RUTGERS
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Impervious Cover Reduction Action Plan
for
Secaucus, Hudson County, New Jersey

Prepared for Secaucus by the
Rutgers Cooperative Extension Water Resources Program

June 2022

ACKNOWLEDGEMENTS:

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Introduction

Located in Hudson County, New Jersey, the Town of Secaucus covers approximately 6.54 square miles. Figures 1 and 2 illustrate that Secaucus is dominated by urban land use. A total of 62.7% of the municipality's land use is classified as urban. Of the urban land in Secaucus, industrial 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 Secaucus 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 Secaucus. Based upon the 2015 NJDEP land use/land cover data, approximately 60.4% of Secaucus has impervious cover. This level of impervious cover suggests that the waterways in Secaucus likely range from being non-supporting to urban drainage. [1]

Methodology

Secaucus contains a portion of one subwatershed (Figure 4). For this impervious cover reduction action plan (RAP), projects have been identified in the one subwatershed. Aerial imagery initially was studied to identify potential project sites that contain extensive impervious cover. Field inspections were conducted to determine if viable options exist at the sites to reduce impervious cover or to disconnect impervious surfaces from draining directly to the local waterway or storm sewer system. During the field inspections, appropriate green infrastructure practices for the sites were recommended. Sites that already had green infrastructure 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.

