RUTGERS
New Jersey Agricultural
Experiment Station

Draft

Impervious Cover Reduction Action Plan
for
Town of Clinton, Hunterdon County, New Jersey

Prepared for Clinton by the
Rutgers Cooperative Extension Water Resources Program

November 12, 2020

Highlands Council
New Jersey

ACKNOWLEDGEMENTS:

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Introduction

Located in Hunterdon County, New Jersey, Clinton covers approximately 1.42 square miles. Figures 1 and 2 illustrate that Clinton is dominated by urban land use. A total of 57.3% of the municipality's land use is classified as urban. Of the urban land in Clinton, 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 Clinton 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 Clinton. Based upon the 2015 NJDEP land use/land cover data, approximately 24.6% of Clinton has impervious cover. This level of impervious cover suggests that the streams in Clinton likely range from being impacted to non-supporting streams. [1]

Methodology

Clinton contains portions of three subwatersheds (Figure 4). For this impervious cover reduction action plan, projects have been identified in all 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.

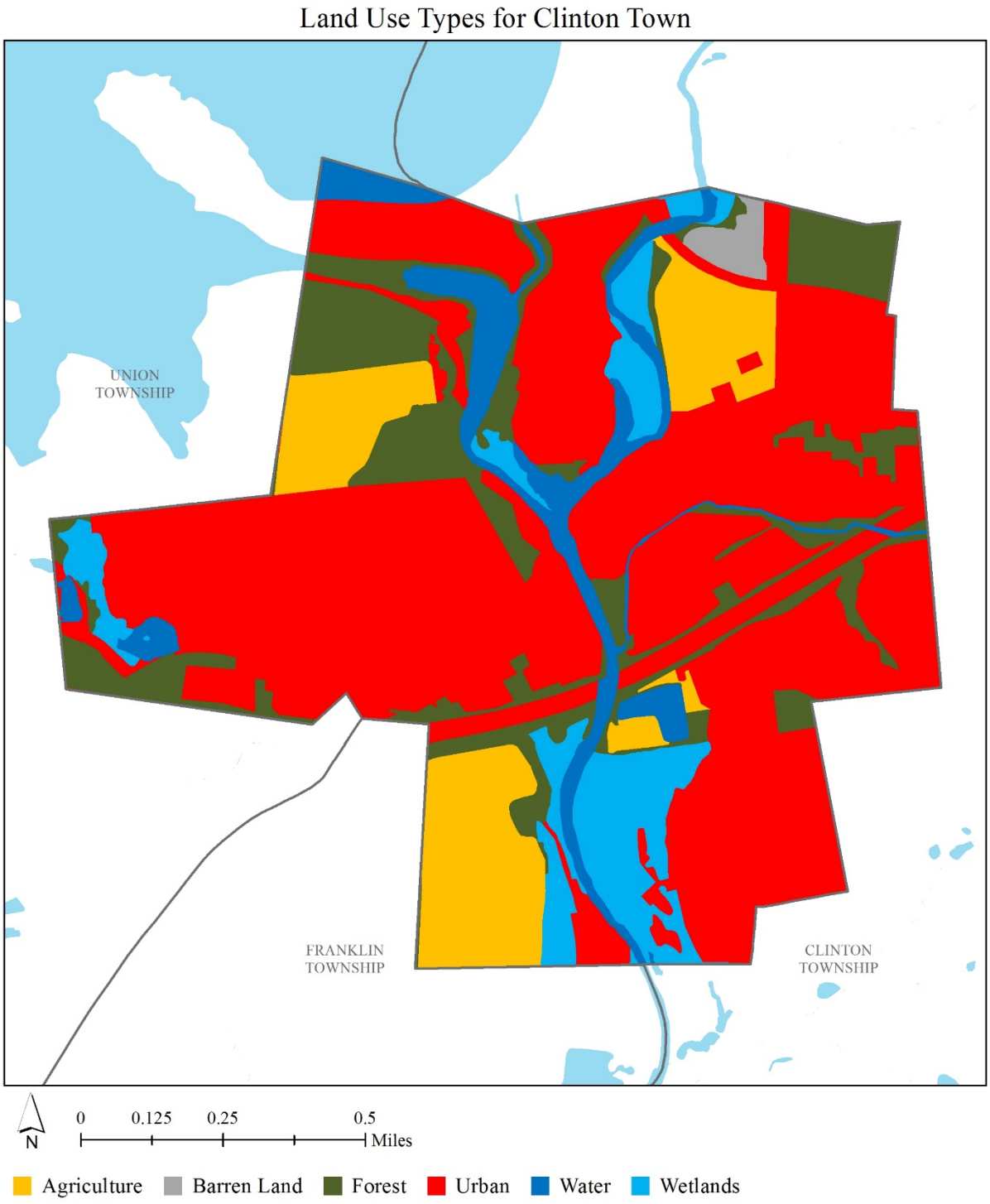


Figure 1: Map illustrating the land use in Clinton

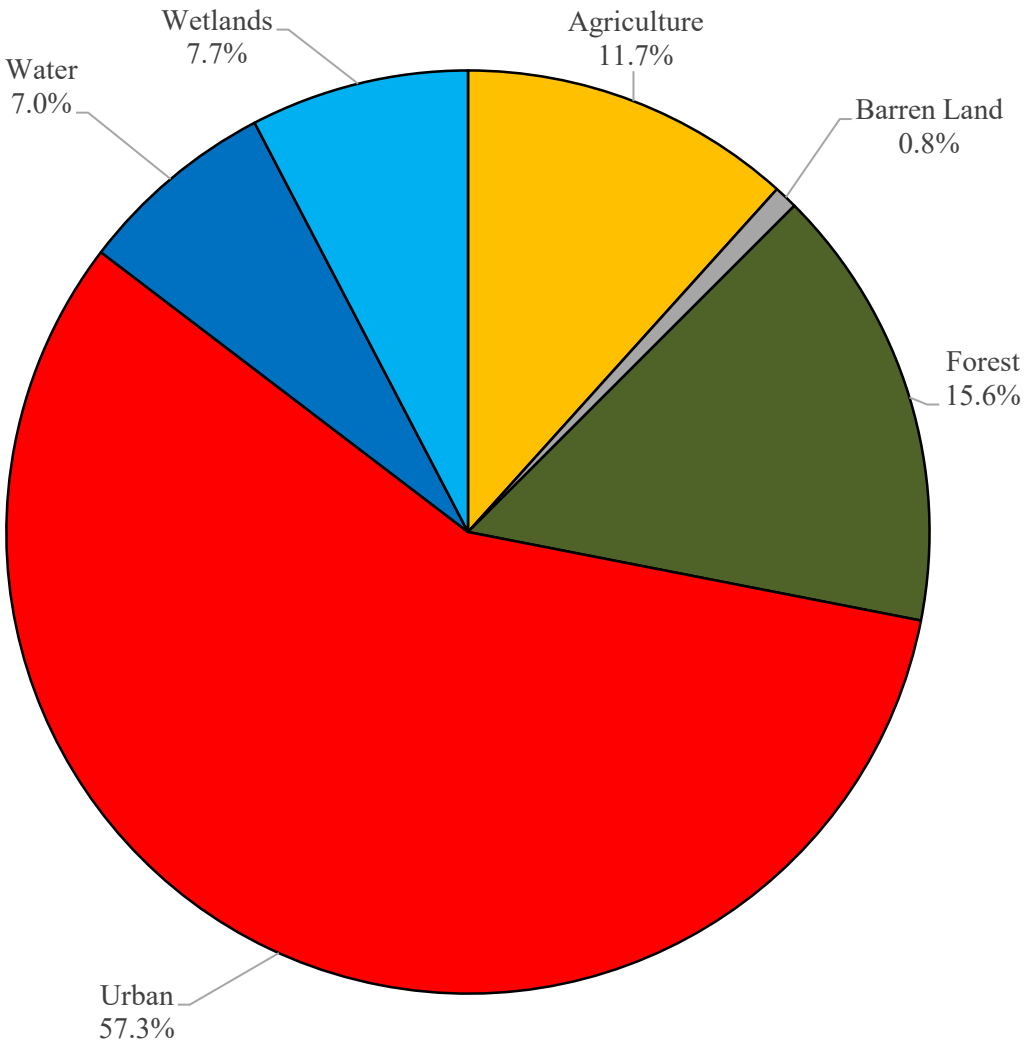


Figure 2: Pie chart illustrating the land use in Clinton

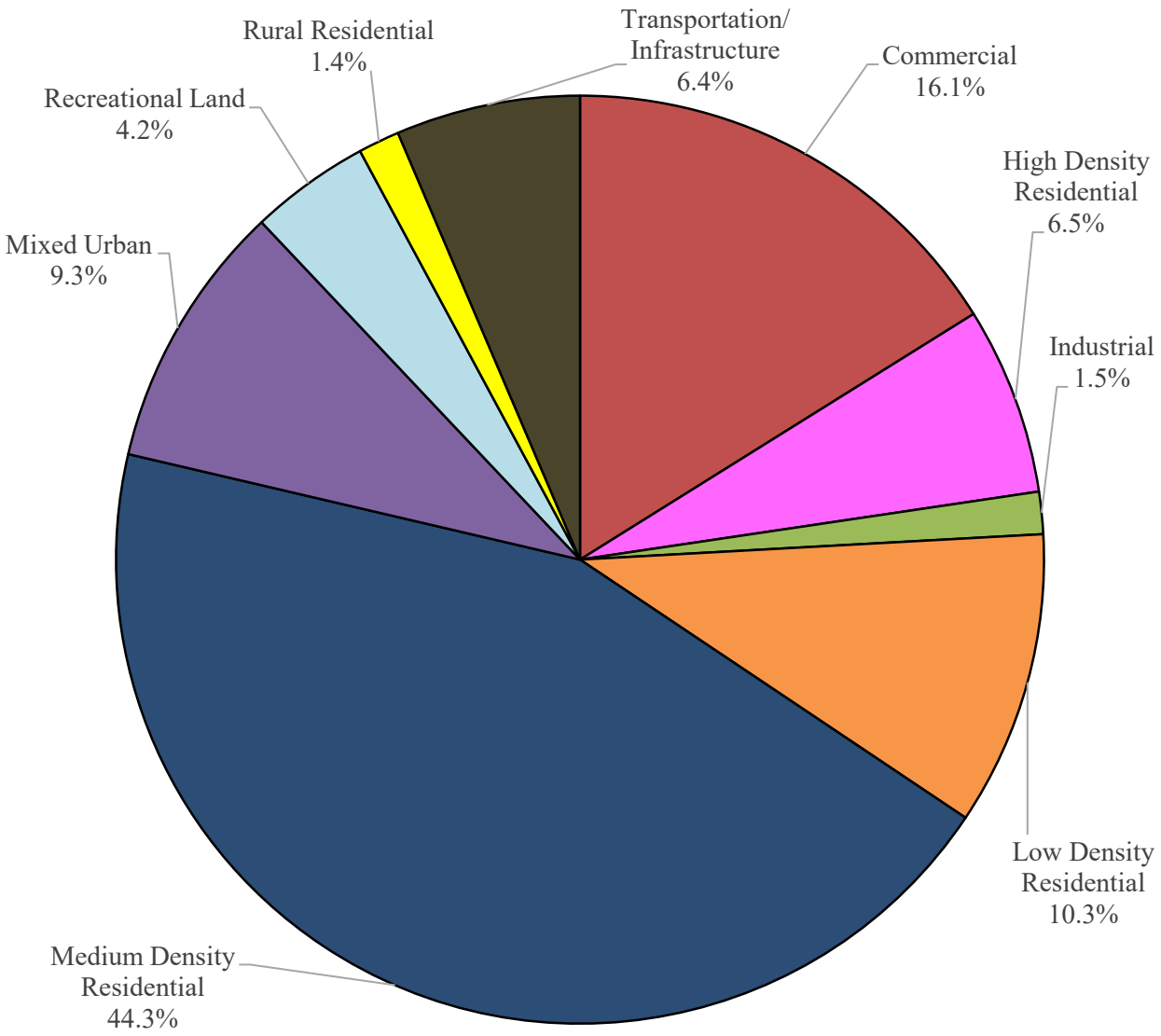


