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Draft

Impervious Cover Reduction Action Plan for Roxbury Township, Morris County, New Jersey

Prepared for Roxbury Township by the
Rutgers Cooperative Extension Water Resources Program

June 19, 2020

Highlands Council
New Jersey

ACKNOWLEDGEMENTS:

This document has been prepared by the Rutgers Cooperative Extension Water Resources Program, with funding and direction from the New Jersey Highlands Water Protection and Planning Council and the New Jersey Agricultural Experiment Station, to highlight green infrastructure opportunities within Roxbury Township. We would like to thank the New Jersey Highlands Water Protection and Planning Council, the New Jersey Agricultural Experiment Station, and Roxbury Township for their input and support in creating this document.

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New Jersey

Table of Contents

Introduction

Located in Morris County, New Jersey, Roxbury Township covers approximately 21.89 square miles. Figures 1 and 2 illustrate that Roxbury Township is dominated by urban land use. A total of 42.9% of the municipality's land use is classified as urban. Of the urban land in Roxbury Township, medium density residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2015 land use/land cover geographical information system (GIS) data layer categorizes Roxbury Township 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 Roxbury Township. Based upon the 2015 NJDEP land use/land cover data, approximately 13.6% of Roxbury Township has impervious cover. This level of impervious cover suggests that the streams in Roxbury Township are likely impacted streams. [1]

Methodology

Roxbury Township contains portions of five subwatersheds (Figure 4). For this impervious cover reduction action plan, projects have been identified in four 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.