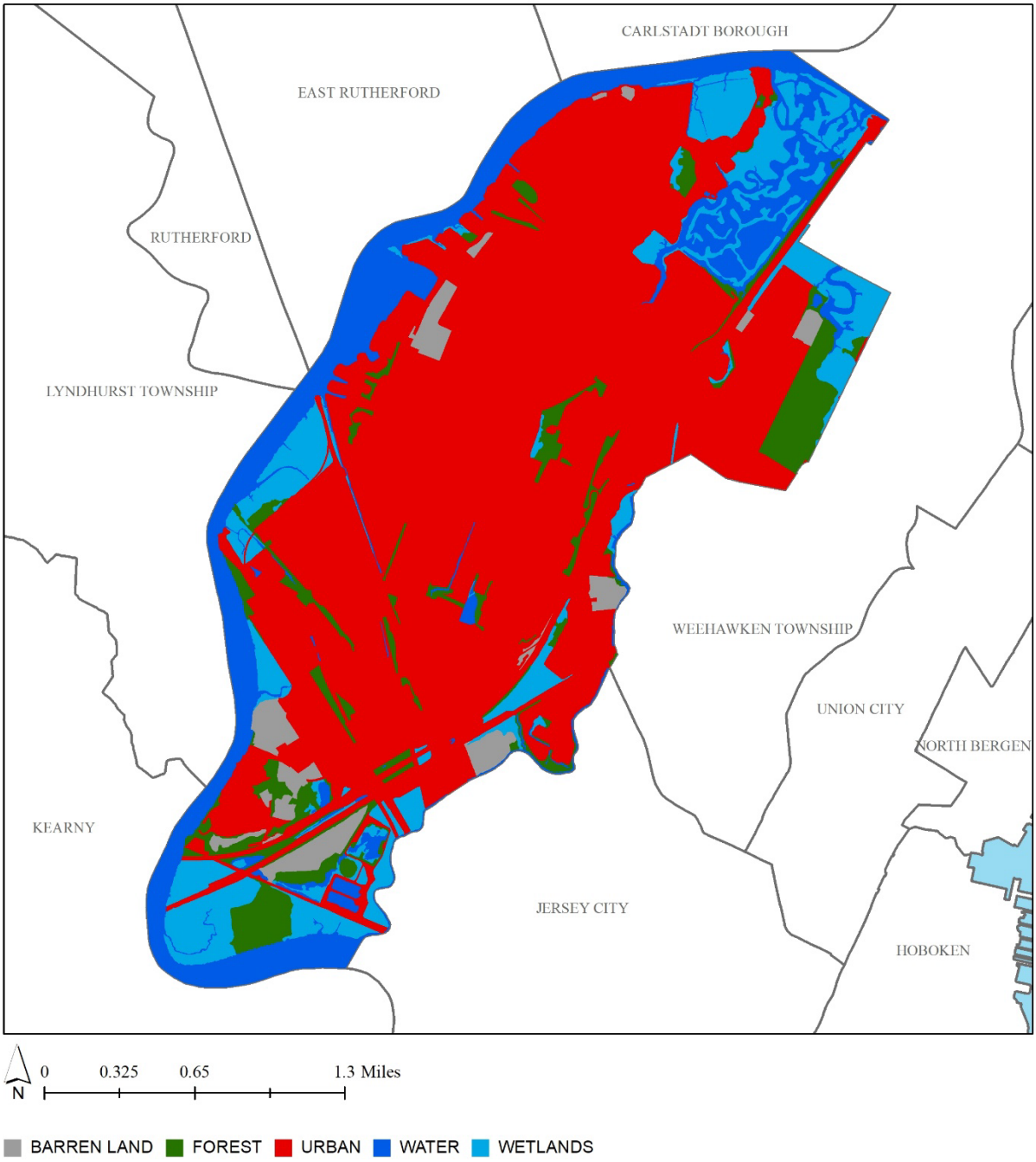


Figure 1: Map illustrating land use in Secaucus

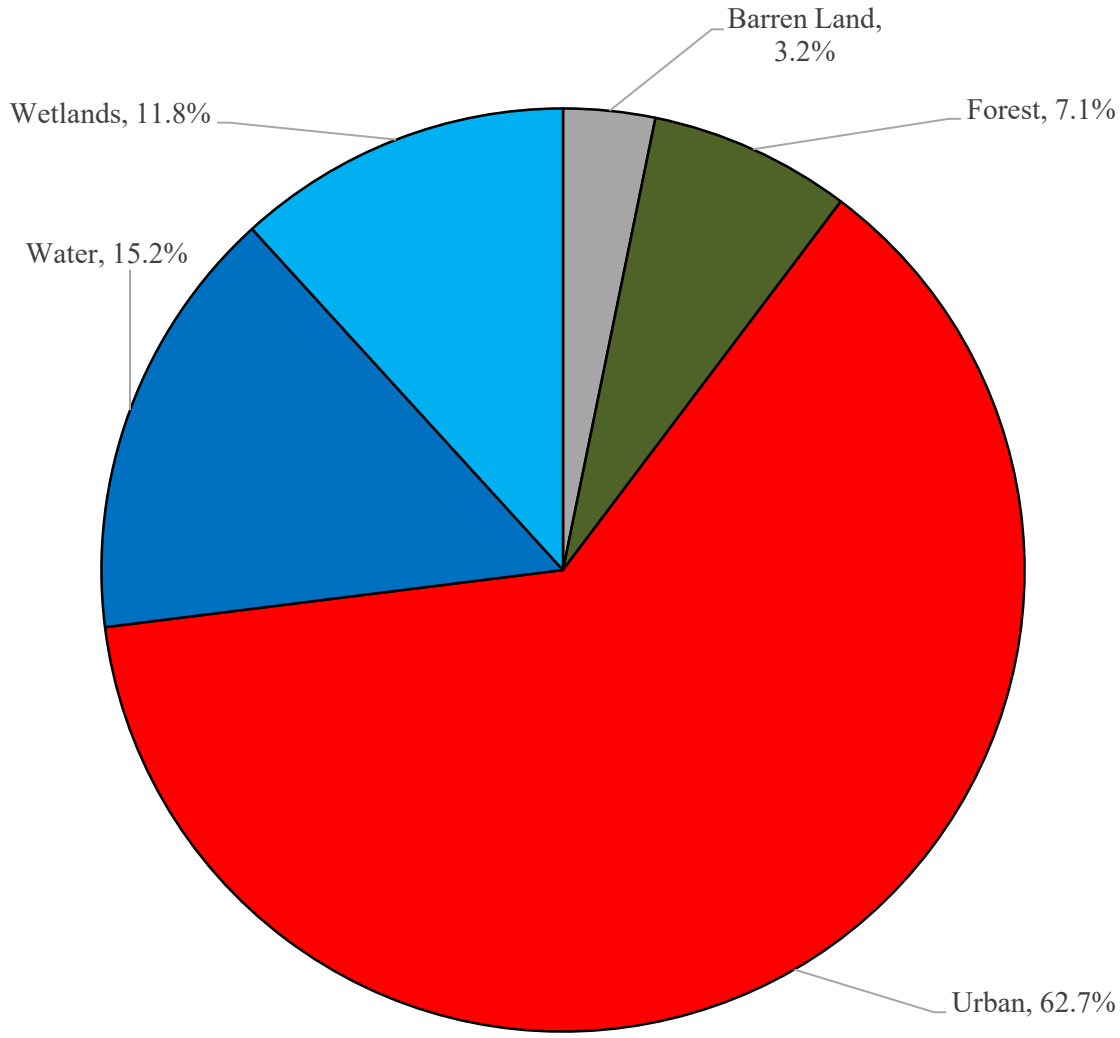


Figure 2: Pie chart illustrating the land use in Secaucus

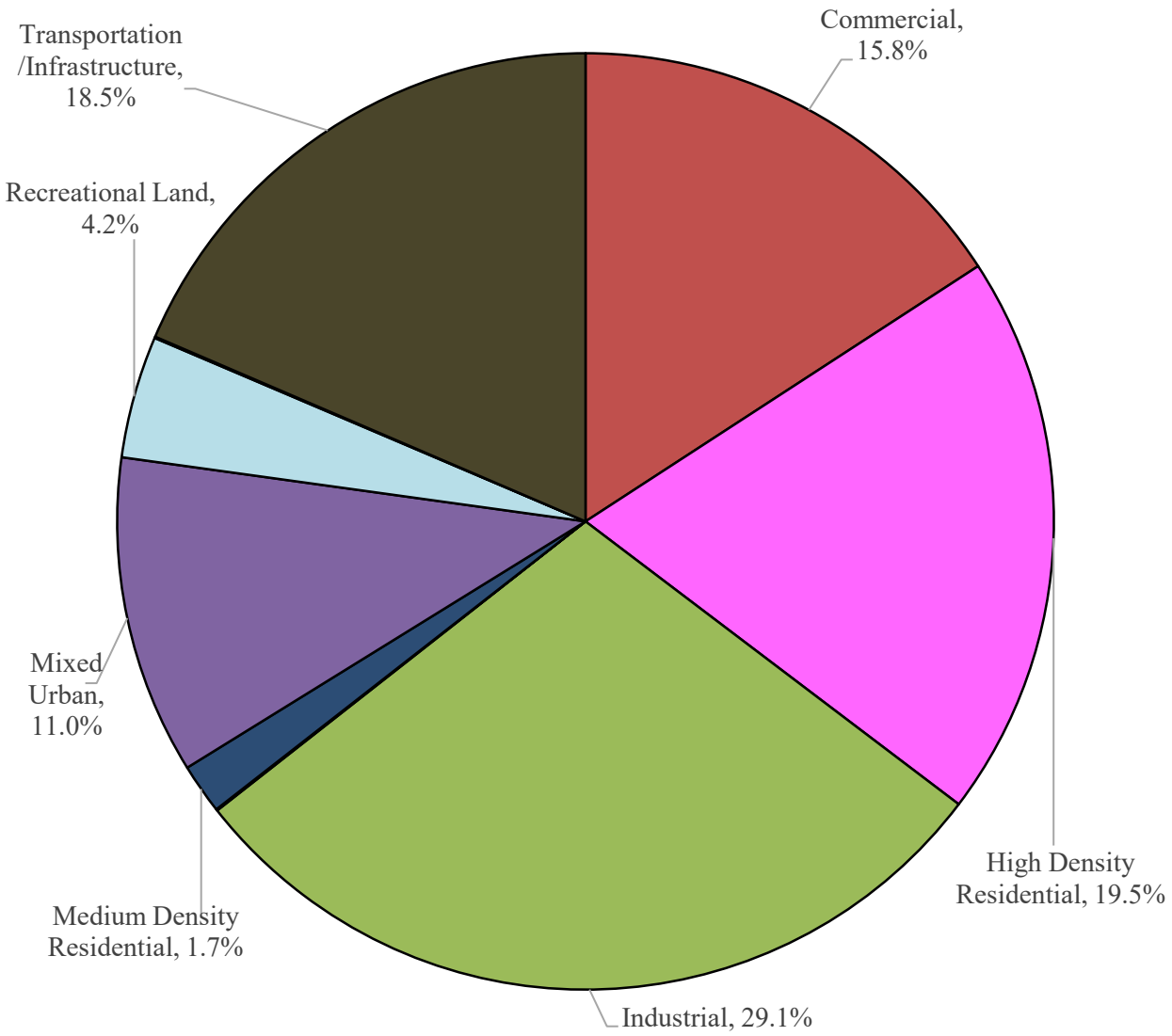


Figure 3: Pie chart illustrating the various types of urban land use in Secaucus

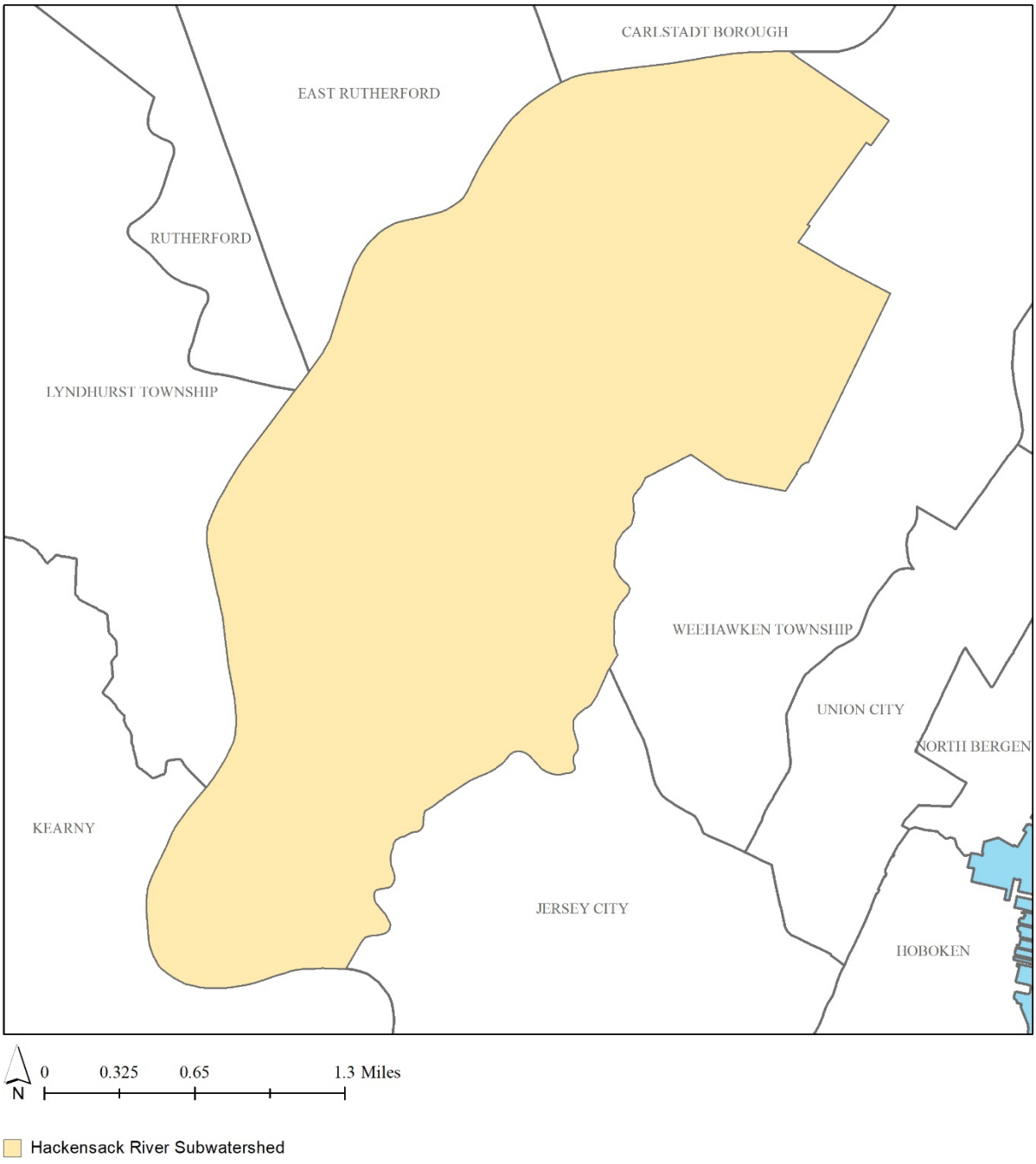


Figure 4: Map of the subwatersheds in Secaucus

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 New Jersey water quality design storm (1.25 inches of rain over two hours) and for the average annual rainfall total of 44 inches.

