RUTGERS
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Impervious Cover Reduction Action Plan
for
Glen Gardner Borough, Hunterdon County, New Jersey

Prepared for Glen Gardner Borough by the
Rutgers Cooperative Extension Water Resources Program

February 24, 2020

Highlands Council
New Jersey

ACKNOWLEDGEMENTS:

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Table of Contents

Introduction …… 1

Methodology ……..... 1

Green Infrastructure Practices …… 8

Potential Project Sites …… 10

Conclusion ……..... 11

Appendix A: Climate Resilient Green Infrastructure

a. Green Infrastructure Sites

b. Proposed Green Infrastructure Concepts

c. Summary of Existing Conditions

d. Summary of Proposed Green Infrastructure Practices

Introduction

Located in Hunterdon County, New Jersey, Glen Gardner Borough covers approximately 1.52 square miles. Figures 1 and 2 illustrate that Glen Gardner Borough is dominated by forest land use. A total of 40.9% of the municipality's land use is classified as urban. Of the urban land in Glen Gardner Borough, rural residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2015 land use/land cover geographical information system (GIS) data layer categorizes Glen Gardner 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 Glen Gardner Borough. Based upon the 2015 NJDEP land use/land cover data, approximately 10.1% of Glen Gardner Borough has impervious cover. This level of impervious cover suggests that the streams in Glen Gardner Borough likely range from sensitive to impacted streams. [1]

Methodology

Glen Gardner 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.