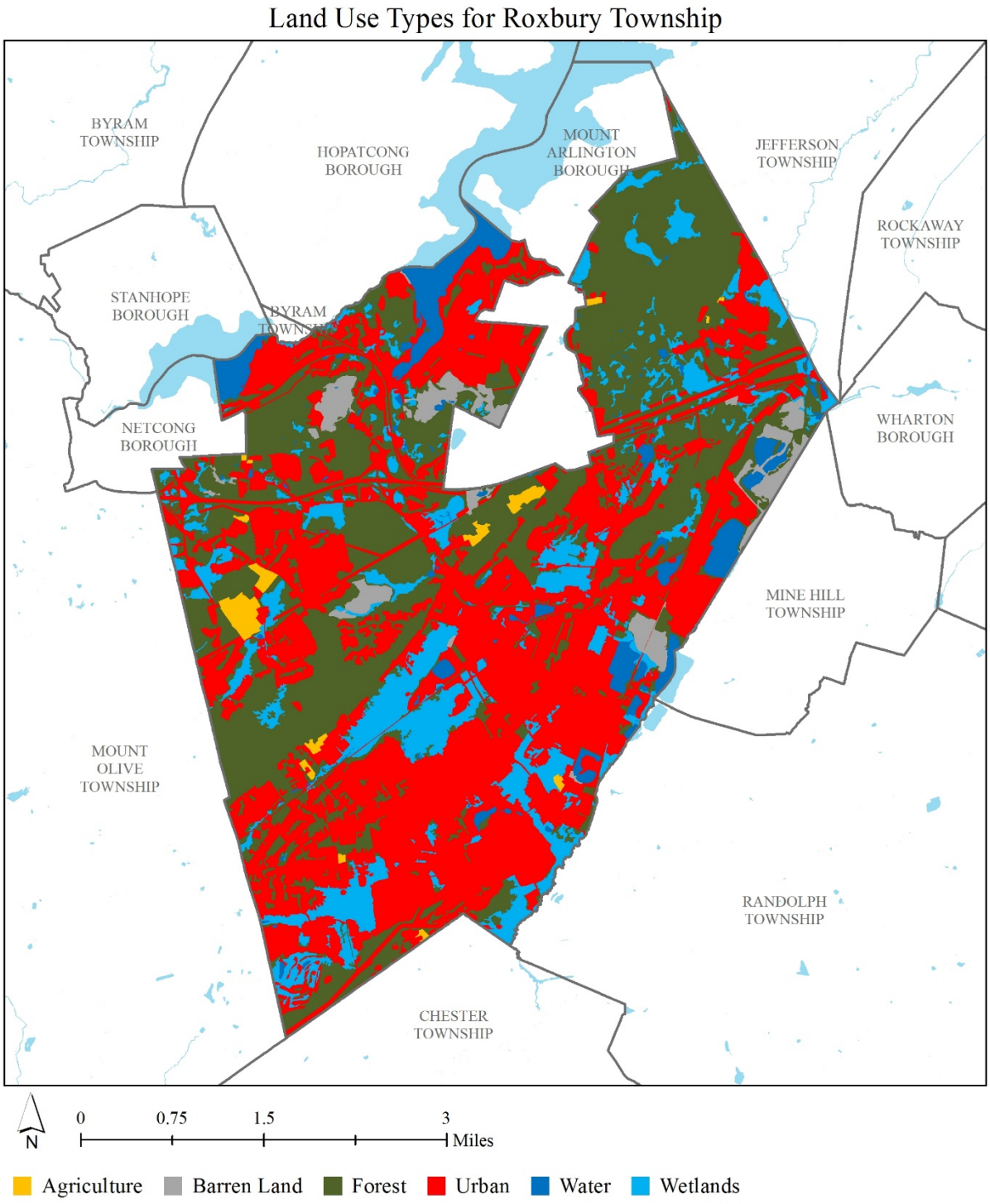


Figure 1: Map illustrating the land use in Roxbury Township

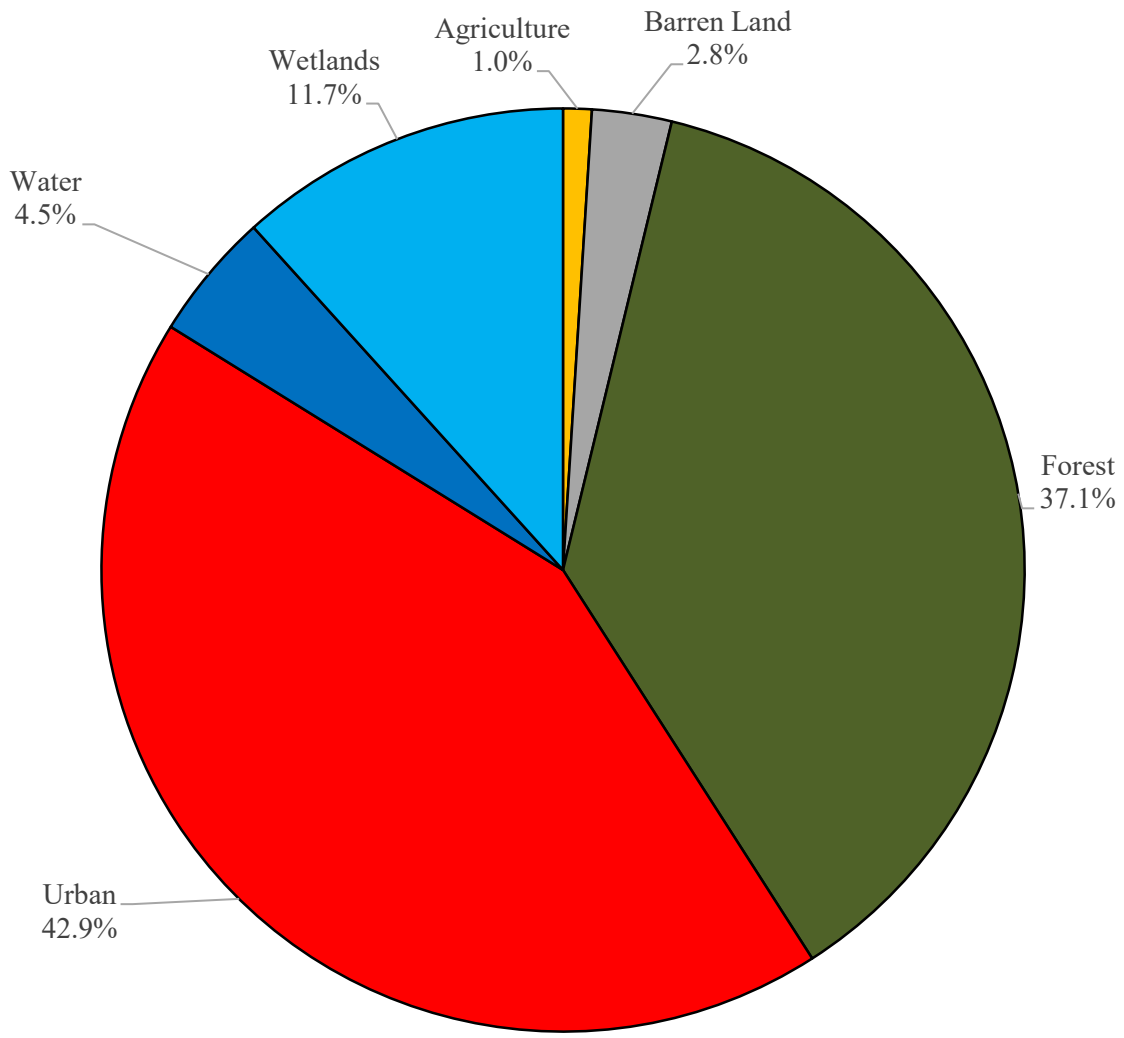


Figure 2: Pie chart illustrating the land use in Roxbury Township

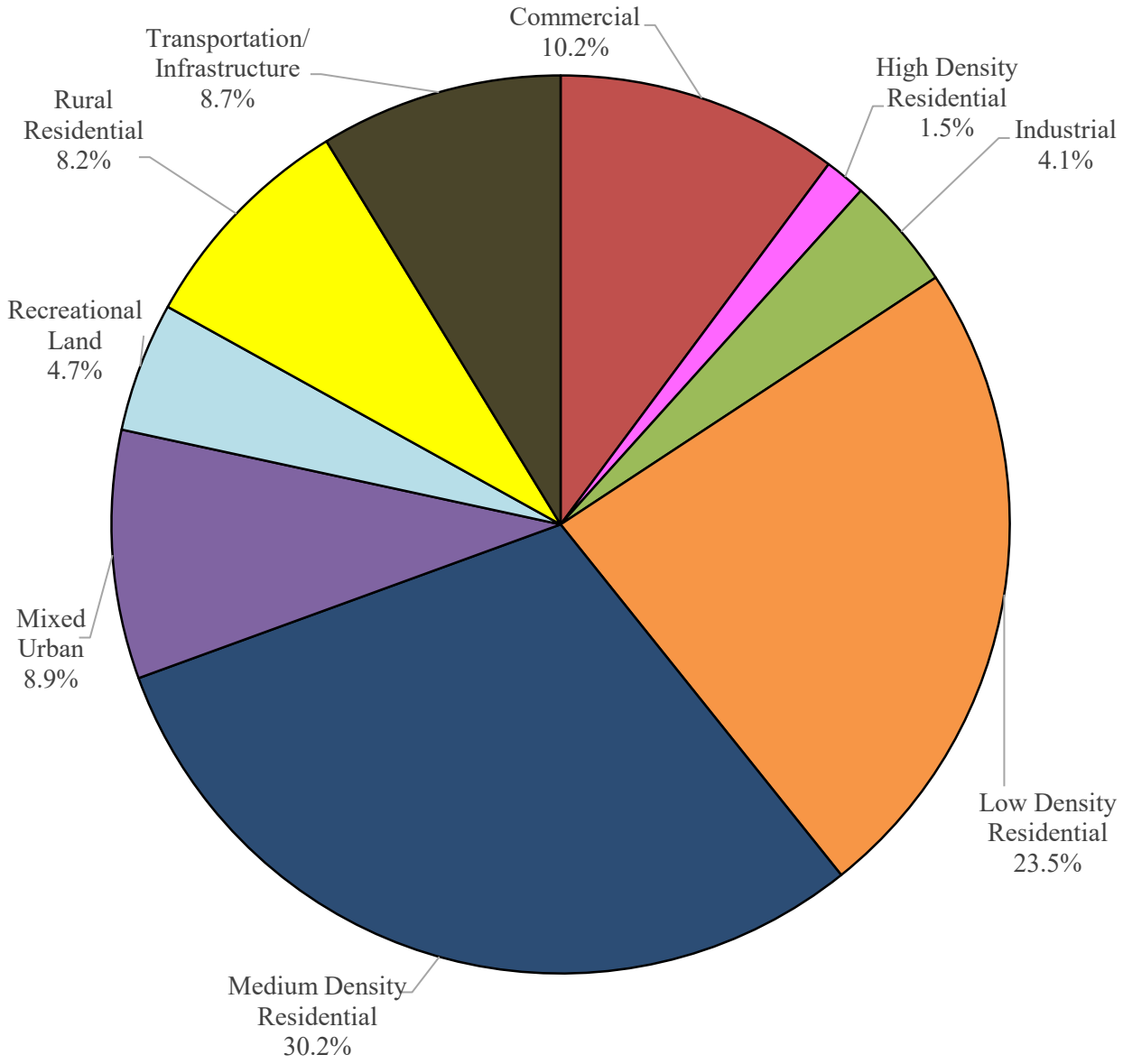


Figure 3: Pie chart illustrating the various types of urban land use in Roxbury Township

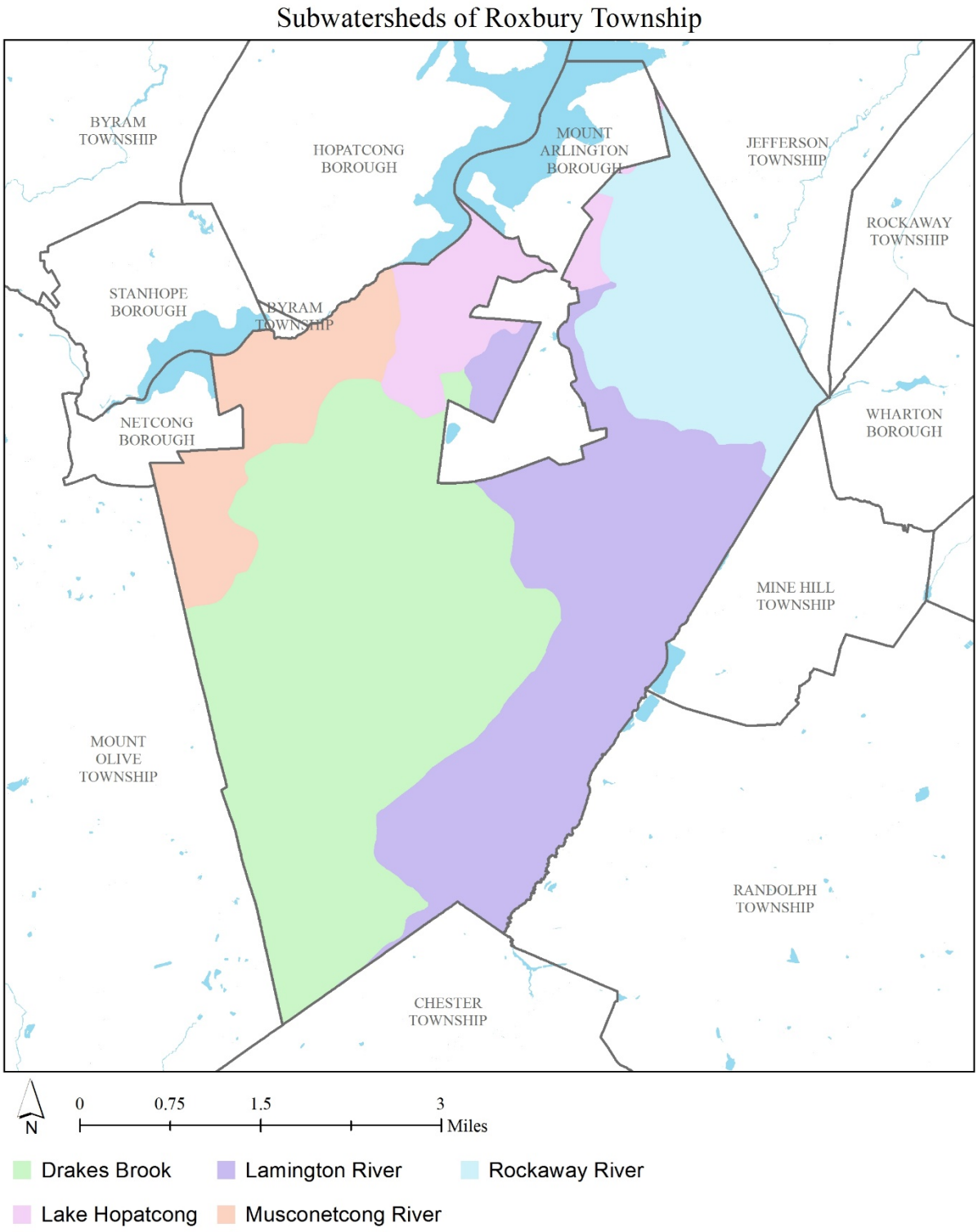


Figure 4: Map of the subwatersheds in Roxbury Township

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 Roxbury Township 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 Roxbury Township. 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.