Preliminary soil assessments were conducted for each potential project site identified in Secaucus 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, allowing for the capture of 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, February 2004, Page 3-11.

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 yield 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 Secaucus. The practices are discussed below.

Disconnected downspouts

This is often referred to as simple disconnection. A downspout is simply disconnected 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 are designed with an underlying stone layer to retain stormwater runoff and allow it to slowly seep into the ground.




[3] United States Environmental Protection Agency (USEPA). 2015. Benefits of Green Infrastructure. http://www.epa.gov/greeninfrastructure/benefits-green-infrastructure

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.

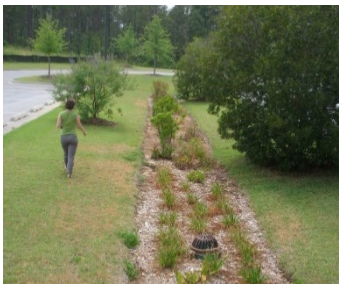
Downspout planter boxes

These are large wooden boxes that house a variety of water-retaining and/or filtering plants. When installed at the base of a downspout, water is captured by the plants which reduces stormwater runoff volume, provides a water source for the vegetation, and provides a small patch of habitat and food sources for birds and insects.

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. Bioswales are often designed for larger scale sites where water needs time to move and slowly infiltrate into the groundwater. Much like rain garden systems, bioswales can also be designed with an underdrain pipe that allows excess water to discharge to the nearest catch basin or existing stormwater system.

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. Tree filter boxes 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 with a focus 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, recharge potential, TSS removal potential, maximum volume reduction potential per storm, peak reduction potential, and estimated project costs are provided. This information will be especially useful in instances where proposed development projects cannot satisfy the New Jersey stormwater management requirements (N.J.A.C. 7:8).

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 through a wide variety of volunteer groups, such as Boy Scouts, Girl Scouts, Municipal Green Teams, corporate volunteerism, faith-based groups, school groups, watershed groups, and other active community organizations.

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 green infrastructure 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

SECAUCUS: GREEN INFRASTRUCTURE SITES

SITES WITHIN THE HACKENSACK RIVER SUBWATERSHED

1. Clarendon Elementary School
2. Fountain Park
3. Kane Stadium
4. Laurel Hill Park
5. Secaucus Fire Department Engine 1 & Buchmuller Park
6. Secaucus Middle & High School
7. Secaucus Public Library
8. Secaucus Recreation Center
9. Secaucus Swim Center
10. Town Hall
11. Town Hall Annex
12. Trolley Park

b. Proposed Green Infrastructure Concepts

Clarendon Elementary School

Subwatershed: Hackensack River

Site Area: 419,145 sq. ft.

Address: 685 5th Street
Secaucus, NJ 07094

Block and Lot: Block 70, Lot 1

Parking spaces in the parking lot to the north and south of the building can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot. A rain garden can be installed in various turfgrass areas near the building to capture, treat, and infiltrate stormwater runoff from the rooftop. Stormwater planters can be installed west of the property to capture, treat, and infiltrate stormwater runoff from the roadway. 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"
63	265,980	12.8	134.3	1,221.2	0.207	7.29

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	0.246	41	18,150	0.68	2,370	$11,850
Pervious pavement	0.469	78	34,500	1.30	3,220	$80,500
Stormwater planters	0.098	16	7,200	0.27	940	$352,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Clarendon Elementary School

- bioretention system
- pervious pavement
- stormwater planter
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 100' 200'

Fountain Park

Subwatershed: Hackensack River

Site Area: 55,165 sq. ft.

Address: 693 Humboldt Street
Secaucus, NJ 07094

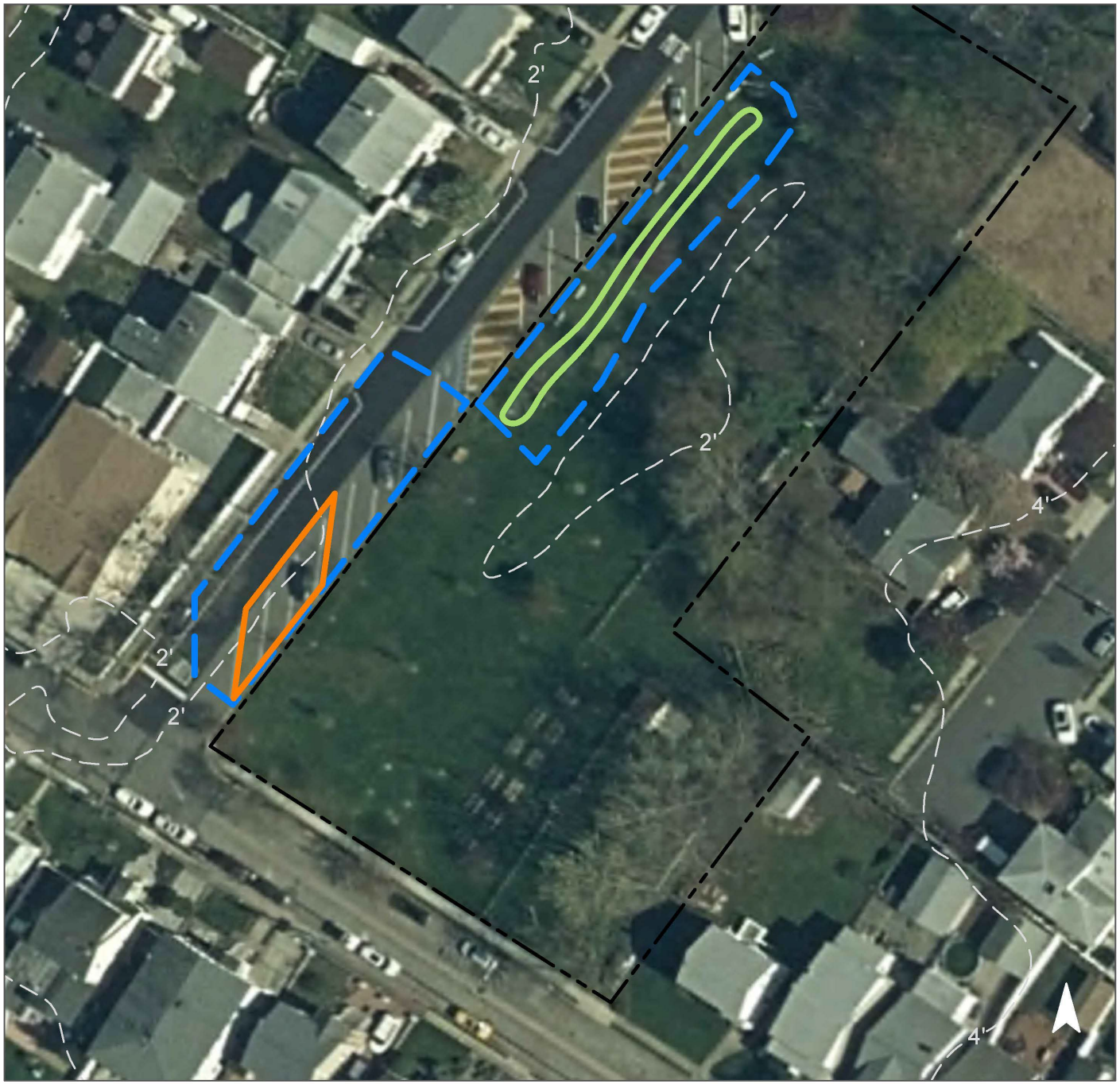
Block and Lot: Block 93, Lot 1

An existing rock swale can be converted to a bioswale to aid in infiltration of the stormwater runoff entering it. Additionally, the parking spaces to the west of the park can be converted to pervious pavement to capture, treat, and infiltrate 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"
22	11,865	0.6	6.0	54.5	0.009	0.33

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
Bioswale	0.129	15	4,640	0.08	1,240	$6,200
Pervious pavement	0.142	24	10,430	0.39	1,000	$25,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Fountain Park

- bioswale
- pervious pavement
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 30' 60'

Kane Stadium

Subwatershed: Hackensack River

Site Area: 194,150 sq. ft.