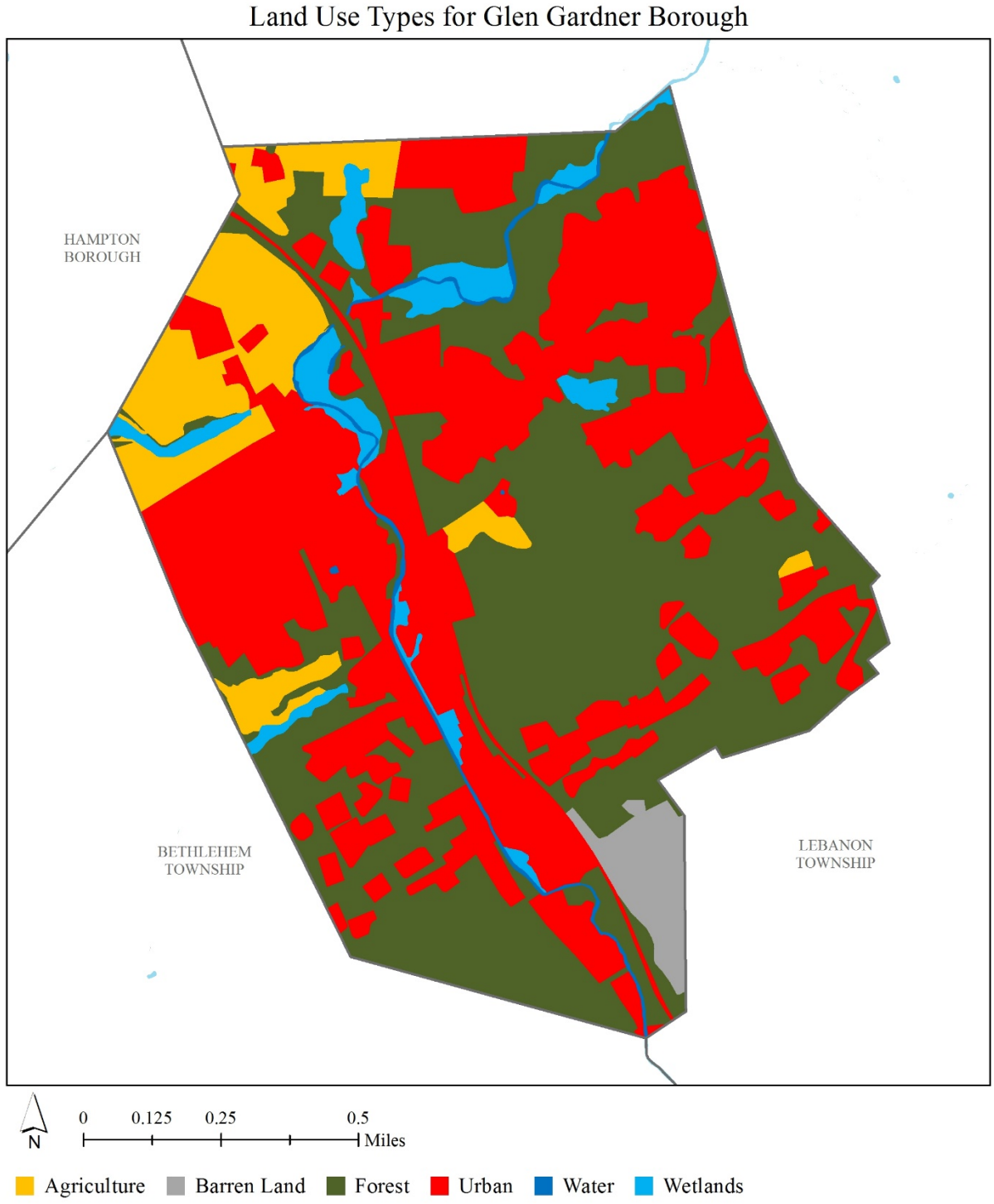


Figure 1: Map illustrating the land use in Glen Gardner

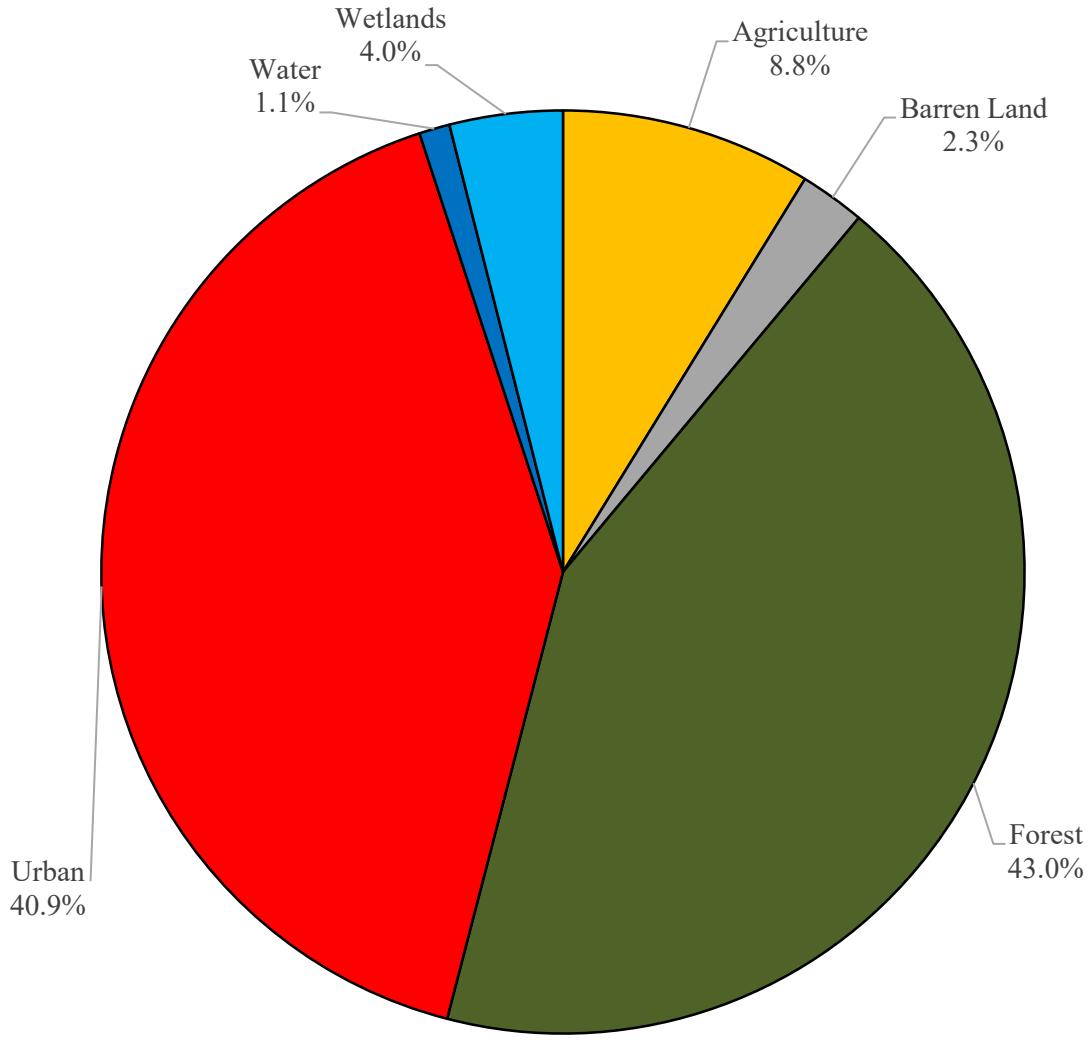


Figure 2: Pie chart illustrating the land use in Glen Gardner Borough

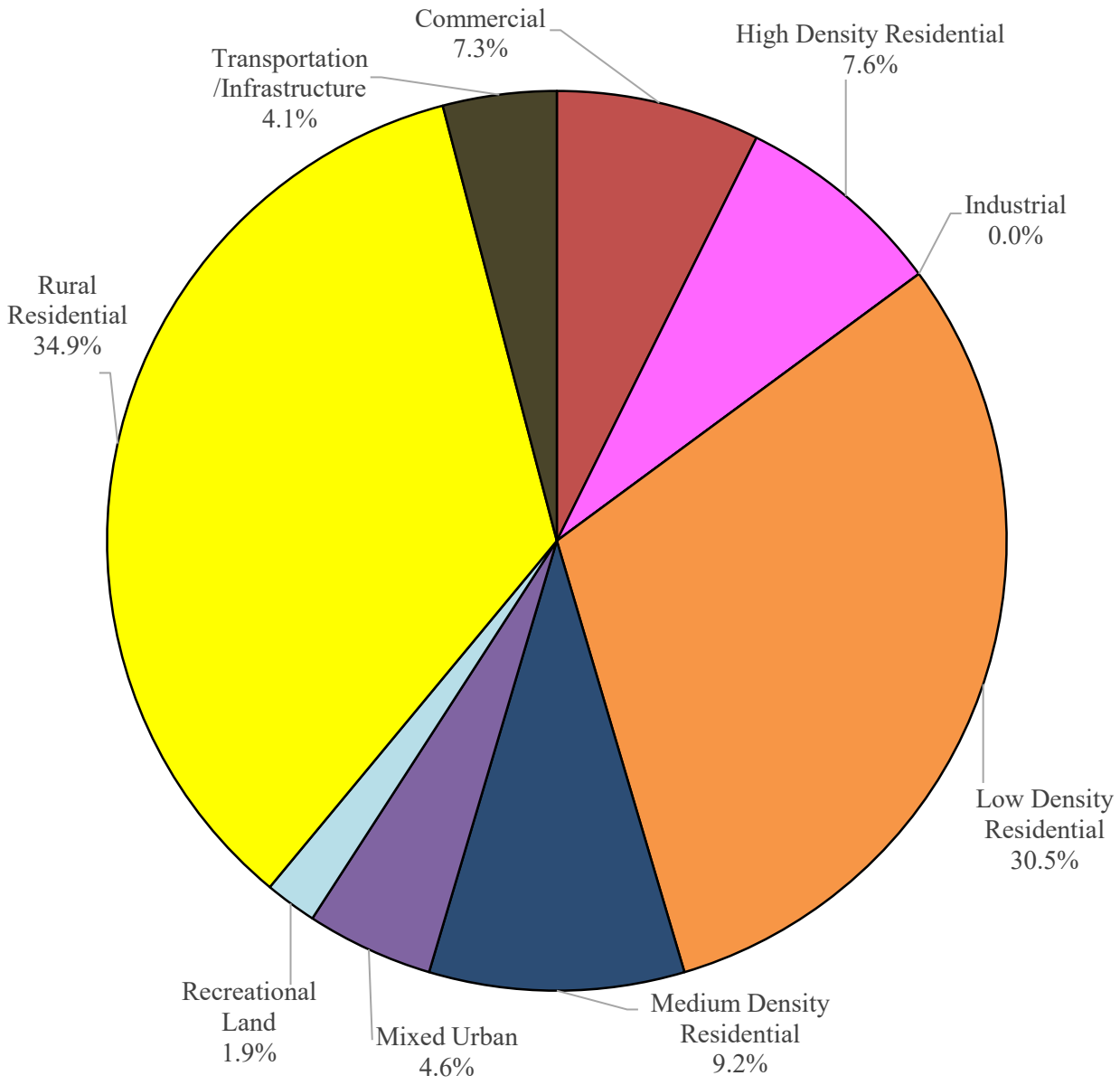


Figure 3: Pie chart illustrating the various types of urban land use in Glen Gardner Borough

