RUTGERS
New Jersey Agricultural
Experiment Station

Draft

Impervious Cover Reduction Action Plan
for
High Bridge Borough, Hunterdon County, New Jersey

Prepared for High Bridge Borough by the
Rutgers Cooperative Extension Water Resources Program

January 27, 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 High Bridge Borough. We would like to thank the New Jersey Highlands Water Protection and Planning Council, the New Jersey Agricultural Experiment Station, and High Bridge Borough for their input and support in creating this document.

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Introduction

Located in Hunterdon County, New Jersey, High Bridge Borough covers approximately 2.43 square miles. Figures 1 and 2 illustrate that High Bridge Borough is dominated by urban land use. A total of 51.2% of the municipality's land use is classified as urban. Of the urban land in High Bridge Borough, medium density 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 High Bridge Borough 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 High Bridge Borough. Based upon the 2015 NJDEP land use/land cover data, approximately 14.1% of High Bridge Borough has impervious cover. This level of impervious cover suggests that the streams in High Bridge Borough are likely impacted streams. [1]

Methodology

High Bridge Borough contains portions of two subwatersheds (Figure 4). For this impervious cover reduction action plan, projects have been identified in one 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.

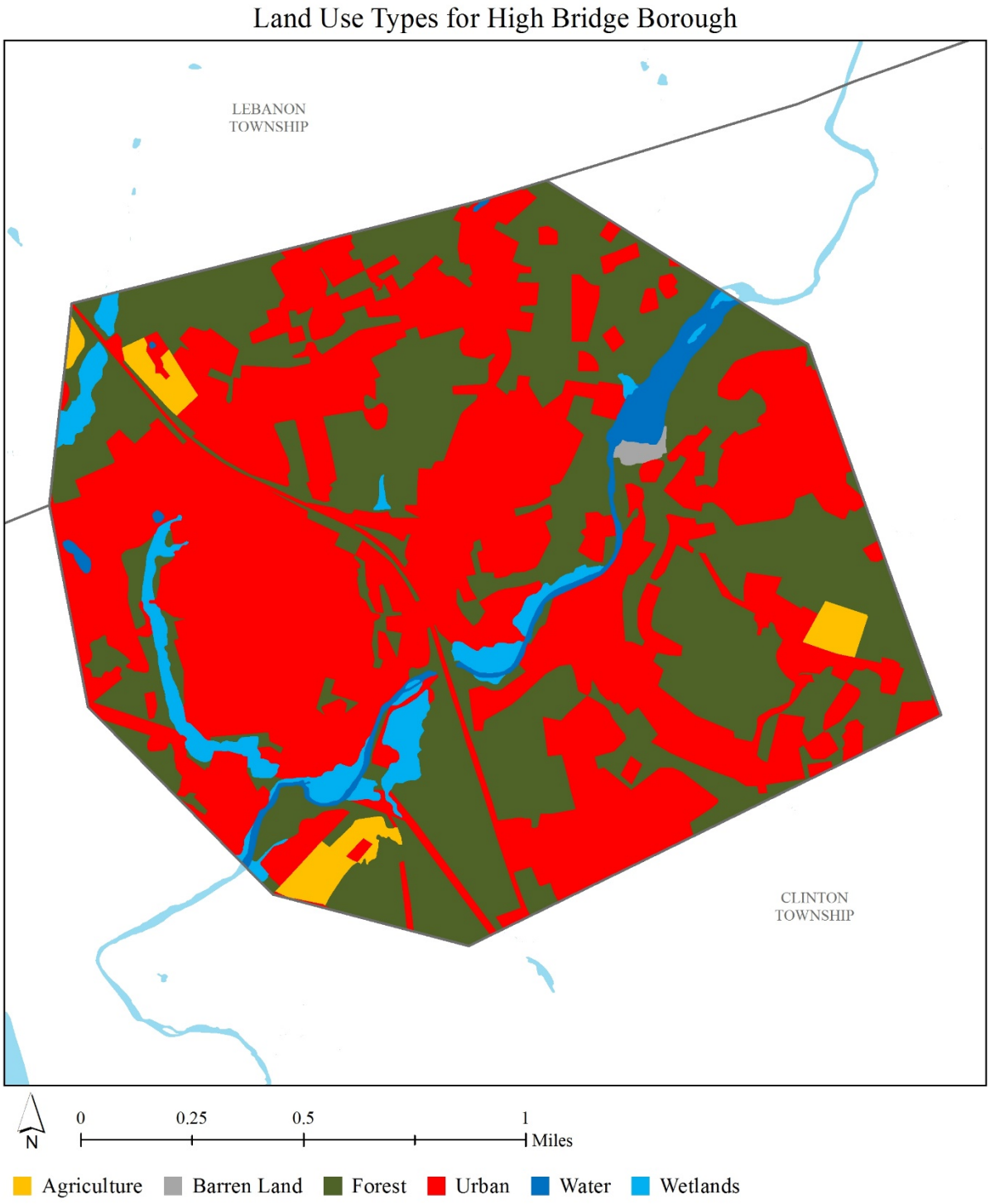