Address: 95 Dorigo Lane
Secaucus, NJ 07094

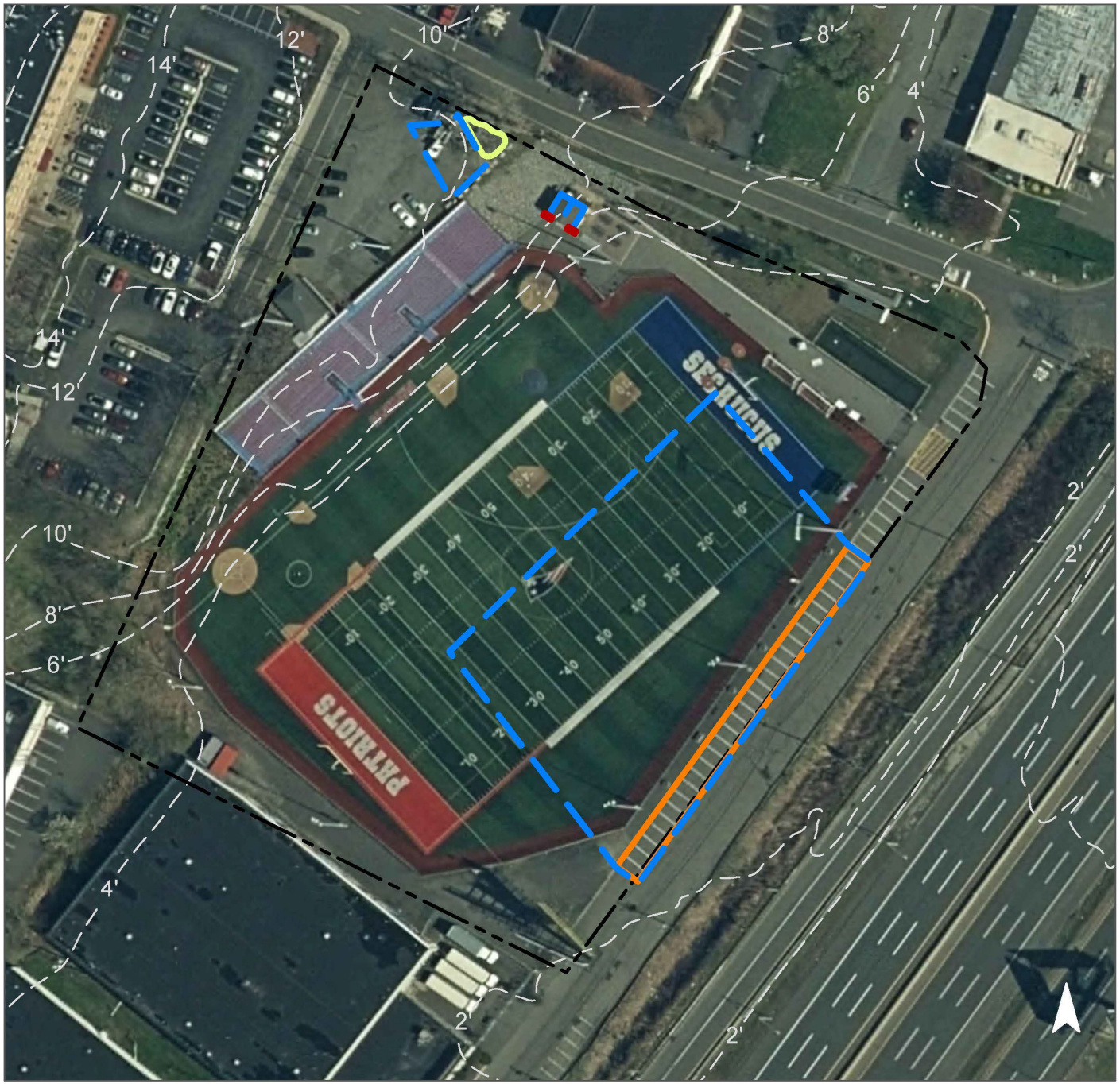
Block and Lot: Block 98, Lot 11.01

Parking spaces in the parking lot to the east of the field can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot and football field. A rain garden can be installed in the open area north of the parking lot to capture, treat, and infiltrate stormwater runoff from the pavement. Downspout planter boxes can be installed at the building downspouts to capture the stormwater from 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"
93	181,145	8.7	91.5	831.7	0.151	4.97

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	2,650	0.10	345	$1,725
Pervious pavement	1.120	188	82,470	3.10	7,680	$192,000
Planter boxes	n/a	1	n/a	n/a	2 (boxes)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Kane Stadium

- bioretention system
- pervious pavement
- planter box
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 50' 100'

Laurel Hill Park

Subwatershed: Hackensack River

Site Area: 3,822,545 sq. ft.

Address: 36 Laurel Hill Road
Secaucus, NJ 07094

Block and Lot: Block 5, Lot 2.01

Parking spaces in the southwestern parking lot can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot. Rain gardens and a bioswale can be installed nearby various parking lot areas to capture, treat, and infiltrate stormwater runoff from the parking areas. One of the buildings can have cisterns installed to capture the stormwater runoff from the rooftop for non-potable water reuse. 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"
21	815,220	39.3	411.7	3,743.0	0.635	22.36

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.265	44	19,510	0.73	2,545	$12,725
Bioswale	0.099	12	3,590	0.04	960	$4,800
Pervious pavement	0.310	52	22,780	0.86	2,200	$55,000
Rainwater harvesting	0.021	4	1,000	0.04	1,000 (gal)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Laurel Hill Park

- bioretention system
- bioswale
- pervious pavement
- rainwater harvesting
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 100' 200'

Secaucus Fire Department Engine 1 & Buchmuller Park

Subwatershed: Hackensack River

Site Area: 195,165 sq. ft.