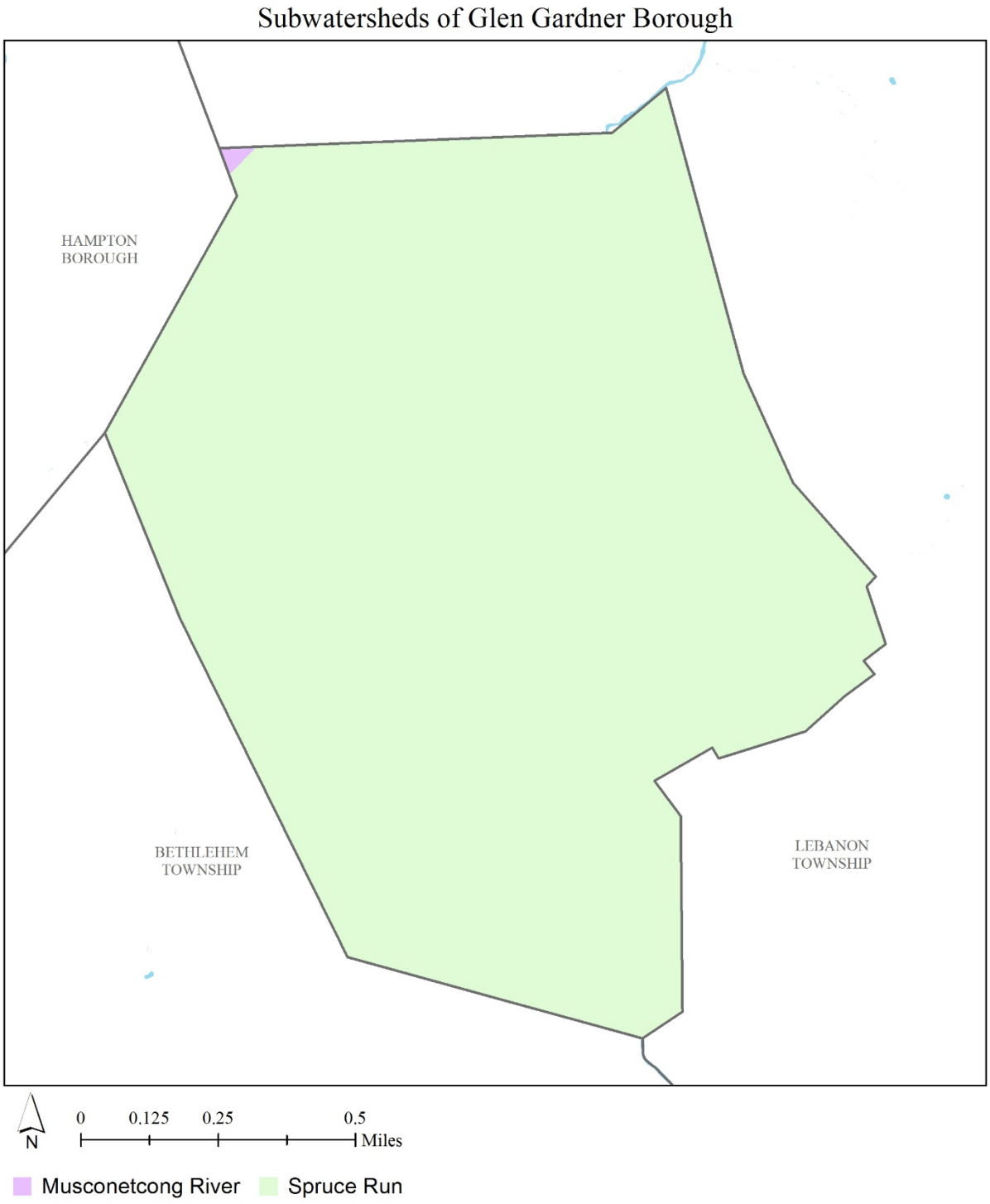


Figure 4: Map of the subwatersheds in Glen Gardner Borough

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 Glen Gardner 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 Glen Gardner 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.

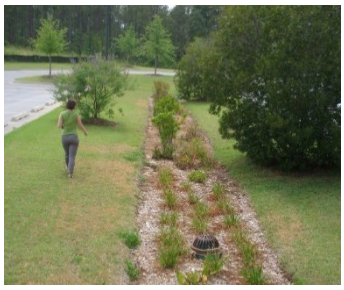
Downspout planter boxes

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

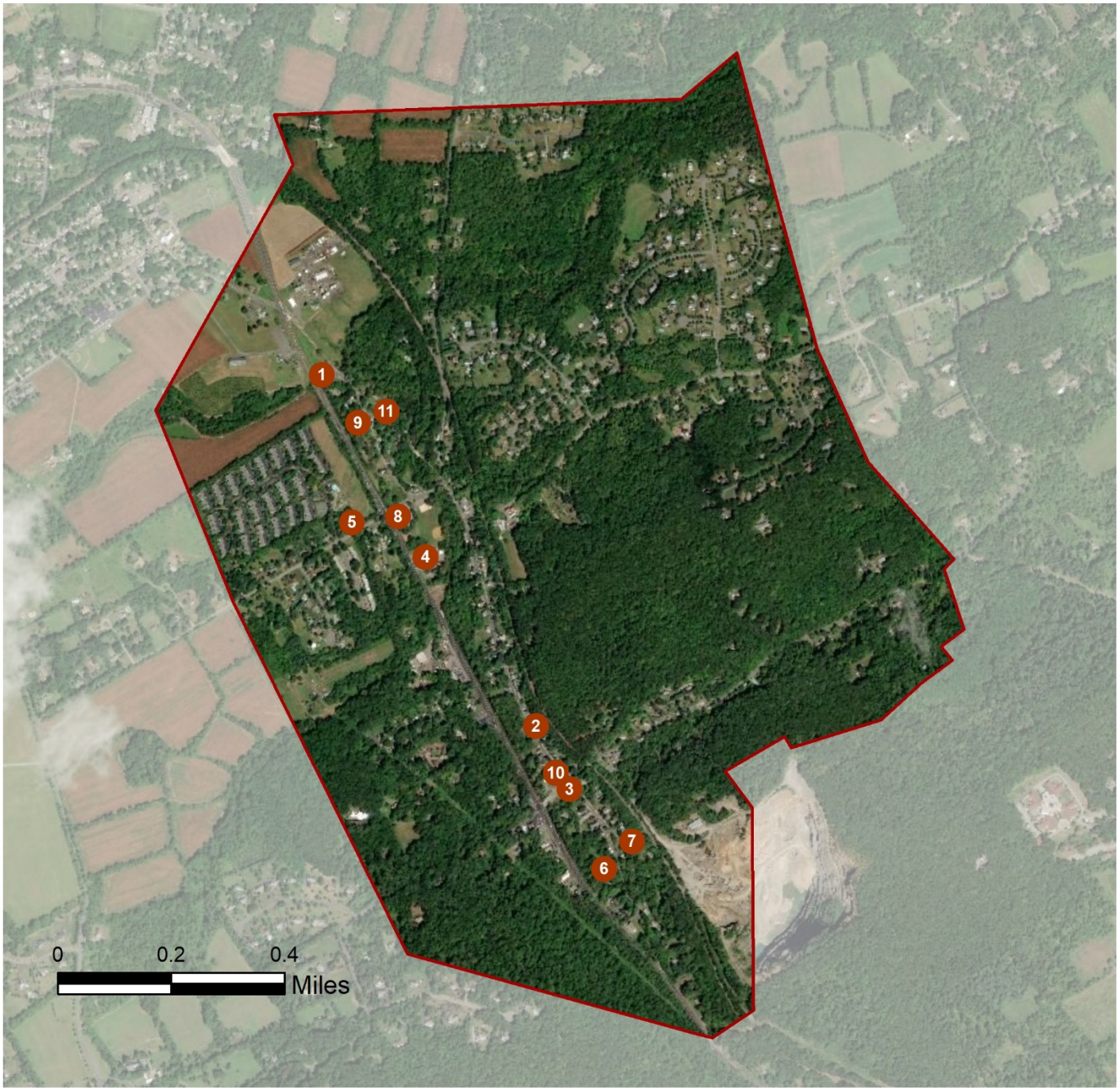
This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented by a wide variety of people such as boy scouts,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

GLEN GARDNER BOROUGH: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE SPRUCE RUN SUBWATERSHED

1. Duryea Agency
2. Glen Gardner Borough Hall
3. Glen Gardner General Store
4. Glen Gardner Volunteer Fire Department & Veterans of Foreign Wars Memorial Park
5. Glen Manor Veterinary Hospital
6. Main Street Park
7. Saint Gregory Palamas Orthodox Church
8. The Ginger Tree Preschool
9. The Youth Center
10. United States Postal Service
11. Veteran of Foreign Wars

b. Proposed Green Infrastructure Concepts

DURYEA AGENCY

Subwatershed: Spruce Run

Site Area: 111,222 sq. ft.

