Impervious Cover Reduction Action Plan
for
Hopatcong Borough, Sussex County, New Jersey

Prepared for Hopatcong Borough by the
Rutgers Cooperative Extension Water Resources Program

February 27, 2016

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Introduction

Located in Sussex County in northern New Jersey, Hopatcong Borough covers approximately 12.2 square miles. Figures 1 and 2 illustrate that Hopatcong Borough is dominated by forest land uses. A total of 31.4% of the municipality's land use is classified as urban. Of the urban land in Hopatcong Borough, medium density residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2012 land use/land cover geographical information system (GIS) data layer categorizes Hopatcong 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 Hopatcong Borough. Based upon the 2012 NJDEP land use/land cover data, approximately 9.7% of Hopatcong Borough has impervious cover. This level of impervious cover suggests that the streams in Hopatcong Borough are likely sensitive streams. [1]

Methodology

Hopatcong Borough contains portions of three subwatersheds (Figure 4). For this impervious cover reduction action plan, projects have been identified in each 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] Caraco, D., R. Claytor, P. Hinkle, H. Kwon, T. Schueler, C. Swann, S. Vysotsky, and J. Zielinski. 1998. Rapid Watershed Planning Handbook. A Comprehensive Guide for Managing Urbanizing Watersheds. Prepared by Center For Watershed Protection, Ellicott City, MD. Prepared for U.S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds and Region V. October 1998