Address: 150 Plaza Center
Secaucus, NJ 07094

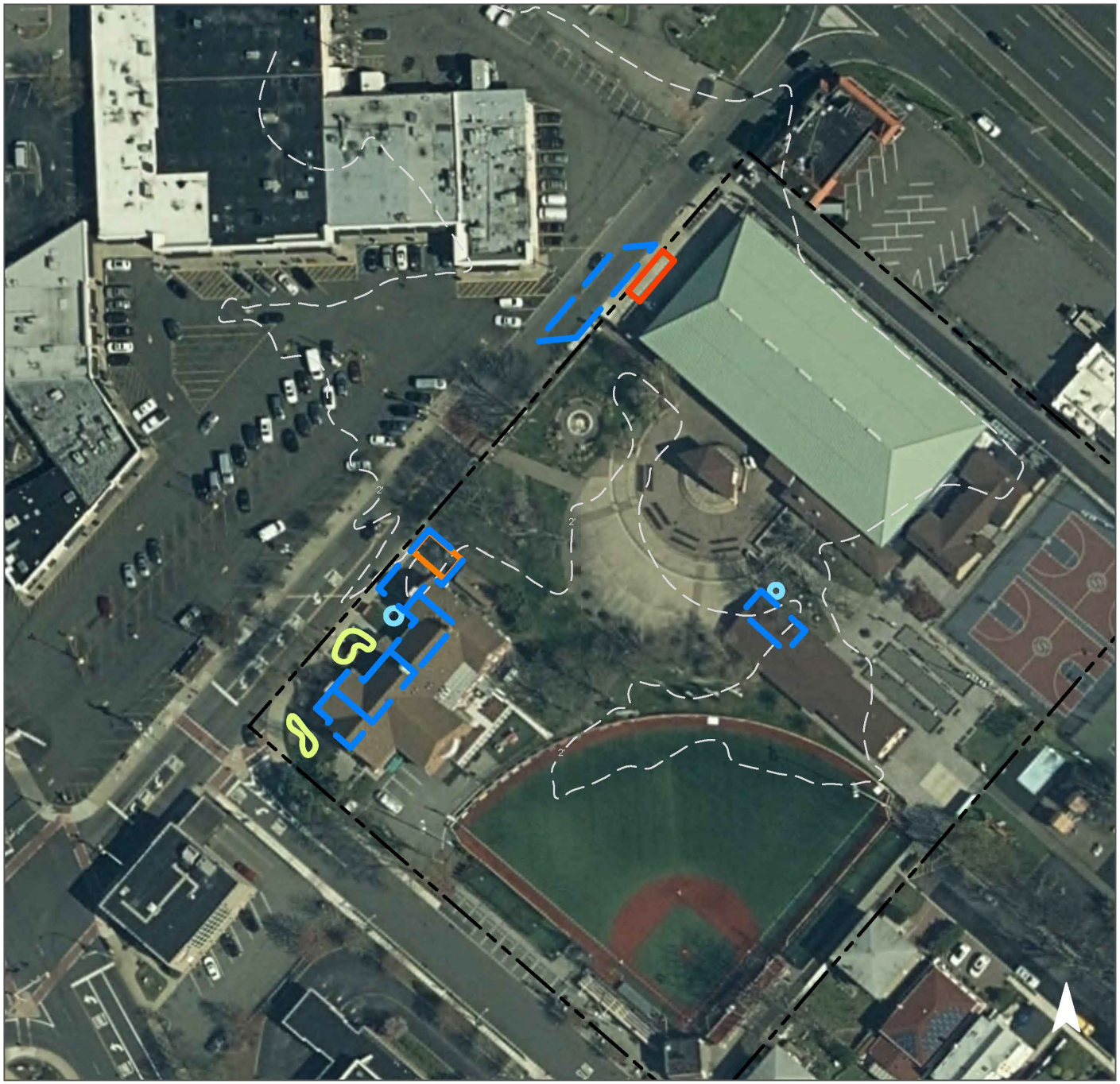
Block and Lot: Block 143, Lot 1

Parking spaces in the parking lot to the north of the building can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot. Rain gardens can be installed around the building to capture, treat, and infiltrate stormwater runoff from the roof. A stormwater planter can be installed in front of the Secaucus Ice Rink in Buchmuller Park to capture, treat, and infiltrate stormwater runoff from the Plaza Center roadway. Cisterns can be installed at the fire department and in Buchmuller Park for non-potable water reuse. 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"
92	178,630	8.6	90.2	820.2	0.139	4.90

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	0.048	8	3,530	0.13	460	$2,300
Pervious pavement	0.034	6	2,490	0.09	540	$13,500
Rainwater harvesting	0.046	8	1,750	0.07	1,750 (gal)	$3,500
Stormwater planter	0.038	6	2,760	0.10	360	$135,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Secaucus Fire Department Engine 1 & Buchmuller Park

- bioretention system
- pervious pavement
- rainwater harvesting
- stormwater planter
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 50' 100'

Secaucus Middle & High School

Subwatershed: Hackensack River

Site Area: 1,310,920 sq. ft.

Address: 11 Millridge Road
Secaucus, NJ 07094

Block and Lot: Block 226, Lot 17.01

Parking spaces in the southwest parking lot can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot. A rain garden can be installed in the island north of the building and to the west of the building to capture, treat, and infiltrate stormwater runoff from the pavement and rooftop, respectively. 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	487,485	23.5	246.2	2,238.2	0.380	13.37

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	0.146	25	10,780	0.41	1,405	$7,025
Pervious pavement	0.261	44	19,250	0.72	2,680	$67,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Secaucus Middle & High School

- bioretention system
- pervious pavement
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 100' 200'

Secaucus Public Library

Subwatershed: Hackensack River

Site Area: 66,235 sq. ft.

Address: 1379 Paterson Plank Road
Secaucus, NJ 07094

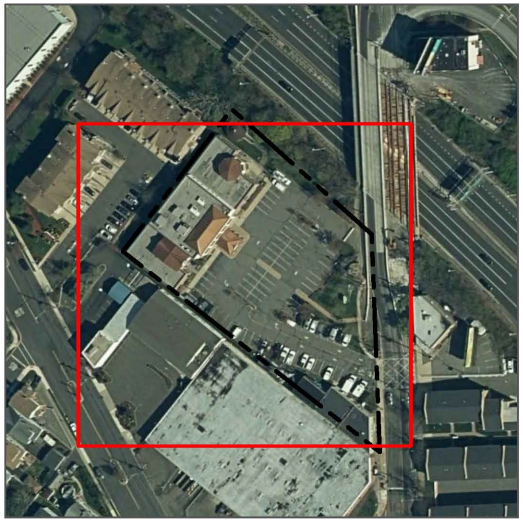
Block and Lot: Block 132, Lot 3

Parking spaces in the parking lot to the south of the building can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot. A rain garden can be installed southeast of the parking lot to capture, treat, and infiltrate stormwater runoff from the pavement. Downspout planter boxes can be installed nearby the building entrance to capture the rooftop stormwater runoff. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
88	57,970	2.8	29.3	266.2	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
Bioretention system	0.066	11	4,850	0.18	635	%3,175
Pervious pavement	0.398	67	29,330	1.10	3,060	$76,500
Planter boxes	n/a	1	n/a	n/a	2 (boxes)	$1,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Secaucus Public Library

- bioretention system
- pervious pavement
- planter box
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 25' 50'

Secaucus Recreation Center

Subwatershed: Hackensack River

Site Area: 169,760 sq. ft.