Figure 3: Pie chart illustrating the various types of urban land use in Clinton

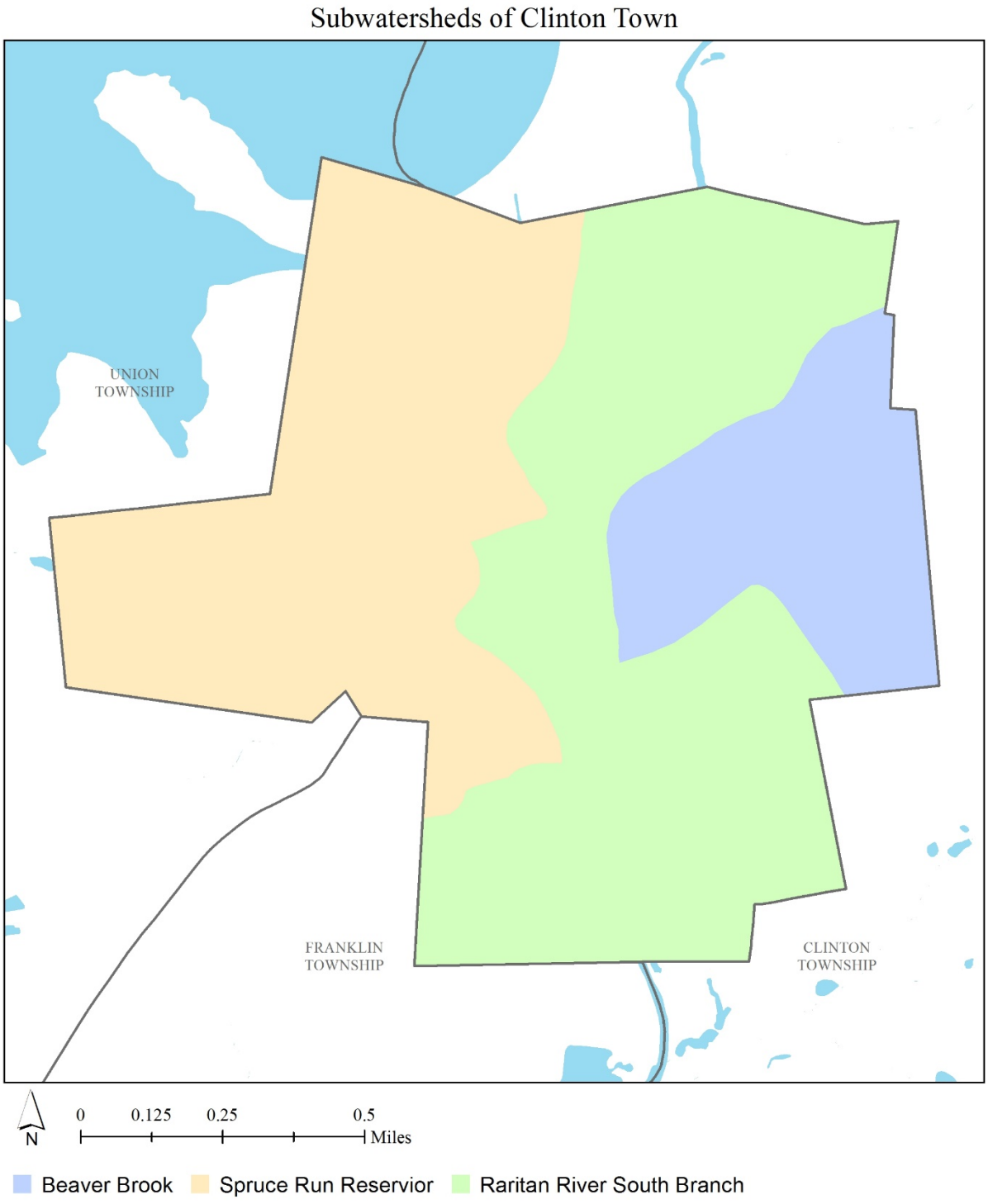


Figure 4: Map of the subwatersheds in Clinton

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 Clinton 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 Clinton. 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.

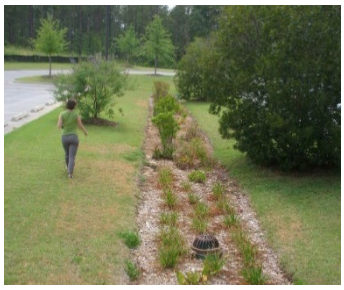
Downspout planter boxes

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

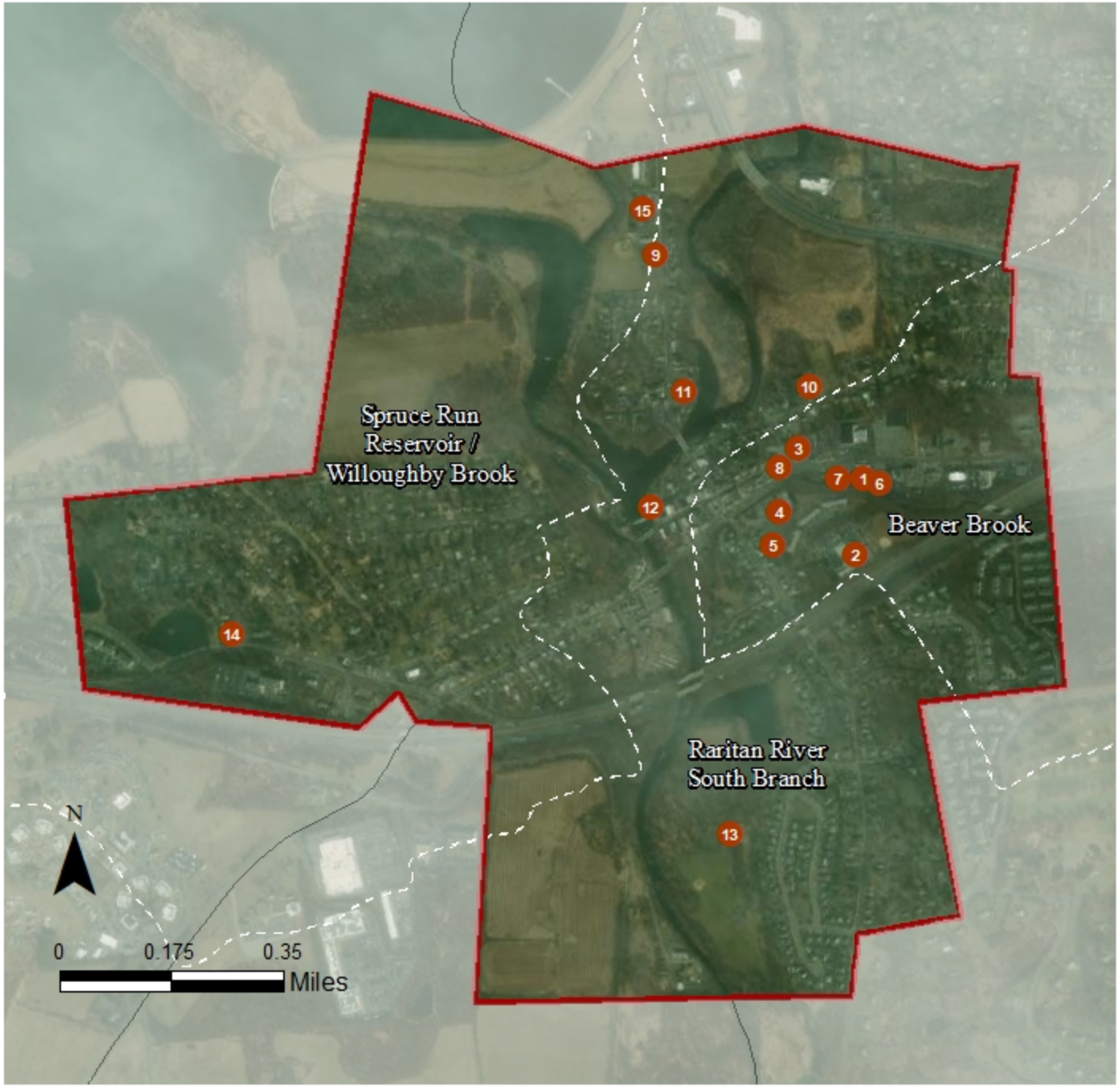
This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented by a wide variety of people such as boy scouts,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

TOWN OF CLINTON: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE BEAVER BROOK SUBWATERSHED

1. Basil Bandwagon
2. Clinton Elementary School
3. Clinton Fire Department
4. Clinton Municipal Offices
5. Evangel Chapel
6. Neo Sushi
7. Tirpok Cleaners
8. United States Postal Service

SITES WITHIN THE RARITAN RIVER SOUTH BRANCH SUBWATERSHED

9. Clinton Community Center
10. Clinton Presbyterian Church
11. Clinton United Methodist Church
12. Hunterdon Art Museum
13. Hunts Mills Park

SITES WITHIN THE SPRUCE RUN RESERVOIR /WILLOUGHBY BROOK SUBWATERSHED

14. Pediatric Surgical Associates
15. North County Library

b. Proposed Green Infrastructure Concepts

BASIL BANDWAGON

Subwatershed: Beaver Brook

Site Area: 44,236 sq. ft.