Figure 1: Map illustrating the land use in High Bridge Borough

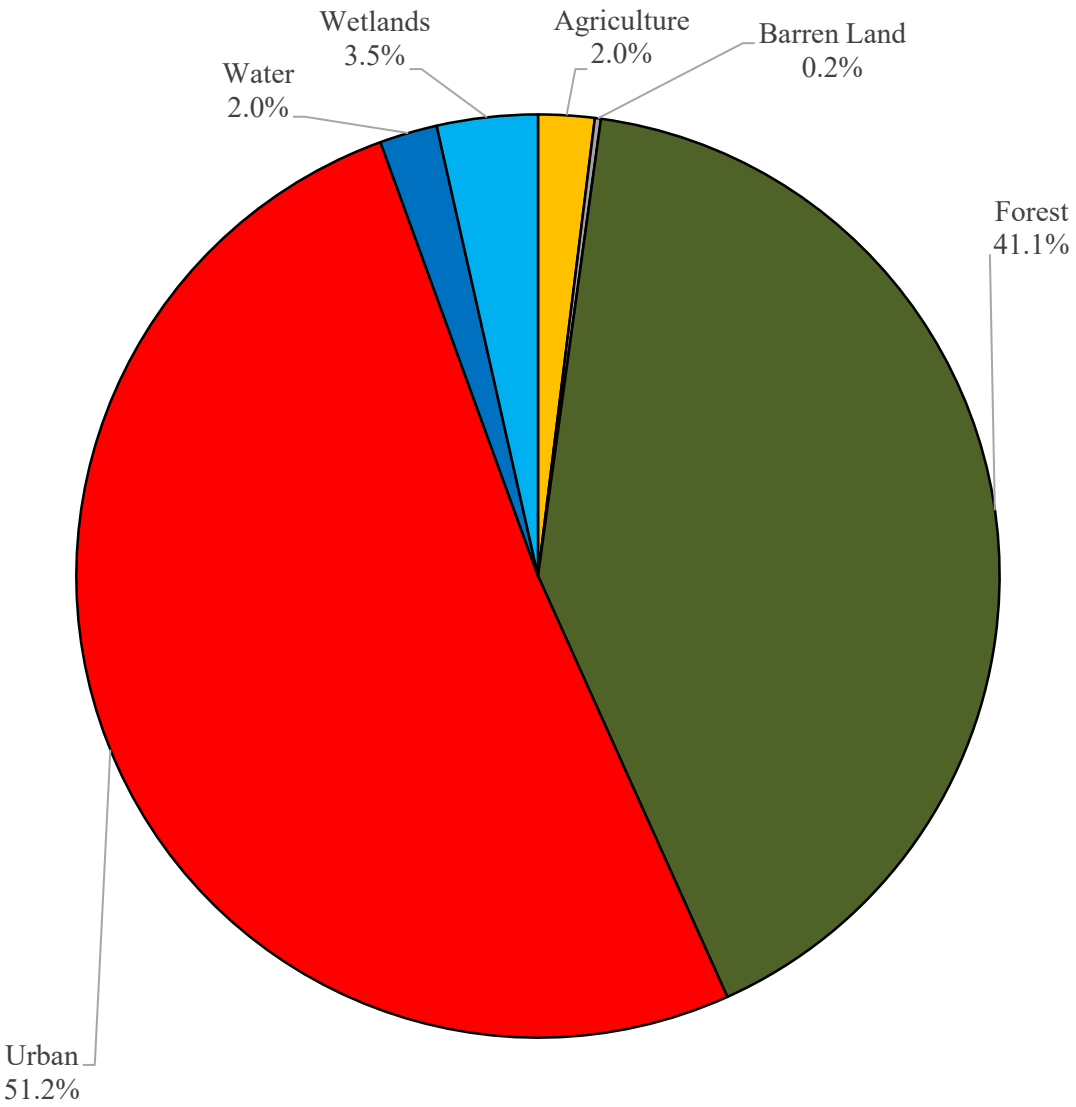


Figure 2: Pie chart illustrating the land use in High Bridge Borough

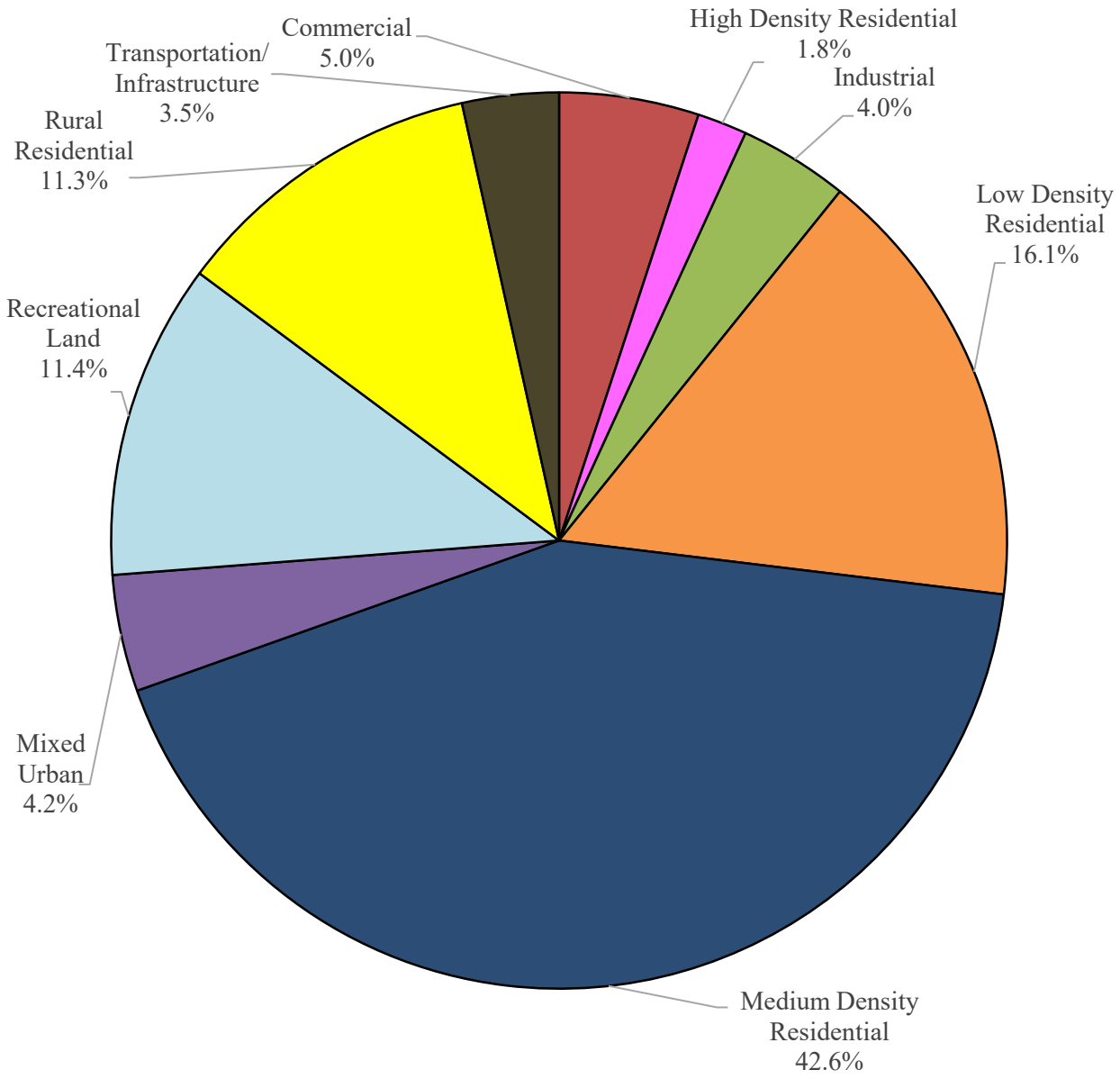


Figure 3: Pie chart illustrating the various types of urban land use in High Bridge Borough

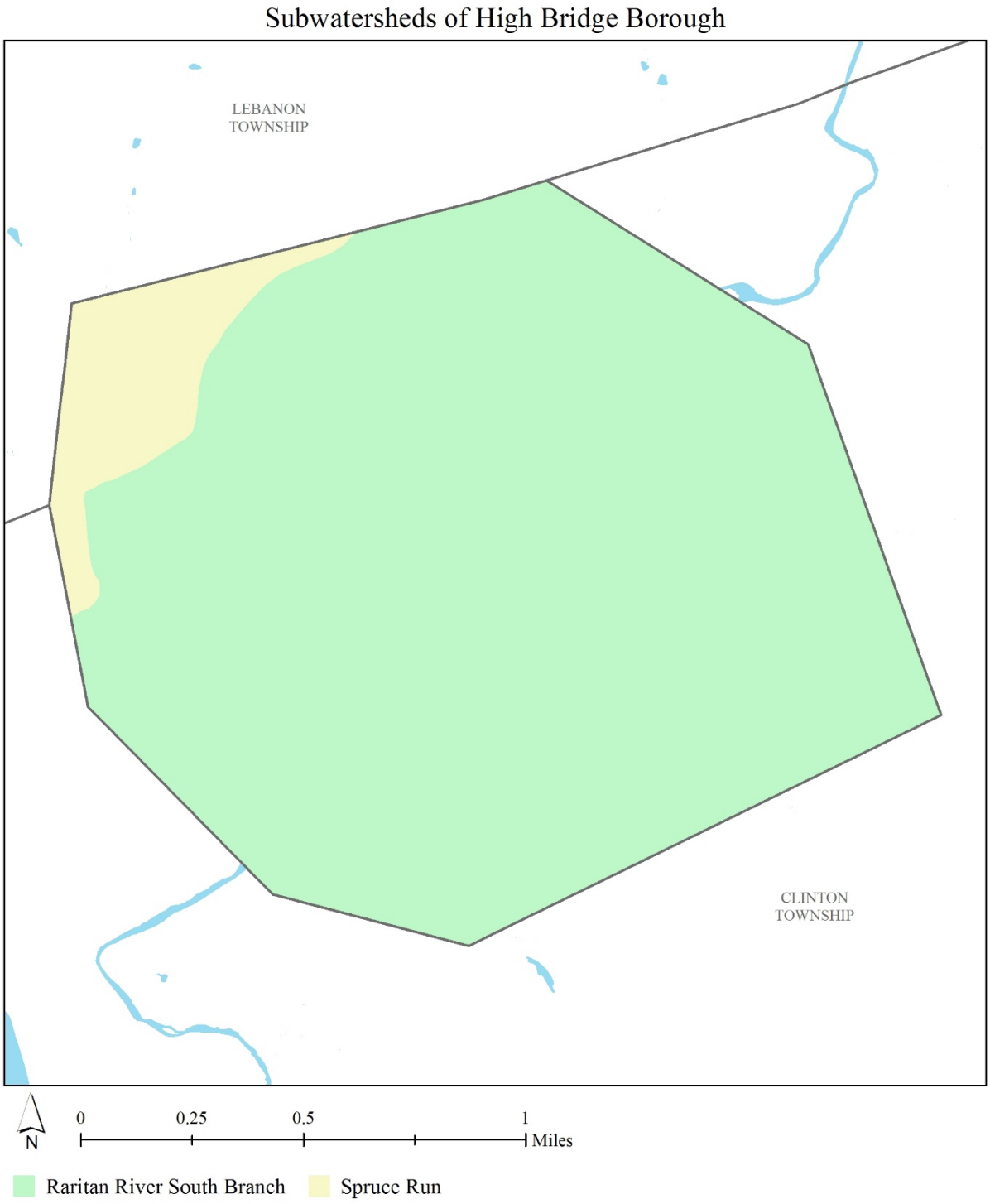


Figure 4: Map of the subwatersheds in High Bridge Borough

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 High Bridge Borough 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 High Bridge Borough. 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.

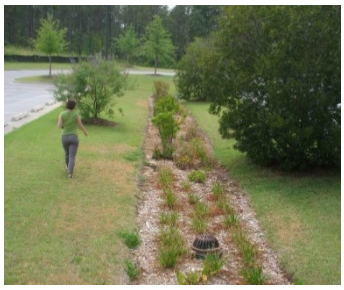
Downspout planter boxes

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

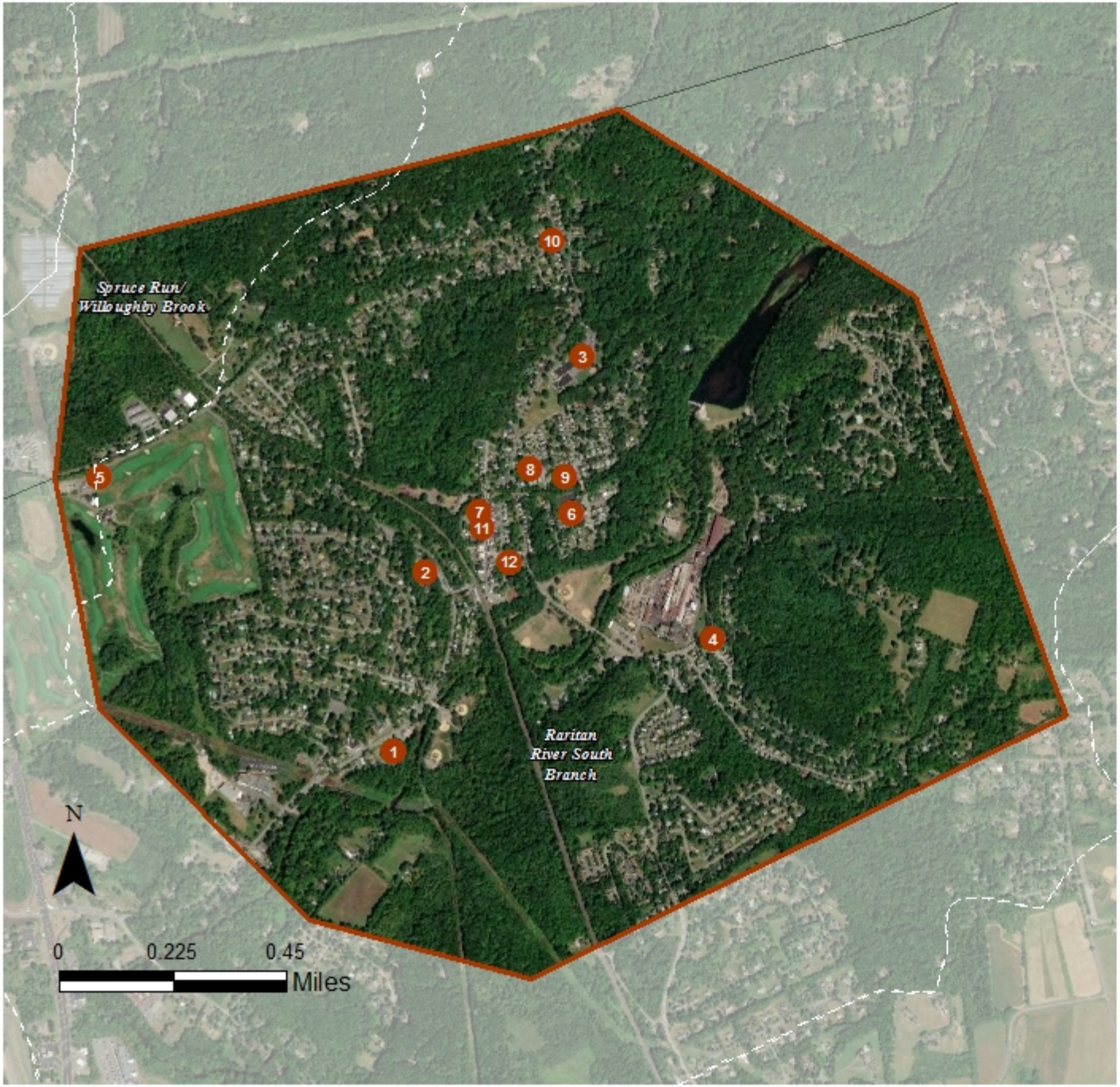
This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented by a wide variety of people such as boy scouts,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

HIGH BRIDGE BOROUGH: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE RARITAN RIVER SOUTH BRANCH SUBWATERSHED

1. Borough of High Bridge Municipal Buildings
2. High Bridge Department of Works
3. High Bridge Elementary School
4. High Bridge Fire Department
5. High Bridge Golf Club
6. High Bridge Middle School
7. High Bridge Public Library
8. High Bridge Reformed Church
9. High Bridge United Methodist Church
10. Hilltop Deli & Catering
11. St. Joseph Church
12. United States Postal Service

b. Proposed Green Infrastructure Concepts

BOROUGH OF HIGH BRIDGE MUNICIPAL BUILDINGS

Subwatershed: Raritan River South Branch

Site Area: 233,539 sq. ft.