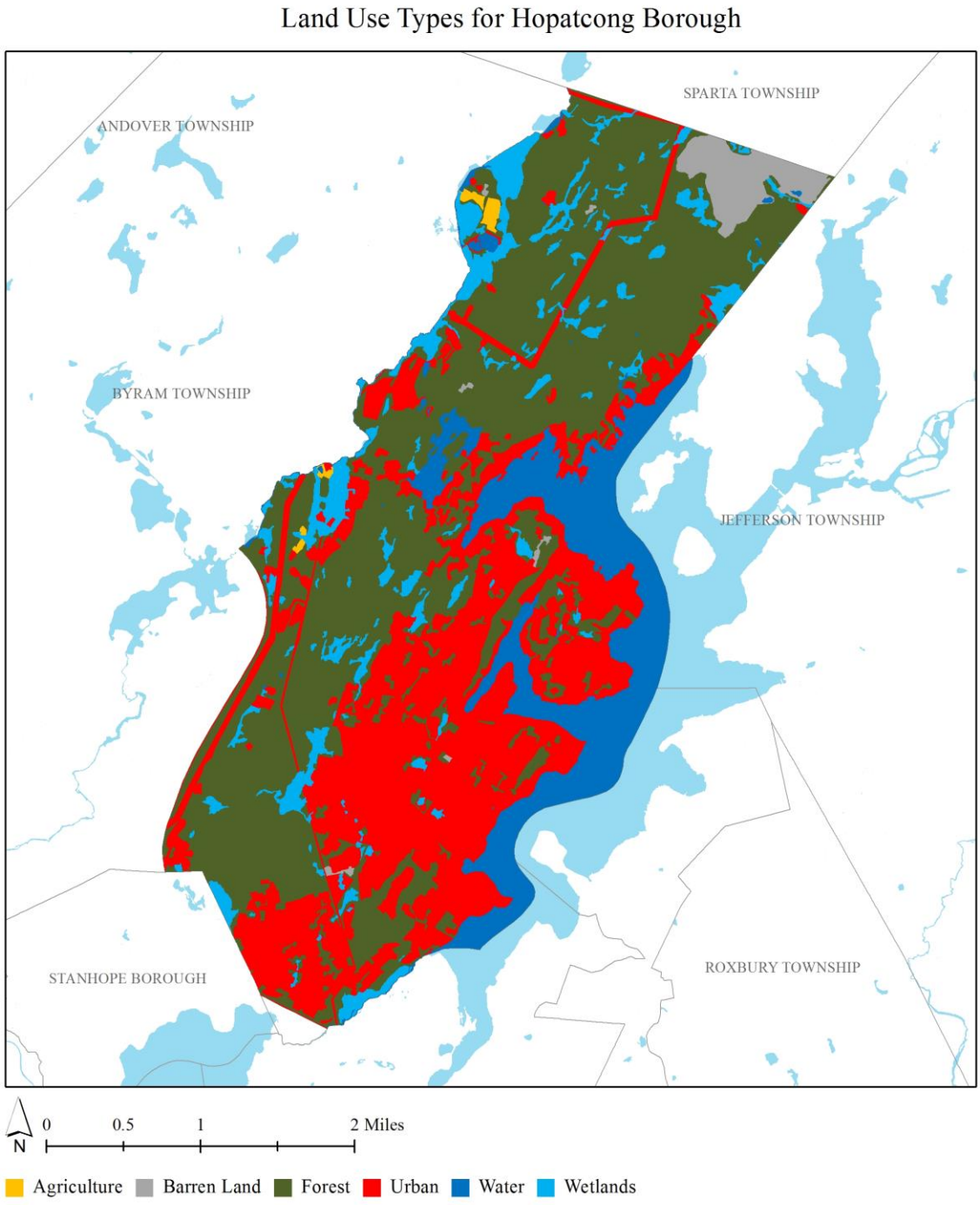


Figure 4: Map illustrating the land use in Hopatcong Borough

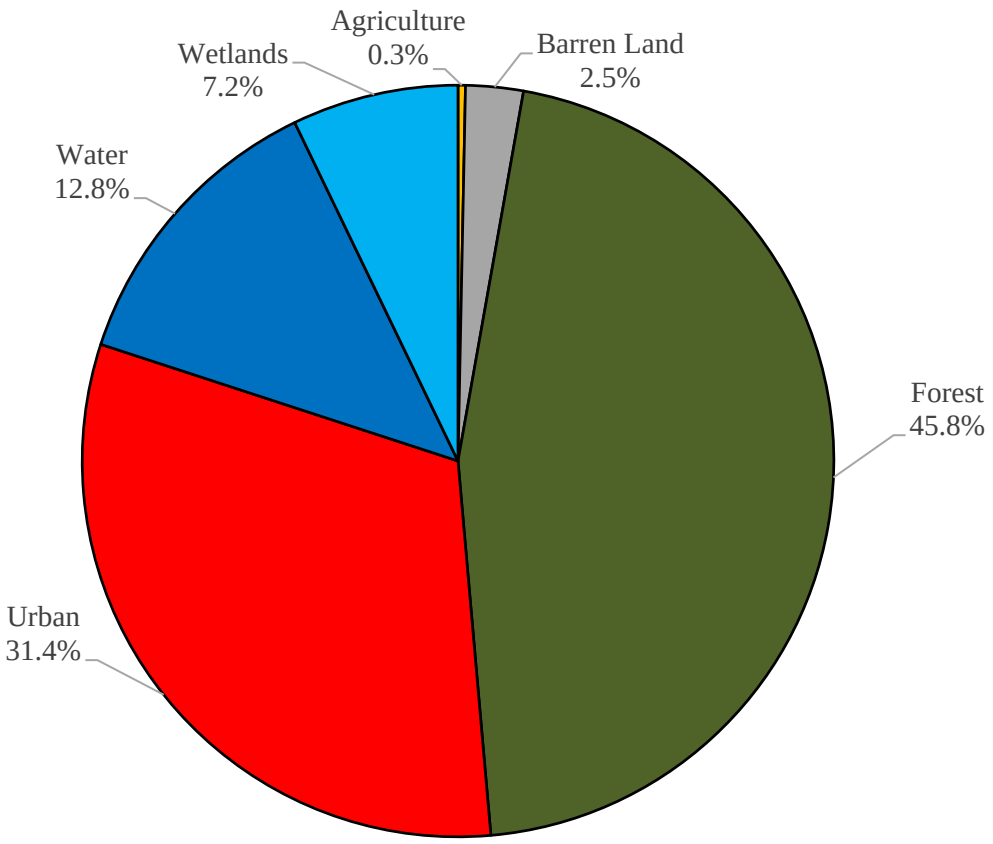


Figure 3: Pie chart illustrating the land use in Hopatcong Borough

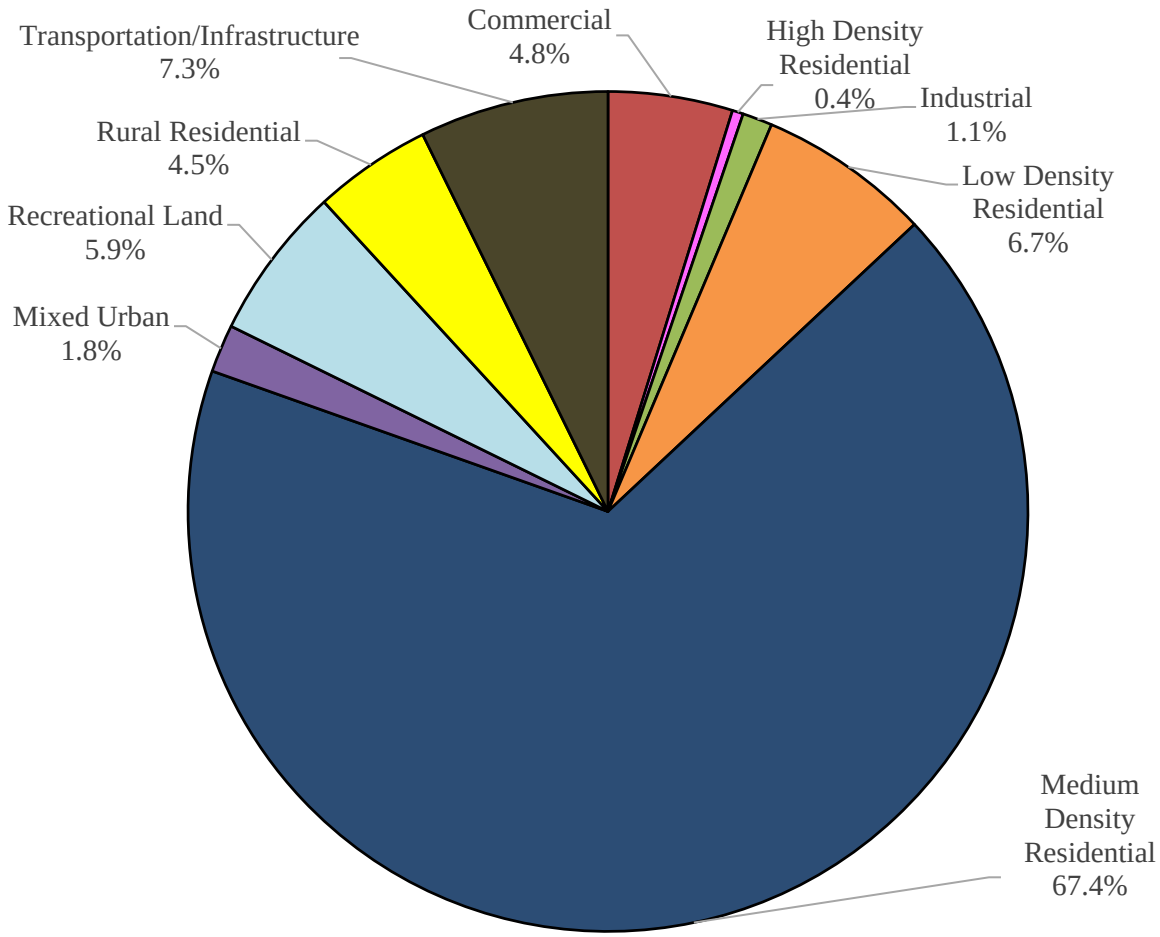


Figure 5: Pie chart illustrating the various types of urban land use in Hopatcong Borough

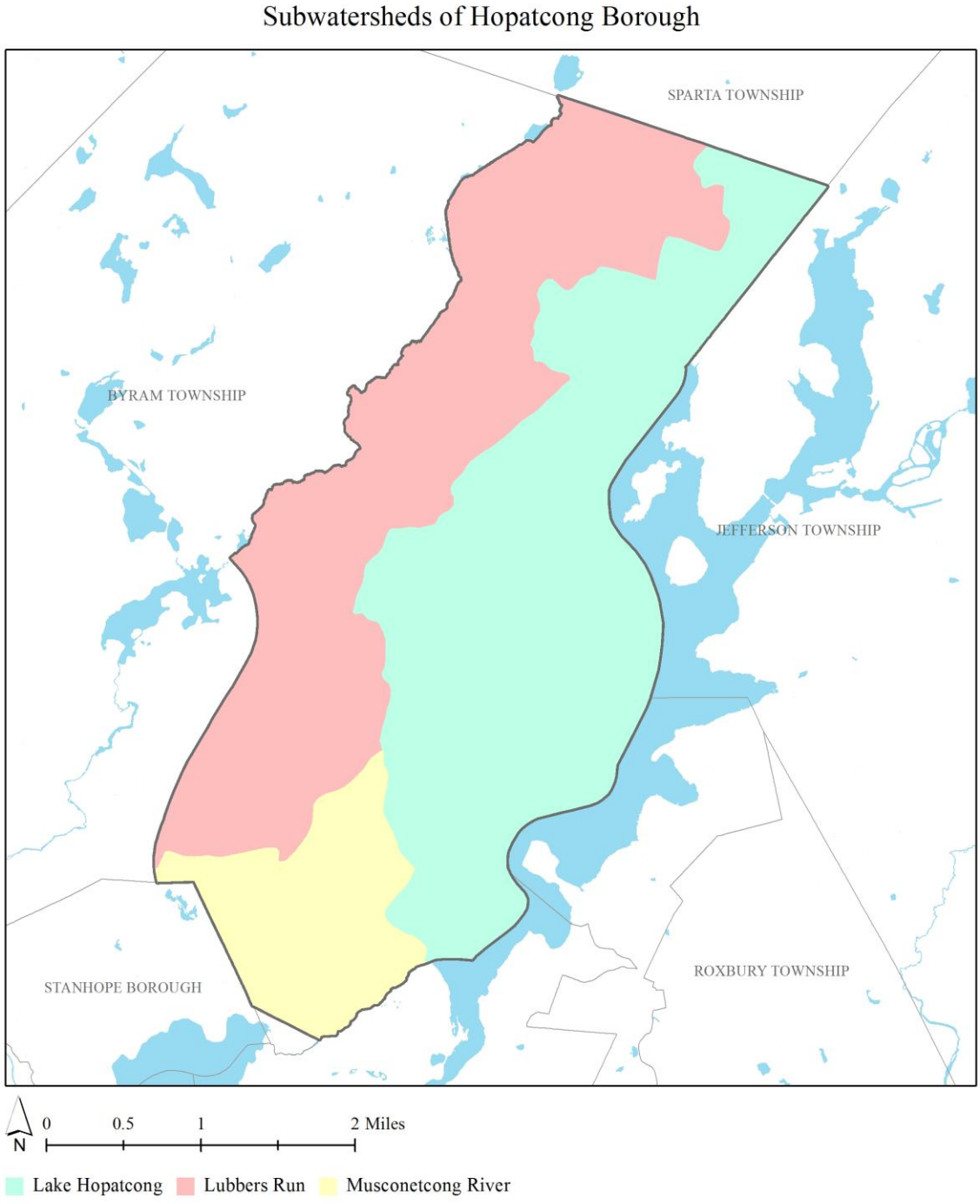


Figure 6: Map of the subwatersheds in Hopatcong Borough

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 2012 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 Hopatcong 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 principal, 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 Hopatcong 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

Attachment 1 contains information on potential project sites where green infrastructure practices could be installed. The recommended green infrastructure practices and the drainage area that the green infrastructure practice can treat are identified for each potential project site. For each practice, the recharge potential, TSS removal potential, maximum volume reduction potential per storm, and the peak reduction potential 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*.

