTESSORI SCHOOL

Subwatershed: Raritan River North Branch

Site Area: 133,335 sq. ft.

Address: 577 Route 24
Mendham, NJ 07945

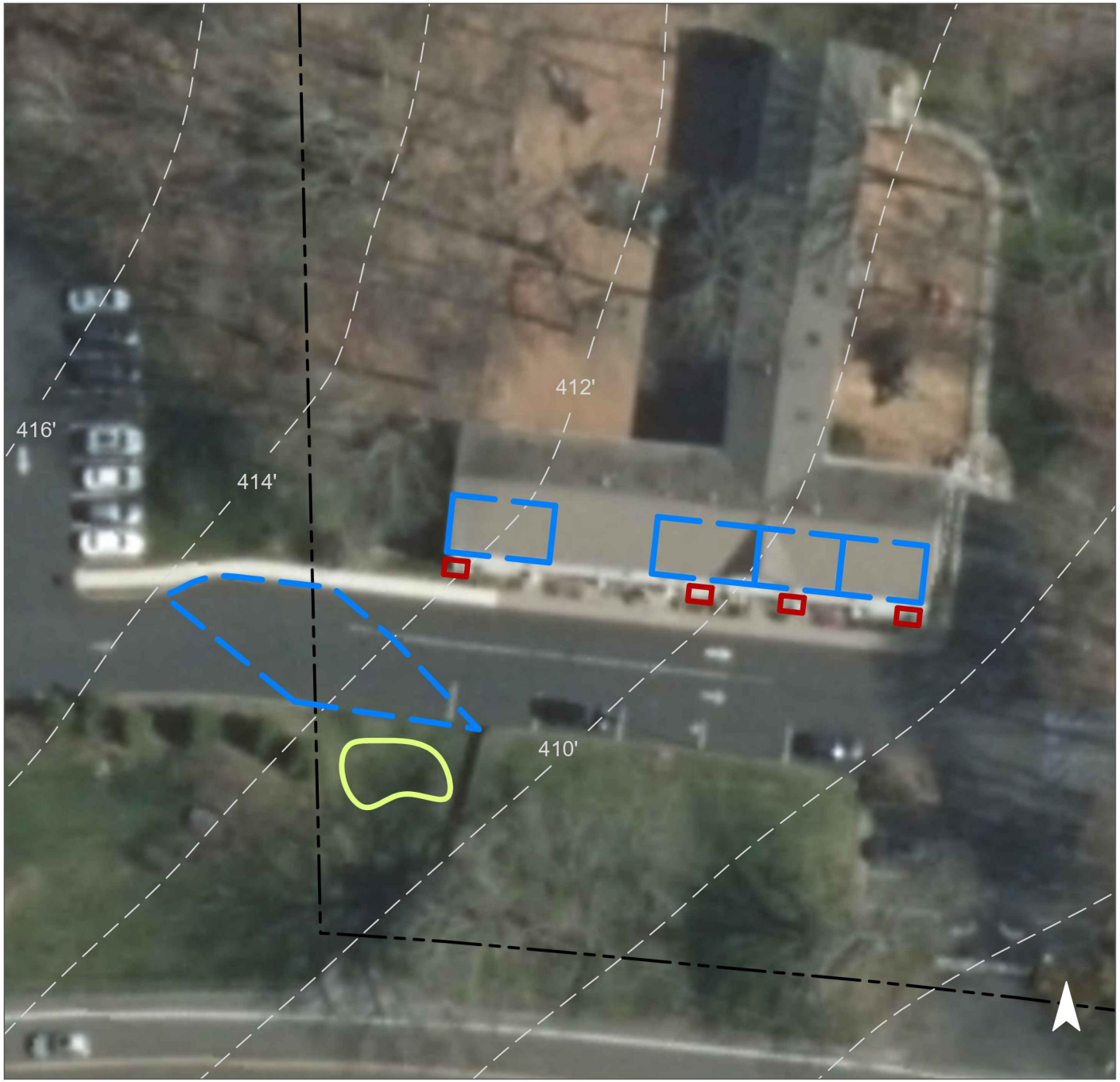
Block and Lot: Block 27, Lot 4

A rain garden can be installed south of the roadway to capture, treat, and infiltrate stormwater runoff from the pavement. Downspout planter boxes can be installed along the front, southern wall of the building to capture stormwater 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"
16	21,600	1.0	10.9	99.2	0.017	0.59

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	0.040	7	2,960	0.11	390	$1,950
Planter boxes	N/A	3	N/A	N/A	4 (boxes)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Westmont Montessori School