Address: 38 Old Highway 22
Clinton, NJ 08809

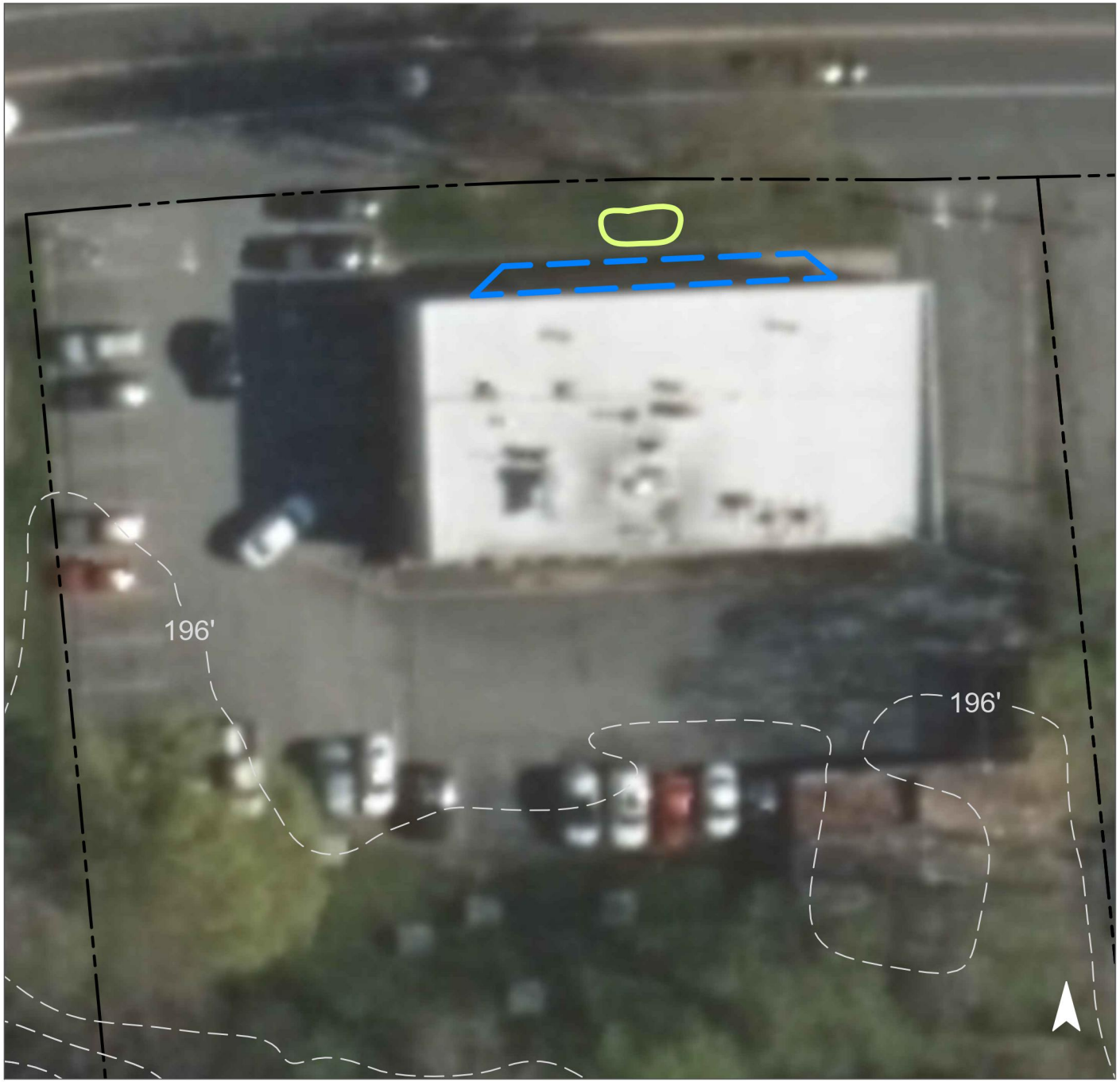
Block and Lot: Block 22, Lot 16

A rain garden can be installed in front of the building to capture the stormwater from the rooftop awning of the building. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
37	136,325	6.6	68.9	625.9	0.106	3.74

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.009	2	680	0.03	90	$450

GREEN INFRASTRUCTURE RECOMMENDATIONS



Basil Bandwagon

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

0 15' 30'

CLINTON ELEMENTARY SCHOOL

Subwatershed: Beaver Brook

Site Area: 369,275 sq. ft.

Address: 10 School Street
Clinton, NJ 08809

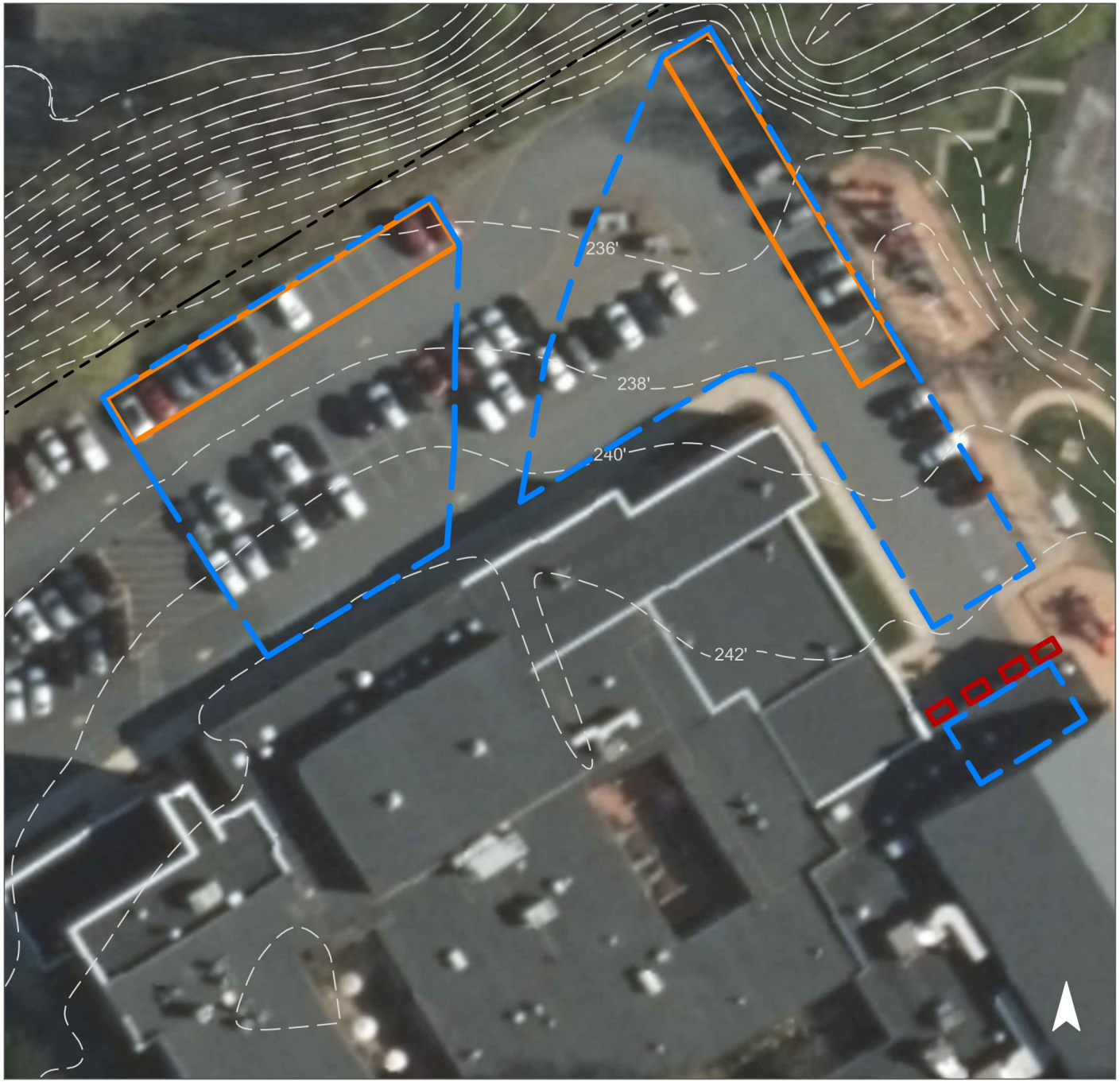
Block and Lot: Block 22, Lot 13

Porous pavement can be installed on the northern and eastern parking strips to capture stormwater from the parking lot. Downspout planter boxes can be constructed along the northeastern edge of the building to allow roof runoff to be reused. 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"
37	136,325	6.6	68.9	625.9	0.106	3.74

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.589	99	44,630	1.68	4,535	$113,375
Planter boxes	n/a	6	n/a	n/a	4 (boxes)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Clinton Elementary School

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

0 25' 50'

CLINTON FIRE DEPARTMENT

Subwatershed: Beaver Brook

Site Area: 51,009 sq. ft.

Address: 1 New Street
Clinton, NJ 08809

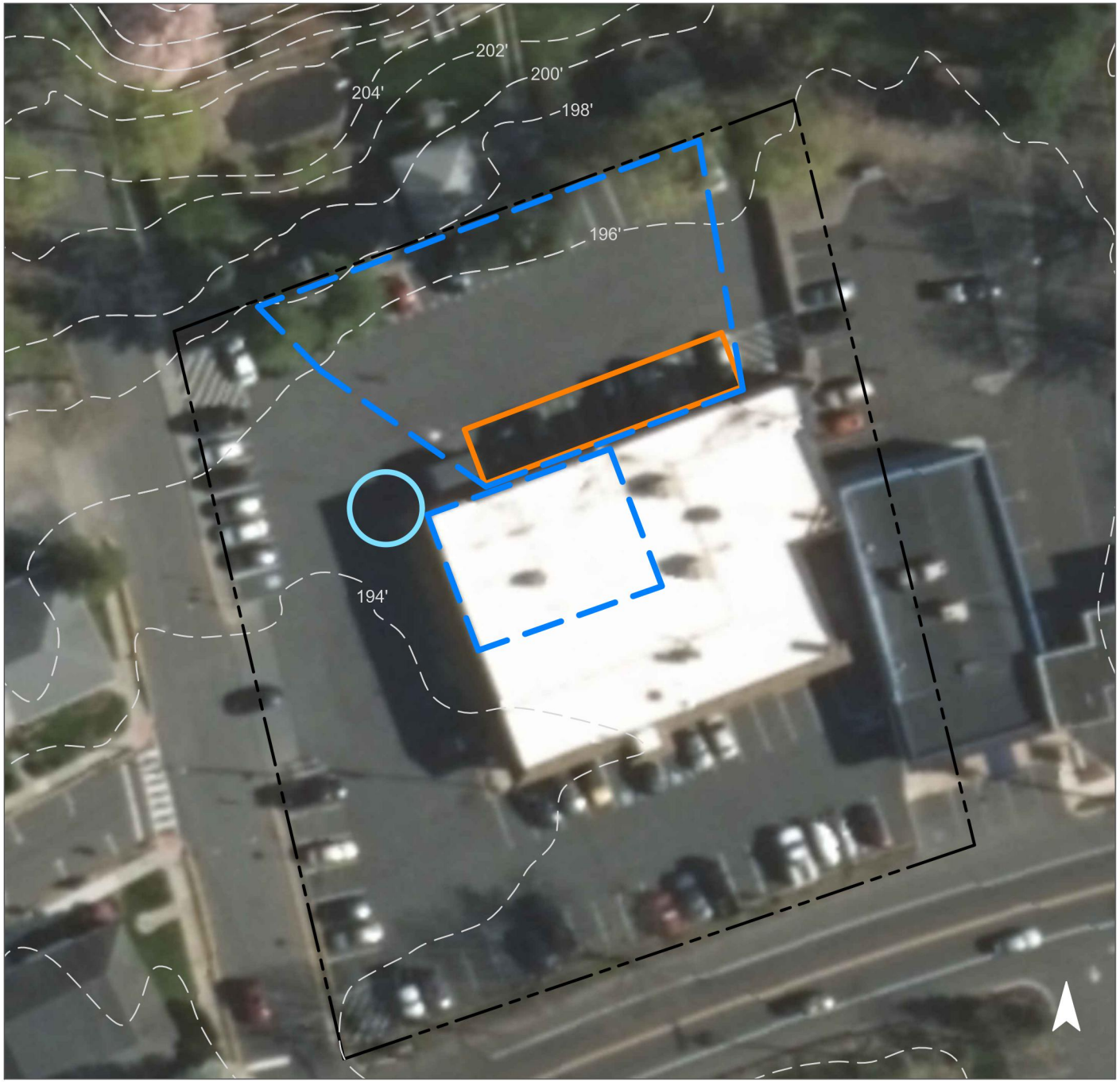
Block and Lot: Block 21, Lots 36 & 37

A rainwater harvesting system can be installed near the west corner of the building to capture rainwater and be reused for activities such as washing vehicles. The parking strip north of the building can be converted to pervious pavement to aid in the infiltration of stormwater from the large 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"
80	40,925	2.0	20.7	187.9	0.032	1.12