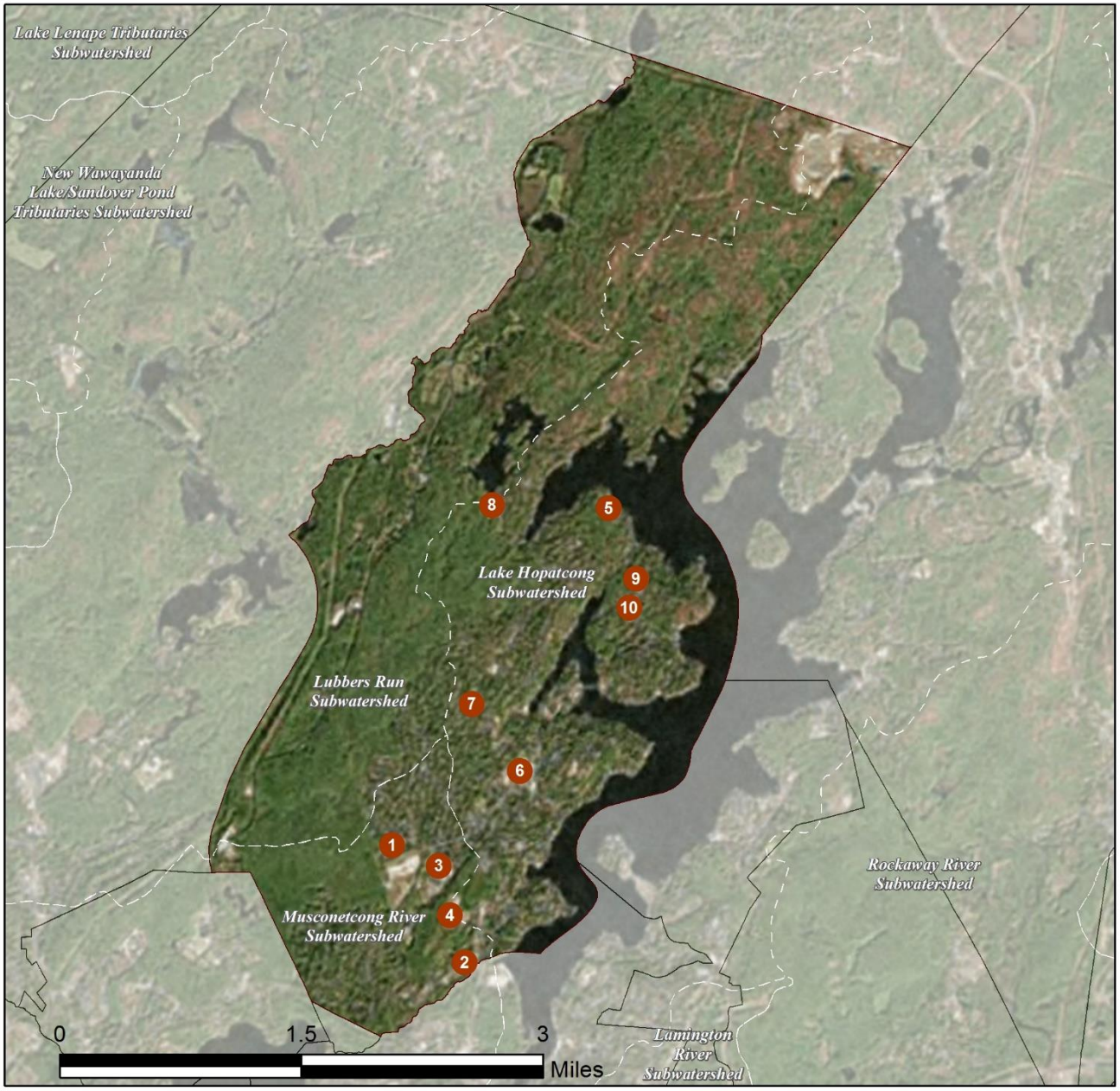
Conclusion

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.

a. Green Infrastructure Sites

HOPATCONG BOROUGH: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE MUSCONETCONG RIVER SUBWATERSHED:

1. Durban Avenue School
2. Full Life Assembly of God
3. Hopatcong High School
4. Hopatcong Senior Center

SITES WITHIN THE LAKE HOPATCONG SUBWATERSHED:

5. Byram Bay Christian Church
6. Defiance Engine Company #3
7. Hopatcong Hills Fire & Rescue Company #4
8. Northwood Engine Company #2
9. St. Jude Parish
10. West Side United Methodist Church

b. Proposed Green Infrastructure Concepts

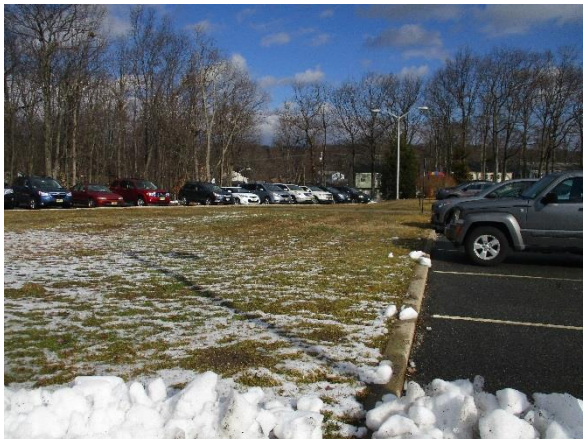
DURBAN AVENUE SCHOOL

Subwatershed: Musconetcong River

Site Area: 603,716 sq. ft.

Address: 616 Durban Avenue
Hopatcong, NJ 07843

Block and Lot: Block 10002, Lot 5

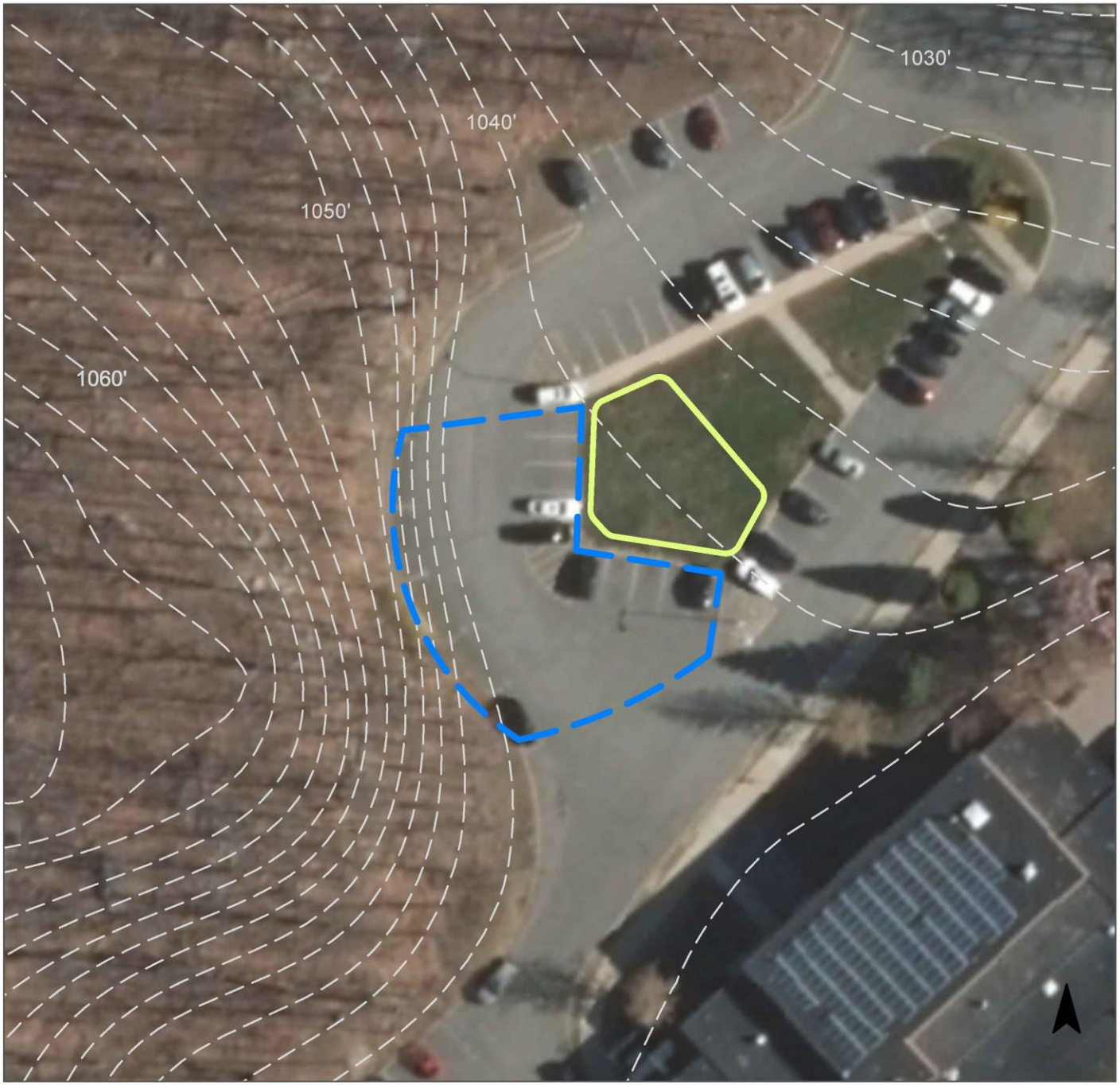


A rain garden can be installed in the parking lot island to capture, treat, and infiltrate runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
28	167,335	8.1	84.5	768.3	0.130	4.59

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	0.189	32	13,516	0.74	1,815	$9,075

GREEN INFRASTRUCTURE RECOMMENDATIONS



Durban Avenue School

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

0 25' 50'

FULL LIFE ASSEMBLY OF GOD

Subwatershed: Musconetcong River

Site Area: 87,397 sq. ft.