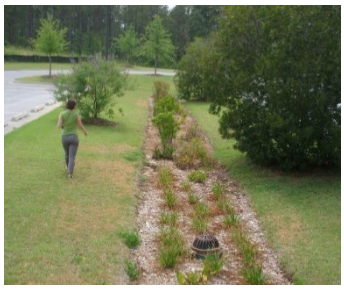
Downspout planter boxes

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

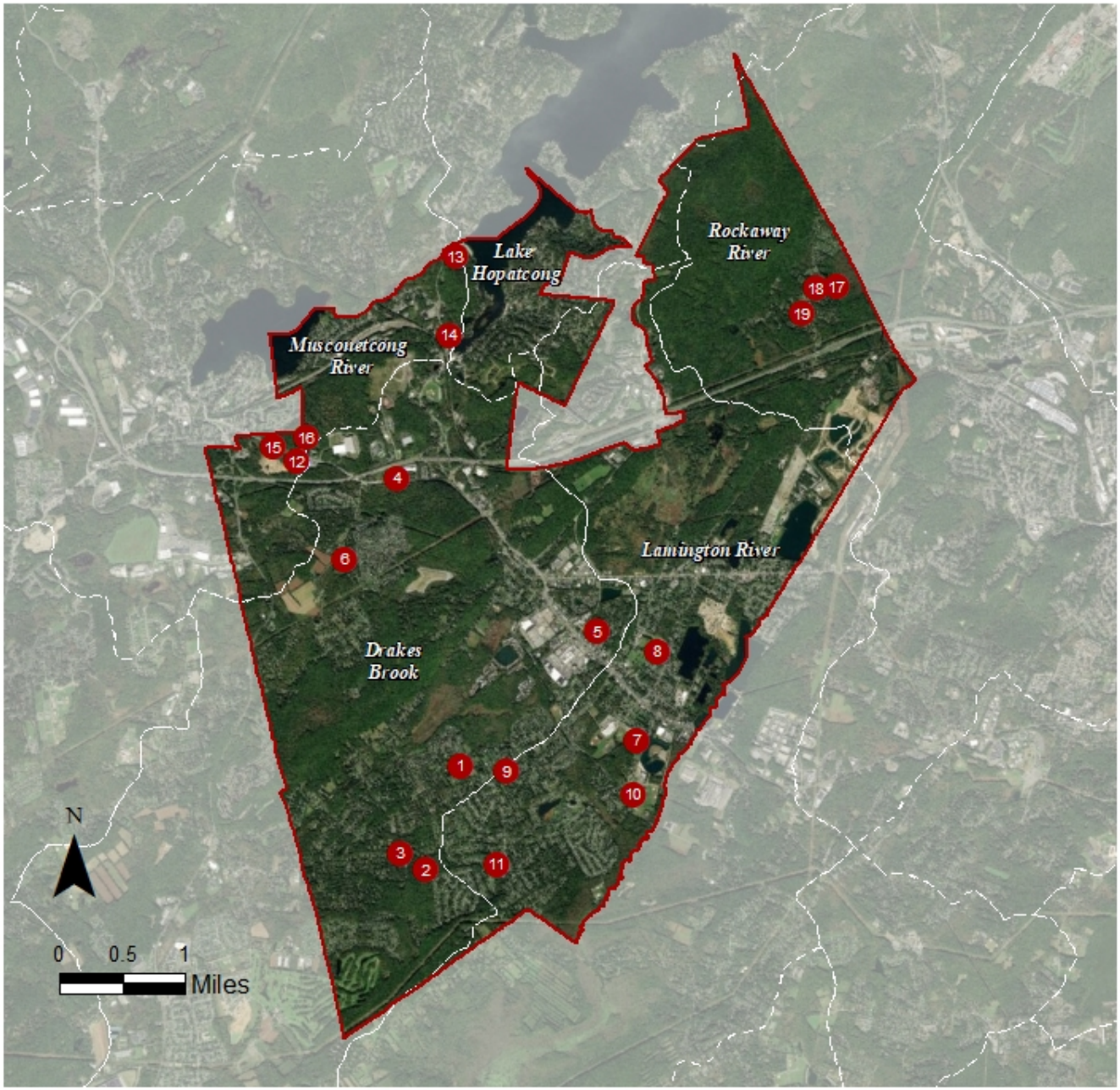
This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented by a wide variety of people such as boy scouts,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

ROXBURY TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE DRAKES BROOK SUBWATERSHED

1. Jefferson Elementary School
2. Kiwanis Park
3. Roxbury Community Garden
4. Roxbury Township Court Clerk
5. Saint Therese Church
6. The Church of Jesus Christ of Latter-day Saints

SITES WITHIN THE LAMINGTON RIVER SUBWATERSHED

7. Eisenhower Middle School & Roxbury High School
8. Franklin Elementary School & Lincoln Roosevelt School
9. Hillside Lutheran Brethren Church
10. Horseshoe Lake Recreation Complex
11. Kennedy Elementary School

SITES WITHIN THE MUSCONETCONG RIVER SUBWATERSHED

12. Grace Church on the Mount
13. Lake Hopatcong Historical Museum and State Park
14. Landing Post Office
15. Saint Hubert's Animal Welfare Center Noah's Ark
16. The Animal Hospital of Roxbury

SITES WITHIN THE ROCKAWAY RIVER SUBWATERSHED

17. Berkshire Valley Park
18. Roxbury Fire Company 3
19. United Methodist Church

b. Proposed Green Infrastructure Concepts

JEFFERSON ELEMENTARY SCHOOL

Subwatershed: Drakes Brook

Site Area: 628,219 sq. ft.

Address: 35 Corn Hollow Road
Succasunna, NJ 07876

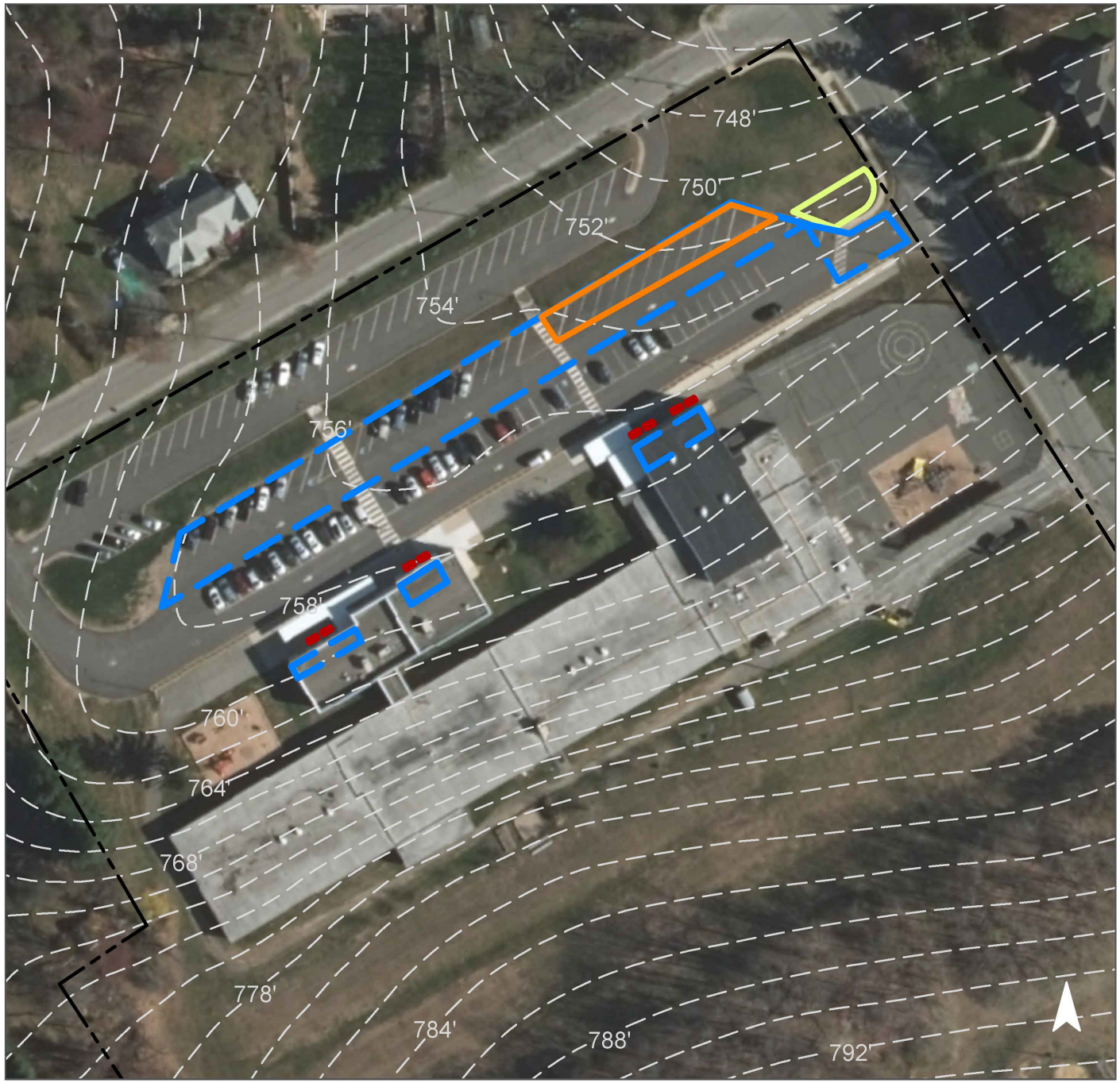
Block and Lot: Block 4501, Lot 10

Parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater. Downspout planter boxes can be installed on multiple locations north of the building. A rain garden can be installed in the parking island to capture, treat, and infiltrate additional stomwater runoff. Downspout planter boxes can be installed near the entrances to capture rooftop runoff and provide visual interest. 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"
31	192,288	9.3	97.1	882.9	0.150	5.27

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	2,480	0.09	740	$3,700
Pervious pavement	0.462	77	33,940	1.28	178	$4,450
Planter boxes	n/a	5	n/a	n/a	8 (boxes)	$8,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Jefferson Elementary School

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

0 50' 100'

KIWANIS PARK

Subwatershed: Drakes Brook

Site Area: 4,578,278 sq. ft.

Address: 9 Makin Lane
Succasunna, NJ 07876

Block and Lot: Block 901, Lot 19

Parking spaces can be replaced with pervious pavement on the southernmost parking strip in the lot to capture and infiltrate stormwater. A rain garden can be installed near the tennis court to capture stormwater. 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"
2	88,107	4.2	44.5	404.5	0.069	2.42

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	4,820	0.18	1,630	$8,150
Pervious pavement	0.505	85	37,040	1.39	3,460	$86,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Kiwanis Park

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

0 30' 60'

ROXBURY COMMUNITY GARDEN

Subwatershed: Drakes Brook

Site Area: 371,852 sq. ft.

Address: 281 Eyland Avenue
Succasunna, NJ 07876

Block and Lot: Block 2802, Lot 5

A cistern can be installed to capture stormwater from the roof of the shed in front of the garden, and the water can be reused for watering plants or other non-potable purposes. 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"
4	16,186	0.8	8.2	74.3	0.013	0.44

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Rainwater harvesting	0.007	1	200	0.01	200 (gal)	$400

GREEN INFRASTRUCTURE RECOMMENDATIONS

Roxbury Community Garden

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

0 10' 20'

ROXBURY TOWNSHIP COURT CLERK

Subwatershed: Drakes Brook

Site Area: 227,319 sq. ft.

Address: 1715 US-46
Ledgewood, NJ 07852

Block and Lot: Block 9603, Lot 5

Parking spaces can be replaced with pervious pavement to capture and infiltrate 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"
58	131,380	6.3	66.4	603.2	0.102	3.60

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	0.378	63	27,720	1.04	2,590	$64,750

GREEN INFRASTRUCTURE RECOMMENDATIONS

Roxbury Township Court Clerk

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

0 25' 50'

SAINT THERESE CHURCH

Subwatershed: Drakes Brook

Site Area: 727,688 sq. ft.