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

0 20' 40'

c. Summary of Existing Conditions

Summary of Existing Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Existing Annual Loads (Commercial) TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (cu.ft.)	Runoff Volumes from I.C. Annual (cu.ft.)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Runoff Volumes from I.C. Annual (Mgal)
	Burnett Brook Sites	**93.69**	**8,599,060**				**9.05**	**394,265**	**19.0**	**199.1**	**1810.2**	**41,069**	**1,445,638**	**0.307**	**10.81**
1	**Black River Middle School Total Site Info**	39.45	1,718,275	33	17.02	15	5.88	256,115	12.3	129.4	1175.9	26,679	939,088	0.200	7.02
2	**Black River Recreation Total Site Info**	44.27	1,928,275	33	17.01	0	0.01	535	0.0	0.3	2.5	56	1,962	0.000	0.01
3	**Highlands Ridge Park Total Site Info**	0.00	4,518,040	26	78.01	0	0.46	19,900	1.0	10.1	91.4	2,073	72,967	0.016	0.55
4	**New Jersey Highlands Council Total Site Info**	9.97	434,470	26	78.02	27	2.70	117,715	5.7	59.5	540.5	12,262	431,622	0.092	3.23
	Lamington River Sites	**557.11**	**24,267,925**				**2.60**	**113,075**	**5.5**	**23.9**	**519.2**	**11,779**	**414,608**	**0.088**	**3.10**
5	**Chester Township Municipal Building Total Site Info**	2.07	90,055	16	34	53	1.09	47,320	2.3	23.9	217.3	4,929	173,507	0.037	1.30
6	**Kay Environmental Education Center Total Site Info**	555.05	24,177,870	15	1	0	1.51	65,755	3.2	33.2	301.9	6,849	241,102	0.051	1.80
	Peapack Brook Sites	**40.78**	**1,776,210**				**11.98**	**521,885**	**25.2**	**263.6**	**2396.2**	**54,363**	**1,913,578**	**0.407**	**14.31**
7	**American Legion Post 342 Total Site Info**	0.66	28,925	26.07	6	35	0.23	10,125	0.5	5.1	46.5	1,055	37,125	0.008	0.28
8	**Dickerson School & Bragg School Total Site Info**	28.77	1,253,070	25.01	38.01	27	7.78	338,830	16.3	171.1	1555.7	35,295	1,242,377	0.264	9.29
9	**Hudson City Savings Bank Total Site Info**	5.92	257,810	26.05	12	46	2.72	118,660	5.7	59.9	544.8	12,360	435,087	0.092	3.25
10	**Iandoli & Edens Attorneys at Law Total Site Info**	2.39	104,110	25	37.03	32	0.77	33,470	1.6	16.9	153.7	3,486	122,723	0.026	0.92
11	**Pizza & Bagels 24 Total Site Info**	3.04	132,295	25	36	16	0.48	20,800	1.0	10.5	95.5	2,167	76,267	0.016	0.57
	Raritan River North Branch Sites	**12.16**	**529,750**				**2.37**	**103,240**	**5.0**	**52.1**	**474.0**	**10,754**	**378,547**	**0.080**	**2.83**
12	**Mendham Animal Hospital Total Site Info**	2.91	126,630	27	3	14	0.40	17,580	0.8	8.9	80.7	1,831	64,460	0.014	0.48
13	**Mendham Hills Community Church Total Site Info**	6.19	269,785	9	20.01	24	1.47	64,060	3.1	32.4	294.1	6,673	234,887	0.050	1.76

Summary of Existing Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Existing Annual Loads (Commercial) TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (cu.ft.)	Annual (cu.ft.)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
14	**Westmont Montessori School**														
	Total Site Info	3.06	133,335	27	4	16	0.50	21,600	1.0	10.9	99.2	2,250	79,200	0.017	0.59