Address: 7 Brooklyn Stanhope Road
Hopatcong, NJ 07874

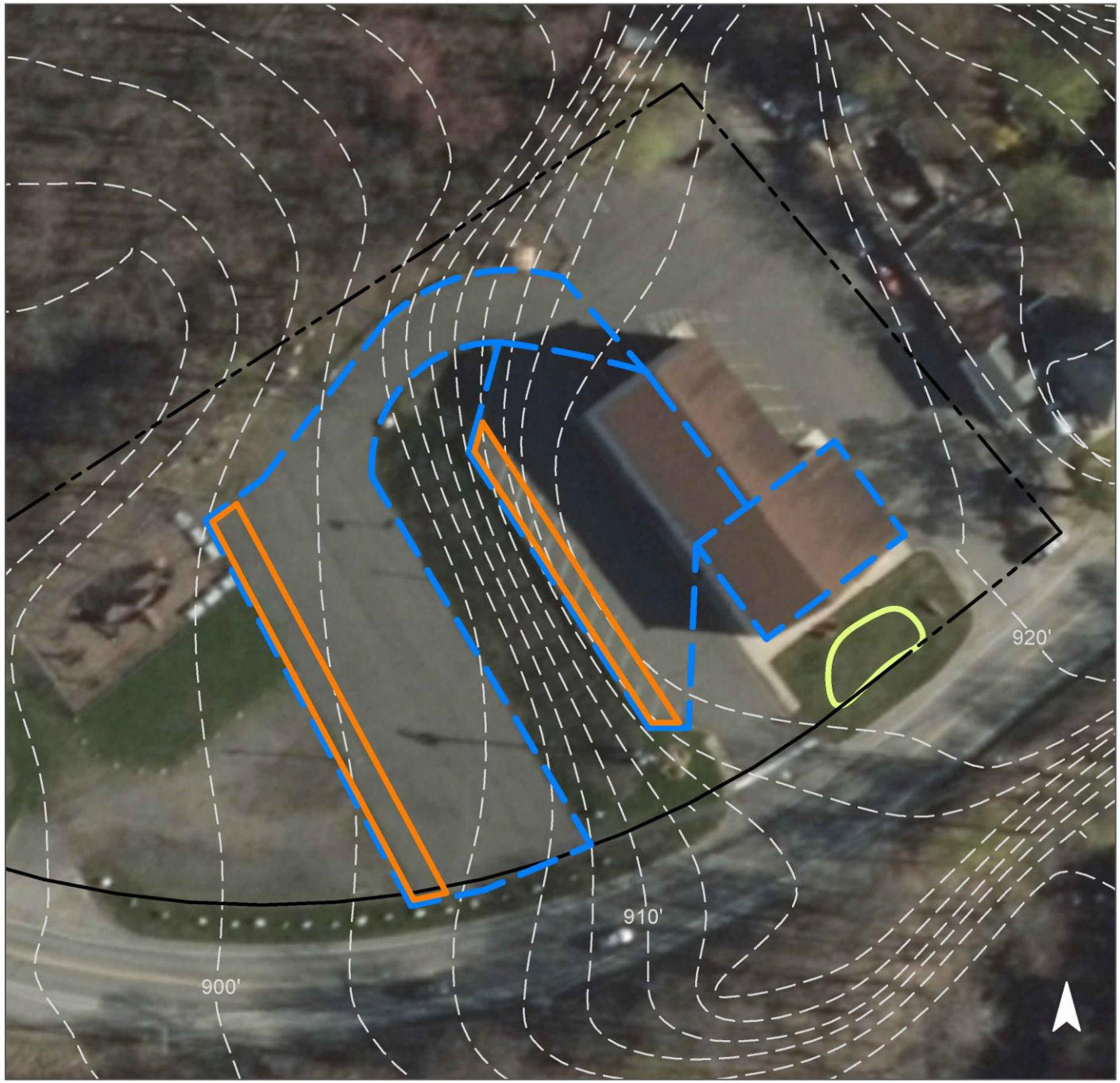
Block and Lot: Block 10601, Lot 8

A bioretention system can be installed to capture, treat, and infiltrate rooftop runoff. Parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater from the parking lot and roof. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
52	45,591	2.2	23.0	209.3	0.036	1.25

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	0.082	14	5,827	0.32	785	$3,925
Pervious pavement	0.655	110	46,787	2.55	4,680	$117,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Full Life Assembly of God

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

0 30' 60'

HOPATCONG HIGH SCHOOL

Subwatershed: **Musconetcong River**

Site Area: **1,954,739 sq. ft.**

Address: **2 Windsor Avenue**
Hopatcong, NJ 07843

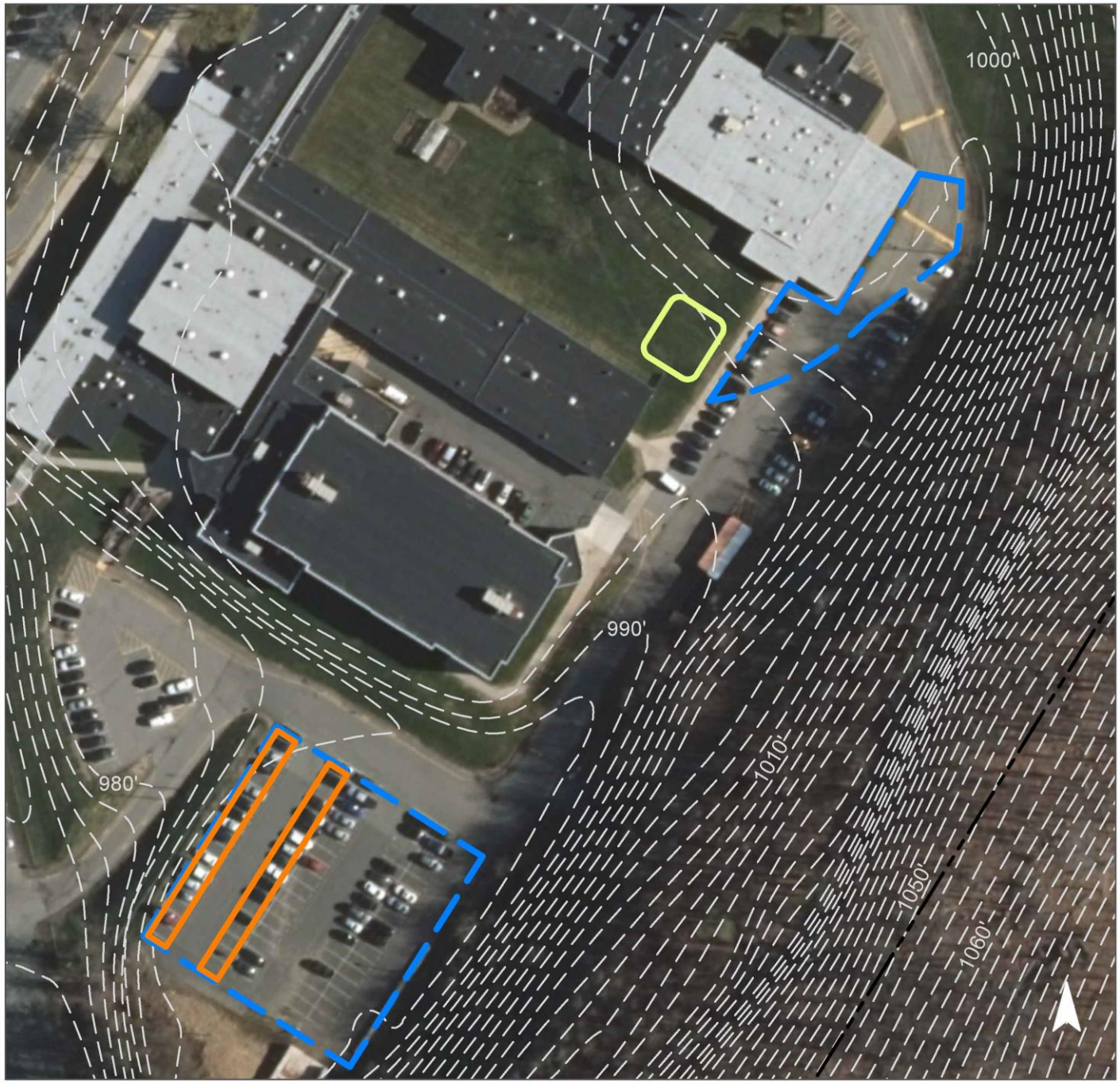
Block and Lot: **Block 10001, Lot 4**

A rain garden can be installed to capture, treat, and infiltrate parking lot runoff. Parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
29	575,408	27.7	290.6	2,641.9	0.448	15.78