Address: 1200 Koelle Boulevard
Secaucus, NJ 07094

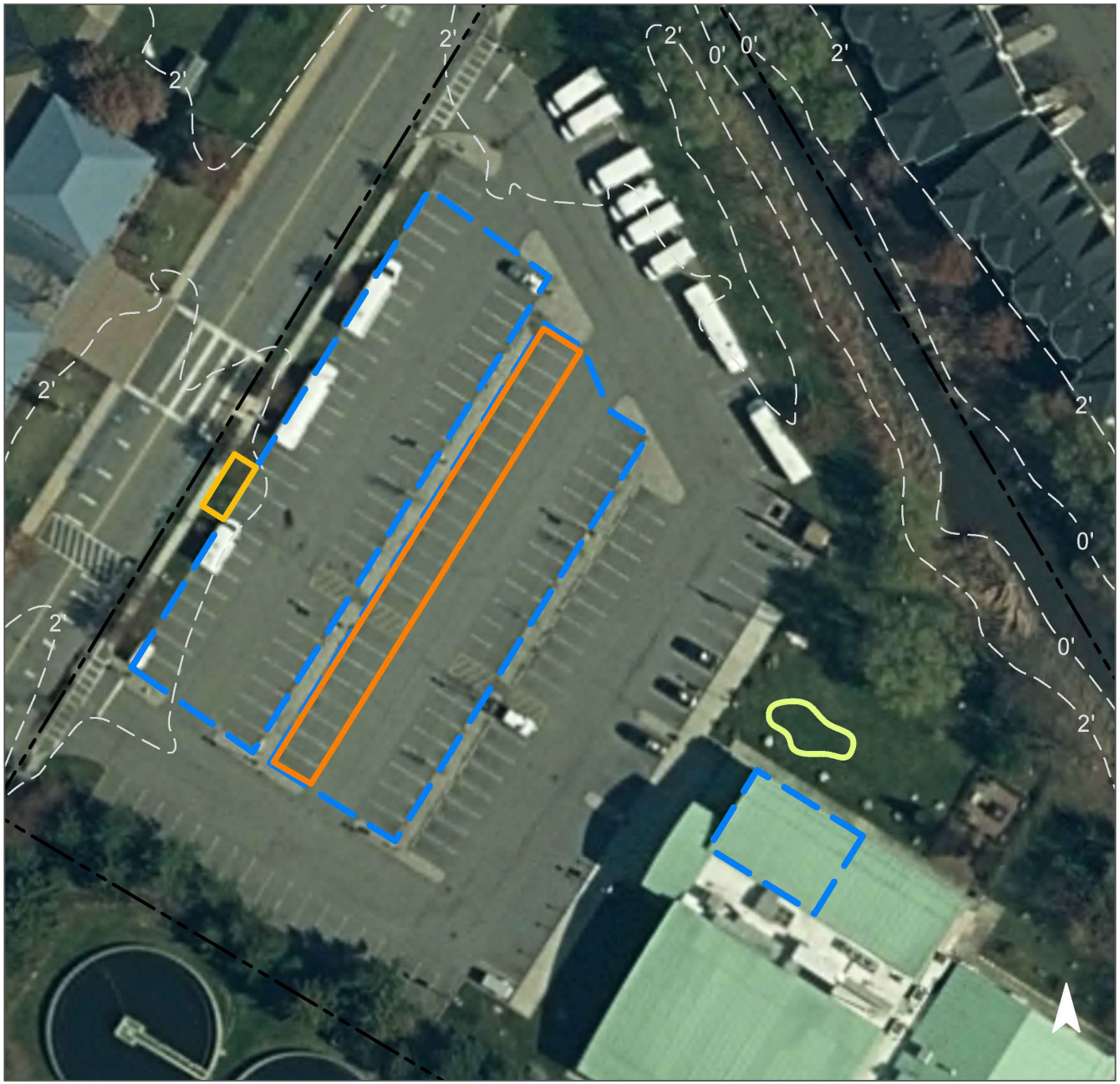
Block and Lot: Block 225, Lot 4.02

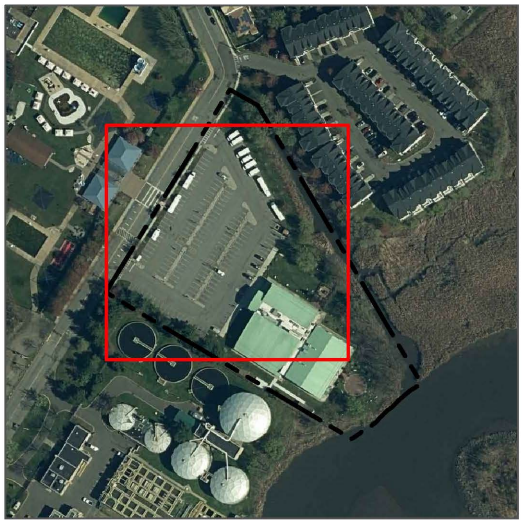
Parking spaces in the center of the parking lot can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot. A rain garden can be installed to the north of the building to capture, treat, and infiltrate stormwater runoff from the roof. A tree filter box can be installed around the existing catch basin to intercept stormwater runoff from the parking lot prior to it entering the catch basin. 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"
60	101,250	4.9	51.1	464.9	0.079	2.78

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	0.046	8	3,390	0.13	440	$2,200
Pervious pavement	0.296	50	21,770	0.82	3,640	$91,000
Tree filter box	n/a	59	n/a	n/a	1 (box)	$20,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Secaucus Recreation Center

- bioretention system
- pervious pavement
- tree filter box
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 30' 60'

Secaucus Swim Center

Subwatershed: Hackensack River

Site Area: 757,270 sq. ft.

Address: 2000 Koelle Boulevard
Secaucus, NJ 07094

Block and Lot: Block 222, Lot 1

Parking spaces in the southern parking lot can be converted to porous pavement to capture and infiltrate stormwater runoff from the parking lot. Rain gardens can be installed east of the main building and to the west of an out building to capture, treat, and infiltrate stormwater runoff from the rooftops. A bioswale can be installed by the western parking lot to help convey stormwater away from the area. 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	122,765	5.9	62.0	563.7	0.096	3.37

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	0.092	15	6,790	0.26	890	$4,450
Bioswale	0.221	27	8,380	0.09	2,240	$11,200
Pervious pavement	0.327	55	24,070	0.90	4,200	$105,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Secaucus Swim Center

- bioretention system
- bioswale
- pervious pavement
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 50' 100'

Town Hall

Subwatershed: Hackensack River

Site Area: 46,670 sq. ft.

Address: 1203 Paterson Plank Road
Secaucus, NJ 07094

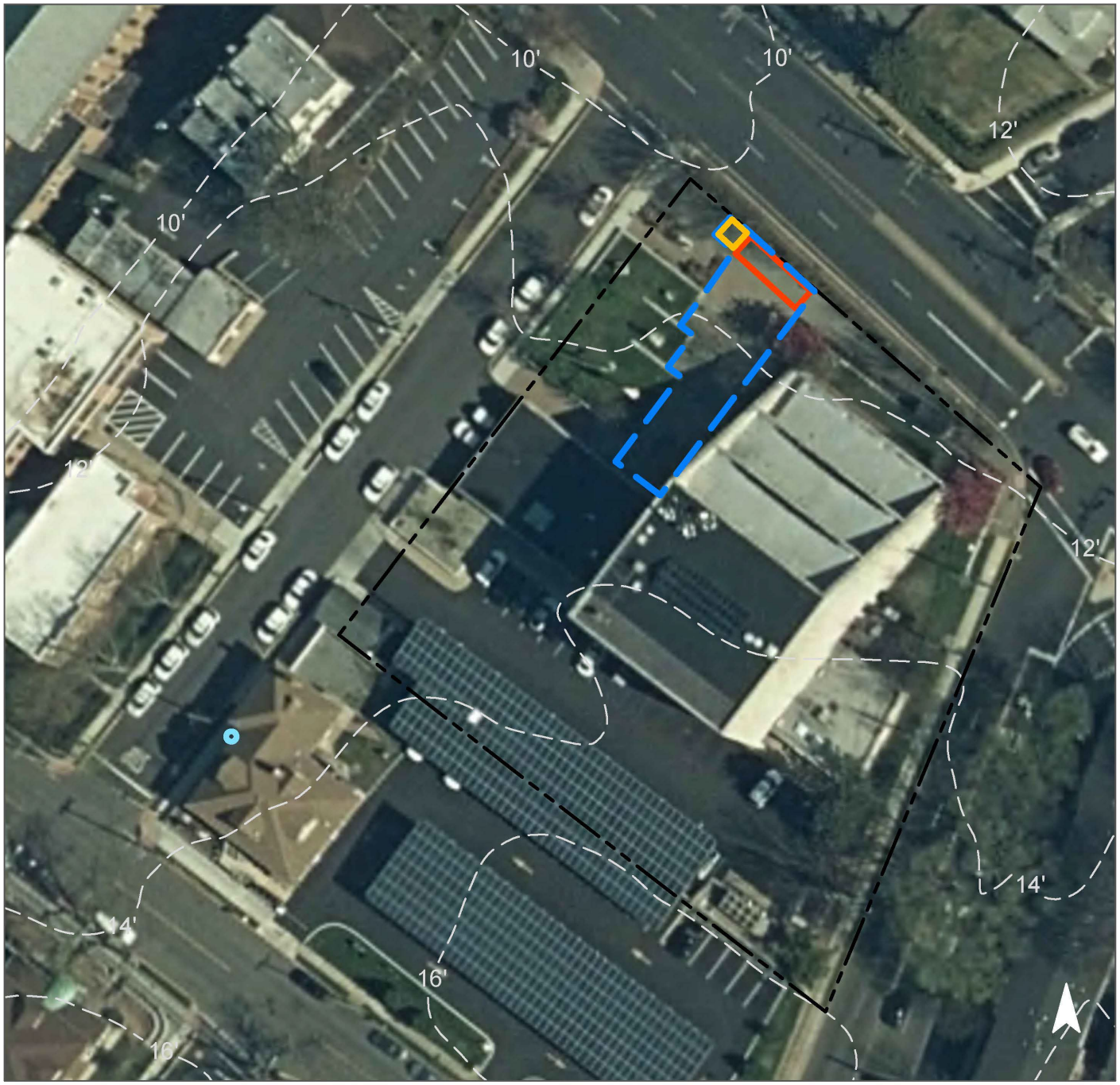
Block and Lot: Block 147, Lot 5

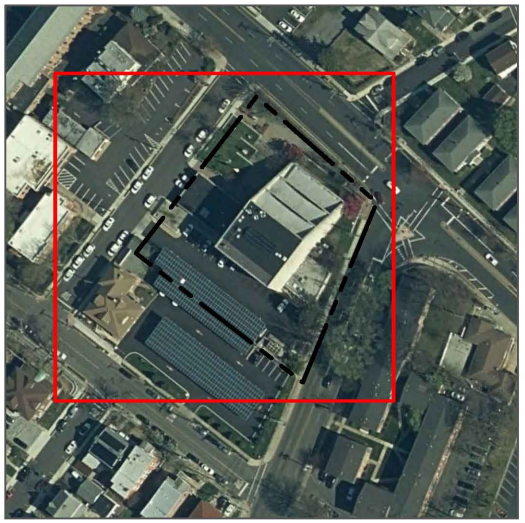
The runoff from the stairway can be intercepted prior to reaching the street by installing a hybrid system of a tree filter box and a stormwater planter. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

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"
96	44,675	2.2	22.6	205.1	0.035	1.23

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
Stormwater planter	0.035	6	2,610	0.10	340	$127,500
Tree filter box	n/a	6	n/a	n/a	1 (box)	$10,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Town Hall

- stormwater planter
- tree filter box
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 30' 60'

Town Hall Annex

Subwatershed: Hackensack River

Site Area: 7,825 sq. ft.