Address: 200 Main Street
Glen Gardner, NJ 08826

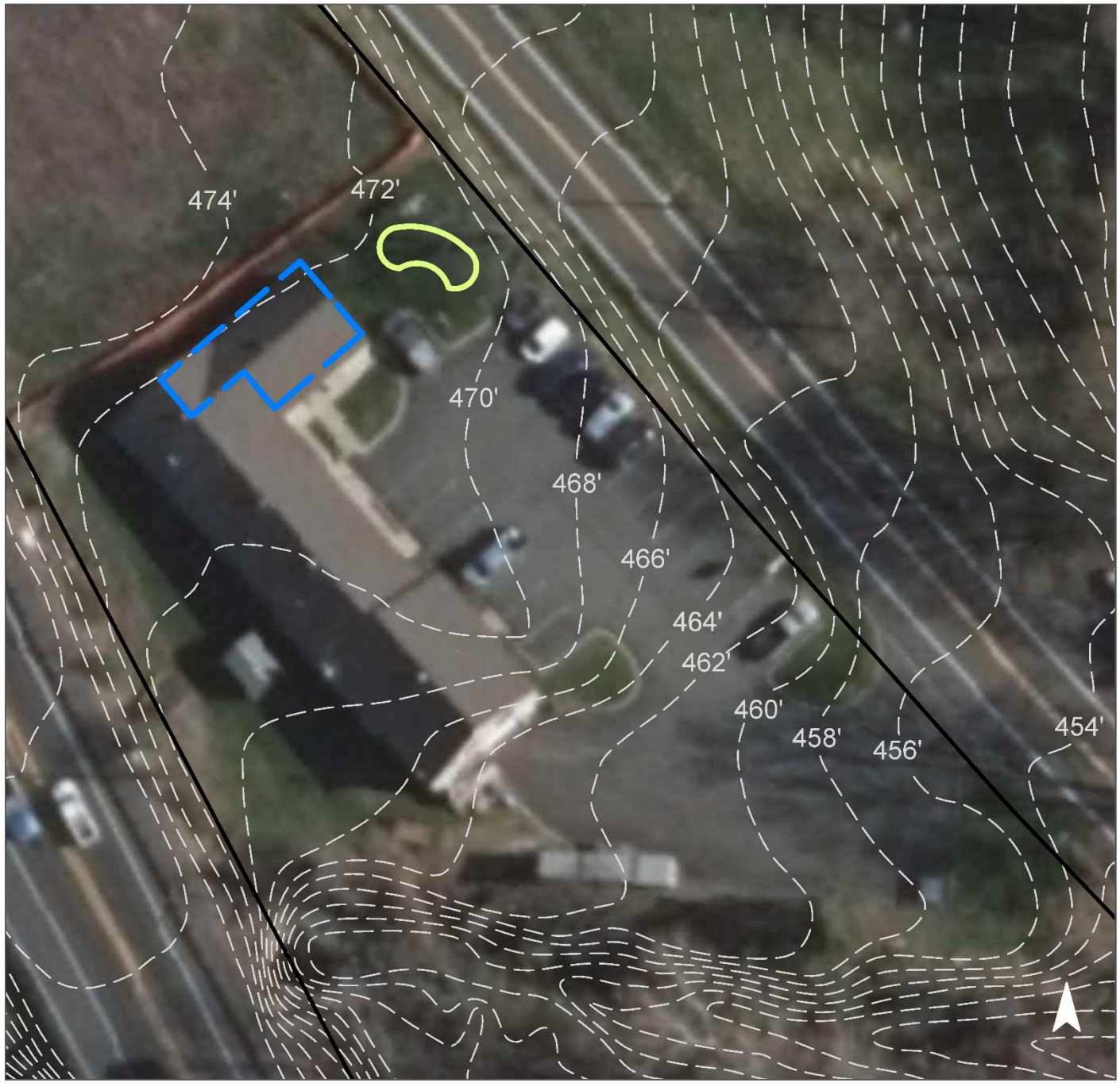
Block and Lot: Block 6, Lot 1, 1.1

A rain garden can be installed in the turfgrass area northwest of the building to capture stormwater from the rooftop 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"
43	48,154	2.3	24.3	221.1	0.038	1.32

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.025	4	1,920	0.07	250	$1,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Duryea Agency

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

0 20' 40'

GLEN GARDNER BOROUGH HALL

Subwatershed: Spruce Run

Site Area: 13,202 sq. ft.