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	0.181	30	12,970	0.71	1,740	$8,700
Pervious pavement	0.678	114	48,470	2.65	5,870	$146,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Hopatcong High School

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

0 50' 100'

HOPATCONG SENIOR CENTER

Subwatershed: Musconetcong River

Site Area: 4,520,902 sq. ft.

Address: 32 Lakeside Boulevard
Hopatcong, NJ 07843

Block and Lot: Block 10001, Lot 3, 6

A rain garden can be installed to capture, treat, and infiltrate rooftop runoff from the main building. Parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
5	248,042	12.0	125.3	1,138.9	0.193	6.80

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.064	11	4,563	0.25	615	$3,075
Pervious pavement	0.225	38	16,060	0.88	1,540	$38,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Hopatcong Senior Center

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

0 25' 50'

BYRAM BAY CHRISTIAN CHURCH

Subwatershed: Lake Hopatcong

Site Area: 11,572 sq. ft.

Address: 218 Maxim Drive
Hopatcong, NJ 07843

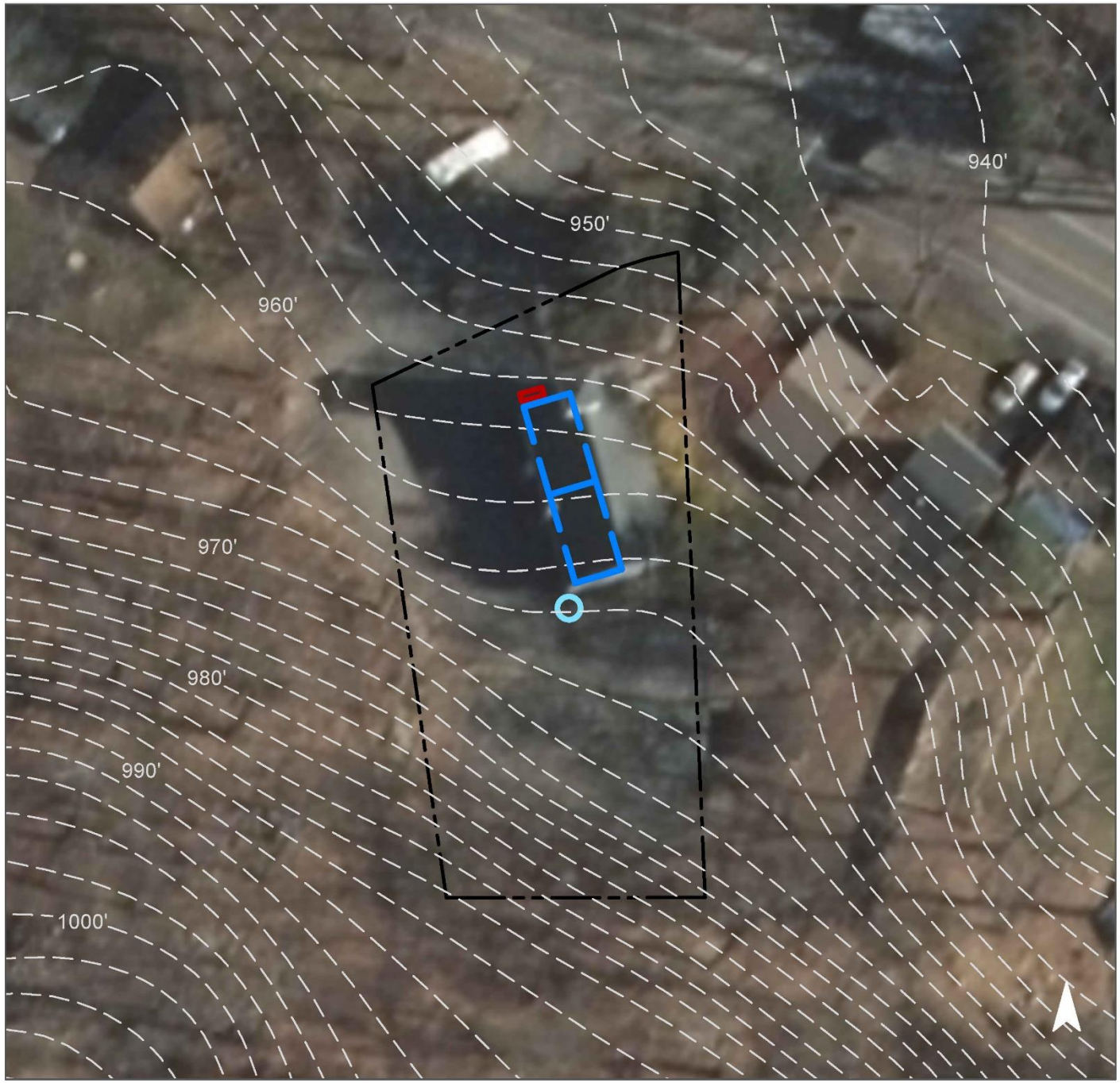
Block and Lot: Block 31105, Lot 8

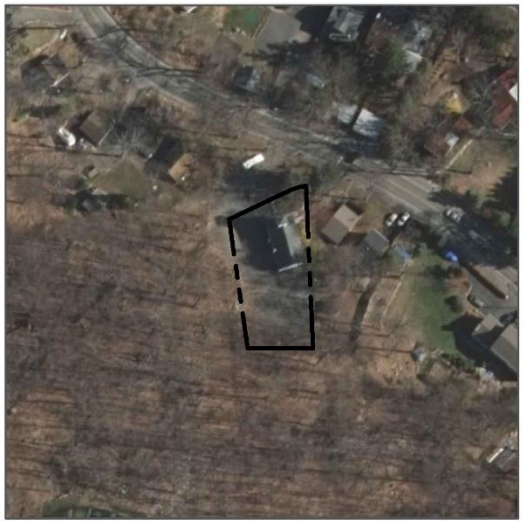
A cistern can be used to capture runoff from the main building. The water can then be used for watering gardens, washing vehicles, or for other non-potable uses. A downspout planter box can be constructed near the main entrance of the building to allow roof runoff to be reused. A preliminary soil assessment 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"
26	2,977	0.1	1.5	13.7	0.002	0.08

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Plater box	n/a	1	n/a	n/a	1 (box)	$1,000
Rainwater harvesting	0.008	1	250	0.02	250 (gal)	$500

GREEN INFRASTRUCTURE RECOMMENDATIONS





Byram Bay Christian Church

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

0 20' 40'

DEFIANCE ENGINE COMPANY #3

Subwatershed: Lake Hopatcong

Site Area: 86,644 sq. ft.