Address: 97 West Main Street
High Bridge, NJ 08829

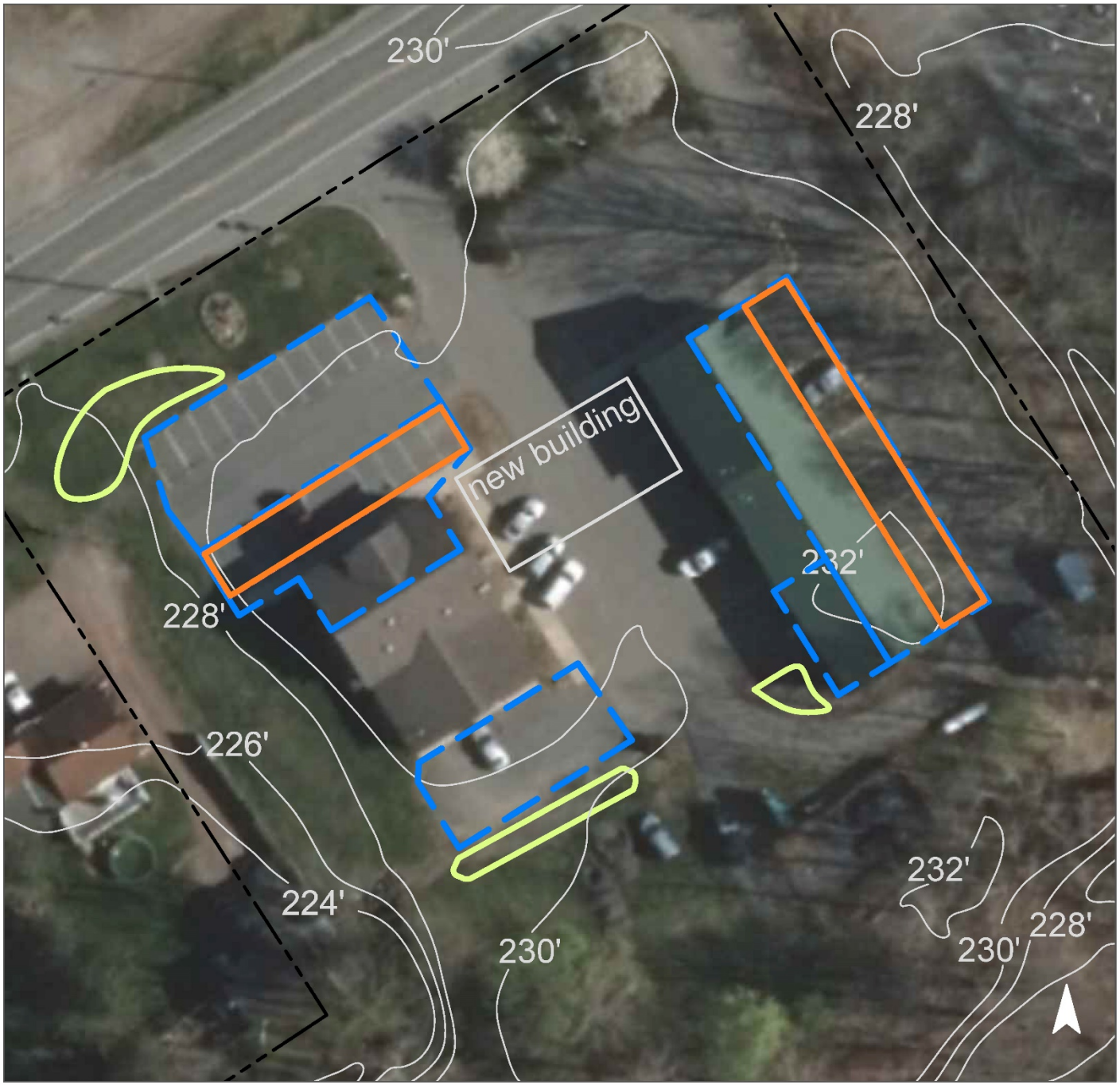
Block and Lot: Block 30
Lot 12

Parking spaces in the parking lot to the north and east of the building can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot and downspouts. Porous pavements can support parked vehicles while allowing stormwater to infiltrate and have an underlying stone layer to store and slowly release captured stormwater into the ground. Rain gardens can be installed in the turfgrass areas adjacent to the parking lot areas to capture additional 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"
23	53,215	2.6	26.9	244.3	0.041	1.46

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	0.172	29	13,030	0.50	1,650	$8,250
Pervious pavement	0.206	35	15,630	0.60	3,925	$98,125

GREEN INFRASTRUCTURE RECOMMENDATIONS



Borough of High Bridge Municipal Buildings

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

0 50' 100'

HIGH BRIDGE DEPARTMENT OF WORKS

Subwatershed: Raritan River South Branch

Site Area: 139,031 sq. ft.

Address: 26 Main Street
High Bridge, NJ 08829

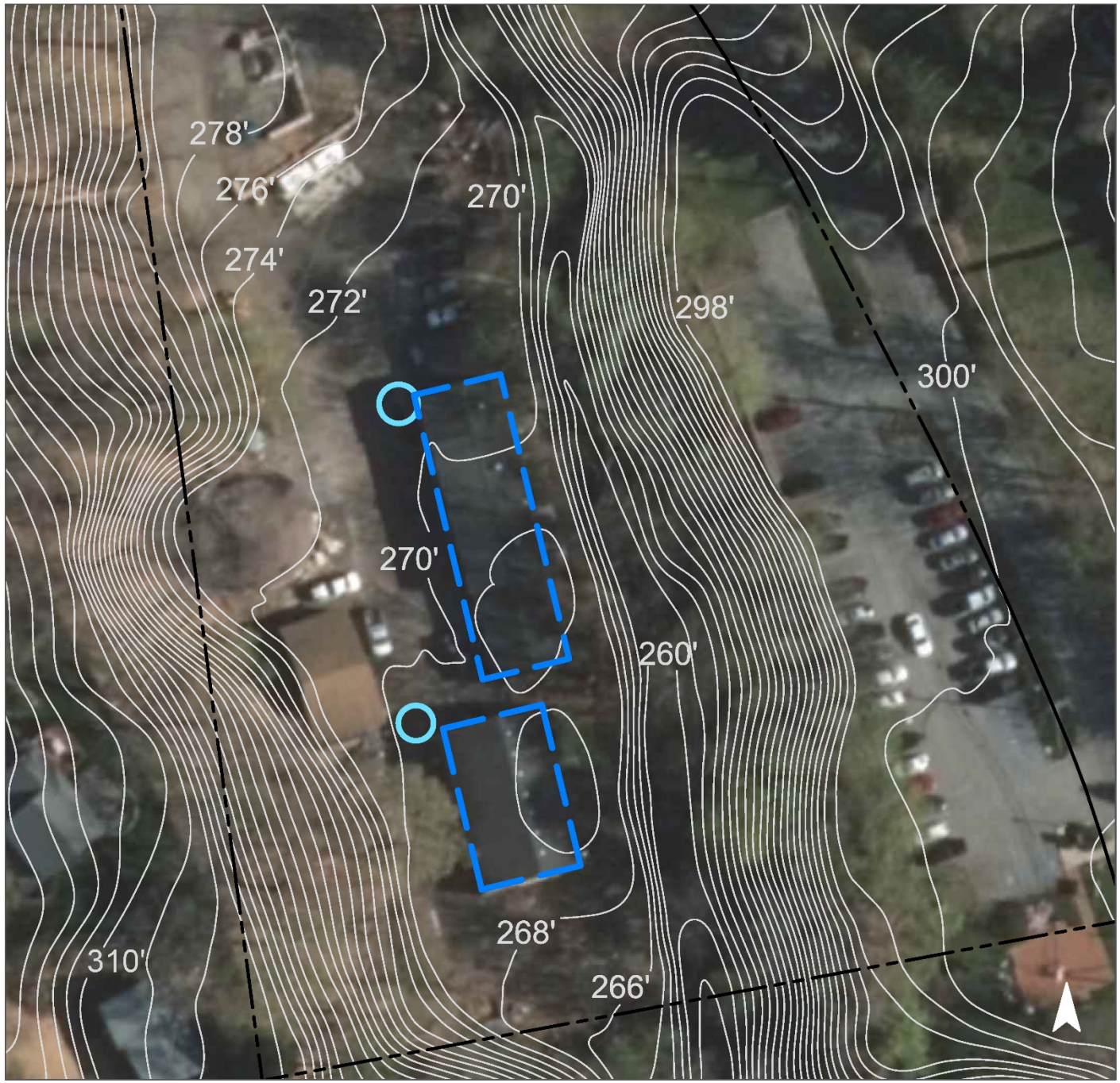
Block and Lot: Block 25
Lot 1

Downspouts on the garages at the High Bridge Department of Works can be connected to cisterns to harvest rainwater from the rooftops. Collected rainwater from the cisterns can then be used for washing public works vehicles as part of a green car wash or be used to water landscaping. 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"
42	57,929	2.8	29.3	266.0	0.045	1.59

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
Rainwater harvesting	0.167	28	5,000	0.19	5,000 (gal)	$10,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



High Bridge
Department of Works

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

0 30' 60'

HIGH BRIDGE ELEMENTARY SCHOOL

Subwatershed: Raritan River South Branch

Site Area: 983,059 sq. ft.