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 %
	Burnett Brook Sites	**32,400**	**0.74**	**0.844**	**141**	**61,940**	**2.32**				**$117,175**	**0.1**
1	**Black River Middle School**											
	Pervious pavement	16,470	0.38	0.429	72	31,490	1.18	3890	25	SF	$97,250	0.1
	Total Site Info	**16,470**	**0.38**	**0.429**	**72**	**31,490**	**1.18**				**$97,250**	**0.1**
2	**Black River Recreation**											
	Bioretention system	4,200	0.10	0.109	18	8,030	0.3	1050	5	SF	$5,250	1.0
	Total Site Info	**4,200**	**0.10**	**0.109**	**18**	**8,030**	**0.3**				**$5,250**	**1.0**
3	**Highlands Ridge Park**											
	Bioretention system	4,480	0.10	0.117	20	8,560	0.32	1120	5	SF	$5,600	0.2
	Total Site Info	**4,480**	**0.10**	**0.117**	**20**	**8,560**	**0.32**				**$5,600**	**0.2**
4	**New Jersey Highlands Council**											
	Bioretention system	7,250	0.17	0.189	32	13,860	0.52	1815	5	SF	$9,075	0.1
	Total Site Info	**7,250**	**0.17**	**0.189**	**32**	**13,860**	**0.52**				**$9,075**	**0.1**
	Lamington River Sites	**5,645**	**0.13**	**0.147**	**25**	**10,790**	**0.41**				**$28,550**	**0.0**
5	**Chester Township Municipal Building**											
	Bioretention system	525	0.01	0.014	2	1,000	0.04	130	5	SF	$650	0.0
	Pervious pavement	1,670	0.04	0.044	7	3,190	0.12	490	25	SF	$12,250	0.0
	Total Site Info	**2,195**	**0.05**	**0.057**	**10**	**4,190**	**0.16**				**$12,900**	**0.0**
6	**Kay Environmental Education Center**											
	Bioretention system	450	0.01	0.012	2	860	0.03	130	5	SF	$650	0.0
	Pervious pavement	3,000	0.07	0.078	13	5,740	0.22	600	25	SF	$15,000	0.0
	Total Site Info	**3,450**	**0.08**	**0.090**	**15**	**6,600**	**0.25**				**$15,650**	**0.1**
	Peapack Brook Sites	**72,465**	**1.66**	**1.888**	**316**	**138,550**	**5.22**				**$282,350**	**0.1**
7	**American Legion Post 342**											
	Bioretention system	800	0.02	0.021	3	1,530	0.06	225	5	SF	$1,125	0.1
	Pervious pavement	9,710	0.22	0.253	42	18,570	0.7	2000	25	SF	$50,000	1.0
	Total Site Info	**10,510**	**0.24**	**0.274**	**46**	**20,100**	**0.76**				**$51,125**	**1.0**

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP	Unit Cost ($/unit)	Unit	Total Cost ($)	I.C. Treated %
8	**Dickerson School & Bragg School**											
	Bioretention systems	8,765	0.20	0.228	38	16,760	0.63	2195	5	SF	$10,975	0.0
	Pervious pavement	36,695	0.84	0.956	160	70,150	2.64	6810	25	SF	$170,250	0.1
	Total Site Info	**45,460**	**1.04**	**1.184**	**198**	**86,910**	**3.27**				**$181,225**	**0.1**
9	**Hudson City Savings Bank**											
	Bioretention systems	3,150	0.07	0.082	14	6,020	0.23	790	5	SF	$3,950	0.0
	Total Site Info	**3,150**	**0.07**	**0.082**	**14**	**6,020**	**0.23**				**$3,950**	**0.0**
10	**Iandoli & Edens Attorneys at Law**											
	Bioretention system	3,560	0.08	0.093	16	6,810	0.26	890	5	SF	$4,450	0.1
	Pervious pavement	3,560	0.08	0.093	16	6,810	0.26	650	25	SF	$16,250	0.1
	Total Site Info	**7,120**	**0.16**	**0.186**	**31**	**13,620**	**0.52**				**$20,700**	**0.2**
11	**Pizza & Bagels 24**											
	Bioretention system	870	0.02	0.023	4	1,660	0.06	220	5	SF	$1,100	0.0
	Pervious pavement	5,355	0.12	0.140	23	10,240	0.38	970	25	SF	$24,250	0.3
	Total Site Info	**6,225**	**0.14**	**0.162**	**27**	**11,900**	**0.44**				**$25,350**	**0.3**
	Raritan River North Branch Sites	**10,265**	**0.24**	**0.234**	**44**	**17,150**	**0.64**				**$50,925**	**0.1**
12	**Mendham Animal Hospital**											
	Bioretention system	1,095	0.03	0.029	5	2,090	0.08	275	5	SF	$1,375	0.1
	Planter boxes	430	0.01	n/a	2	n/a	n/a	2	1000	box	$2,000	0.0
	Total Site Info	**1,525**	**0.04**	**0.029**	**6**	**2,090**	**0.08**				**$3,375**	**0.1**
13	**Mendham Hills Community Church**											
	Bioretention system	880	0.02	0.023	4	1,680	0.06	220	5	SF	$1,100	0.0
	Pervious pavement	5,450	0.13	0.142	24	10,420	0.39	1620	25	SF	$40,500	0.1
	Total Site Info	**6,330**	**0.15**	**0.165**	**28**	**12,100**	**0.45**				**$41,600**	**0.1**
14	**Westmont Montessori School**											
	Bioretention system	1,550	0.04	0.040	7	2,960	0.11	390	5	SF	$1,950	0.1
	Planter boxes	860	0.02	n/a	3	n/a	n/a	4	1000	box	$4,000	0.0
	Total Site Info	**2,410**	**0.06**	**0.040**	**10**	**2,960**	**0.11**				**$5,950**	**0.1**