Address: 43 Hopatchung Road
Hopatcong, NJ 07843

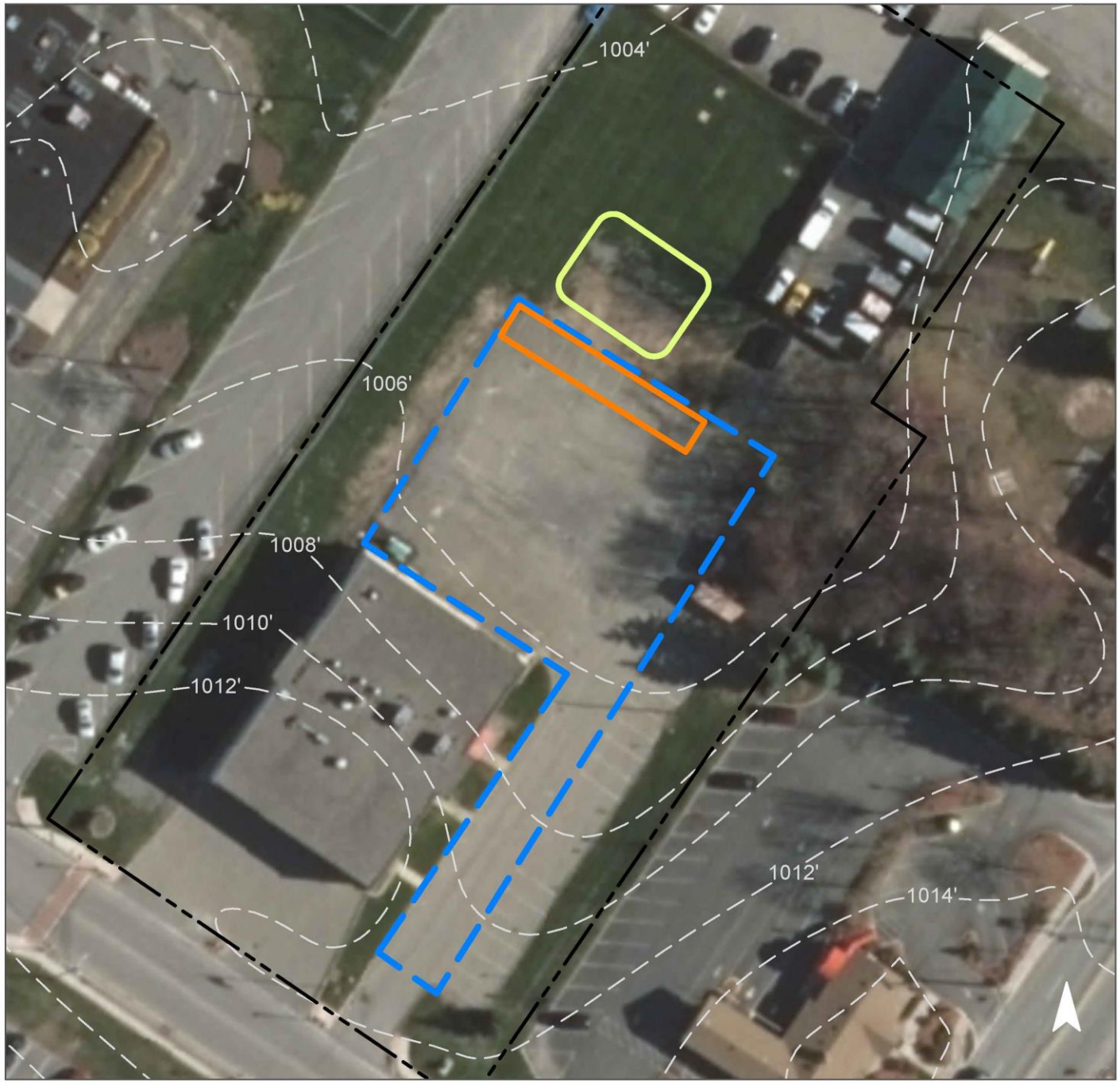
Block and Lot: Block 30319, Lot 1

Porous pavement can be installed to capture, treat, and infiltrate runoff from the parking lot. Any overflow from this system could flow into a bioretention system in the grass area. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
57	49,192	2.4	24.8	225.9	0.038	1.35

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.207	35	14,766	0.81	1,985	$9,925
Pervious pavement	0.236	40	16,890	0.92	1,620	$40,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Defiance Engine Company #3

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

0 30' 60'

HOPATCONG HILLS FIRE & RESCUE COMPANY #4

Subwatershed: Lake Hopatcong

Site Area: 24,187 sq. ft.

Address: 4 Jefferson Trail
Hopatcong, NJ 07843

Block and Lot: Block 40415, Lot 23

A rain garden can be installed to capture, treat, and infiltrate rooftop runoff. A cistern can be installed to capture rooftop runoff. The water can then be used for watering gardens, washing vehicles, or for other non-potable uses. 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"
43	10,449	0.5	5.3	48.0	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	0.036	6	2,558	0.14	350	$1,750
Rainwater harvesting	0.073	12	3,000	0.19	3,000 (gal)	$6,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Hopatcong Hills Fire & Rescue Company #4

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

0 20' 40'

NORTHWOOD ENGINE COMPANY #2

Subwatershed: Lake Hopatcong

Site Area: 72,408 sq. ft.

Address: 440 Maxim Drive
Hopatcong, NJ 07843

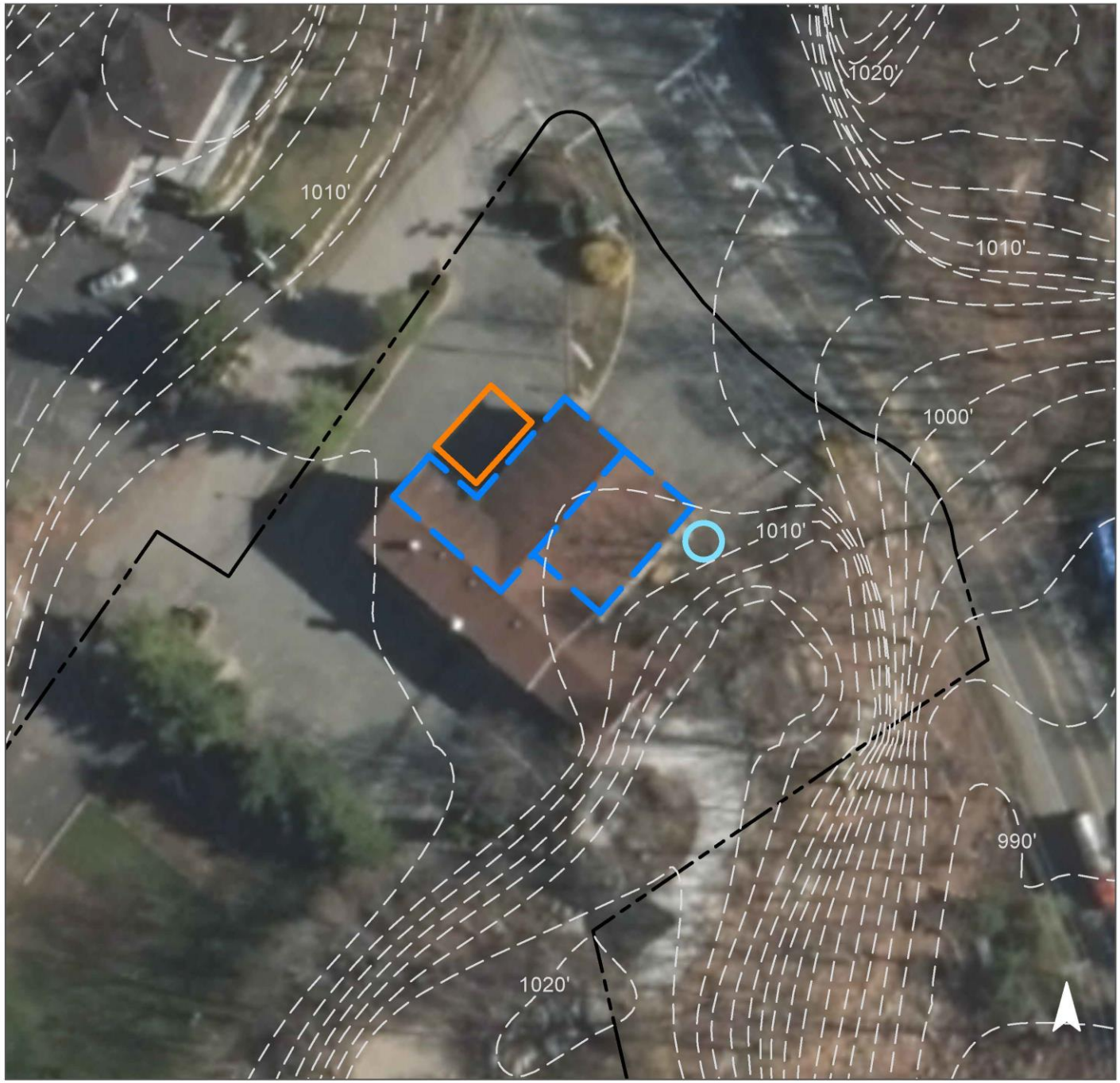
Block and Lot: Block 41202, Lot 15

A cistern can be installed to capture rooftop runoff, and the water can then be used for watering gardens, washing vehicles, or for other non-potable uses. Parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
32	23,417	1.1	11.8	107.5	0.018	0.64

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	0.051	9	3,665	0.20	485	$12,125
Rainwater harvesting	0.034	6	2,461	0.13	2,500 (gal)	$5,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Northwood Engine Company #2

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

0 25' 50'

ST. JUDE PARISH

Subwatershed: Lake Hopatcong

Site Area: 634,973 sq. ft.