Address: 83 Main Street
Glen Gardner, NJ 08826

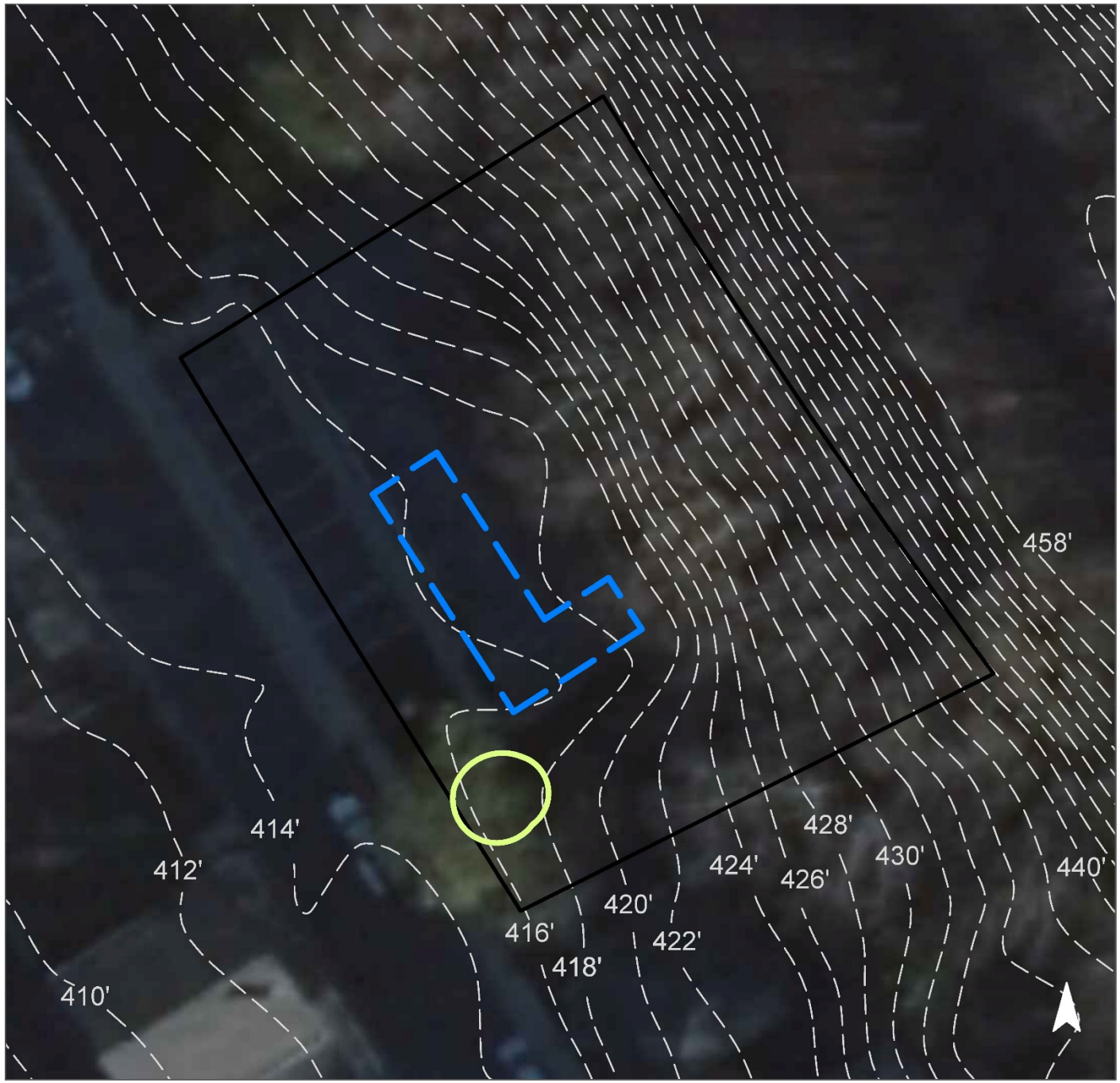
Block and Lot: Block 13, Lot 11

A rain garden can be installed in the turfgrass area in front of the building to capture, treat, and infiltrate stormwater runoff from the rooftop. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
45	5,991	0.3	3.0	27.5	0.005	0.16

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	0.025	4	1,880	0.07	240	$1,200

GREEN INFRASTRUCTURE RECOMMENDATIONS



Glen Gardner
Borough Hall

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

0 20' 40'

GLEN GARDNER GENERAL STORE

Subwatershed: Spruce Run

Site Area: 42,932 sq. ft.

Address: 58 Main Street
Glen Gardner, NJ 08826

Block and Lot: Block 16, Lot 1

A rain garden can be installed to capture stormwater from the building's rooftop 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"
45	19,306	0.9	9.8	88.6	0.015	0.53

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	0.020	3	1,480	0.06	190	$950

GREEN INFRASTRUCTURE RECOMMENDATIONS

Glen Gardner General Store

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

0 15' 30'

GLEN GARDNER VOLUNTEER FIRE COMPANY & VETERANS OF FOREIGN WARS MEMORIAL PARK

Subwatershed: Spruce Run

Site Area: 337,756 sq. ft.

Address: 2168 NJ Route 31
Glen Gardner, NJ 08826

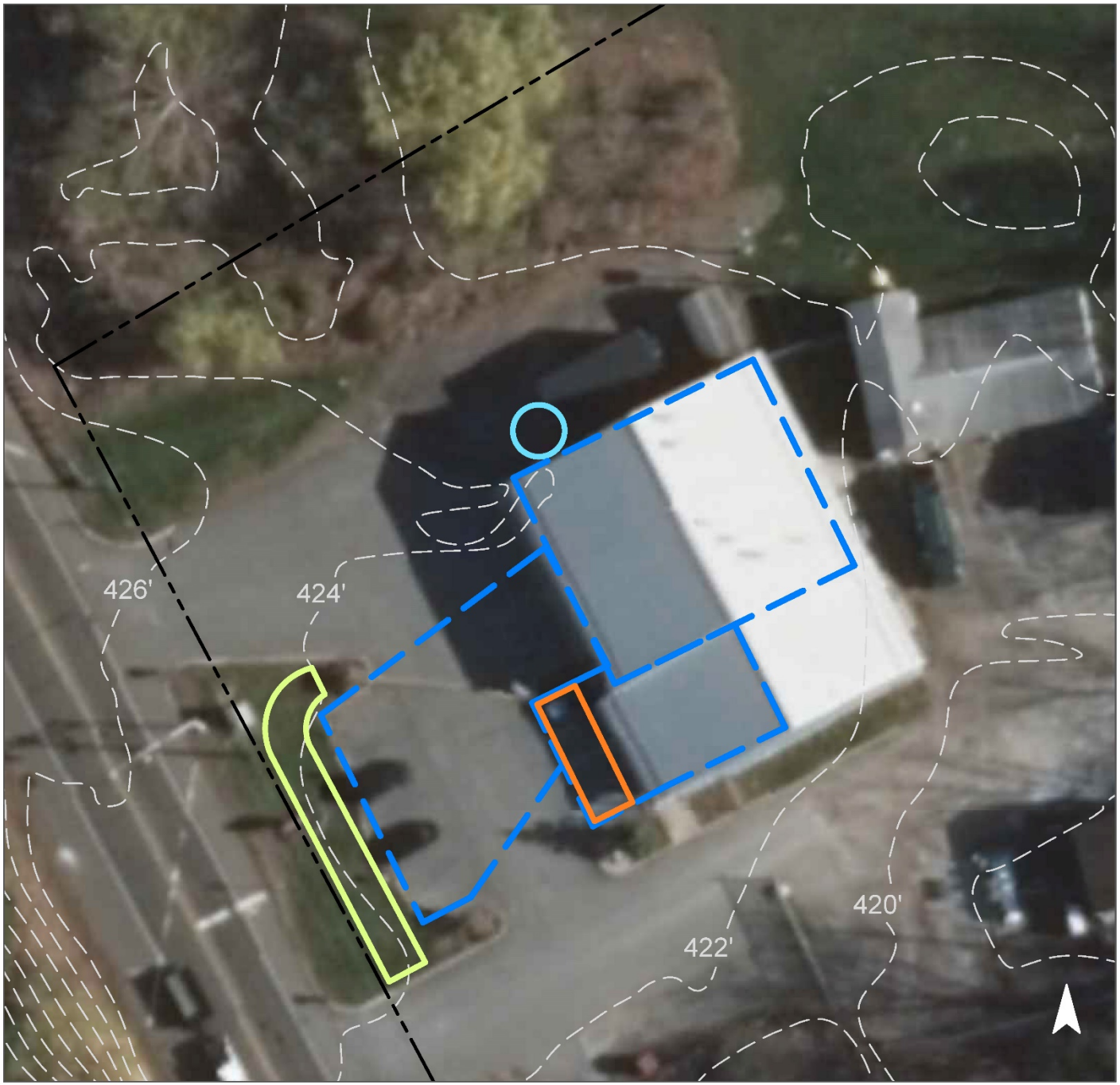
Block and Lot: Block 10, Lot 2, 34, 35

A cistern can be installed at the fire department to collect stormwater from the rooftop for washing vehicles and watering vegetation. A rain garden can be installed in the turfgrass area at the end of the parking lot to increase infiltration and filtration of stormwater. Pervious pavement can be installed near the building to capture additional stormwater from the roof and adjacent paved areas. The parking lot at the park can be retrofitted with pervious pavement to capture stormwater 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"
28	95,604	4.6	48.3	439.0	0.074	2.62