Address: 151 Main Street
Succasunna, NJ 07876

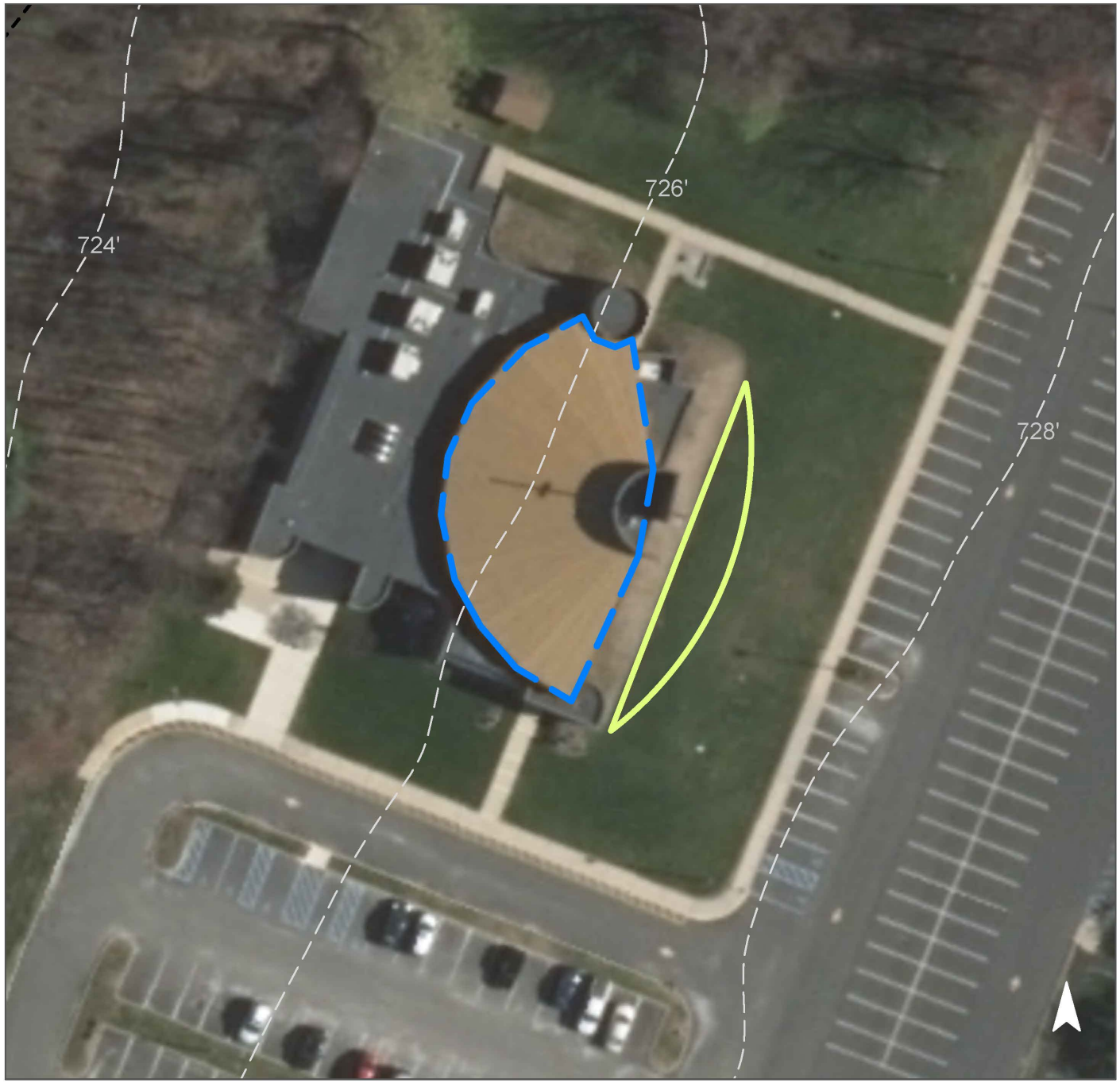
Block and Lot: Block 5103, Lot 1

A rain garden can be installed on the east side of the building 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"
36	264,110	12.7	133.4	1,212.6	0.206	7.24

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.156	26	11,410	0.43	1,450	$7,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Saint Therese Church

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

0 25' 50'

THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS

Subwatershed: Drakes Brook

Site Area: 251,582 sq. ft.

Address: 156 Mountain Road
Ledgewood, NJ 07852

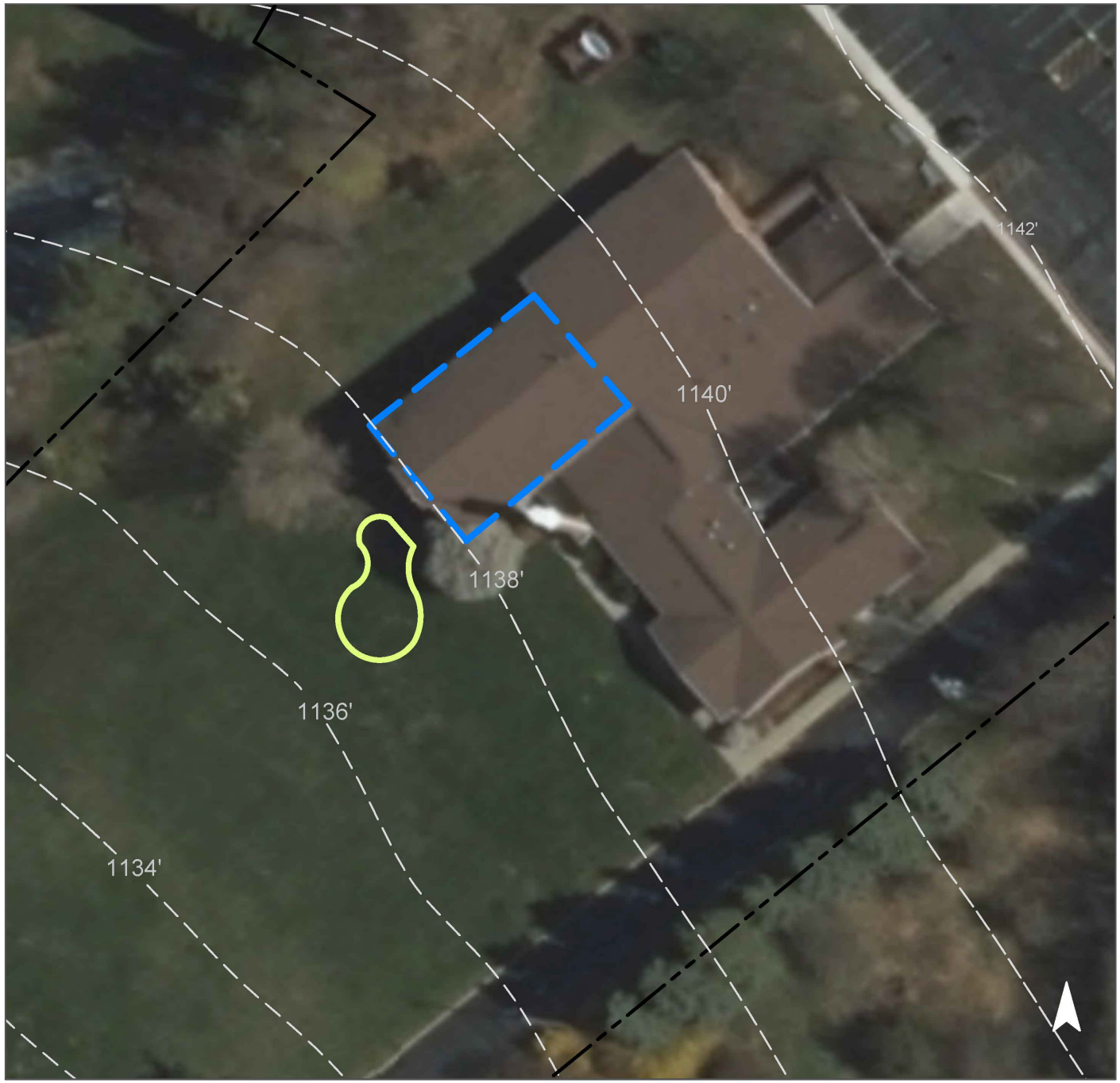
Block and Lot: Block 8201, Lot 9

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

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
43	108,022	5.2	54.6	496.0	0.084	2.96

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.087	15	6,370	0.24	835	$4,175

GREEN INFRASTRUCTURE RECOMMENDATIONS



The Church of Jesus Christ of Latter-day Saints

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

0 25' 50'

EISENHOWER MIDDLE SCHOOL & ROXBURY HIGH SCHOOL

Subwatershed: Lamington River

Site Area: 3,538,538 sq. ft.

Address: 47 Eyland Avenue
Succasunna, NJ 07876

Block and Lot: Block 1801, Lots 2, 3, 4

Three rain gardens can be installed to capture, treat, and infiltrate runoff from rooftops and paved areas. Parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the parking lot areas. A cistern can be installed to capture roof runoff from a maintenance shed. 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"
32	1,137,347	54.8	574.4	5,222.0	0.886	31.19

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	0.627	105	46,020	1.73	6,020	$30,100
Pervious pavement	3.845	644	282,110	10.60	26,350	$658,750
Rainwater harvesting	0.048	8	1,450	0.06	1,450 (gal)	$2,900

GREEN INFRASTRUCTURE RECOMMENDATIONS

Eisenhower Middle School & Roxbury High School

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

0 150' 300'

FRANKLIN ELEMENTARY SCHOOL & LINCOLN ROOSEVELT SCHOOL

Subwatershed: Lamington River

Site Area: 1,431,171 sq. ft.