Address: 40 Fairview Avenue
High Bridge, NJ 08829

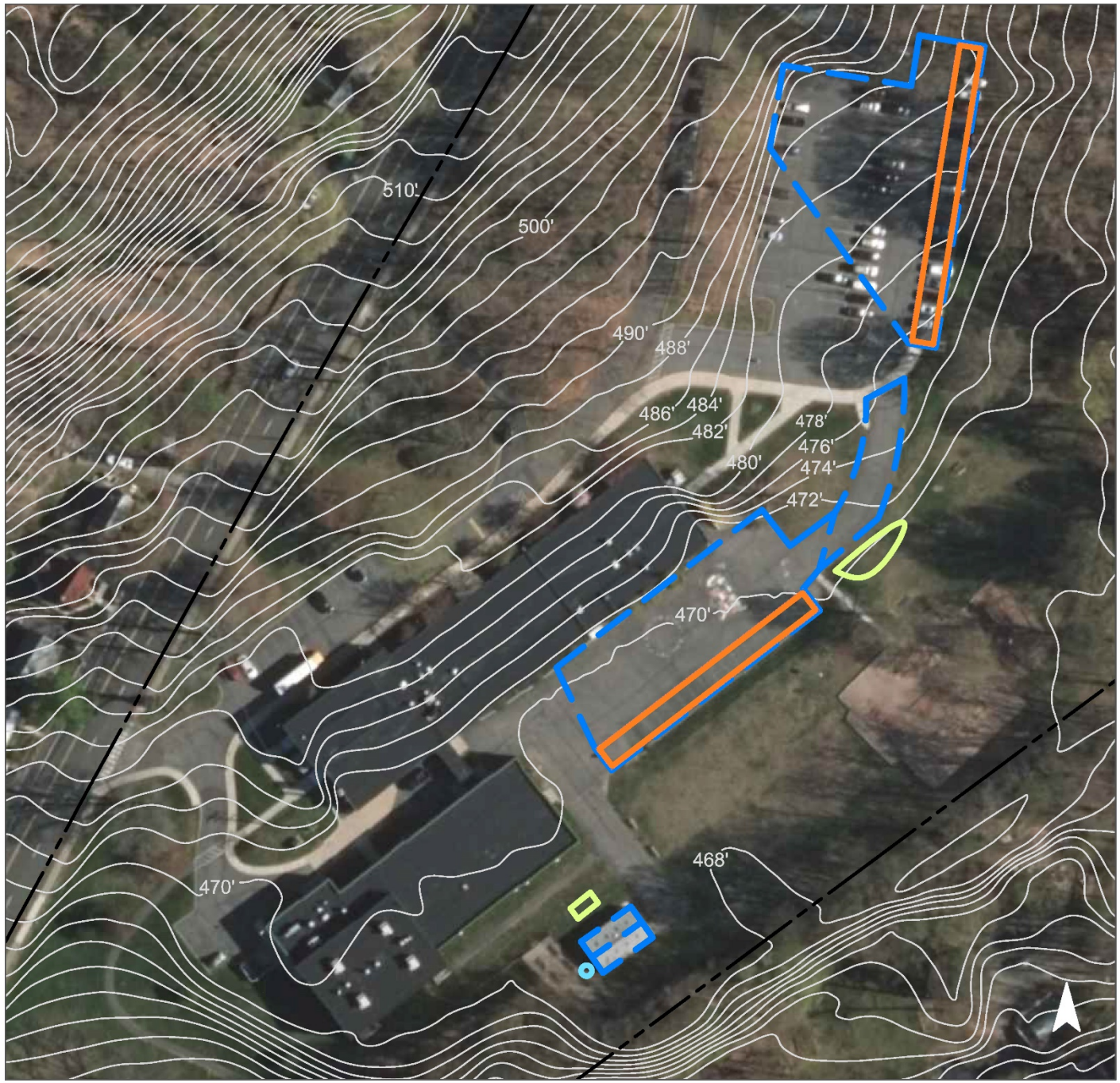
Block and Lot: Block 15
Lot 19

A rain garden can be installed in the turfgrass area near the garden shed and another near the rear parking lot to capture, treat, and infiltrate stormwater runoff from the roof and parking lot. Parking spaces can be converted to porous pavement to intercept water before reaching nearby catch basins. A small cistern could be installed on the shed to collect water for use in watering the garden. 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	197,850	9.5	99.9	908.4	0.154	5.43

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	0.083	14	6,270	0.24	800	$4,000
Pervious pavement	0.791	132	59,940	2.32	6,700	$167,500
Rainwater harvesting	0.013	2	400	0.02	400 (gal)	$800

GREEN INFRASTRUCTURE RECOMMENDATIONS



High Bridge Elementary School

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

0 50' 100'

HIGH BRIDGE FIRE DEPARTMENT

Subwatershed: Raritan River South Branch

Site Area: 132,142 sq. ft.

Address: 7 Maryland Avenue
High Bridge, NJ 08829

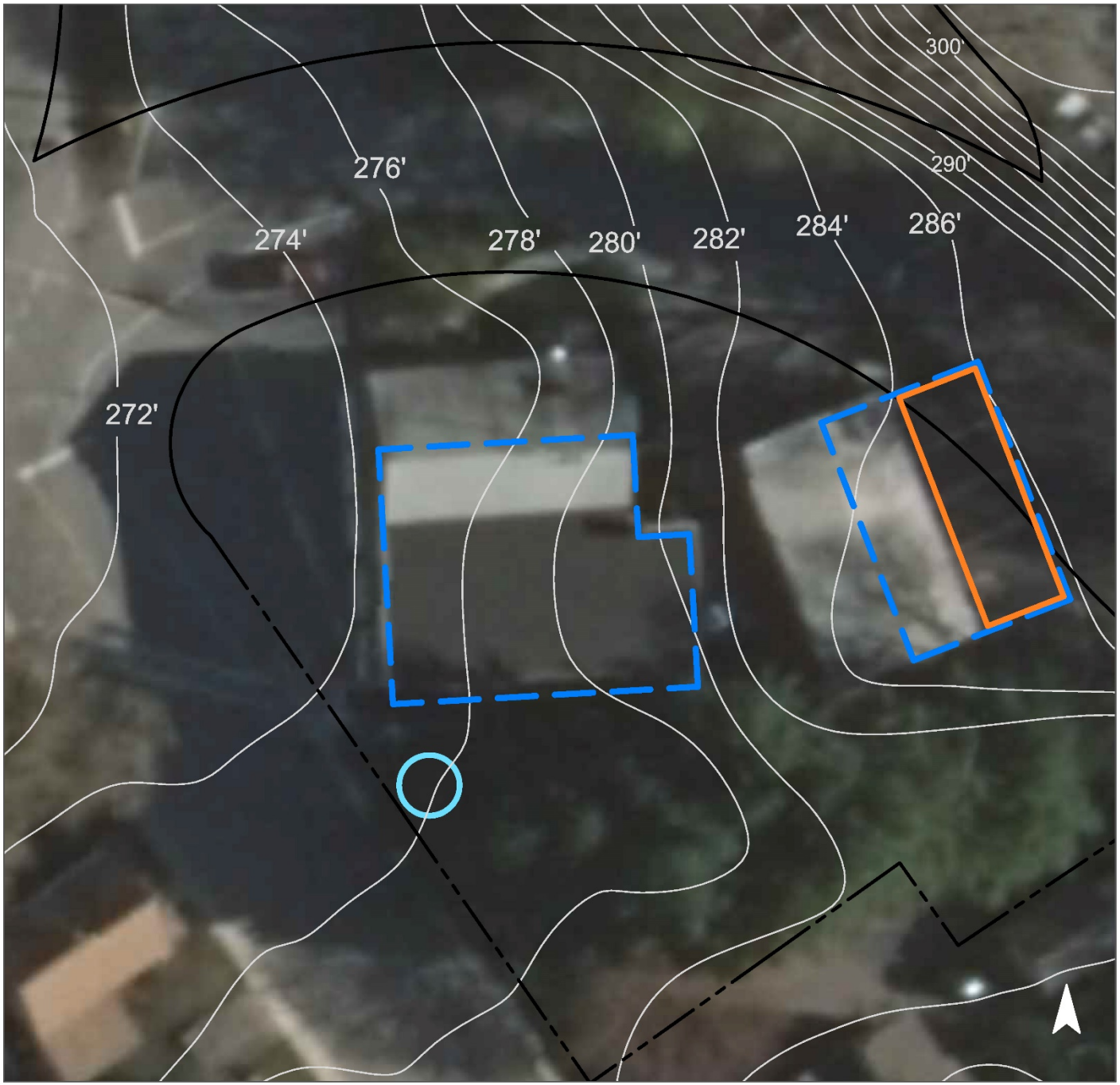
Block and Lot: Block 37; 38
Lot 23, 24, 25; 1

The connected downspouts of the High Bridge Fire Department, near the south end, can be rerouted into a cistern. The cistern can capture and store rainwater from the rooftop that can then be used for washing fire department vehicles or watering landscaping. The parking spaces adjacent to the side building can be repaved with porous asphalt. 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"
13	16,632	0.8	8.4	76.4	0.013	0.46

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	0.043	7	3,250	0.13	900	$22,500
Rainwater harvesting	0.073	12	2,200	0.08	2,200 (gal)	$4,400

GREEN INFRASTRUCTURE RECOMMENDATIONS



High Bridge Fire Department

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

0 15' 30'

HIGH BRIDGE GOLF CLUB

Subwatershed: Raritan River South Branch

Site Area: 4,084,581 sq. ft.