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	0.095	16	7,200	0.27	915	$4,575
Pervious pavement	0.208	35	15,790	0.59	2,685	$67,125
Rainwater harvesting	0.109	18	3,300	0.12	3,300 (gal)	$6,600

GREEN INFRASTRUCTURE RECOMMENDATIONS



Glen Gardner Volunteer Fire Company

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

0 20' 40'

GREEN INFRASTRUCTURE RECOMMENDATIONS

Veterans of Foreign Wars Memorial Park

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

0 20' 40'

GLEN MANOR VETERINARY HOSPITAL

Subwatershed: Spruce Run

Site Area: 32,339 sq. ft.

Address: 5 Glen Manor Drive
Glen Gardner, NJ 08826

Block and Lot: Block 1, Lot 8.1

A small rain garden can be installed adjacent to the building to capture stormwater. Additionally, there is an existing drainage ditch on this site that is eroding. This could potentially be retrofitted into a bioswale, but more investigation is needed. A bioswale would prevent erosion, reduce pollutants, and enhance infiltration to the existing pathway. 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"
33	10,599	0.5	5.4	48.7	0.008	0.29

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 system	0.005	1	400	0.01	50	$250

GREEN INFRASTRUCTURE RECOMMENDATIONS

Glen Manor Veterinary Hospital

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

0 15' 30'

MAIN STREET PARK

Subwatershed: Spruce Run

Site Area: 140,058 sq. ft.

Address: 25 Main Street
Glen Gardner, NJ 08826

Block and Lot: Block 16, Lot 11

A rain garden can be installed along the parking lot to capture, treat, and infiltrate stormwater from the gravel 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"
12	17,034	0.8	8.6	78.2	0.013	0.47

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	0.034	6	2,570	0.10	325	$1,625

GREEN INFRASTRUCTURE RECOMMENDATIONS

Main Street Park

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

0 25' 50'

SAINT GREGORY PALAMAS ORTHODOX CHURCH

Subwatershed: Spruce Run

Site Area: 18,393 sq. ft.

Address: 5 Church Street
Glen Gardner, NJ 08826

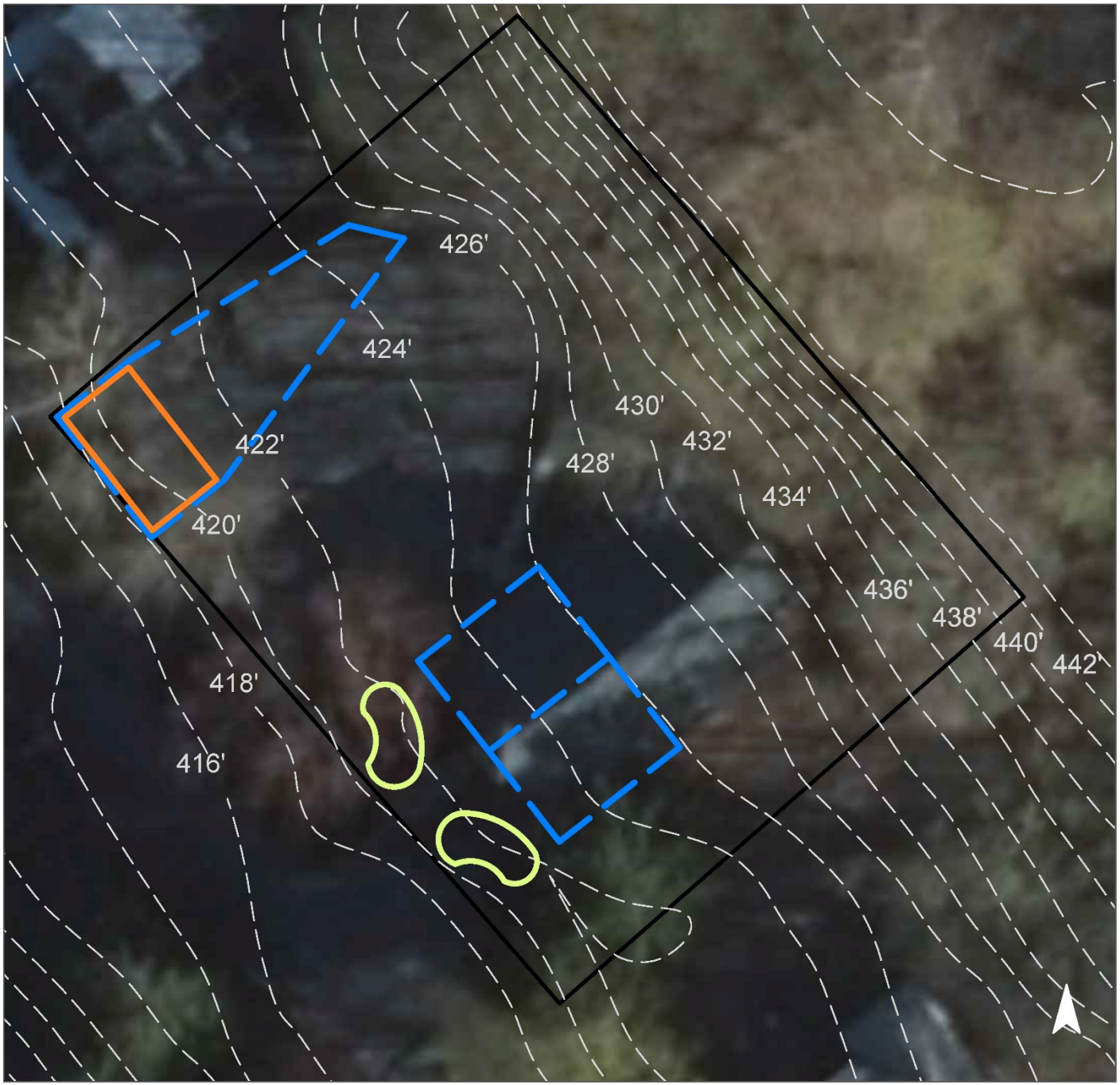
Block and Lot: Block 18, Lot 7

A rain garden can be installed in the turfgrass area on each side of the entrance to capture stormwater from the downspout. Pervious pavement can be installed in the parking spaces to intercept stormwater 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"
27	5,048	0.2	2.5	23.2	0.004	0.14

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	0.035	6	2,660	0.10	340	$1,700
Pervious pavement	0.042	7	3,160	0.12	540	$13,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Saint Gregory Palamas Orthodox Church

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

0 15' 30'

THE GINGER TREE PRESCHOOL

Subwatershed: Spruce Run

Site Area: 79,409 sq. ft.