Address: 8 Meeker Street
Succasunna, NJ 07876

Block and Lot: Block 3901, Lot 2

Rain gardens can be installed at the entrances of both buildings near downspouts to capture, treat, and infiltrate rooftop runoff. Another rain garden can be installed in the turfgrass area near a catch basin to capture water from the parking lot. A section of parking spaces can be converted to porous pavement to capture and infiltrate 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"
29	415,275	20.0	209.7	1,906.7	0.324	11.39

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	0.354	59	26,010	0.98	5,405	$27,025
Pervious pavement	0.475	79	34,840	1.31	3,260	$81,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Franklin Elementary School & Lincoln Roosevelt School

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

0 100' 200'

HILLSIDE LUTHERAN BRETHREN CHURCH

Subwatershed: Lamington River

Site Area: 253,933 sq. ft.

Address: 113 South Hillside Avenue
Succasunna, NJ 07876

Block and Lot: Block 3103, Lot 1

Rain gardens can be installed north and west of the building near downspouts to capture, treat, and infiltrate rooftop runoff. Another rain garden can be installed near the parking lot to capture runoff from the road. Parking spaces can be replaced with pervious pavement to capture and infiltrate 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"
46	117,092	5.6	59.1	537.6	0.091	3.21

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 systems	0.202	34	14,830	0.56	1,945	$9,725
Pervious pavement	0.484	81	35,540	1.34	3,320	$83,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Hillside Lutheran Brethren Church

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

0 50' 100'

HORSESHOE LAKE RECREATION COMPLEX

Subwatershed: Lamington River

Site Area: 3,768,003 sq. ft.

Address: 72 Eyland Avenue
Succasunna, NJ 07876

Block and Lot: Block 1802, Lot 7-8

There are four downspouts along the north side of the building where downspout planter boxes can be installed. A rain garden can be installed at end of the parking lot that will capture stormwater from the parking lot. Another rain garden can be installed on the north side of the building near downspouts. Pervious pavement can be installed to capture and infiltrate runoff from the southern 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"
17	647,900	31.2	327.2	2,974.7	0.505	17.77

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	0.106	18	7,780	0.29	581	$2,905
Pervious pavement	0.190	32	13,920	0.52	1,300	$32,500
Planter boxes	n/a	3	n/a	n/a	4 (boxes)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Horseshoe Lake Recreation Complex

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

0 50' 100'

KENNEDY ELEMENTARY SCHOOL

Subwatershed: Lamington River

Site Area: 587,551 sq. ft.

Address: 20 Pleasant Hill Road
Succasunna, NJ 07876

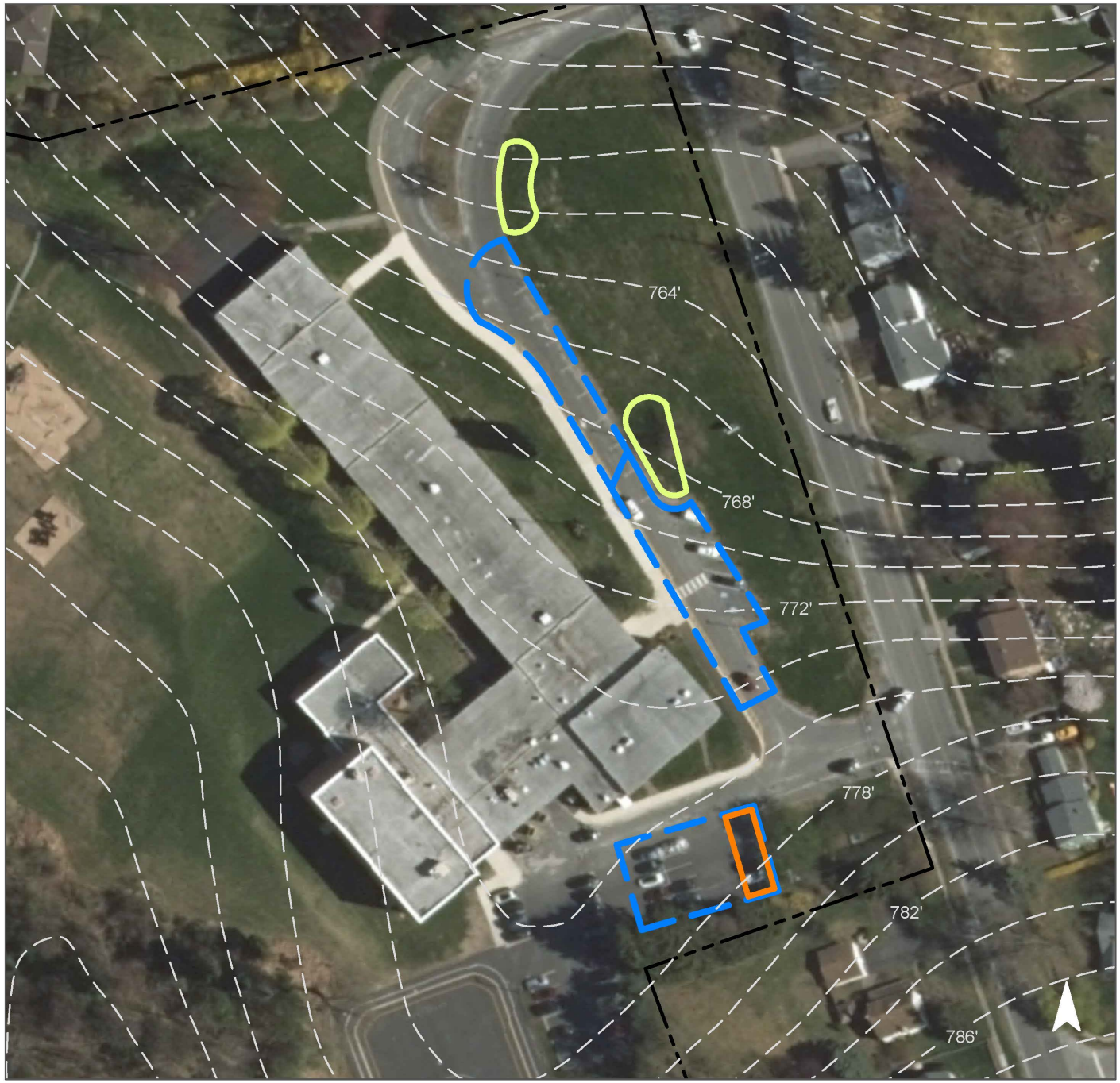
Block and Lot: Block 1201, Lot 19

Two rains gardens can be installed in the turfgrass in front of the building to capture, treat, and infiltrate roadway runoff. Another rain garden can be installed south of the building to capture runoff from the basketball court. Pervious pavement can be installed in the parking lot to capture and infiltrate 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"
26	150,355	7.2	75.9	690.3	0.117	4.12

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.271	45	19,920	0.75	2,605	$13,025
Pervious pavement	0.141	24	10,320	0.39	970	$24,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Kennedy Elementary School

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

0 50' 100'

GRACE CHURCH ON THE MOUNT

Subwatershed: Musconetcong River

Site Area: 388,820 sq. ft.

Address: 1500 US-46
Netcong, NJ 07857

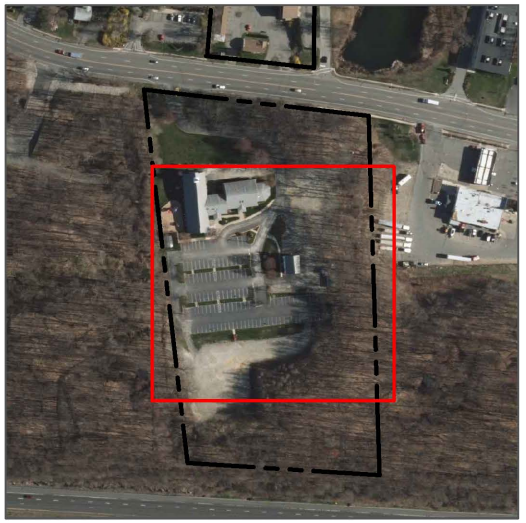
Block and Lot: Block 9302, Lot 2

A rain garden can be installed near a connected downspout and a catch basin to capture, treat, and infiltrate rooftop runoff. Downspout planter boxes can be constructed along the building to allow roof runoff to be reused. A section of parking spaces can be converted to porous pavement to capture and infiltrate 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"
39	149,927	7.2	75.7	688.4	0.117	4.11

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	0.026	4	1,910	0.07	250	$1,250
Pervious pavement	0.190	32	13,920	0.52	1,300	$32,500
Planter boxes	n/a	3	n/a	n/a	4 (boxes)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Grace Church on the Mount

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

0 30' 60'

LAKE HOPATCONG HISTORICAL MUSEUM AND STATE PARK

Subwatershed: Musconetcong River

Site Area: 2,240,313 sq. ft.