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	0.264	44	19,990	0.75	2,120	$53,000
Rainwater harvesting	0.079	13	2,500	0.09	2,500 (gal)	$5,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Clinton Fire Department

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

0 25' 50'

CLINTON MUNICIPAL OFFICES

Subwatershed: Beaver Brook

Site Area: 98,757 sq. ft.

Address: 43 Leigh Street
Clinton, NJ 08809

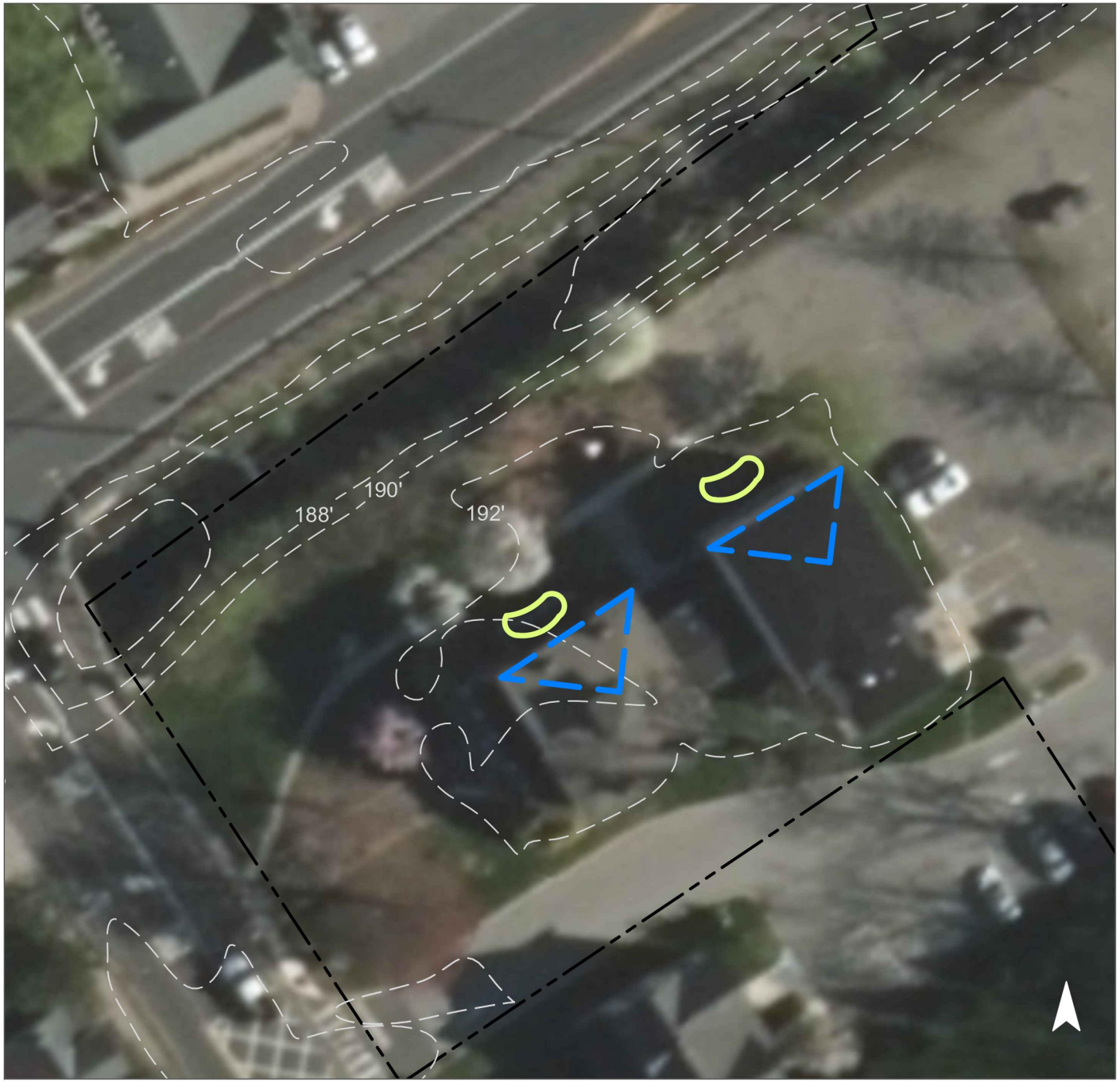
Block and Lot: Block 22, Lot 1

Two rain gardens can be set up in the turfgrass areas adjacent to the building to capture stormwater from the rooftops of the 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"
66	65,604	3.2	33.1	301.2	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 systems	0.021	4	1,600	0.06	210	$1,050

GREEN INFRASTRUCTURE RECOMMENDATIONS



Clinton Municipal Building

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

0 20' 40'

EVANGEL CHAPEL

Subwatershed: Beaver Brook

Site Area: 21,907 sq. ft.

Address: 55 Leigh Street
Clinton, NJ 08809

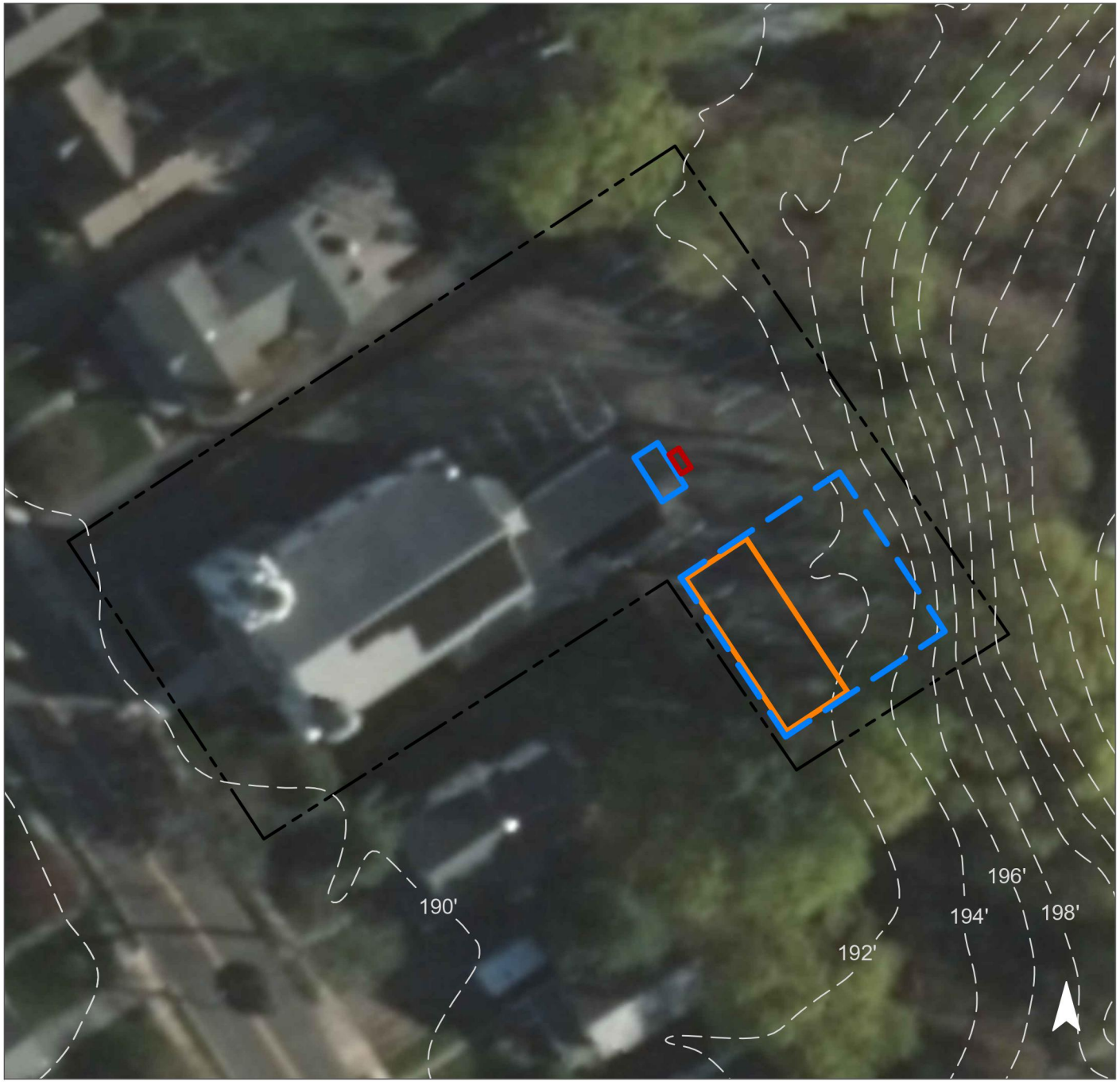
Block and Lot: Block 22, Lot 5.01

Porous pavement can be installed to capture stormwater from the rear end of the building as well as the parking lot. A downspout planter box can be installed along the building's eastern wall to capture some of the rooftop drainage. 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	13,302	0.6	6.7	61.1	0.010	0.36

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.065	11	4,940	0.19	1,000	$25,000
Planter box	n/a	<1	n/a	n/a	1 (box)	$1,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Evangel Chapel

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

0 20' 40'

NEO SUSHI

Subwatershed: Beaver Brook

Site Area: 27,206 sq. ft.

Address: 42 Old Highway 22
Clinton, NJ 08809

Block and Lot: Block 22, Lot 17

Porous pavement can be installed in front of the building to aid in the infiltration of stormwater from the large pavement and rooftop areas if the gutter is reversed in direction into the lot instead of alongside the building. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
78	21,200	1.0	10.7	97.3	0.017	0.58

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.121	20	9,200	0.35	975	$24,375

GREEN INFRASTRUCTURE RECOMMENDATIONS

Neo Sushi

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

0 15' 30'

TIRPOK CLEANERS

Subwatershed: Beaver Brook

Site Area: 17,758 sq. ft.