Address: 203 Cregar Road
High Bridge, NJ 08829

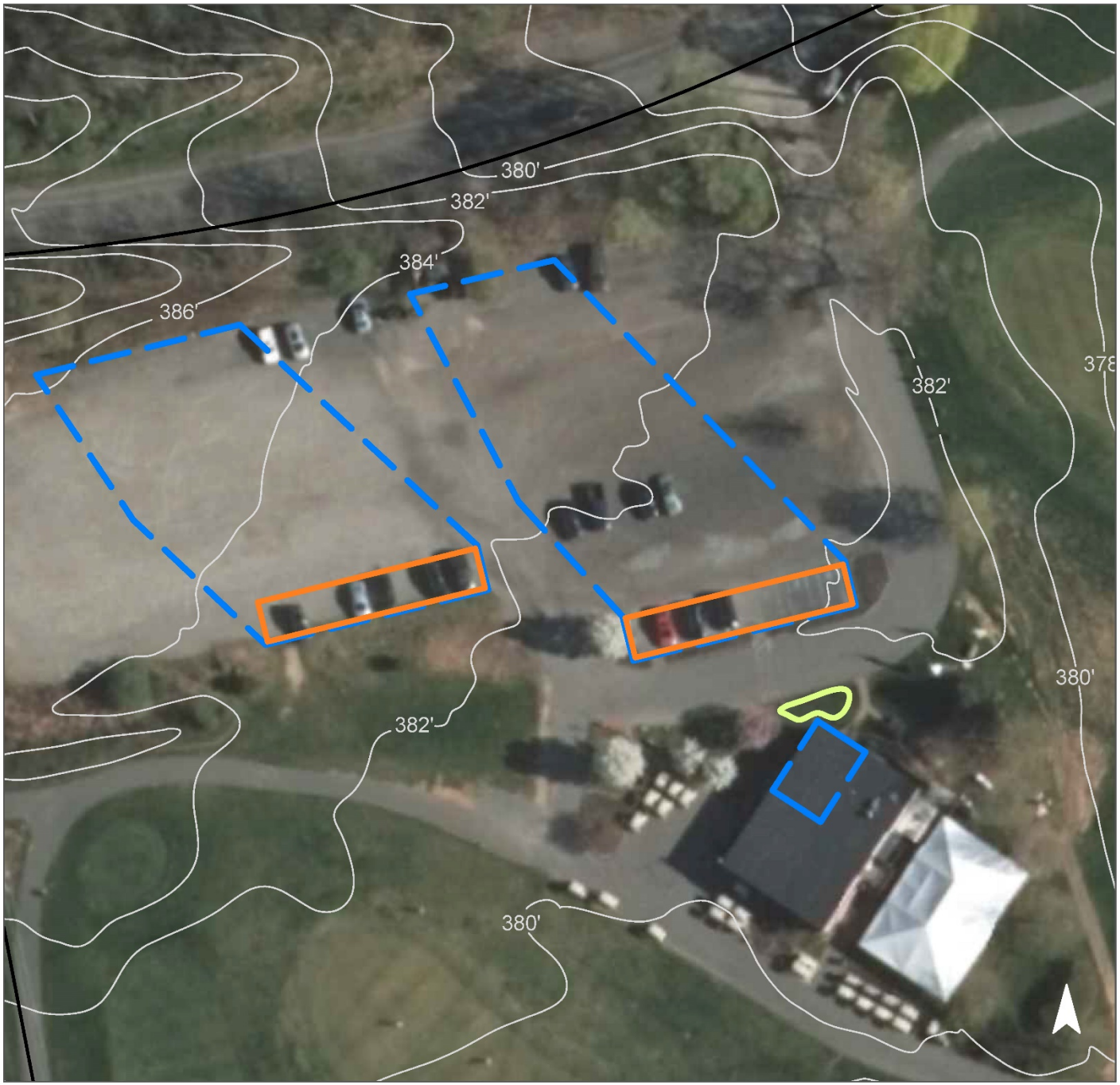
Block and Lot: Block 20
Lot 1, 1.01

Near the entrance of the main building, a rain garden can be installed to collect water from the rooftop. Areas of the parking lot can be retrofitted with porous pavement 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"
7	280,165	13.5	141.5	1,286.3	0.218	7.68

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 system	0.019	3	1,440	0.06	185	$925
Pervious pavement	0.473	79	35,810	1.38	3,240	$81,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



High Bridge Golf Club

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

0 30' 60'

HIGH BRIDGE MIDDLE SCHOOL

Subwatershed: Raritan River South Branch

Site Area: 96,239 sq. ft.

Address: 50 Thomas Street
High Bridge, NJ 08829

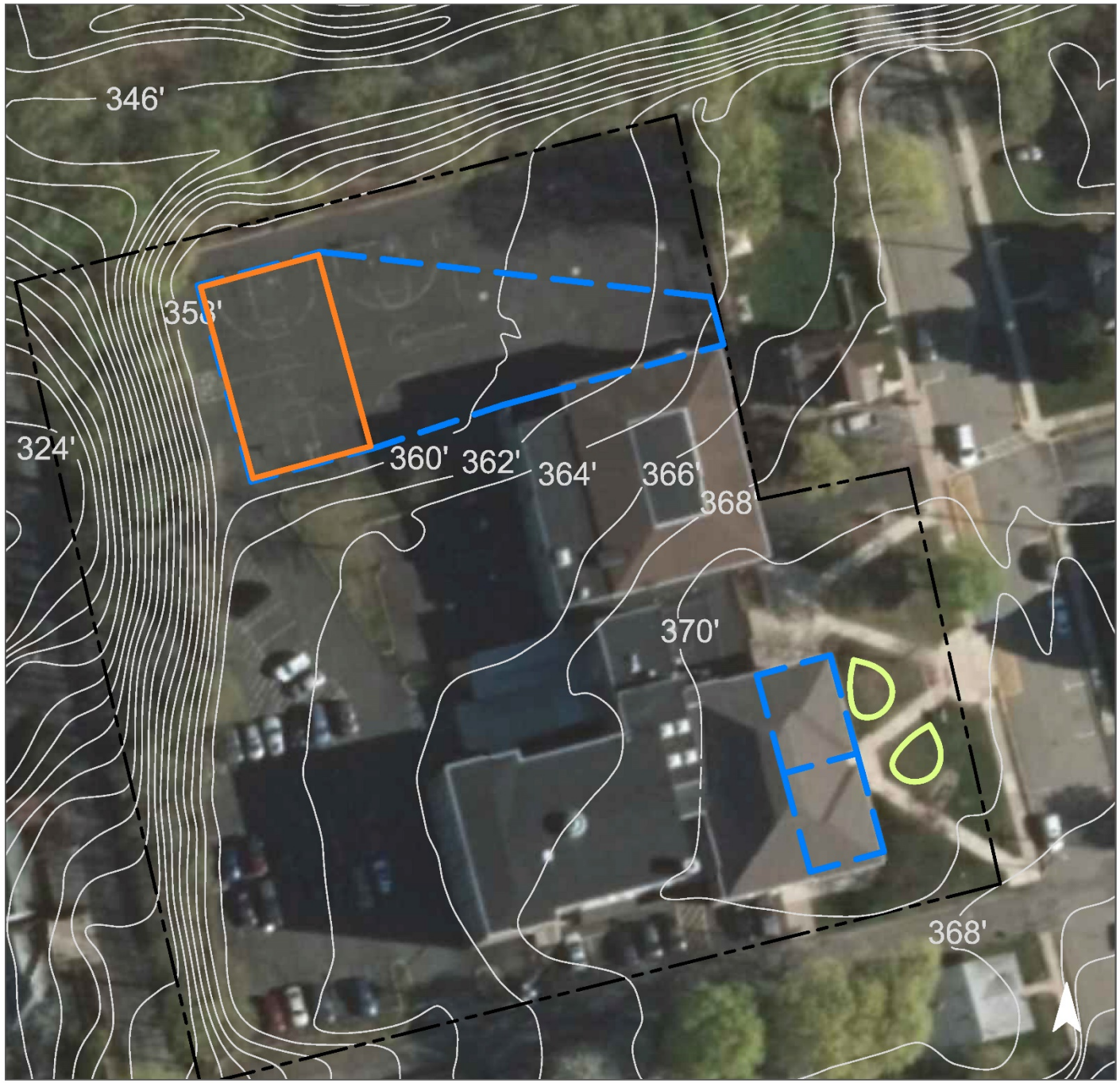
Block and Lot: Block 4.05
Lot 57

Rain gardens can be installed on the front lawn of the school to capture, filter, and infiltrate rainwater from the rooftop by redirecting downspouts into them. The blacktop playground area could be partially or fully repaved with pervious pavement to capture additional stormwater. 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"
72	69,508	3.4	35.1	319.1	0.054	1.91

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 systems	0.063	10	4,730	0.18	600	$3,000
Pervious pavement	0.287	48	21,710	0.84	4,000	$100,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



High Bridge Middle School

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

0 30' 60'

HIGH BRIDGE PUBLIC LIBRARY

Subwatershed: Raritan River South Branch

Site Area: 13,154 sq. ft.

Address: 71 Main Street
High Bridge, NJ 08829

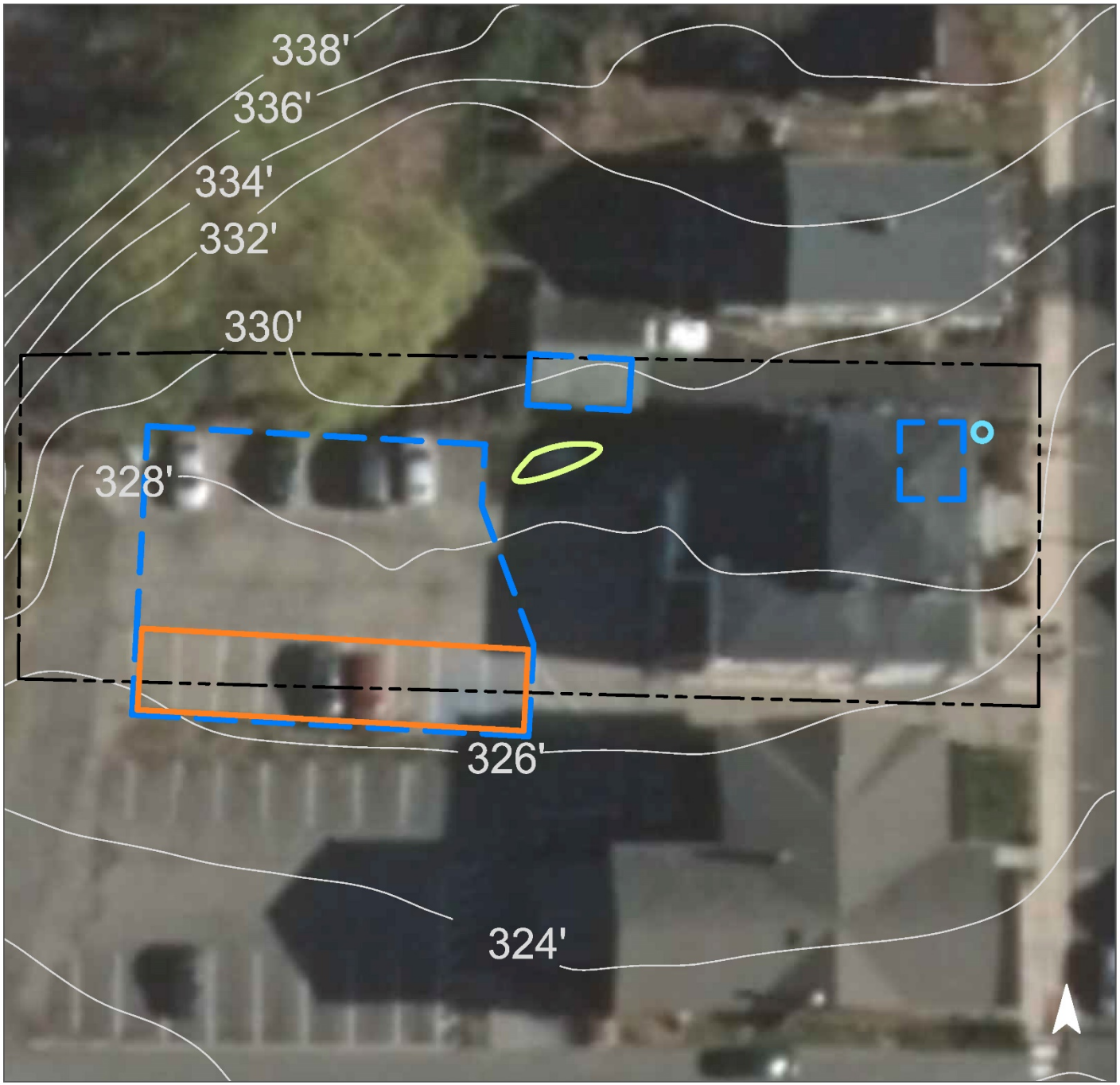
Block and Lot: Block 19.02
Lot 81

A rain barrel could be installed at one of the downspouts to collect rainwater to be used for watering the plants at the front of the building. A rain garden could be installed adjacent to the neighboring shed if the homeowner gives permission to redirect their gutter into it. The parking space could be repaved with porous asphalt to capture a majority 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"
78	10,299	0.5	5.2	47.3	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	0.005	1	400	0.02	50	$250
Pervious pavement	0.107	18	8,150	0.31	1,400	$35,000
Rainwater harvesting	0.002	0	55	0.00	55 (gal)	$250