Address: State Park
Landing, NJ 07850

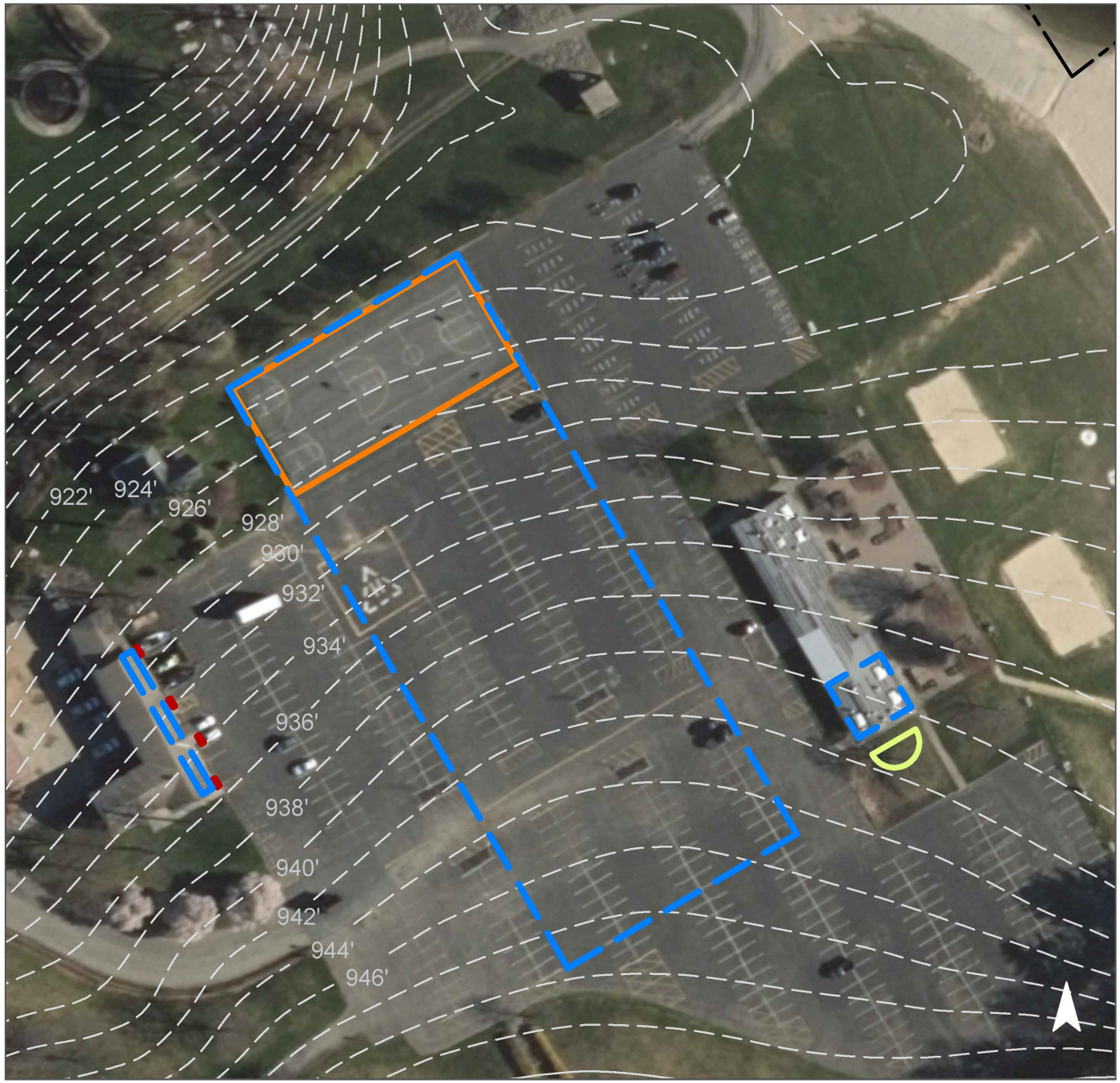
Block and Lot: Block 10802, Lot 1

The basketball court area in the parking lot can be converted to porous pavement to capture and infiltrate runoff from the parking lot. A rain garden can be installed near the bathrooms to capture, treat, and infiltrate runoff from the rooftop. Downspout planter boxes can be installed near the main building at the ends of downspouts to filter 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"
19	415,348	20.0	209.8	1,907.0	0.324	11.39

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	3,060	0.11	400	$2,000
Pervious pavement	1.984	332	145,610	5.47	13,600	$340,000
Planter boxes	n/a	3	n/a	n/a	4 (boxes)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Lake Hopatcong Historical Museum and State Park

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

0 50' 100'

LANDING POST OFFICE

Subwatershed: **Musconetcong River**

Site Area: **19,049 sq. ft.**

Address: **130 Lakeside Boulevard**
Landing, NJ 07850

Block and Lot: **Block 11001, Lot 6**

Pervious pavement can be installed near a downspout to capture and infiltrate stormwater runoff from the rooftop and 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"
82	15,714	0.8	7.9	72.2	0.012	0.43

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.111	19	8,160	0.31	800	$20,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Landing Post Office

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

0 25' 50'

SAINT HUBERT'S ANIMAL WELFARE CENTER NOAH'S ARK

Subwatershed: Musconetcong River

Site Area: 31,535 sq. ft.

Address: 1915 US-46
Ledgewood, NJ 07852

Block and Lot: Block 9402, Lot 11

A rain garden can be installed south of the building near a disconnected downspout 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"
41	12,816	0.6	6.5	58.8	0.010	0.35

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.016	3	1,170	0.04	155	$775

GREEN INFRASTRUCTURE RECOMMENDATIONS

Saint Hubert's Animal Welfare Center Noah's Ark

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

0 20' 40'

THE ANIMAL HOSPITAL OF ROXBURY

Subwatershed: Musconetcong River

Site Area: 35,733 sq. ft.

Address: 1901 US-46
Ledgewood, NJ 07852

Block and Lot: Block 9402, Lot 13-15

Connected downspouts can be rerouted into the existing planter boxes to be converted into downspout planter boxes. Downspout planter boxes can be constructed along the building to allow roof runoff to be reused. Porous pavement can be installed in the main parking spaces to capture and infiltrate 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"
57	20,257	1.0	10.2	93.0	0.016	0.56

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	0.150	25	10,970	0.41	1,025	$25,625
Planter boxes	n/a	3	n/a	n/a	4 (boxes)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

The Animal Hospital of Roxbury

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

0 25' 50'

BERKSHIRE VALLEY PARK

Subwatershed: Rockaway River

Site Area: 187,097 sq. ft.

Address: 79 Mill Road
Wharton, NJ 07885

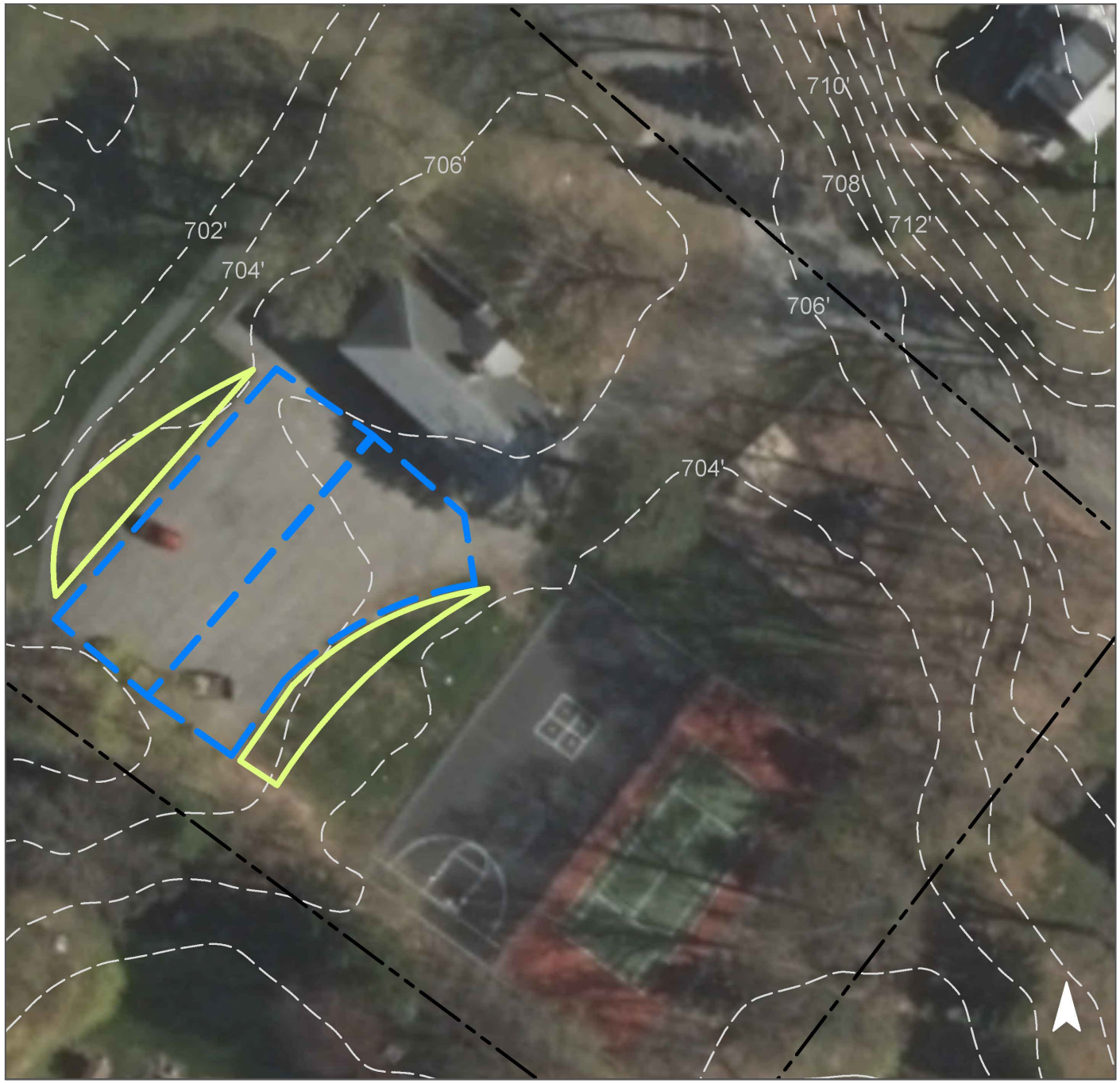
Block and Lot: Block 13002, Lot 11

Two rain gardens can be installed on either side of the parking lot to capture, treat, and infiltrate 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"
30	55,632	2.7	28.1	255.4	0.043	1.53

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 systems	0.225	38	16,480	0.62	2,155	$10,775

GREEN INFRASTRUCTURE RECOMMENDATIONS



Berkshire Valley Park

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

0 25' 50'

ROXBURY FIRE COMPANY 3

Subwatershed: Rockaway River

Site Area: 76,303 sq. ft.