Address: 20 Centre Avenue
Secaucus, NJ 07094

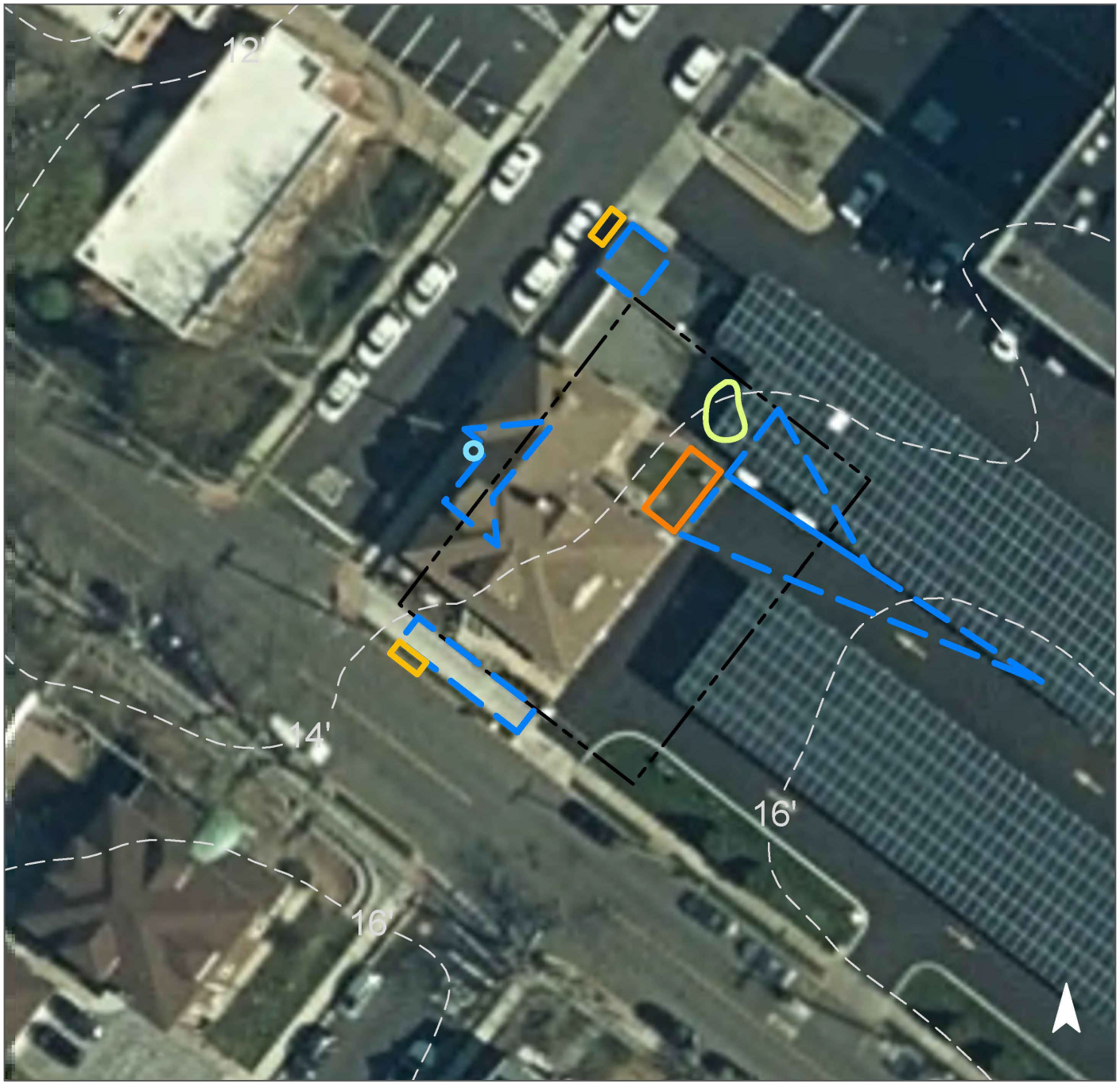
Block and Lot: Block 147, Lot 1

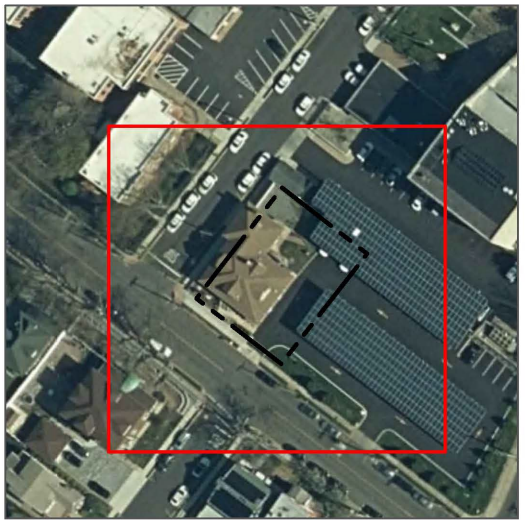
A turfstone pervious pavement patio can be installed behind the building to capture and infiltrate stormwater runoff from the parking lot. A rain garden can be installed in the turfgrass area east of the building to capture, treat, and infiltrate stormwater runoff from the parking lot. Tree filter boxes can capture runoff from the rooftop and sidewalk. A cistern can be installed west of the building to be used for watering the plant beds. 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"
96	7,490	0.4	3.8	34.4	0.006	0.21

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	0.013	2	930	0.03	120	$600
Pervious pavement	0.025	4	1,860	0.07	200	$5,000
Rainwater harvesting	0.009	2	300	0.01	300 (gal)	$600
Tree filter boxes	n/a	2	n/a	n/a	2 (boxes)	$20,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Town Hall Annex

- bioretention system
- pervious pavement
- rainwater harvesting
- tree filter box
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 20' 40'

Trolley Park

Subwatershed: Hackensack River

Site Area: 17,040 sq. ft.

Address: 1640 Paterson Plank Road
Secaucus, NJ 07094

Block and Lot: Block 193, Lot 1.01

A rain garden can be installed to the east of the park to capture, treat, and infiltrate stormwater runoff from the sidewalk and any overflow from the roadway. 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"
7	1,140	0.1	0.6	5.2	0.001	0.03

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	0.074	12	5,460	0.21	710	$3,550

GREEN INFRASTRUCTURE RECOMMENDATIONS

Trolley Park

- bioretention system
- drainage area
- property line
- 2020 Aerial: NJOIT, OGIS

0 20' 40'