Address: 36 Old Highway 22
Clinton, NJ 08809

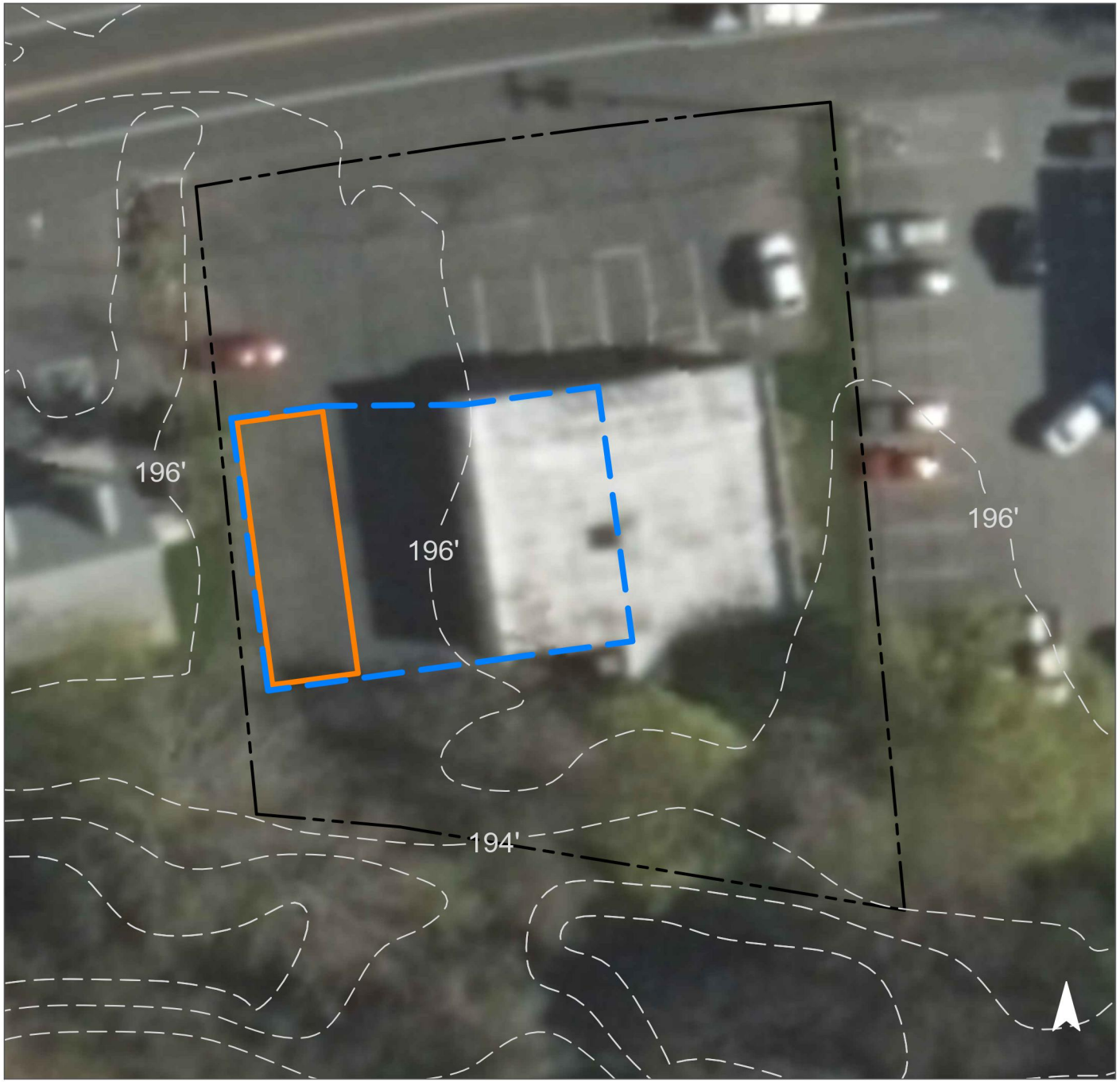
Block and Lot: Block 22, Lot 15

Porous pavement can be installed in the parking lot to capture stormwater from the building and parking lot to alleviate flooding issues as seen in the image above. 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"
82	14,477	0.7	7.3	66.5	0.011	0.40

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	0.098	16	7,420	0.28	970	$24,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Tirpok Cleaners

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

0 15' 30'

UNITED STATES POSTAL SERVICE

Subwatershed: Beaver Brook

Site Area: 10,638 sq. ft.

Address: 24 East Main Street
Clinton, NJ 08809

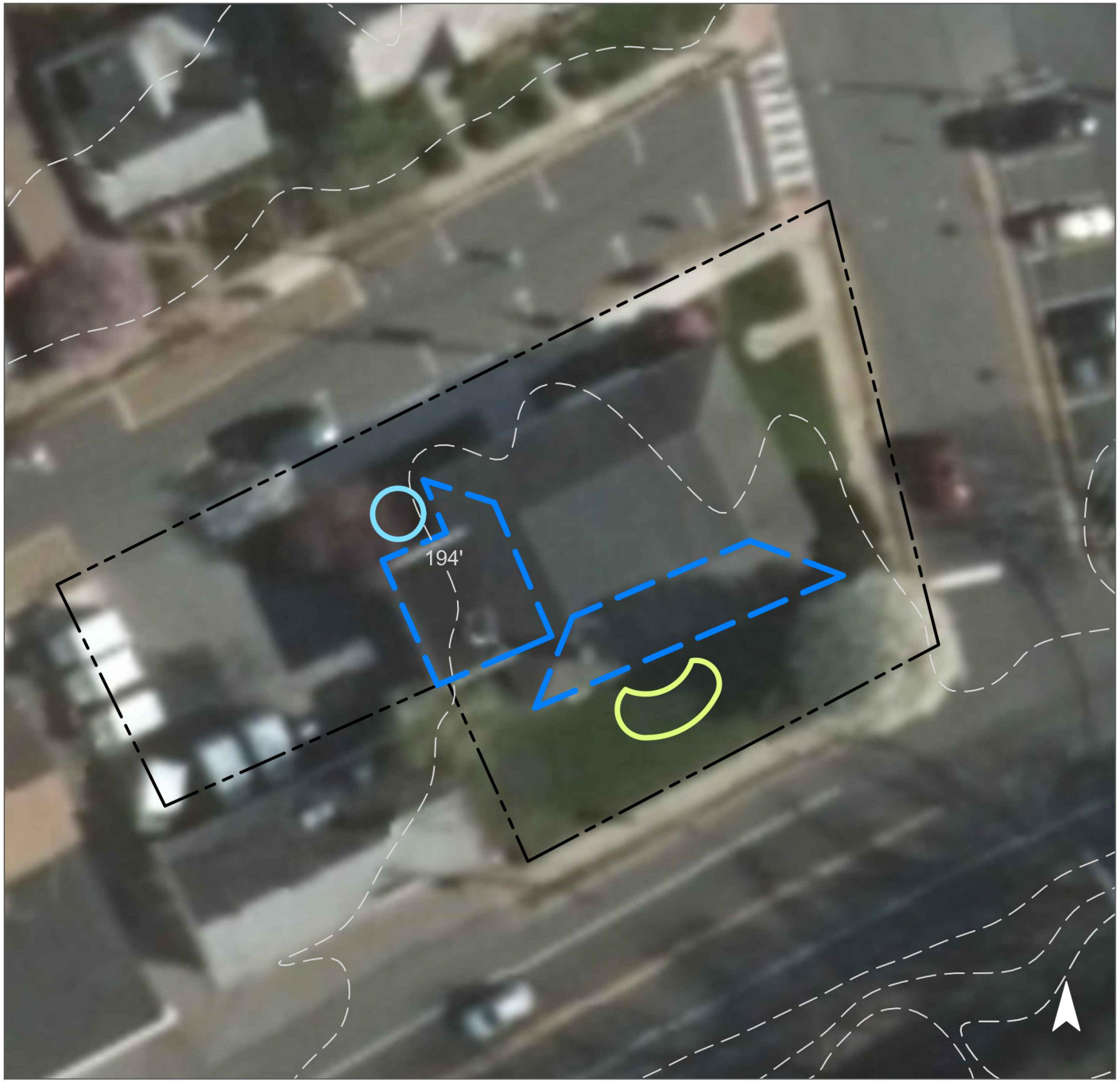
Block and Lot: Block 12, Lot 8

A rain garden can be installed next to the post office to capture stormwater from the roof of the building. A cistern can be installed in the northwestern corner of the building to reuse rainwater for activities such as car washing or watering plants. 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"
82	8,672	0.4	4.4	39.8	0.007	0.24

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.018	3	1,380	0.05	175	$875
Rainwater harvesting	0.019	3	600	0.02	600 (gal)	$1,200

GREEN INFRASTRUCTURE RECOMMENDATIONS



United States Postal Service

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

0 15' 30'

CLINTON COMMUNITY CENTER

Subwatershed: Raritan South River Branch

Site Area: 180,581 sq. ft.