Address: 40 Maxim Drive
Hopatcong, NJ 07843

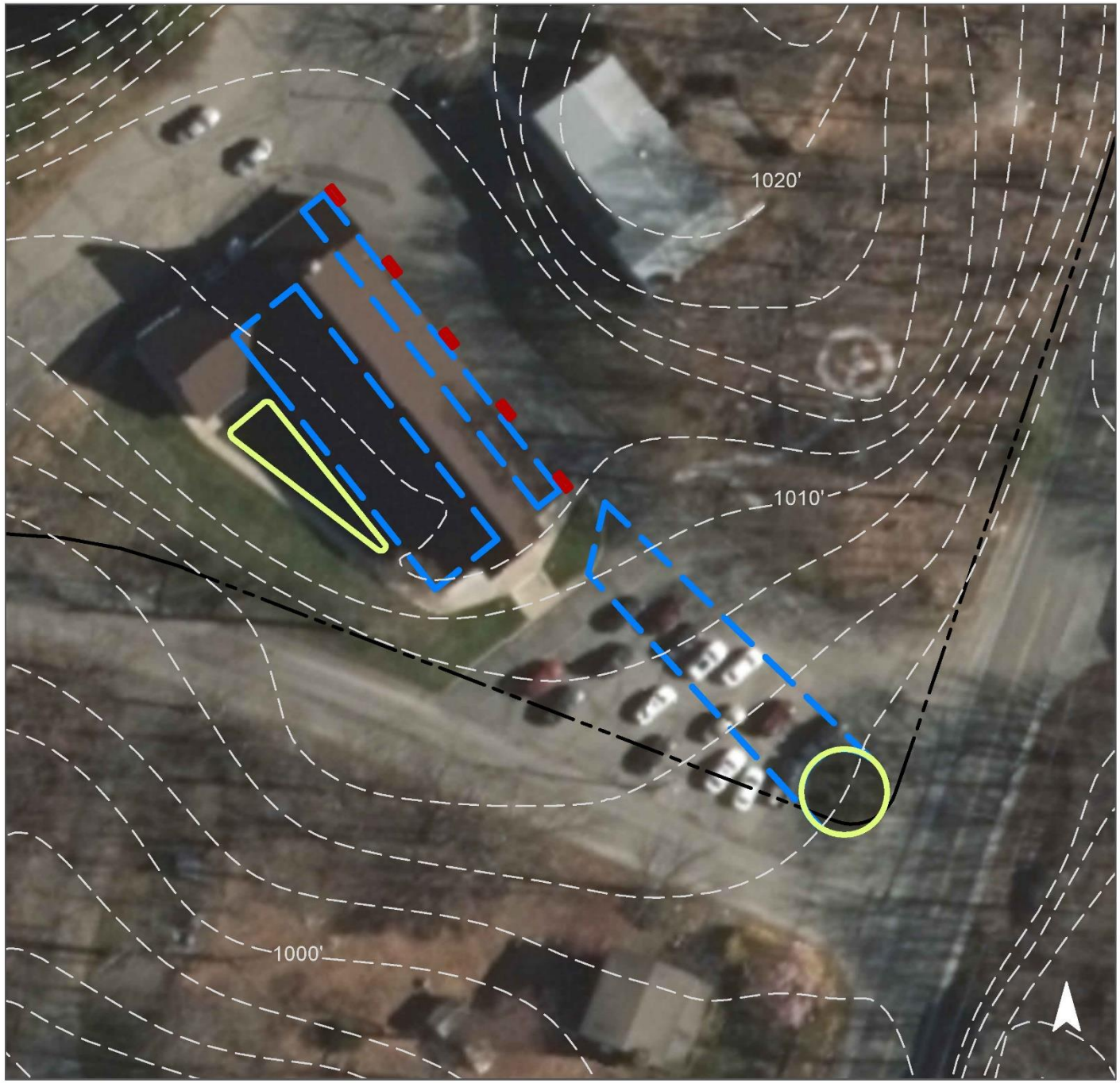
Block and Lot: Block 31206, Lot 8

Bioretention systems can be installed to capture, treat, and infiltrate rooftop and parking lot runoff. Downspout planter boxes can be constructed around the perimeter 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"
17	109,414	5.3	55.3	502.4	0.085	3.00

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	0.136	23	9,702	0.53	1,305	$6,525
Planter boxes	n/a	4	n/a	n/a	5 (boxes)	$5,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



St. Jude Parish

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

0 25' 50'

WEST SIDE UNITED METHODIST CHURCH

Subwatershed: Lake Hopatcong

Site Area: 297,589 sq. ft.