Address: 1 School Street
Glen Gardner, NJ 08826

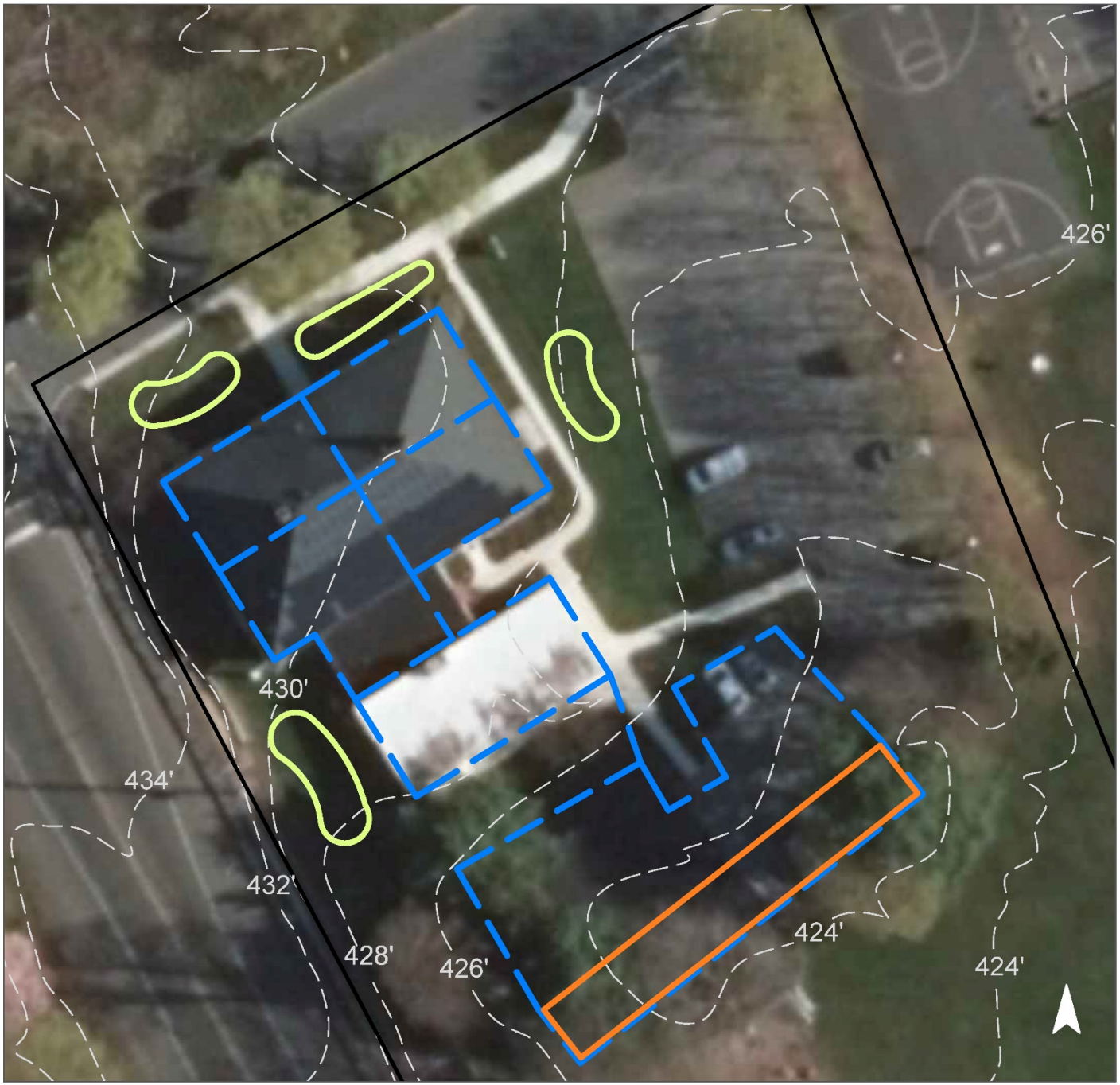
Block and Lot: Block 10, Lot 1

The runoff from almost the entire building could be managed by directing stormwater into rain gardens in the turfgrass areas adjacent to the building. The gardens would also provide educational and aesthetic value to the school. The remainder of the rooftop and a large portion of the parking lot could be managed by installing pervious pavement in the parking spaces of 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"
45	36,067	1.7	18.2	165.6	0.028	0.99

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.138	23	10,420	0.39	1,350	$6,750
Pervious pavement	0.203	34	15,390	0.58	2,040	$51,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



The Ginger Tree Preschool

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

0 20' 40'

THE YOUTH CENTER

Subwatershed: Spruce Run

Site Area: 30,929 sq. ft.

Address: 16 Hampton Road
Glen Gardner, NJ 08826

Block and Lot: Block 6, Lot 4

A rain garden can be installed in the turfgrass area near the entrance to collect and infiltrate stormwater from the adjacent paved areas. The rain garden will also provide educational opportunities and attract native pollinators. 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	13,535	0.7	6.8	62.1	0.011	0.37

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 system	0.015	2	1,110	0.04	410	$2,050

GREEN INFRASTRUCTURE RECOMMENDATIONS

The Youth Center

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

0 20' 40'

UNITED STATES POSTAL SERVICE

Subwatershed: Spruce Run

Site Area: 15,046 sq. ft.

Address: 64 Main Street
Glen Gardner, NJ 08826

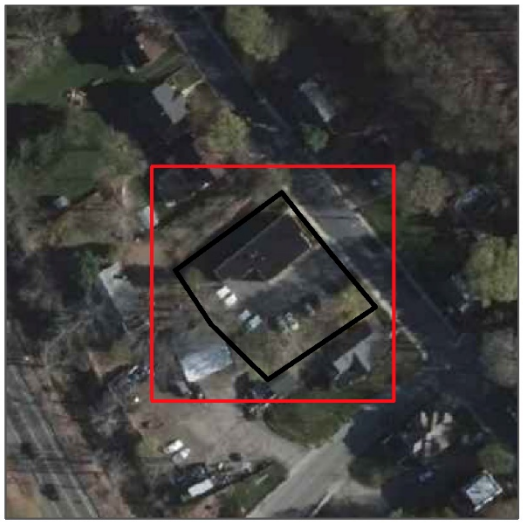
Block and Lot: Block 10, Lot 30

A rain garden can be installed in the turfgrass area adjacent to the post office to collect stormwater from the rooftop of the building by redirecting downspouts into it. Pervious pavement can be installed at the back end of the lot to capture stormwater 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"
61	9,106	0.4	4.6	41.8	0.007	0.25

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.042	7	3,160	0.12	400	$2,000
Pervious pavement	0.151	25	11,430	0.43	900	$22,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



United States Postal Service

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

0 15' 30'

VETERANS OF FOREIGN WARS

Subwatershed: Spruce Run

Site Area: 65,504 sq. ft.