Address: 271 Berkshire Valley Road
Wharton, NJ 07885

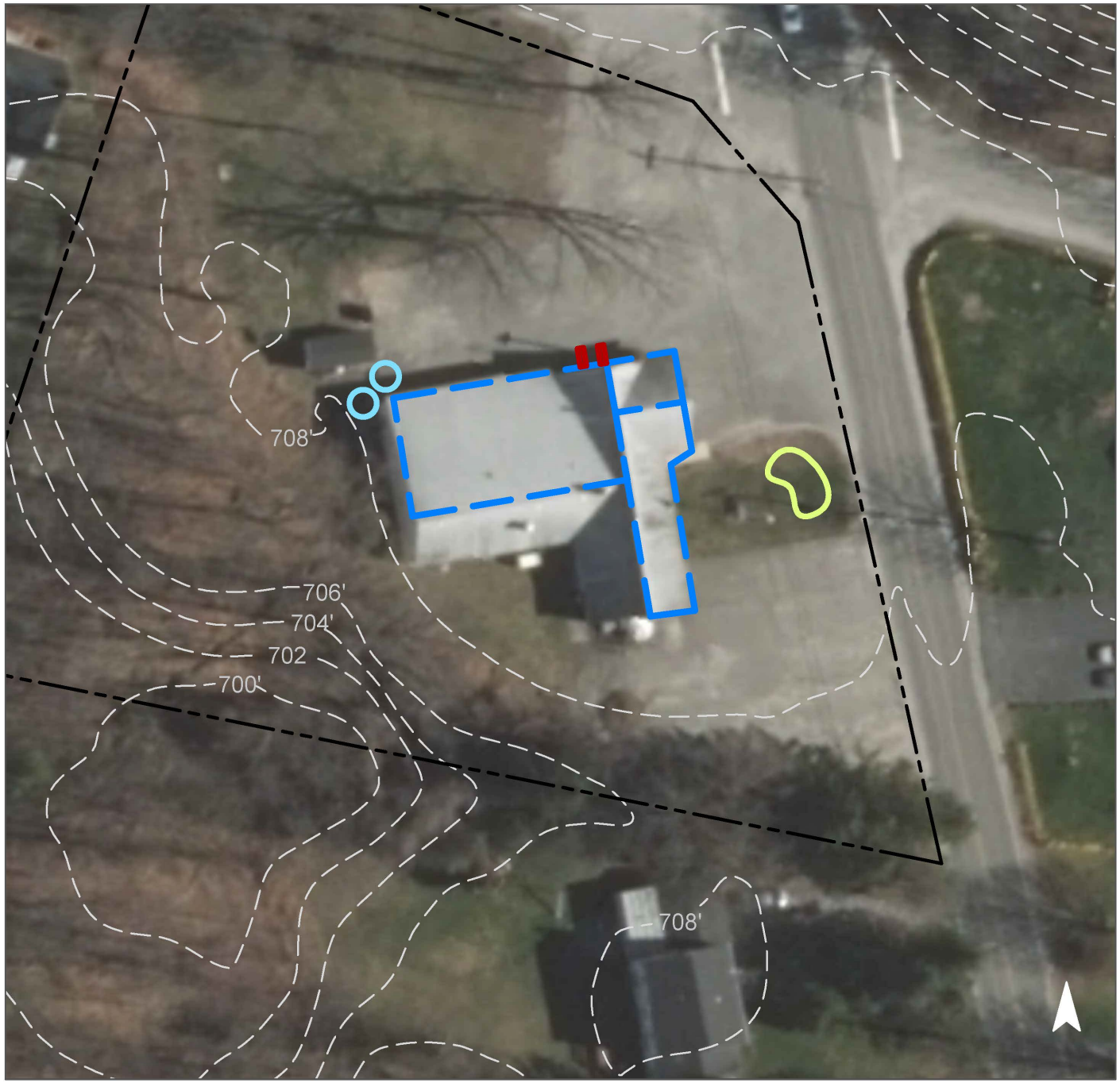
Block and Lot: Block 12501, Lot 21

A rain garden can be installed near the entrance of the building to capture, treat, and infiltrate rooftop runoff. A cistern can be installed at the back of the building to capture roof runoff, which can be used for watering gardens, washing vehicles, or for other non-potable uses. Downspout planter boxes can be installed in front of the building to filter rooftop runoff and provide visual interest. 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	32,868	1.6	16.6	150.9	0.026	0.90

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 system	0.030	5	2,190	0.08	285	$1,425
Planter boxes	n/a	2	n/a	n/a	2 (boxes)	$2,000
Rainwater harvesting	0.067	11	2,000	0.08	2,000 (gal)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Roxbury Fire Company 3

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

0 25' 50'

UNITED METHODIST CHURCH

Subwatershed: Rockaway River

Site Area: 8,786 sq. ft.

Address: 296 Berkshire Valley Road
Wharton, NJ 07885

Block and Lot: Block 13002, Lot 1

A connected downspout can be disconnected and led into a rain garden on the north side of the building near the entrance 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	2,633	0.1	1.3	12.1	0.002	0.07

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	0.026	4	1,910	0.07	154	$770

GREEN INFRASTRUCTURE RECOMMENDATIONS

United Methodist Church

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

0 10' 20'

c. Summary of Existing Conditions

Summary of Existing Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Existing Annual Loads (Commercial)			Runoff Volumes from I.C.		Runoff Volumes from I.C.	
									TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Water Quality Storm (1.25" over 2-hours) (cu.ft.)	Annual (cu.ft.)	Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
	DRAKES BROOK SITES	**155.78**	**6,785,633**				**18.37**	**800,093**	**38.6**	**404.1**	**3,673.5**	**83,343**	**2,933,674**	**0.623**	**21.94**
1	**Jefferson Elementary School**														
	Total Site Info	14.44	628,915	4501	10	31	4.41	192,288	9.3	97.1	882.9	20,030	705,055	0.150	5.27
2	**Kiwanis Park**														
	Total Site Info	105.10	4,578,278	901	19	2	2.02	88,107	4.2	44.5	404.5	9,178	323,060	0.069	2.42
3	**Roxbury Community Garden**														
	Total Site Info	8.54	371,852	2802	5	4	0.37	16,186	0.8	8.2	74.3	1,686	59,347	0.013	0.44
4	**Roxbury Township Court Clerk**														
	Total Site Info	5.22	227,319	9603	5	58	3.02	131,380	6.3	66.4	603.2	13,685	481,728	0.102	3.60
5	**Saint Therese Church and School**														
	Total Site Info	16.71	727,688	5103	1	36	6.06	264,110	12.7	133.4	1,212.6	27,511	968,403	0.206	7.24
6	**The Church of Jesus Christ of Latter-Day Saints**														
	Total Site Info	5.78	251,582	8201	9	43	2.48	108,022	5.2	54.6	496.0	11,252	396,082	0.084	2.96
	LAMINGTON RIVER SITES	**220**	**9,579,196**				**56.66**	**2,467,969**	**119.0**	**1246.4**	**11,331.4**	**257,080**	**9,049,220**	**1.923**	**67.69**
7	**Eisenhower Middle School & Roxbury High School**														
	Total Site Info	81.23	3,538,538	1801	2, 3, 4	32	26.11	1,137,347	54.8	574.4	5,222.0	118,474	4,170,273	0.886	31.19
8	**Franklin Elementary School & Lincoln Roosevelt School**														
	Total Site Info	32.86	1,431,171	3901	2	29	9.53	415,275	20.0	209.7	1,906.7	43,258	1,522,676	0.324	11.39
9	**Hillside Lutheran Brethren Church**														
	Total Site Info	5.83	253,933	3103	1	46	2.69	117,092	5.6	59.1	537.6	12,197	429,337	0.091	3.21
10	**Horseshoe Lake Recreation Complex**														
	Total Site Info	86.50	3,768,003	1802	7, 8	17	14.87	647,900	31.2	327.2	2,974.7	67,490	2,375,633	0.505	17.77
11	**Kennedy Elementary School**														
	Total Site Info	13.49	587,551	1201	19	26	3.45	150,355	7.2	75.9	690.3	15,662	551,301	0.117	4.12
	MUSCONETCONG RIVER SITES	**62.34**	**2,715,450**				**14.10**	**614,062**	**29.6**	**310.1**	**2,819.4**	**63,965**	**2,251,562**	**0.478**	**16.84**
12	**Grace Church on the Mount**														
	Total Site Info	8.93	388,820	9302	2	39	3.44	149,927	7.2	75.7	688.4	15,617	549,733	0.117	4.11
13	**Lake Hopatcong Historical Museum and State Park**														
	Total Site Info	51.43	2,240,313	10802	1	19	9.54	415,348	20.0	209.8	1,907.0	43,265	1,522,943	0.324	11.39
14	**St. Hubert's Animal Welfare Center Noah's Ark**														
	Total Site Info	0.72	31,535	9402	11	41	0.29	12,816	0.6	6.5	58.8	1,335	46,991	0.010	0.35