Address: 16 Maxim Drive
Hopatcong, NJ 07843

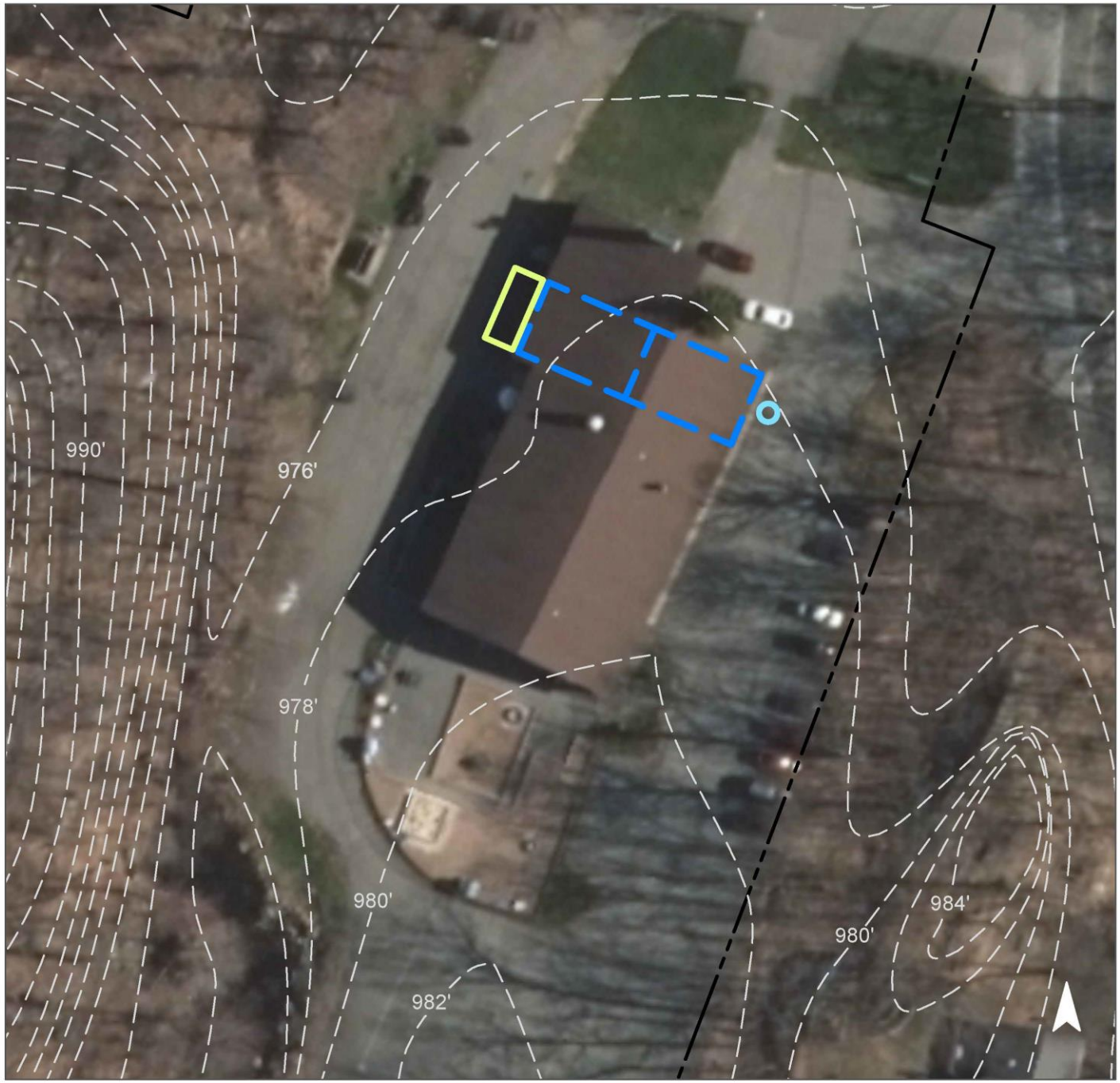
Block and Lot: Block 31503, Lot 29

Cisterns can be installed to capture rooftop runoff, and the water can then be used for watering gardens, washing vehicles, or for other non-potable uses. A bioretention system can be installed to capture, treat, and infiltrate rooftop 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"
30	87,851	4.2	44.4	403.4	0.068	2.41

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	1,773	0.10	240	$1,200
Rainwater harvesting	0.025	4	750	0.06	750 (gal)	$1,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



West Side United Methodist Church

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

0 25' 50'

c. Summary of Existing Conditions

Summary of Existing Site Conditions

Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	Existing Annual Loads TP (lb/yr)	Existing Annual Loads TN (lb/yr)	Existing Annual Loads TSS (lb/yr)	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Runoff Volumes from I.C. Annual (Mgal)
MUSCONETCONG RIVER SUBWATERSHED	**164.53**	**7,166,754**			**50.0**	**523.4**	**4,758.4**		**23.79**	**1,036,376**	**0.808**	**28.42**
Durban Avenue School												
Total Site Info	13.86	603,716	10002	5	8.1	84.5	768.3	28	3.84	167,335	0.130	4.59
Full Life Assembly of God												
Total Site Info	2.01	87,397	10601	8	2.2	23.0	209.3	52	1.05	45,591	0.036	1.25
Hopatcong High School												
Total Site Info	44.87	1,954,739	10001	4	27.7	290.6	2,641.9	29	13.21	575,408	0.448	15.78
Hopatcong Senior Center												
Total Site Info	103.79	4,520,902	10001	3,6	12.0	125.3	1,138.9	5	5.69	248,042	0.193	6.80
LAKE HOPATCONG SUBWATERSHED	**25.88**	**1,127,372**			**13.7**	**143.1**	**1,300.7**		**6.50**	**283,300**	**0.221**	**7.77**
Byram Bay Christian Church												
Total Site Info	0.27	11,572	31105	8	0.1	1.5	13.7	26	0.07	2,977	0.002	0.08
Defiance Engine Company #3												
Total Site Info	1.99	86,644	30319	1	2.4	24.8	225.9	57	1.13	49,192	0.038	1.35
Hopatcong Hills Fire & Rescue Company #4												
Total Site Info	0.56	24,187	40415	23	0.5	5.3	48.0	43	0.24	10,449	0.008	0.29
Northwood Engine Company #2												
Total Site Info	1.66	72,408	41202	15	1.1	11.8	107.5	32	0.54	23,417	0.018	0.64
St. Jude Parish												
Total Site Info	14.58	634,973	31206	8	5.3	55.3	502.4	17	2.51	109,414	0.085	3.00
West Side United Methodist Church												
Total Site Info	6.83	297,589	31503	29	4.2	44.4	403.4	30	2.02	87,851	0.068	2.41

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)	(SF)	($)		($)	%
	MUSCONETCONG RIVER SUBWATERSHED	**79,585**	**1.83**	**2.074**	**347**	**148,194**	**8.10**	**17,045**			**$327,025**	**7.7%**
1	**Durban Avenue School**											
	Bioretention system	7,260	0.17	0.189	32	13,516	0.74	1,815	5	SF	$9,075	4.3%
	Total Site Info	**7,260**	**0.17**	**0.189**	**32**	**13,516**	**0.74**	**1,815**			**$9,075**	**4.3%**
2	**Full Life Assembly of God**											
	Bioretention system	3,130	0.07	0.082	14	5,827	0.32	785	5	SF	$3,925	6.9%
	Pervious pavement	25,125	0.58	0.655	110	46,787	2.55	4,680	25	SF	$117,000	55.1%
	Total Site Info	**28,255**	**0.65**	**0.736**	**123**	**52,614**	**2.87**	**5,465**			**$120,925**	**62.0%**
3	**Hopatcong High School**											
	Bioretention system	6,965	0.16	0.181	30	12,970	0.71	1,740	5	SF	$8,700	1.2%
	Pervious pavement	26,030	0.60	0.678	114	48,470	2.65	5,870	25	SF	$146,750	4.5%
	Total Site Info	**32,995**	**0.76**	**0.860**	**144**	**61,441**	**3.36**	**7,610**			**$155,450**	**5.7%**
4	**Hopatcong Senior Center**											
	Bioretention system	2,450	0.06	0.064	11	4,563	0.25	615	5	SF	$3,075	1.0%
	Pervious pavement	8,625	0.20	0.225	38	16,060	0.88	1,540	25	SF	$38,500	3.5%
	Total Site Info	**11,075**	**0.25**	**0.289**	**48**	**20,622**	**1.13**	**2,155**			**$41,575**	**4.5%**
	LAKE HOPATCONG SUBWATERSHED	**33,180**	**0.76**	**0.831**	**144**	**55,814**	**3.10**	**12,491**			**$91,025**	**11.7%**
5	**Byram Bay Christian Church**											
	Planter box	215	0.00	n/a	1	n/a	n/a	1	1,000	box	$1,000	7.2%
	Rainwater harvesting	305	0.01	0.008	1	250	0.02	250	2	gal	$500	10.2%
	Total Site Info	**520**	**0.01**	**0.008**	**2**	**250**	**0.02**	**251**			**$1,500**	**17.5%**
6	**Defiance Engine Company #3**											
	Bioretention system	7,930	0.18	0.207	35	14,766	0.81	1,985	5	SF	$9,925	16.1%
	Pervious pavement	9,070	0.21	0.236	40	16,890	0.92	1,620	25	SF	$40,500	18.4%
	Total Site Info	**17,000**	**0.39**	**0.443**	**74**	**31,655**	**1.73**	**3,605**			**$50,425**	**34.6%**

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)	(SF)	($)		($)	%
7 **Hopatcong Hills Fire & Rescue Company #4**											
Bioretention system	1,375	0.03	0.036	6	2,558	0.14	350	5	SF	$1,750	13.2%
Rainwater harvesting	2,810	0.06	0.073	12	3,000	0.19	3,000	2	gal	$6,000	26.9%
Total Site Info	**4,185**	**0.10**	**0.109**	**18**	**5,558**	**0.33**	**3,350**			**$7,750**	**40.1%**
8 **Northwood Engine Company #2**											
Pervious pavement	1,970	0.05	0.051	9	3,665	0.20	485	25	SF	$12,125	8.4%
Rainwater harvesting	1,320	0.03	0.034	6	2,461	0.13	2,500	2	gal	$5,000	5.6%
Total Site Info	**3,290**	**0.08**	**0.086**	**14**	**6,126**	**0.33**	**2,985**			**$17,125**	**14.0%**
9 **St. Jude Parish**											
Bioretention systems	5,210	0.12	0.136	23	9,702	0.53	1,305	5	SF	$6,525	4.8%
Planter boxes	1,075	0.02	n/a	4	n/a	n/a	5	1,000	box	$5,000	1.0%
Total Site Info	**6,285**	**0.14**	**0.136**	**27**	**9,702**	**0.53**	**1,310**			**$11,525**	**5.7%**
10 **West Side United Methodist Church**											
Bioretention system	950	0.02	0.025	4	1,773	0.10	240	5	SF	$1,200	1.1%
Rainwater harvesting	950	0.02	0.025	4	750	0.06	750	2	gal	$1,500	1.1%
Total Site Info	**1,900**	**0.04**	**0.050**	**8**	**2,523**	**0.16**	**990**			**$2,700**	**2.2%**