GREEN INFRASTRUCTURE RECOMMENDATIONS



High Bridge Public Library

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

0 15' 30'

HIGH BRIDGE REFORMED CHURCH

Subwatershed: Raritan River South Branch

Site Area: 32,614 sq. ft.

Address: 23 Church Street
High Bridge, NJ 08829

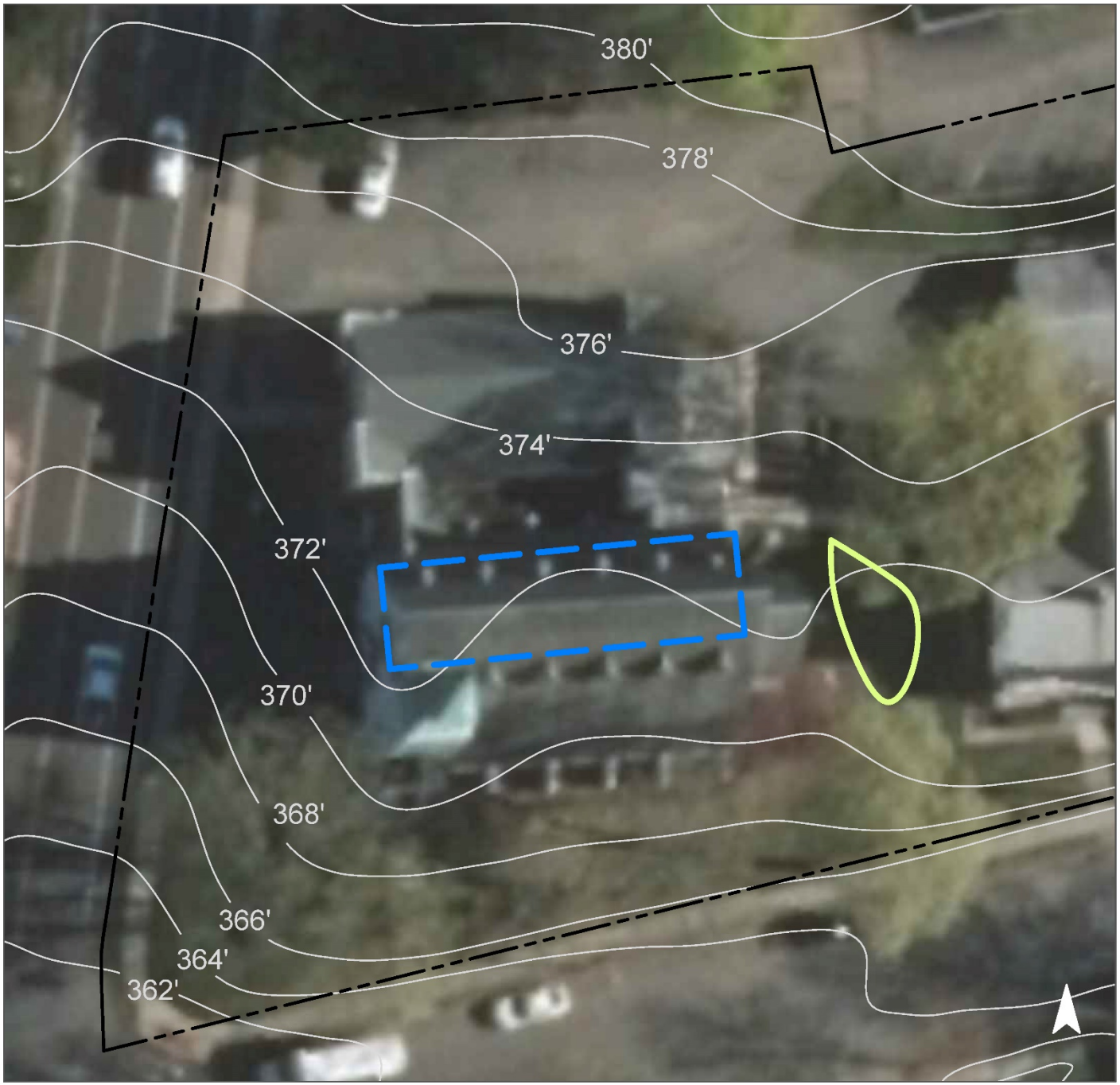
Block and Lot: Block 11
Lot 6, 7

A rain garden to the east the church can be installed to capture, filter, and infiltrate roof runoff. The garden will also provide aesthetic value to the property, attract natural pollinators, and create an education experience. 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"
74	23,993	1.2	12.1	110.2	0.019	0.66

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	0.036	6	2,760	0.11	350	$1,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



High Bridge Reformed Church

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

0 15' 30'

HIGH BRIDGE UNITED METHODIST CHURCH

Subwatershed: Raritan River South Branch

Site Area: 20,876 sq. ft.

Address: 36 Church Street
High Bridge, NJ 08829

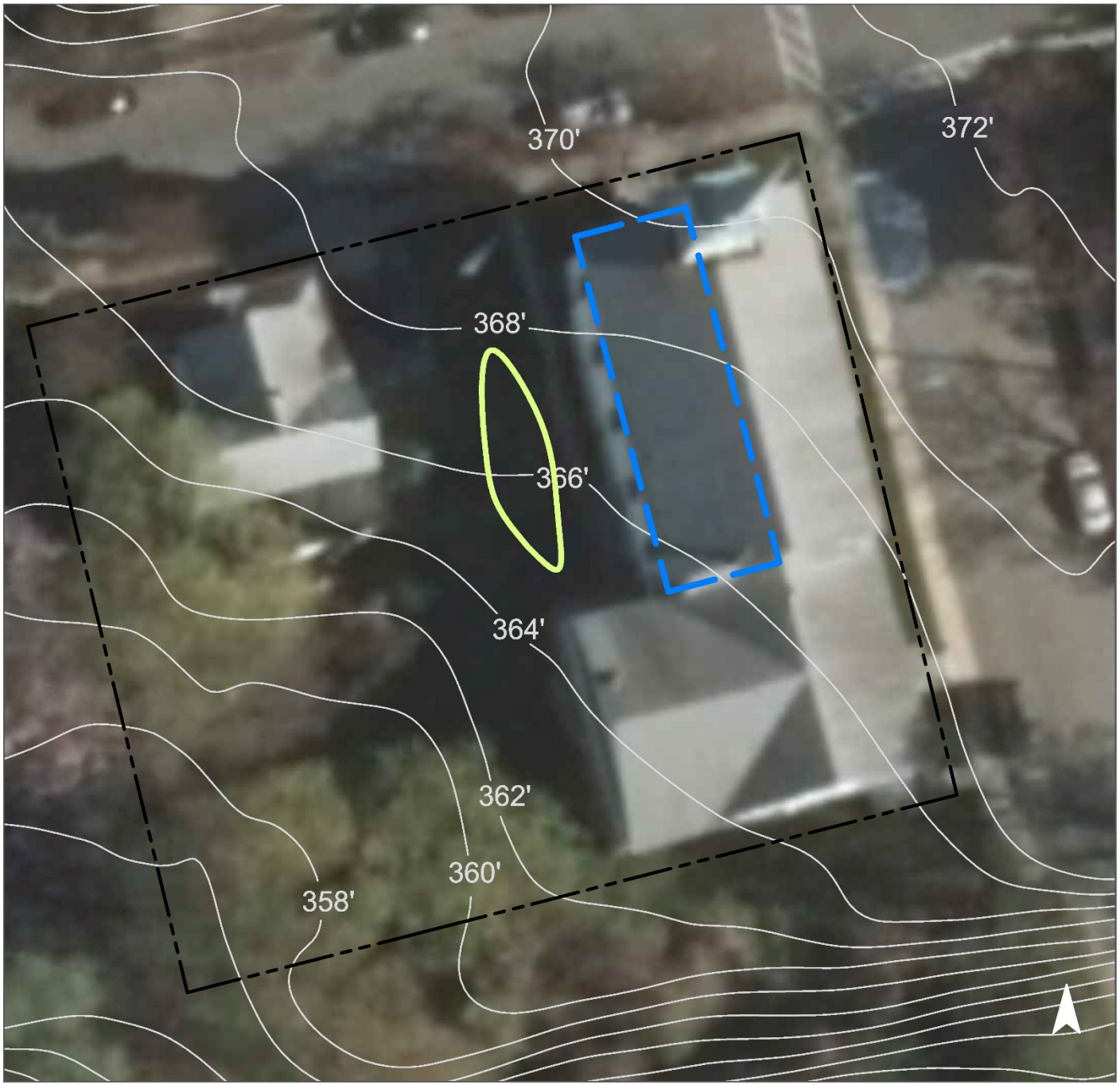
Block and Lot: Block 4.03
Lot 3, 4

A rain garden can be installed to the west of the church to capture, treat, and infiltrate stormwater from the rooftop. The garden will provide aesthetic value to the property, attract natural pollinators, and create an education experience. 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"
61	12,632	0.6	6.4	58.0	0.010	0.35

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	0.042	7	3,200	0.12	410	$2,050

GREEN INFRASTRUCTURE RECOMMENDATIONS



High Bridge United Methodist Church

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

0 15' 30'

HILLTOP DELI & CATERING

Subwatershed: Raritan River South Branch

Site Area: 7,042 sq. ft.