Address: 63 Halstead Street
Clinton, NJ 08809

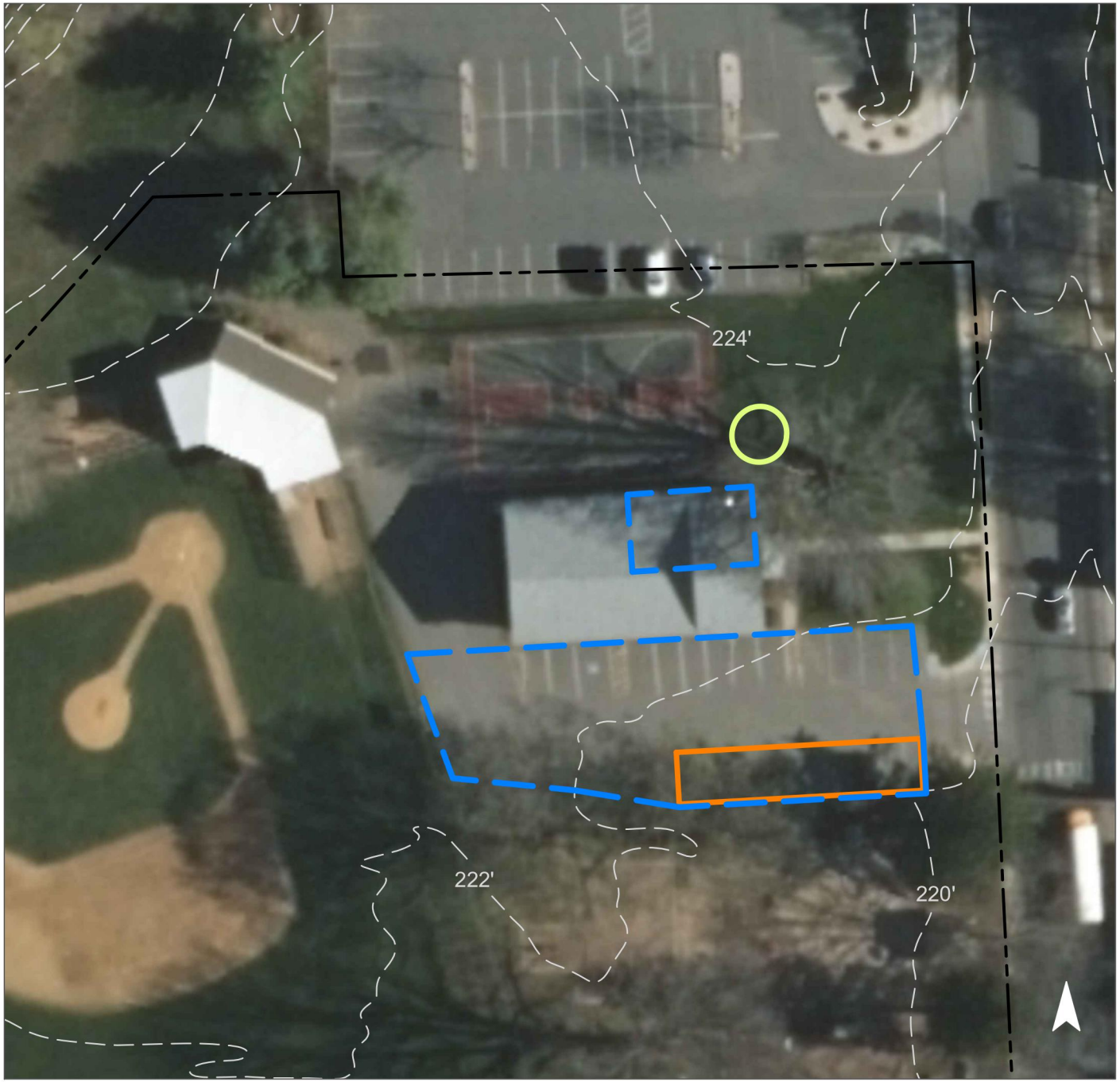
Block and Lot: Block 16, Lot 21

Stormwater can be captured from both the building rooftop and the pavement surfaces using both a porous pavement and rain garden installation to aid in the capture, treatment, and infiltration of stormwater 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"
19	35,043	1.7	17.7	160.9	0.027	0.96

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	0.027	4	2,030	0.08	260	$1,300
Pervious pavement	0.213	36	16,160	0.61	1,460	$36,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Clinton Community Center

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

0 25' 50'

CLINTON PRESBYTERIAN CHURCH

Subwatershed: Raritan South River Branch

Site Area: 71,446 sq. ft.

Address: 91 Center Street
Clinton, NJ 08809

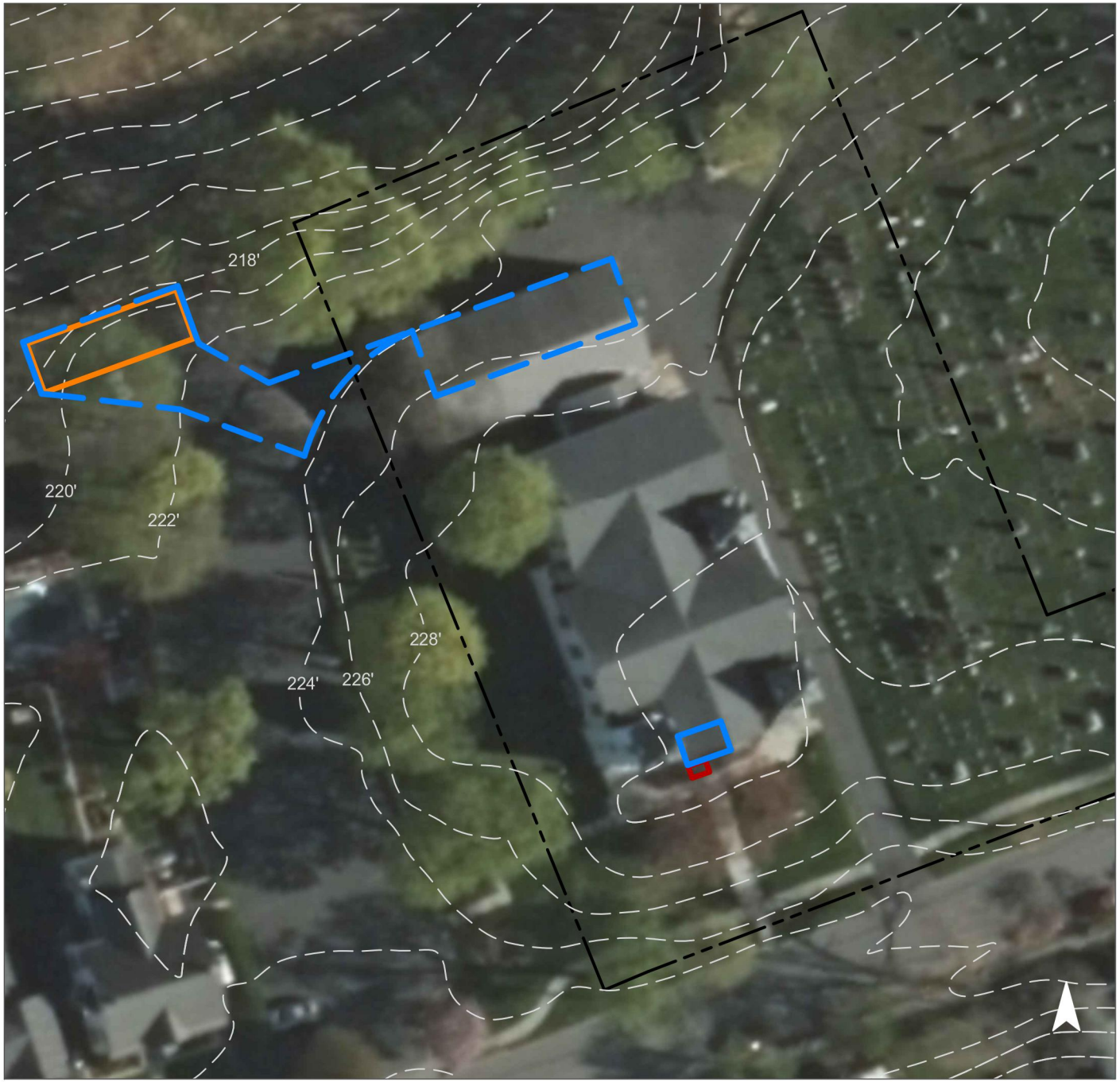
Block and Lot: Block 14, Lots 20 & 21

Porous pavement can be installed in the northwestern corner of the parking lot to capture stormwater from the parking lot as well as the nearby building's disconnected downspouts. A downspout planter box can be installed next to the south entrance of the building to capture and treat the 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"
44	31,409	1.5	15.9	144.2	0.024	0.86

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	0.117	20	8,890	0.33	970	$24,250
Planter box	n/a	<1	n/a	n/a	1 (box)	$1,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Clinton Presbyterian Church

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

0 25' 50'

CLINTON UNITED METHODIST CHURCH

Subwatershed: Raritan River South Branch

Site Area: 56,694 sq. ft.

Address: 12 Halstead Street
Clinton, NJ 08809

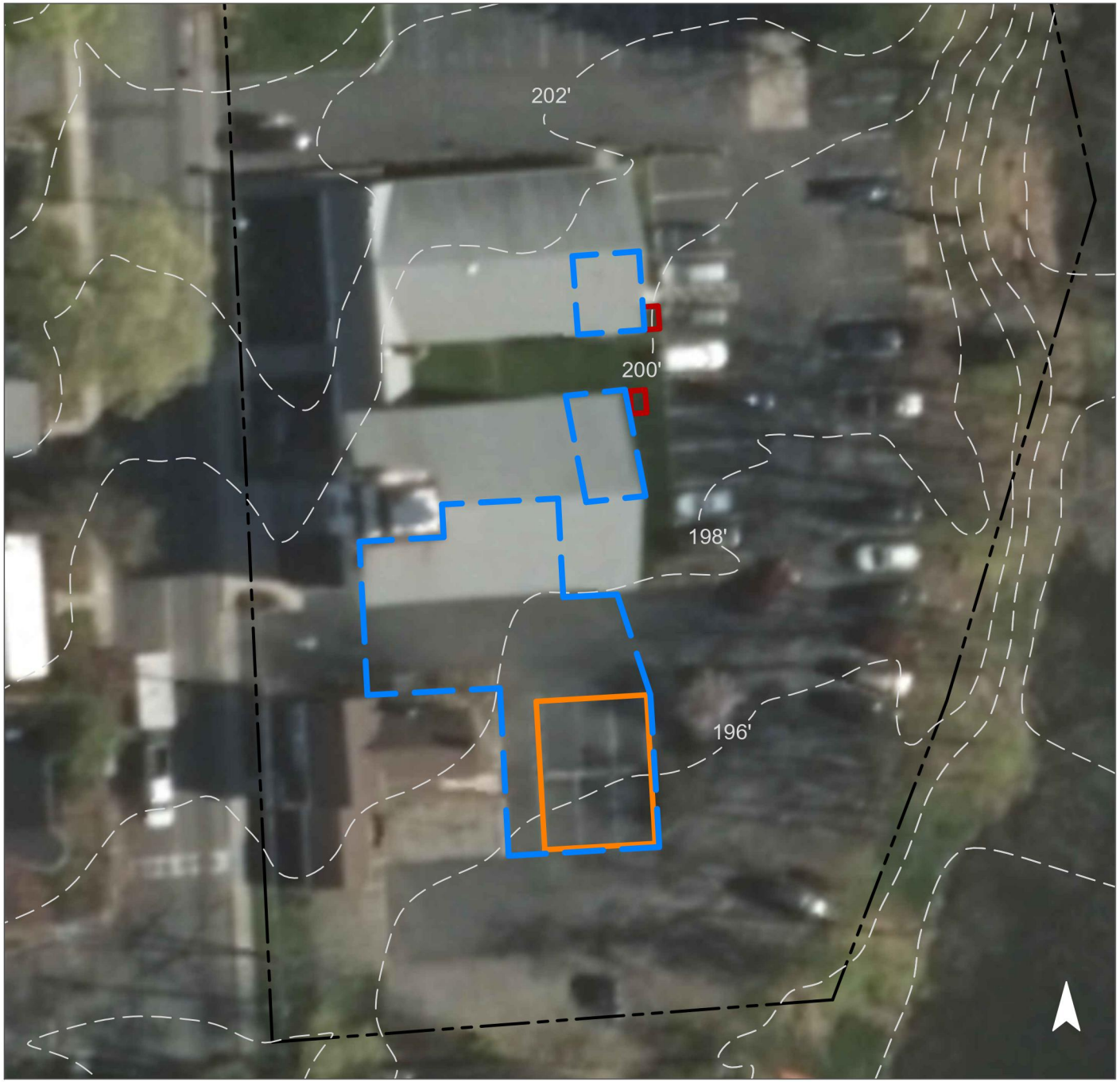
Block and Lot: Block 15, Lot 4

Porous pavement can be used to capture the storm water leaving the rooftop and surrounding pavement. Downspout planter boxes can be installed alongside the eastern wall of the buildings to prevent stormwater from flowing over the pavement and collecting pollutants. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
65	37,066	1.8	18.7	170.2	0.029	1.02

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	0.117	20	8,890	0.33	1,130	$28,250
Planter boxes	n/a	1	n/a	n/a	2 (boxes)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Clinton United Methodist Church

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

0 20' 40'

HUNTERDON ART MUSEUM

Subwatershed: Raritan River South Branch

Site Area: 41,440 sq. ft.