c. 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)
	Hackensack River Sites	**162.12**	**7,061,891**				**52.24**	**2,275,615**	**109.7**	**1,149.3**	**10,448.2**	**237,043**	**8,343,922**	**1.773**	**62.41**
1	**Clarendon Elementary School**														
	Total Site Info	**9.62**	**419,145**	**70**	**1**	**63**	**6.11**	**265,980**	**12.8**	**134.3**	**1,221.2**	**27,706**	**975,260**	**0.207**	**7.29**
2	**Fountain Park**														
	Total Site Info	**1.27**	**55,165**	**93**	**1**	**22**	**0.27**	**11,865**	**0.6**	**6.0**	**54.5**	**1,236**	**43,505**	**0.009**	**0.33**
3	**Kane Stadium**														
	Total Site Info	**4.46**	**194,150**	**98**	**11.01**	**93**	**4.16**	**181,145**	**8.7**	**91.5**	**831.7**	**18,869**	**664,198**	**0.141**	**4.97**
4	**Laurel Hill Park**														
	Total Site Info	**87.75**	**3,822,545**	**5**	**2.01**	**21**	**18.71**	**815,220**	**39.3**	**411.7**	**3,743.0**	**84,919**	**2,989,140**	**0.635**	**22.36**
5	**Secaucus Fire Department Engine 1 & Buchmuller Park**														
	Total Site Info	**4.48**	**195,165**	**143**	**1**	**92**	**4.10**	**178,630**	**8.6**	**90.2**	**820.2**	**18,607**	**654,977**	**0.139**	**4.90**
6	**Secaucus Middle & High School**														
	Total Site Info	**30.09**	**1,310,920**	**226**	**17.01**	**37**	**11.19**	**487,485**	**23.5**	**246.2**	**2,238.2**	**50,780**	**1,787,445**	**0.380**	**13.37**
7	**Secaucus Public Library**														
	Total Site Info	**1.52**	**66,235**	**132**	**3**	**88**	**1.33**	**57,970**	**2.8**	**29.3**	**266.2**	**6,039**	**212,557**	**0.045**	**1.59**
8	**Secaucus Recreation Center**														
	Total Site Info	**3.90**	**169,760**	**225**	**4.02**	**60**	**2.32**	**101,250**	**4.9**	**51.1**	**464.9**	**10,547**	**371,250**	**0.079**	**2.78**
9	**Secaucus Swim Center**														
	Total Site Info	**17.38**	**757,270**	**222**	**1**	**16**	**2.82**	**122,765**	**5.9**	**62.0**	**563.7**	**12,788**	**450,138**	**0.096**	**3.37**
10	**Town Hall**														
	Total Site Info	**1.07**	**46,670**	**147**	**5**	**96**	**1.03**	**44,675**	**2.2**	**22.6**	**205.1**	**4,654**	**163,808**	**0.035**	**1.23**
11	**Town Hall Annex**														
	Total Site Info	**0.18**	**7,825**	**147**	**1**	**96**	**0.17**	**7,490**	**0.4**	**3.8**	**34.4**	**780**	**27,463**	**0.006**	**0.21**
12	**Trolley Park**														
	Total Site Info	**0.39**	**17,041**	**193**	**1.01**	**7**	**0.03**	**1,140**	**0.1**	**0.6**	**5.2**	**119**	**4,180**	**0.001**	**0.03**

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 %
	Hackensack River Sites	**213,995**	**4.91**	**5.111**	**904**	**357,220**	**13.01**				**$1,457,400**	**9%**
1	**Clarendon Elementary School**											
	Bioretention systems	9,460	0.22	0.246	41	18,150	0.68	2,370	5	SF	$11,850	4%
	Pervious pavement	17,985	0.41	0.469	78	34,500	1.30	3,220	25	SF	$80,500	7%
	Stormwater planters	3,750	0.09	0.098	16	7,200	0.27	940	375	SF	$352,500	1%
	Total Site Info	**31,195**	**0.72**	**0.813**	**136**	**59,850**	**2.25**				**$444,850**	**12%**
2	**Fountain Park**											
	Bioswale	4,960	0.11	0.129	15	4,640	0.08	1,240	5	SF	$6,200	42%
	Pervious pavement	5,440	0.12	0.142	24	10,430	0.39	1,000	25	SF	$25,000	46%
	Total Site Info	**10,400**	**0.24**	**0.271**	**39**	**15,070**	**0.47**				**$31,200**	**88%**
3	**Kane Stadium**											
	Bioretention system	1,380	0.03	0.036	6	2,650	0.10	345	5	SF	$1,725	1%
	Pervious pavement	43,000	0.99	1.120	188	82,470	3.10	7,680	25	SF	$192,000	24%
	Planter boxes	290	0.01	n/a	1	n/a	n/a	2	1000	box	$2,000	0%
	Total Site Info	**44,670**	**1.03**	**1.156**	**195**	**85,120**	**3.20**				**$195,725**	**25%**
4	**Laurel Hill Park**											
	Bioretention systems	10,170	0.23	0.265	44	19,510	0.73	2,545	5	SF	$12,725	1%
	Bioswale	3,795	0.09	0.099	12	3,590	0.04	960	5	SF	$4,800	0%
	Pervious pavement	11,880	0.27	0.310	52	22,780	0.86	2,200	25	SF	$55,000	1%
	Rainwater harvesting	810	0.02	0.021	4	1,000	0.04	1,000	2	gal	$2,000	0%
	Total Site Info	**26,655**	**0.61**	**0.695**	**112**	**46,880**	**1.67**				**$74,525**	**3%**
5	**Secaucus Fire Department Engine 1 & Buchmuller Park**											
	Bioretention systems	1,840	0.04	0.048	8	3,530	0.13	460	5	SF	$2,300	1%
	Pervious pavement	1,300	0.03	0.034	6	2,490	0.09	540	25	SF	$13,500	1%
	Total Site Info	**6,360**	**0.15**	**0.166**	**28**	**10,530**	**0.39**				**$154,300**	**4%**

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 %
6	**Secaucus Middle & High School**											
	Bioretention systems	5,620	0.13	0.146	25	10,780	0.41	1,405	5	SF	$7,025	1%
	Pervious pavement	10,035	0.23	0.261	44	19,250	0.72	2,680	25	SF	$67,000	2%
	Rainwater harvesting		0.00	0.000	0	0	0.00		2	gal	$0	0%
	Stormwater planter		0.00	0.000	0	0	0.00		375	SF	$0	0%
	Total Site Info	**15,655**	**0.36**	**0.408**	**68**	**30,030**	**1.13**				**$74,025**	**3%**
7	**Secaucus Public Library**											
	Bioretention system	2,530	0.06	0.066	11	4,850	0.18	635	5	SF	$3,175	4%
	Pervious pavement	15,290	0.35	0.398	67	29,330	1.10	3,060	25	SF	$76,500	26%
	Total Site Info	**18,220**	**0.42**	**0.464**	**79**	**34,180**	**1.28**				**$81,675**	**31%**
8	**Secaucus Recreation Center**											
	Bioretention system	1,765	0.04	0.046	8	3,390	0.13	440	5	SF	$2,200	2%
	Pervious pavement	11,350	0.26	0.296	50	21,770	0.82	3,640	25	SF	$91,000	11%
	Planter box (downspout)		0.00	n/a	0	n/a	n/a		1000	box	$0	0%
	Total Site Info	**28,115**	**0.65**	**0.342**	**116**	**25,160**	**0.95**				**$113,200**	**28%**
9	**Secaucus Swim Center**											
	Bioretention systems	3,540	0.08	0.092	15	6,790	0.26	890	5	SF	$4,450	3%
	Pervious pavement	12,550	0.29	0.327	55	24,070	0.90	4,200	25	SF	$105,000	10%
	Tree filter box		0.00	n/a	0	n/a	n/a		10000	box	$0	0%
	Total Site Info	**24,590**	**0.56**	**0.641**	**97**	**39,240**	**1.25**				**$120,650**	**20%**
10	**Town Hall**											
	Bioretention system		0.00	0.000	0	0	0.00		5	SF	$0	0%
	Bioswale		0.00	0.000	0	0	HyCAD Reach		5	SF	$0	0%
	Pervious pavement		0.00	0.000	0	0	0.00		25	SF	$0	0%
	Total Site Info	**2,980**	**0.07**	**0.035**	**12**	**2,610**	**0.10**				**$137,500**	**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 %
11	**Town Hall Annex**											
	Stormwater planter		0.00	0.000	0	0	0.00		375	SF	$0	0%
	Tree filter boxes	510	0.01	n/a	2	n/a	n/a	2	10000	box	$20,000	7%
	Total Site Info	**2,310**	**0.05**	**0.047**	**10**	**3,090**	**0.11**				**$26,200**	**31%**
12	**Trolley Park**											
	Bioretention system	2,845	0.07	0.074	12	5,460	0.21	710	5	SF	$3,550	250%
	Pervious pavement		0.00	0.000	0	0	0.00		25	SF	$0	0%
	Rainwater harvesting		0.00	0.000	0	0			2	gal	$0	0%
	Tree filter box		0.00	n/a	0	n/a	n/a		10000	box	$0	0%
	Total Site Info	**2,845**	**0.07**	**0.074**	**12**	**5,460**	**0.21**				**$3,550**	**250%**