Address: 115 Fairview Avenue
High Bridge, NJ 08829

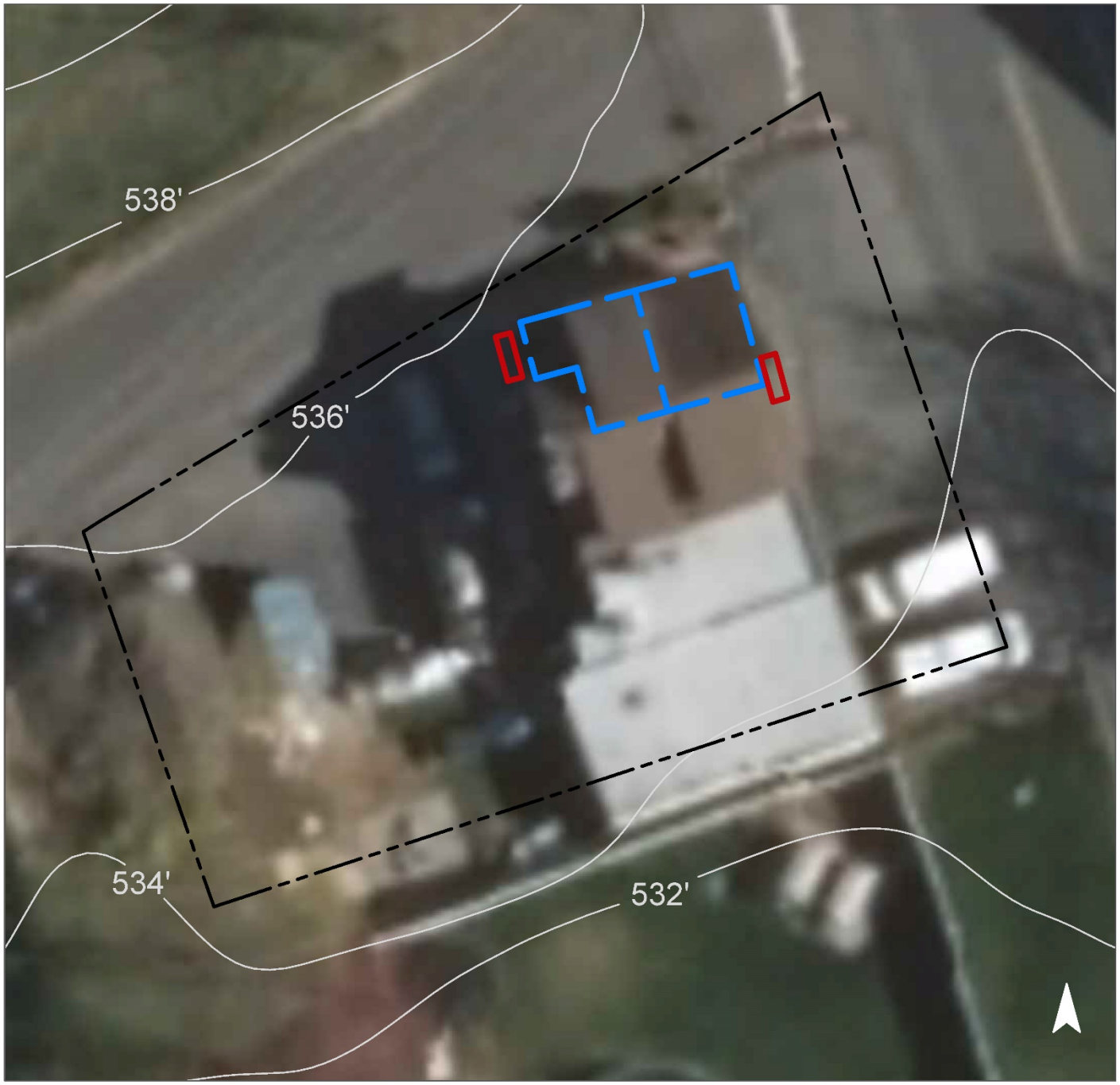
Block and Lot: Block 17
Lot 1

Downspout planter boxes can be installed at the downspouts of the building. Downspout planter boxes are constructed at the base of downspouts with plants that will utilize rooftop runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
42	2,992	0.1	1.5	13.7	0.002	0.08

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size	Estimated Cost
Planter boxes	n/a	2	n/a	n/a	2 (boxes)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Hilltop Deli & Catering

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

0 10' 20'

ST. JOSEPH CHURCH

Subwatershed: Raritan River South Branch

Site Area: 20,531 sq. ft.

Address: 59 Main Street
High Bridge, NJ 08829

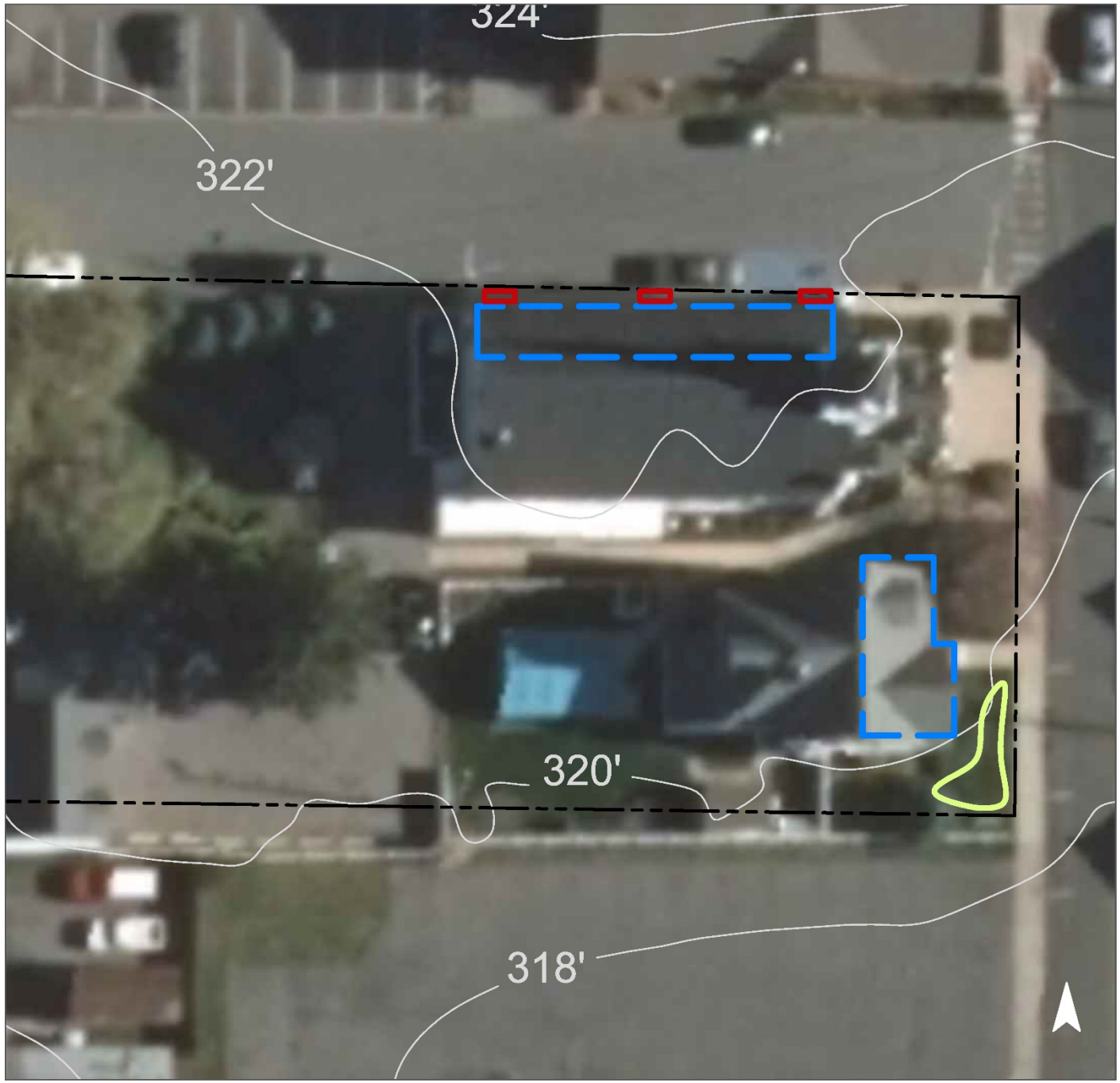
Block and Lot: Block 19.03
Lot 83, 83.01, 83.02

The downspouts along the north side of the building can be rerouted into downspout planter boxes to filter roof runoff. A small rain garden can be installed at the front of the building by redirecting downspouts into it. 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"
81	16,683	0.8	8.4	76.6	0.013	0.46

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	0.015	2	1,110	0.04	140	$700
Planter boxes	n/a	2	n/a	n/a	3 (boxes)	$3,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



St. Joseph Church

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

0 15' 30'

UNITED STATES POSTAL SERVICE

Subwatershed: Raritan River South Branch

Site Area: 10,090 sq. ft.