Address: 7 Lower Center Street Clinton, NJ 08809

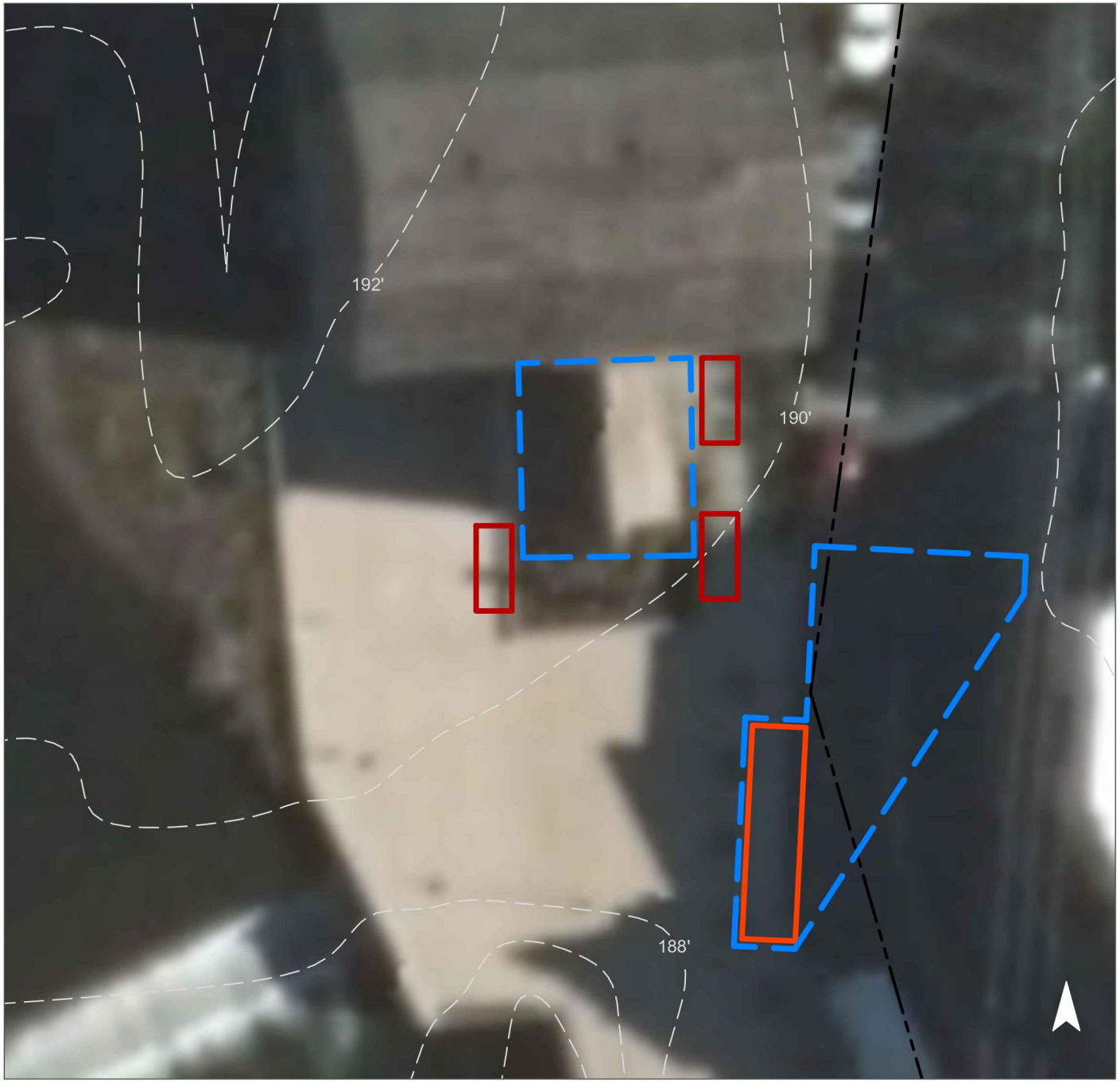
Block and Lot: Block 9, Lot 1

A stormwater planter can be installed in the sidewalk to intercept stormwater runoff from the roadway or sidewalk to allow the stormwater to infiltrate into the ground. Downspout planter boxes can be constructed along the building to allow roof runoff to be reused. 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"
28	11,704	0.6	5.9	53.7	0.009	0.32

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
Planter boxes	n/a	2	n/a	n/a	3 (boxes)	$3,000
Stormwater planter	0.025	4	1,890	0.07	240	$90,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Hunterdon Art Museum

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

0 10' 20'

HUNTS MILLS PARK

Subwatershed: Raritan River South Branch

Site Area: 1,587,929 sq. ft.

Address: 32 Haver Farm Road
Clinton, NJ 08809

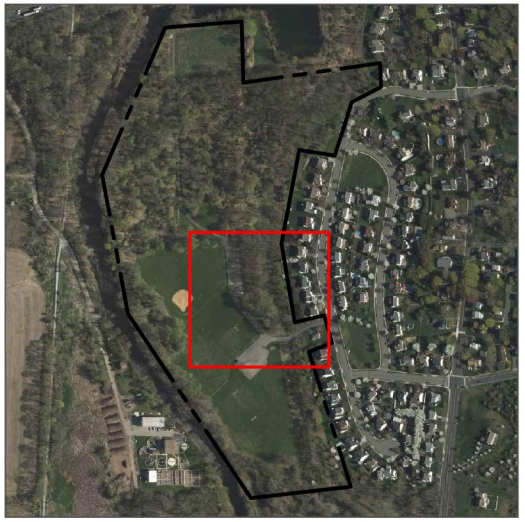
Block and Lot: Block 29, Lot 8

Two proposed rain gardens can be installed in the turfgrass area near both parking lots. Another rain garden can be installed west of the building near a downspout to aid in infiltration of the stormwater from the roof top. 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"
6	89,179	4.3	45.0	409.5	0.069	2.45

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.096	16	7,290	0.27	925	$4,625

GREEN INFRASTRUCTURE RECOMMENDATIONS



Hunts Mills Park

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

0 50' 100'

PEDIATRIC SURGICAL ASSOCIATES

Subwatershed: Spruce Run Reservoir/Willoughby Brook

Site Area: 27,148 sq. ft.

Address: 122 West Main Street
Clinton, NJ 08809

Block and Lot: Block 1, Lot 1

A proposed rain garden can be installed in the front of the building to aid in infiltration of stormwater from the roof top. A downspout planter box can be installed at the northwestern corner of the building to prevent rooftop stormwater from flowing across 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"
69	18,661	0.9	9.4	85.7	0.015	0.51

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	0.016	3	1,200	0.05	155	$775
Planter box	n/a	1	n/a	n/a	1 (box)	$1,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Pediatric Surgical Associates

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

0 20' 40'

NORTH COUNTY LIBRARY

Subwatershed: Spruce Run Reservoir/Willoughby Brook

Site Area: 76,533 sq. ft.

Address: 65 Halstead Street
Clinton, NJ 08809

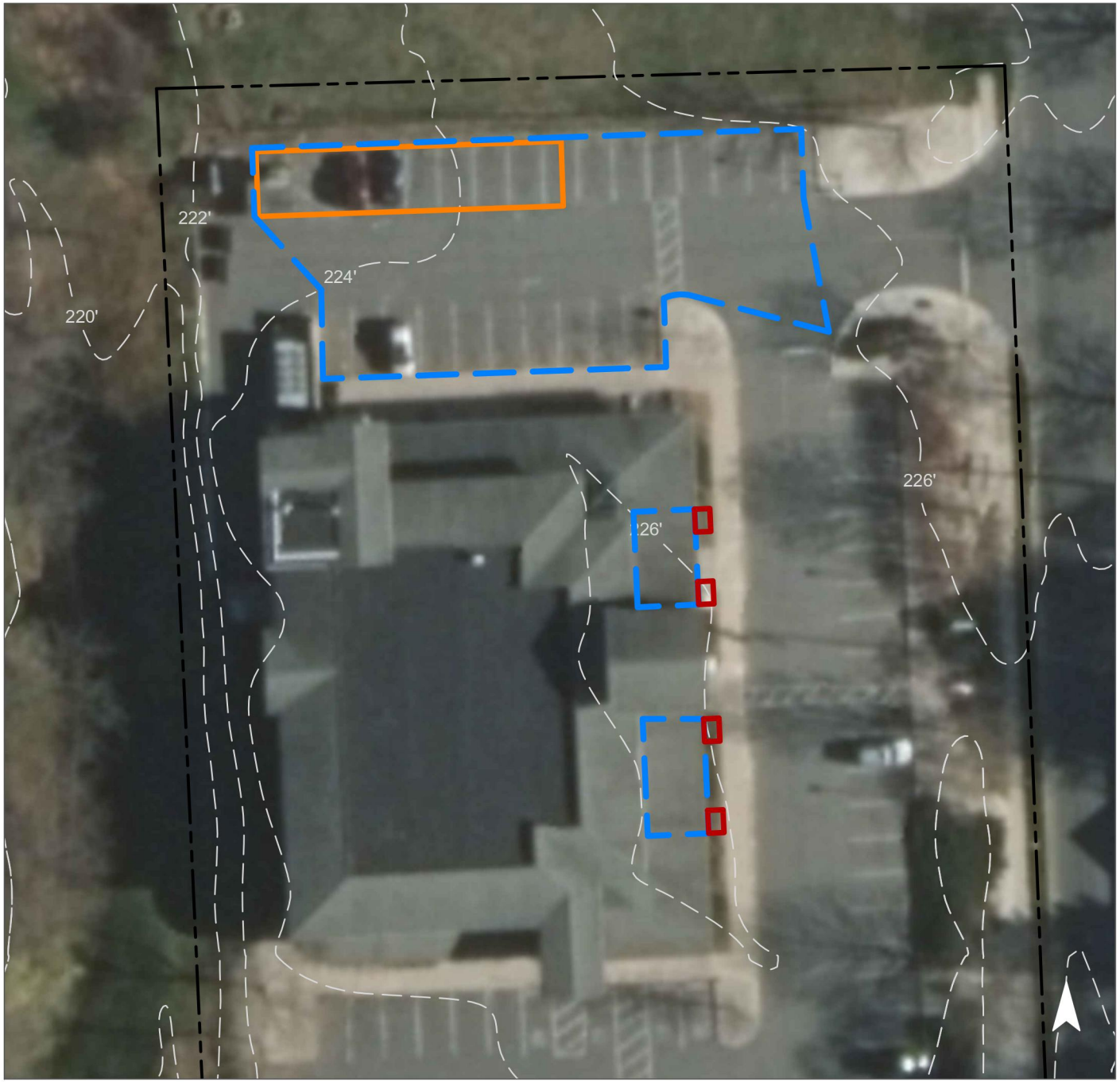
Block and Lot: Block 16, Lot 22.01

Pervious pavement can be installed in front of the building to aid in the infiltration of the stormwater from the large pavement and rooftop areas. Multiple downspout planter boxes can be constructed along the building to allow roof runoff to be reused. 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"
73	56,020	2.7	28.3	257.2	0.044	1.54