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) TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (cu.ft.)	Runoff Volumes from I.C. Annual (cu.ft.)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Runoff Volumes from I.C. Annual (Mgal)
15	**The Animal Hospital of Roxbury**														
	Total Site Info	0.82	35,733	9402	13, 14,15	57	0.47	20,257	1.0	10.2	93.0	2,110	74,276	0.016	0.56
16	**United States Postal Service**														
	Total Site Info	0.44	19,049	11001	6	82	0.36	15,714	0.8	7.9	72.2	1,637	57,619	0.012	0.43
	ROCKAWAY RIVER SITES	**6.25**	**272,186**				**2.05**	**89,299**	**4.3**	**45.1**	**410.0**	**9,302**	**327,429**	**0.070**	**2.45**
17	**Berkshire Valley Park**														
	Total Site Info	4.30	187,097	13002	11	29	1.24	53,798	2.6	27.2	247.0	5,604	197,259	0.042	1.48
18	**Roxbury Fire Company 3**														
	Total Site Info	1.75	76,303	12501	21	43	0.75	32,868	1.6	16.6	150.9	3,424	120,515	0.026	0.90
19	**United Methodist Church**														
	Total Site Info	0.20	8,786	13002	1	30	0.06	2,633	0.1	1.3	12.1	274	9,655	0.002	0.07

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area		Recharge Potential	TSS Removal Potential	Max Volume Reduction Potential	Peak Discharge Reduction Potential	Size of BMP	Unit Cost	Unit	Total Cost	I.C. Treated
		Area (SF)	Area (ac)	(Mgal/yr)	(lbs/yr)	(gal/storm)	(cfs)		($/unit)		($)	%
	DRAKES BROOK SITES	**66,290**	**1.52**	**1.694**	**288**	**123,980**	**4.66**				**$187,375**	**8.3%**
1	**Jefferson Elementary School**											
	Bioretention system	1,300	0.03	0.034	6	2,480	0.09	740	$5	SF	$3,700	0.7%
	Pervious pavement	17,750	0.41	0.462	77	33,940	1.28	178	$25	SF	$4,450	9.2%
	Planter boxes	1,290	0.03	n/a	5	n/a	n/a	8	$1,000	box	$8,000	0.7%
	Total Site Info	**20,340**	**0.47**	**0.496**	**88**	**36,420**	**1.37**				**$16,150**	**10.6%**
2	**Kiwanis Park**											
	Bioretention system	2,525	0.06	0.066	11	4,820	0.18	1,630	$5	SF	$8,150	2.9%
	Pervious pavement	19,375	0.44	0.505	85	37,040	1.39	3,460	$25	SF	$86,500	22.0%
	Total Site Info	**21,900**	**0.50**	**0.571**	**96**	**41,860**	**1.57**				**$94,650**	**24.9%**
3	**Roxbury Community Garden**											
	Rainwater harvesting	250	0.01	0.007	1	200	0.01	200	$2	gal	$400	1.5%
	Total Site Info	**250**	**0.01**	**0.007**	**1**	**200**	**0.01**				**$400**	**1.5%**
4	**Roxbury Township Court Clerk**											
	Pervious pavement	14,500	0.33	0.378	63	27,720	1.04	2,590	$25	SF	$64,750	11.0%
	Total Site Info	**14,500**	**0.33**	**0.378**	**63**	**27,720**	**1.04**				**$64,750**	**11.0%**
5	**Saint Therese Church**											
	Bioretention system	5,970	0.14	0.156	26	11,410	0.43	1,450	$5	SF	$7,250	2.3%
	Total Site Info	**5,970**	**0.14**	**0.156**	**26**	**11,410**	**0.43**				**$7,250**	**2.3%**
6	**The Church of Jesus Christ of Latter-day Saints**											
	Bioretention system	3,330	0.08	0.087	15	6,370	0.24	835	$5	SF	$4,175	3.1%
	Total Site Info	**3,330**	**0.08**	**0.087**	**15**	**6,370**	**0.24**				**$4,175**	**3.1%**
	LAMINGTON RIVER SITES	**259,700**	**5.96**	**6.744**	**1,132**	**492,740**	**18.53**				**$969,680**	**10.5%**
7	**Eisenhower Middle School & Roxbury High School**											
	Bioretention systems	24,070	0.55	0.627	105	46,020	1.73	6,020	$5	SF	$30,100	2.1%
	Pervious pavement	147,560	3.39	3.845	644	282,110	10.60	26,350	$25	SF	$658,750	13.0%
	Rainwater harvesting	1,860	0.04	0.048	8	1,450	0.06	1,450	$2	gal	$2,900	0.2%
	Total Site Info	**173,490**	**3.98**	**4.520**	**757**	**329,580**	**12.39**				**$691,750**	**15.3%**
8	**Franklin Elementary School & Lincoln Roosevelt School**											
	Bioretention systems	13,605	0.31	0.354	59	26,010	0.98	5,405	$5	SF	$27,025	3.3%
	Pervious pavement	18,225	0.42	0.475	79	34,840	1.31	3,260	$25	SF	$81,500	4.4%
	Total Site Info	**31,830**	**0.73**	**0.829**	**139**	**60,850**	**2.29**				**$108,525**	**7.7%**
9	**Hillside Lutheran Brethren Church**											
	Bioretention systems	7,760	0.18	0.202	34	14,830	0.56	1,945	$5	SF	$9,725	6.6%
	Pervious pavement	18,590	0.43	0.484	81	35,540	1.34	3,320	$25	SF	$83,000	15.9%

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 %
	Total Site Info	**26,350**	**0.60**	**0.687**	**115**	**50,370**	**1.90**				**$92,725**	**22.5%**
10	**Horseshoe Lake Recreation Complex**											
	Bioretention systems	4,070	0.09	0.106	18	7,780	0.29	581	$5	SF	$2,905	0.6%
	Pervious pavement	7,280	0.17	0.190	32	13,920	0.52	1,300	$25	SF	$32,500	1.1%
	Planter boxes	860	0.02	n/a	3	n/a	n/a	4	$1,000	box	$4,000	0.1%
	Total Site Info	**12,210**	**0.28**	**0.296**	**53**	**21,700**	**0.81**				**$39,405**	**1.9%**
11	**Kennedy Elementary School**											
	Bioretention systems	10,420	0.24	0.271	45	19,920	0.75	2,605	$5	SF	$13,025	6.9%
	Pervious pavement	5,400	0.12	0.141	24	10,320	0.39	970	$25	SF	$24,250	3.6%
	Total Site Info	**15,820**	**0.36**	**0.412**	**69**	**30,240**	**1.14**				**$37,275**	**10.5%**
	MUSCONETCONG RIVER SITES	**96,785**	**2.22**	**2.477**	**421**	**181,740**	**6.82**				**$428,150**	**15.8%**
12	**Grace Church on the Mount**											
	Bioretention system	1,000	0.02	0.026	4	1,910	0.07	250	$5	SF	$1,250	0.7%
	Pervious pavement	7,280	0.17	0.190	32	13,920	0.52	1,300	$25	SF	$32,500	4.9%
	Planter boxes	860	0.02	n/a	3	n/a	n/a	4	$1,000	box	$4,000	0.6%
	Total Site Info	**9,140**	**0.21**	**0.216**	**39**	**15,830**	**0.59**				**$37,750**	**5.5%**
13	**Lake Hopatcong Historical Museum and State Park**											
	Bioretention system	1,600	0.04	0.042	7	3,060	0.11	400	$5	SF	$2,000	0.4%
	Pervious pavement	76,160	1.75	1.984	332	145,610	5.47	13,600	$25	SF	$340,000	18.3%
	Planter boxes	860	0.02	n/a	3	n/a	n/a	4	$1,000	box	$4,000	0.2%
	Total Site Info	**76,160**	**1.75**	**1.984**	**332**	**145,610**	**5.47**				**$340,000**	**18.7%**
14	**Landing Post Office**											
	Pervious pavement	4,270	0.10	0.111	19	8,160	0.31	800	$25	SF	$20,000	27.2%
	Total Site Info	**4,270**	**0.10**	**0.111**	**19**	**8,160**	**0.31**				**$20,000**	**27.2%**
15	**Saint Hubert's Animal Welfare Center Noah's Ark**											
	Bioretention system	615	0.01	0.016	3	1,170	0.04	155	$5	SF	$775	4.8%
	Total Site Info	615	0.01	0.016	3	1,170	0.04				$775	4.8%
16	**The Animal Hospital of Roxbury**											
	Pervious pavement	**5,740**	**0.13**	**0.150**	**25**	**10,970**	**0.41**	**1,025**	$25	**SF**	**$25,625**	**28.3%**
	Planter boxes	860	0.02	n/a	3	n/a	n/a	4	$1,000	box	$4,000	4.2%
	Total Site Info	**6,600**	**0.15**	**0.150**	**28**	**10,970**	**0.41**				**$29,625**	**32.6%**
	ROCKAWAY RIVER SITES	**13,760**	**0.32**	**0.347**	**60**	**22,580**	**0.85**				**$18,970**	**15.4%**
17	**Berkshire Valley Park**											
	Bioretention system	8,620	0.20	0.225	38	16,480	0.62	2,155	$5	SF	$10,775	16.0%
	Total Site Info	**8,620**	**0.20**	**0.225**	**38**	**16,480**	**0.62**				**$10,775**	**16.0%**

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)		($/unit)		($)	%
18	**Roxbury Fire Company 3**											
	Bioretention system	1,145	0.03	0.030	5	2,190	0.08	285	$5	SF	$1,425	3.5%
	Planter boxes	430	0.01	n/a	2	n/a	n/a	2	$1,000	box	$2,000	1.3%
	Rainwater harvesting	2,565	0.06	0.067	11	2,000	0.08	2,000	$2	gal	$4,000	7.8%
	Total Site Info	**4,140**	**0.10**	**0.097**	**18**	**4,190**	**0.16**				**$7,425**	**12.6%**
19	**United Methodist Church**											
	Bioretention system	1,000	0.02	0.026	4	1,910	0.07	154	$5	SF	$770	38.0%
	Total Site Info	**1,000**	**0.02**	**0.026**	**4**	**1,910**	**0.07**				**$770**	**38.0%**