Address: 179 East Main Street
Glen Gardner, NJ 08826

Block and Lot: Block 5, Lot 11, 12

A rain garden can be installed on either side of the entrance to capture stormwater from the rooftop by redirecting the downspout under the sidewalk. Pervious pavement can replace sections of parking spaces to capture a large portion of the parking lot 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"
41	26,639	1.3	13.5	122.3	0.021	0.73

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	0.031	5	2,370	0.09	300	$1,500
Pervious pavement	0.465	78	35,220	1.32	3,925	$98,125

GREEN INFRASTRUCTURE RECOMMENDATIONS

Veterans of Foreign Wars

- bioretention system
- pervious pavement
- 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 (SF)	Existing Annual Loads (Commercial)			Runoff Volumes from I.C.	
								TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
	SPRUCE RUN SITES	**20.36**	**886,790**				**287,083**	**13.8**	**145.0**	**1,318.1**	**0.224**	**7.87**
1	**Duryea Agency**											
	Total Site Info	2.55	111,222	6	1, 1.1	43	48,154	2.3	24.3	221.1	0.038	1.32
2	**Glen Gardner Borough Hall**											
	Total Site Info	0.30	13,202	13	11	45	5,991	0.3	3.0	27.5	0.005	0.16
3	**Glen Gardner General Store**											
	Total Site Info	0.99	42,932	16	1	45	19,306	0.9	9.8	88.6	0.015	0.53
4	**Glen Gardner Volunteer Fire Company & Veterans of Foreign Wars Memorial Park**											
	Total Site Info	7.75	337,756	10	2, 34, 35	28	95,604	4.6	48.3	439.0	0.074	2.62
5	**Glen Manor Veterinary Hospital**											
	Total Site Info	0.74	32,339	1	8.1	33	10,599	0.5	5.4	48.7	0.008	0.29
6	**Main Street Park**											
	Total Site Info	3.22	140,058	16	11	12	17,034	0.8	8.6	78.2	0.013	0.47
7	**Saint Gregory Palamas Orthodox Church**											
	Total Site Info	0.42	18,393	18	7	27	5,048	0.2	2.5	23.2	0.004	0.14
8	**The Ginger Tree Preschool**											
	Total Site Info	1.82	79,409	10	1	45	36,067	1.7	18.2	165.6	0.028	0.99
9	**The Youth Center**											
	Total Site Info	0.71	30,929	6	4	44	13,535	0.7	6.8	62.1	0.011	0.37
10	**United States Postal Service**											
	Total Site Info	0.35	15,046	10	30	61	9,106	0.4	4.6	41.8	0.007	0.25
11	**Veterans of Foreign Wars**											
	Total Site Info	1.50	65,504	5	11, 12	41	26,639	1.3	13.5	122.3	0.021	0.73

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 %
	SPRUCE RUN SITES	**63,050**	**1.45**	**1.643**	**275**	**119,460**	**4.48**				**$282,700**	**22.0%**
1	**Duryea Agency**											
	Bioretention system	975	0.02	0.025	4	1,920	0.07	250	$5	SF	$1,250	2.0%
	Total Site Info	**975**	**0.02**	**0.025**	**4**	**1,920**	**0.07**	**250**			**$1,250**	**2.0%**
2	**Glen Gardner Borough Hall**											
	Bioretention system	950	0.02	0.025	4	1,880	0.07	240	$5	SF	$1,200	15.9%
	Total Site Info	**950**	**0.02**	**0.025**	**4**	**1,880**	**0.07**	**240**			**$1,200**	**15.9%**
3	**Glen Gardner General Store**											
	Bioretention system	750	0.02	0.020	3	1,480	0.06	190	$5	SF	$950	3.9%
	Total Site Info	**750**	**0.02**	**0.020**	**3**	**1,480**	**0.06**	**190**			**$950**	**3.9%**
4	**Glen Gardner Volunteer Fire Company & Veterans of Foreign Wars Memorial Park**											
	Bioretention system	3,650	0.08	0.095	16	7,200	0.27	915	$5	SF	$4,575	3.8%
	Pervious pavement	8,000	0.18	0.208	35	15,790	0.59	2,685	$25	SF	$67,125	8.4%
	Rainwater harvesting	4,200	0.10	0.109	18	3,300	0.12	3,300	$2	gal	$6,600	4.4%
	Total Site Info	**15,850**	**0.36**	**0.413**	**69**	**26,290**	**0.98**	**6,900**			**$78,300**	**16.6%**
5	**Glen Manor Veterinary Hospital**											
	Bioretention system	200	0.00	0.005	1	400	0.01	50	$5	SF	$250	1.9%
	Total Site Info	**200**	**0.00**	**0.005**	**1**	**400**	**0.01**	**50**			**$250**	**1.9%**
6	**Main Street Park**											
	Bioretention system	1,300	0.03	0.034	6	2,570	0.10	325	$5	SF	$1,625	7.6%
	Total Site Info	**1,300**	**0.03**	**0.034**	**6**	**2,570**	**0.10**	**325**			**$1,625**	**7.6%**
7	**Saint Gregory Palamas Orthodox Church**											
	Bioretention systems	1,350	0.03	0.035	6	2,660	0.10	340	$5	SF	$1,700	26.7%
	Pervious pavement	1,600	0.04	0.042	7	3,160	0.12	540	$25	SF	$13,500	31.7%
	Total Site Info	**2,950**	**0.07**	**0.077**	**13**	**5,820**	**0.22**	**880**			**$15,200**	**58.4%**
8	**The Ginger Tree Preschool**											
	Bioretention systems	5,280	0.12	0.138	23	10,420	0.39	1,350	$5	SF	$6,750	14.6%

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)		($/unit)		($)	%
	Pervious pavement	7,800	0.18	0.203	34	15,390	0.58	2,040	$25	SF	$51,000	21.6%
	Total Site Info	**13,080**	**0.30**	**0.341**	**57**	**25,810**	**0.97**	**3,390**			**$57,750**	**36.3%**
9	**The Youth Center**											
	Bioretention system	565	0.01	0.015	2	1,110	0.04	410	$5	SF	$2,050	4.2%
	Total Site Info	**565**	**0.01**	**0.015**	**2**	**1,110**	**0.04**	**410**			**$2,050**	**4.2%**
10	**United States Postal Service**											
	Bioretention system	1,600	0.04	0.042	7	3,160	0.12	400	$5	SF	$2,000	17.6%
	Pervious pavement	5,790	0.13	0.151	25	11,430	0.43	900	$25	SF	$22,500	63.6%
	Total Site Info	**7,390**	**0.17**	**0.193**	**32**	**14,590**	**0.55**	**1,300**			**$24,500**	**81.2%**
11	**Veterans of Foreign Wars**											
	Bioretention system	1,200	0.03	0.031	5	2,370	0.09	300	$5	SF	$1,500	4.5%
	Pervious pavement	17,840	0.41	0.465	78	35,220	1.32	3,925	$25	SF	$98,125	67.0%
	Total Site Info	**19,040**	**0.44**	**0.496**	**83**	**37,590**	**1.41**	**4,225**			**$99,625**	**71.5%**