Address: 10 McDonald Street
High Bridge, NJ 08829

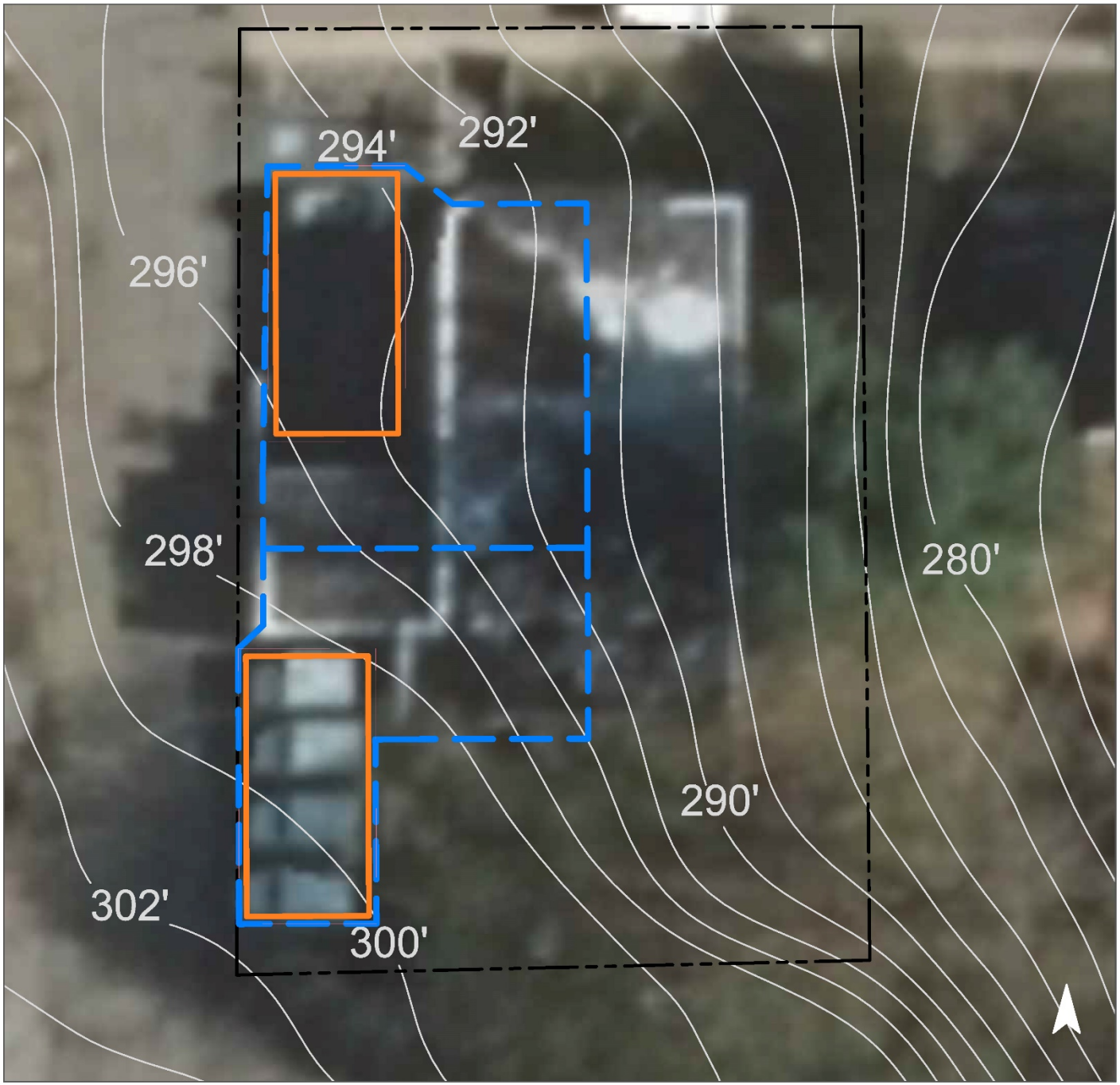
Block and Lot: Block 29.02
Lot 5

The parking spaces to the north and south of the building can be converted into porous pavement. Porous pavement will allow water directed from the rooftop to pass through where it is stored and allowed to infiltrate into the ground. 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"
72	7,228	0.3	3.7	33.2	0.006	0.20

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.092	15	6,990	0.27	1,300	$32,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



United States Postal Service

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

0 10' 20'

c. Summary of Existing Conditions

Summary of Existing Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Existing Annual Loads (Commercial)			Runoff Volumes from I.C.		Runoff Volumes from I.C.	
									TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Water Quality Storm (1.25" over 2-hours) (cu.ft.)	Annual (cu.ft.)	Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
	Raritan River South Branch Subwatershed SITES	**132.53**	**5,772,898**				**17.20**	**749,125**	**36.1**	**378.3**	**3,439.5**	**78,034**	**2,746,791**	**0.584**	**20.55**
1	**Borough of High Bridge Municipal Buildings**														
	Total Site Info	5.36	233,539	30	12	23	1.22	53,215	2.6	26.9	244.3	5,543	195,120	0.041	1.46
2	**High Bridge Department of Works**														
	Total Site Info	3.19	139,031	25	1	42	1.33	57,929	2.8	29.3	266.0	6,034	212,406	0.045	1.59
3	**High Bridge Elementary School**														
	Total Site Info	22.57	983,059	15	19	20	4.54	197,850	9.5	99.9	908.4	20,609	725,451	0.154	5.43
4	**High Bridge Fire Department**														
	Total Site Info	3.03	132,142	37; 38	23,24,25, 1	13	0.38	16,632	0.8	8.4	76.4	1,733	60,985	0.013	0.46
5	**High Bridge Golf Club**														
	Total Site Info	93.77	4,084,581	20	1, 1.01	7	6.43	280,165	13.5	141.5	1,286.3	29,184	1,027,272	0.218	7.68
6	**High Bridge Middle School**														
	Total Site Info	2.21	96,239	4.05	57	72	1.60	69,508	3.4	35.1	319.1	7,240	254,864	0.054	1.91
7	**High Bridge Public Library**														
	Total Site Info	0.30	13,154	19.02	81	78	0.24	10,299	0.5	5.2	47.3	1,073	37,761	0.008	0.28
8	**High Bridge Reformed Church**														
	Total Site Info	0.75	32,614	11	6, 7	74	0.55	23,993	1.2	12.1	110.2	2,499	87,973	0.019	0.66
9	**High Bridge United Methodist Church**														
	Total Site Info	0.48	20,876	4.03	3, 4	61	0.29	12,632	0.6	6.4	58.0	1,316	46,316	0.010	0.35
10	**Hilltop Deli & Catering**														
	Total Site Info	0.16	7,042	17	1	42	0.07	2,992	0.1	1.5	13.7	312	10,969	0.002	0.08
11	**St. Joseph Church**														
	Total Site Info	0.47	20,531	19.03	83, 83.01, 83.02	81	0.38	16,683	0.8	8.4	76.6	1,738	61,170	0.013	0.46
12	**United States Postal Service**														
	Total Site Info	0.23	10,090	29.02	5	72	0.17	7,228	0.3	3.7	33.2	753	26,503	0.006	0.20

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 %
	Raritan River South Branch Subwatershed SITES	**104,285**	**2.39**	**2.689**	**454**	**192,075**	**7.41**				**$578,000**	**13.9%**
1	**Borough of High Bridge Municipal Buildings**											
	Bioretention systems	6,600	0.15	0.172	29	13,030	0.50	1,650	$5	SF	$8,250	12.4%
	Pervious pavement	7,920	0.18	0.206	35	15,630	0.60	3,925	$25	SF	$98,125	14.9%
	Total Site Info	**14,520**	**0.33**	**0.378**	**63**	**28,660**	**1.10**				**$106,375**	**27.3%**
2	**High Bridge Department of Works**											
	Rainwater harvesting	6,415	0.15	0.167	28	5,000	0.19	5,000	$2	gal	$10,000	11.1%
	Total Site Info	**6,415**	**0.15**	**0.167**	**28**	**5,000**	**0.19**				**$10,000**	**11.1%**
3	**High Bridge Elementary School**											
	Bioretention systems	3,175	0.07	0.083	14	6,270	0.24	800	$5	SF	$4,000	1.6%
	Pervious pavement	30,365	0.70	0.791	132	59,940	2.32	6,700	$25	SF	$167,500	15.3%
	Rainwater harvesting	500	0.01	0.013	2	400	0.02	400	$2	gal	$800	0.3%
	Total Site Info	**34,040**	**0.78**	**0.887**	**148**	**66,610**	**2.58**				**$172,300**	**17.2%**
4	**High Bridge Fire Department**											
	Pervious pavement	1,650	0.04	0.043	7	3,250	0.13	900	$25	SF	$22,500	9.9%
	Rainwater harvesting	2,800	0.06	0.073	12	2,200	0.08	2,200	$2	gal	$4,400	16.8%
	Total Site Info	**4,450**	**0.10**	**0.116**	**19**	**5,450**	**0.21**				**$26,900**	**26.8%**
5	**High Bridge Golf Club**											
	Bioretention system	730	0.02	0.019	3	1,440	0.06	185	$5	SF	$925	0.3%
	Pervious pavement	18,140	0.42	0.473	79	35,810	1.38	3,240	$25	SF	$81,000	6.5%
	Total Site Info	**18,870**	**0.43**	**0.492**	**82**	**37,250**	**1.44**				**$81,925**	**6.7%**
6	**High Bridge Middle School**											
	Bioretention systems	2,400	0.06	0.063	10	4,730	0.18	600	$5	SF	$3,000	3.5%
	Pervious pavement	11,000	0.25	0.287	48	21,710	0.84	4,000	$25	SF	$100,000	15.8%
	Total Site Info	**13,400**	**0.31**	**0.349**	**58**	**26,440**	**1.02**				**$103,000**	**19.3%**
7	**High Bridge Public Library**											
	Bioretention system	200	0.00	0.005	1	400	0.02	50	$5	SF	$250	1.9%
	Pervious pavement	4,125	0.09	0.107	18	8,150	0.31	1,400	$25	SF	$35,000	40.1%
	Rainwater harvesting	70	0.00	0.002	0	55	0.00	55	$250	barrel	$250	0.7%
	Total Site Info	**4,395**	**0.10**	**0.115**	**19**	**8,605**	**0.33**				**$35,500**	**42.7%**

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 %
8	**High Bridge Reformed Church**											
	Bioretention system	1,400	0.03	0.036	6	2,760	0.11	350	$5	SF	$1,750	5.8%
	Total Site Info	**1,400**	**0.03**	**0.036**	**6**	**2,760**	**0.11**				**$1,750**	**5.8%**
9	**High Bridge United Methodist Church**											
	Bioretention system	1,620	0.04	0.042	7	3,200	0.12	410	$5	SF	$2,050	12.8%
	Total Site Info	**1,620**	**0.04**	**0.042**	**7**	**3,200**	**0.12**				**$2,050**	**12.8%**
10	**Hilltop Deli & Catering**											
	Planter boxes	430	0.01	n/a	2	n/a	n/a	2	$1,000	box	$2,000	14.4%
	Total Site Info	**430**	**0.01**	**0.000**	**2**	**0**	**0.00**				**$2,000**	**14.4%**
11	**St. Joseph Church**											
	Bioretention system	560	0.01	0.015	2	1,110	0.04	140	$5	SF	$700	3.4%
	Planter boxes	645	0.01	n/a	2	n/a	n/a	3	$1,000	box	$3,000	3.9%
	Total Site Info	**1,205**	**0.03**	**0.015**	**5**	**1,110**	**0.04**				**$3,700**	**7.2%**
12	**United States Postal Service**											
	Pervious pavement	3,540	0.08	0.092	15	6,990	0.27	1,300	$25	SF	$32,500	49.0%
	Total Site Info	**3,540**	**0.08**	**0.092**	**15**	**6,990**	**0.27**				**$32,500**	**49.0%**