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	0.203	34	15,360	0.58	1,460	$36,500
Planter boxes	n/a	3	n/a	n/a	4 (boxes)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



North County Library

- pervious pavement
- 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)			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)
	BEAVER BROOK SITES	**14.71**	**640,785**				**7.60**	**331,201**	**16.0**	**167.3**	**1,520.7**	**34,500**	**1,214,403**	**0.258**	**9.08**
1	**Basil Bandwagon**														
	Total Site Info	1.02	44,236	22	16	69	0.70	30,696	1.5	15.5	140.9	3,197	112,552	0.024	0.84
2	**Clinton Elementary School**														
	Total Site Info	8.48	369,275	22	13	37	3.13	136,325	6.6	68.9	625.9	14,201	499,858	0.106	3.74
3	**Clinton Fire Department**														
	Total Site Info	1.17	51,009	21	36,37	80	0.94	40,925	2.0	20.7	187.9	4,263	150,059	0.032	1.12
4	**Clinton Municipal Offices**														
	Total Site Info	2.27	98,757	22	1	66	1.51	65,604	3.2	33.1	301.2	6,834	240,548	0.051	1.80
5	**Evangel Chapel Clinton**														
	Total Site Info	0.50	21,907	22	5.01	61	0.31	13,302	0.6	6.7	61.1	1,386	48,772	0.010	0.36
6	**Neo Sushi**														
	Total Site Info	0.62	27,206	22	17	78	0.49	21,200	1.0	10.7	97.3	2,208	77,734	0.017	0.58
7	**Tirpok Cleaners**														
	Total Site Info	0.41	17,758	22	15	82	0.33	14,477	0.7	7.3	66.5	1,508	53,082	0.011	0.40
8	**United States Postal Service**														
	Total Site Info	0.24	10,638	12	8	82	0.20	8,672	0.4	4.4	39.8	903	31,798	0.007	0.24
	RARITAN RIVER SOUTH BRANCH SITES	**44.49**	**1,938,091**				**4.69**	**204,403**	**9.9**	**103.2**	**938.5**	**21,292**	**749,476**	**0.159**	**5.61**
9	**Clinton Community Center**														
	Total Site Info	4.15	180,581	16	21	19	0.80	35,043	1.7	17.7	160.9	3,650	128,492	0.027	0.96
10	**Clinton Presbyterian Church**														
	Total Site Info	1.64	71,446	14	20,21	44	0.72	31,409	1.5	15.9	144.2	3,272	115,168	0.024	0.86
11	**Clinton United Methodist Church**														
	Total Site Info	1.30	56,694	15	4	65	0.85	37,066	1.8	18.7	170.2	3,861	135,910	0.029	1.02
12	**Hunterdon Art Museum**														
	Total Site Info	0.95	41,440	9	1	28	0.27	11,704	0.6	5.9	53.7	1,219	42,916	0.009	0.32
13	**Hunts Mills Park**														
	Total Site Info	36.45	1,587,929	29	8	6	2.05	89,179	4.3	45.0	409.5	9,289	326,990	0.069	2.45
	SPRUCE RUN RESERVOIR/WILLOUGHBY BROOK SITES	**2.38**	**103,681**				**1.71**	**74,681**	**3.6**	**37.7**	**342.9**	**7,779**	**273,830**	**0.058**	**2.05**
14	**Pediatric Surgical Associates**														
	Total Site Info	0.62	27,148	1	1	69	0.43	18,661	0.9	9.4	85.7	1,944	68,425	0.015	0.51
15	**North County Library**														
	Total Site Info	1.76	76,533	16	22.01	73	1.29	56,020	2.7	28.3	257.2	5,835	205,406	0.044	1.54

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area		Recharge Potential	TSS Removal Potential	Max Volume Reduction Potential	Peak Discharge Reduction Potential	Size of BMP	Unit Cost	Unit	Total Cost	I.C. Treated
		Area (SF)	Area (ac)	(Mgal/yr)	(lbs/yr)	(gal/storm)	(cfs)		($/unit)		($)	%
	BEAVER BROOK SITES	**50,935**	**1.17**	**1.284**	**221**	**92,940**	**3.50**				**$253,575**	**15.4%**
1	**Basil Bandwagon**											
	Bioretention system	345	0.01	0.009	2	680	0.03	90	$5	SF	$450	1.1%
	Total Site Info	**345**	**0.01**	**0.009**	**2**	**680**	**0.03**				**$450**	**1.1%**
2	**Clinton Elementary School**											
	Pervious pavement	22,610	0.52	0.589	99	44,630	1.68	4,535	$25	SF	$113,375	16.6%
	Planter boxes	1,550	0.04	n/a	6	n/a	n/a	4	$1,000	box	$4,000	1.1%
	Total Site Info	**24,160**	**0.55**	**0.589**	**104**	**44,630**	**1.68**				**$117,375**	**17.7%**
3	**Clinton Fire Department**											
	Pervious pavement	10,130	0.23	0.264	44	19,990	0.75	2,120	$25	SF	$53,000	24.8%
	Rainwater harvesting	3,040	0.07	0.079	13	2,500	0.09	2,500	$2	gal	$5,000	7.4%
	Total Site Info	**13,170**	**0.30**	**0.343**	**57**	**22,490**	**0.84**				**$58,000**	**32.2%**
4	**Clinton Municipal Offices**											
	Bioretention systems	810	0.02	0.021	4	1,600	0.06	210	$5	SF	$1,050	1.2%
	Total Site Info	**810**	**0.02**	**0.021**	**4**	**1,600**	**0.06**				**$1,050**	**1.2%**
5	**Evangel Chapel Clinton**											
	Pervious pavement	2,500	0.06	0.065	11	4,940	0.19	1,000	$25	SF	$25,000	18.8%
	Planter box	100	0.00	n/a	0	n/a	n/a	1	$1,000	box	$1,000	0.8%
	Total Site Info	**2,600**	**0.06**	**0.065**	**11**	**4,940**	**0.19**				**$26,000**	**19.5%**
6	**Neo Sushi**											
	Pervious pavement	4,660	0.11	0.121	20	9,200	0.35	975	$25	SF	$24,375	22.0%
	Total Site Info	**4,660**	**0.11**	**0.121**	**20**	**9,200**	**0.35**				**$24,375**	**22.0%**
7	**Tirpok Cleaners**											
	Pervious pavement	3,760	0.09	0.098	16	7,420	0.28	970	$25	SF	$24,250	26.0%
	Total Site Info	**3,760**	**0.09**	**0.098**	**16**	**7,420**	**0.28**				**$24,250**	**26.0%**
8	**United States Postal Service**											
	Bioretention system	700	0.02	0.018	3	1,380	0.05	175	$5	SF	$875	8.1%
	Rainwater harvesting	730	0.02	0.019	3	600	0.02	600	$2	gal	$1,200	8.4%
	Total Site Info	**1,430**	**0.03**	**0.037**	**6**	**1,980**	**0.07**				**$2,075**	**16.5%**

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area		Recharge Potential	TSS Removal Potential	Max Volume Reduction Potential	Peak Discharge Reduction Potential	Size of BMP	Unit Cost	Unit	Total Cost	I.C. Treated
		Area (SF)	Area (ac)	(Mgal/yr)	(lbs/yr)	(gal/storm)	(cfs)		($/unit)		($)	%
	RARITAN RIVER SOUTH BRANCH SITES	**23,750**	**0.55**	**0.596**	**103**	**45,150**	**1.69**				**$190,925**	**11.6%**
9	**Clinton Community Center**											
	Bioretention system	1,030	0.02	0.027	4	2,030	0.08	260	$5	SF	$1,300	2.9%
	Pervious pavement	8,190	0.19	0.213	36	16,160	0.61	1,460	$25	SF	$36,500	23.4%
	Total Site Info	**9,220**	**0.21**	**0.240**	**40**	**18,190**	**0.69**				**$37,800**	**26.3%**
10	**Clinton Presbyterian Church**											
	Pervious pavement	4,500	0.10	0.117	20	8,890	0.33	970	$25	SF	$24,250	14.3%
	Planter box	100	0.00	n/a	0	n/a	n/a	1	$1,000	box	$1,000	0.3%
	Total Site Info	**4,600**	**0.11**	**0.117**	**20**	**8,890**	**0.33**				**$25,250**	**14.6%**
11	**Clinton United Methodist Church**											
	Pervious pavement	4,500	0.10	0.117	20	8,890	0.33	1,130	$25	SF	$28,250	12.1%
	Planter boxes	200	0.00	n/a	1	n/a	n/a	2	$1,000	box	$2,000	0.5%
	Total Site Info	**4,700**	**0.11**	**0.117**	**20**	**8,890**	**0.33**				**$30,250**	**12.7%**
12	**Hunterdon Art Museum**											
	Planter boxes	580	0.01	n/a	2	n/a	n/a	3	$1,000	box	$3,000	5.0%
	Stormwater planter	960	0.02	0.025	4	1,890	0.07	240	$375	SF	$90,000	8.2%
	Total Site Info	**1,540**	**0.04**	**0.025**	**6**	**1,890**	**0.07**				**$93,000**	**13.2%**
13	**Hunts Mills Park**											
	Bioretention systems	3,690	0.08	0.096	16	7,290	0.27	925	$5	SF	$4,625	4.1%
	Total Site Info	**3,690**	**0.08**	**0.096**	**16**	**7,290**	**0.27**				**$4,625**	**4.1%**
	SPRUCE RUN RESERVOIR/WILLOUGHBY BROOK SITES	**9,415**	**0.22**	**0.219**	**40**	**16,560**	**0.63**				**$42,275**	**12.6%**
14	**Pediatric Surgical Associates**											
	Bioretention system	610	0.01	0.016	3	1,200	0.05	155	$5	SF	$775	3.3%
	Planter box	140	0.00	n/a	1	n/a	n/a	1	$1,000	box	$1,000	0.8%
	Total Site Info	**750**	**0.02**	**0.016**	**3**	**1,200**	**0.05**				**$1,775**	**4.0%**
15	**North County Library**											
	Pervious pavement	7,780	0.18	0.203	34	15,360	0.58	1,460	$25	SF	$36,500	13.9%
	Planter boxes	885	0.02	n/a	3	n/a	n/a	4	$1,000	box	$4,000	1.6%
	Total Site Info	**8,665**	**0.20**	**0.203**	**37**	**15,360**	**0.58**				**$40,500**	**15.5%**