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Draft

Impervious Cover Reduction Action Plan for Lebanon Borough, Hunterdon County, New Jersey

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

January 27, 2020

Highlands Council
New Jersey

ACKNOWLEDGEMENTS:

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New Jersey

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Introduction

Located in Hunterdon County, New Jersey, Lebanon Borough covers approximately 0.89 square miles. Figures 1 and 2 illustrate that Lebanon Borough is dominated by urban land use. A total of 69.1% of the municipality's land use is classified as urban. Of the urban land in Lebanon Borough, commercial 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 Lebanon 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 Lebanon Borough. Based upon the 2015 NJDEP land use/land cover data, approximately 30.5% of Lebanon Borough has impervious cover. This level of impervious cover suggests that the streams in Lebanon Borough likely are non-supporting streams. [1]

Methodology

Lebanon Borough contains one subwatershed (Figure 4). For this impervious cover reduction action plan, projects have been identified in this watershed. 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.

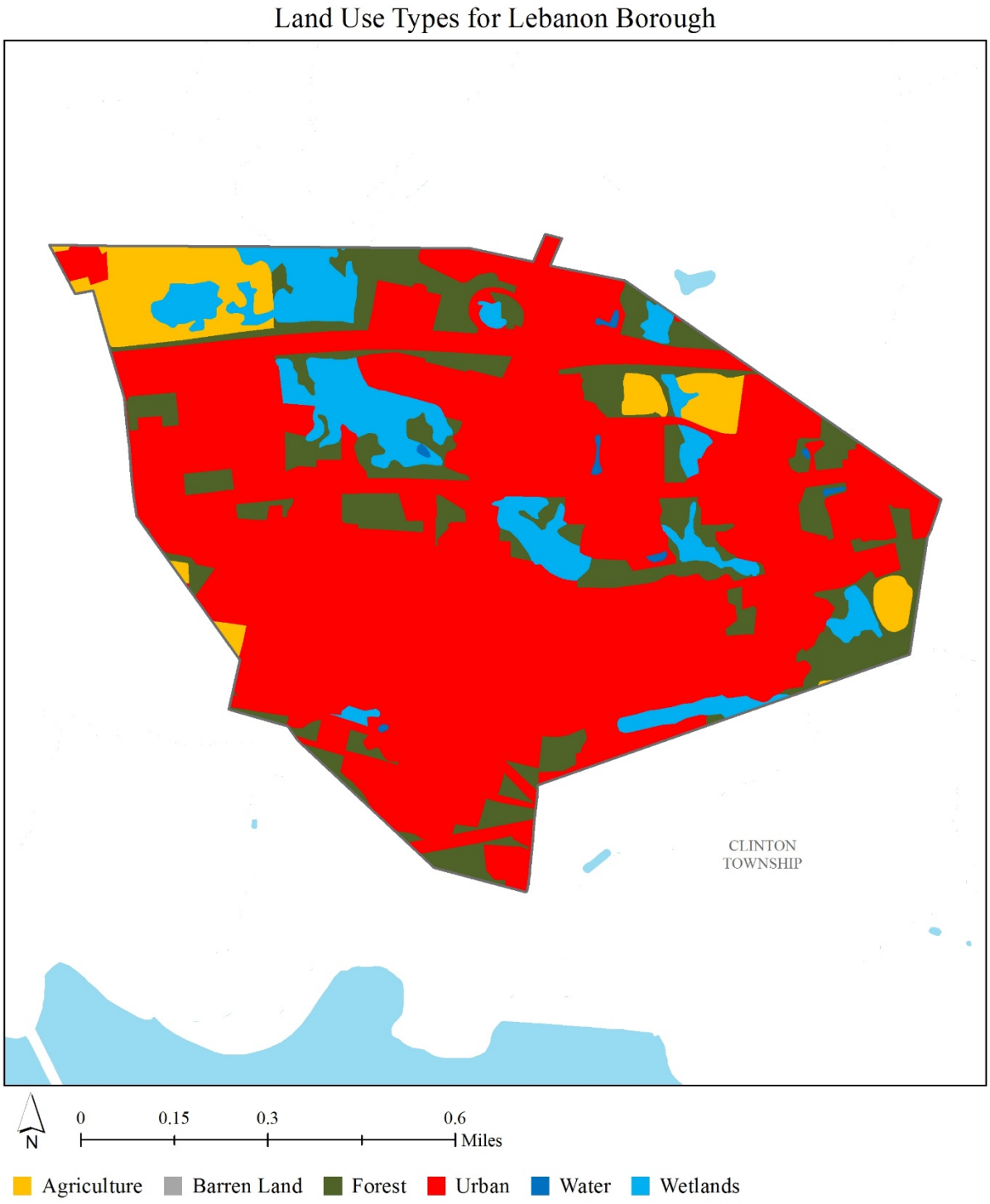


Figure 1: Map illustrating the land use in Lebanon Borough

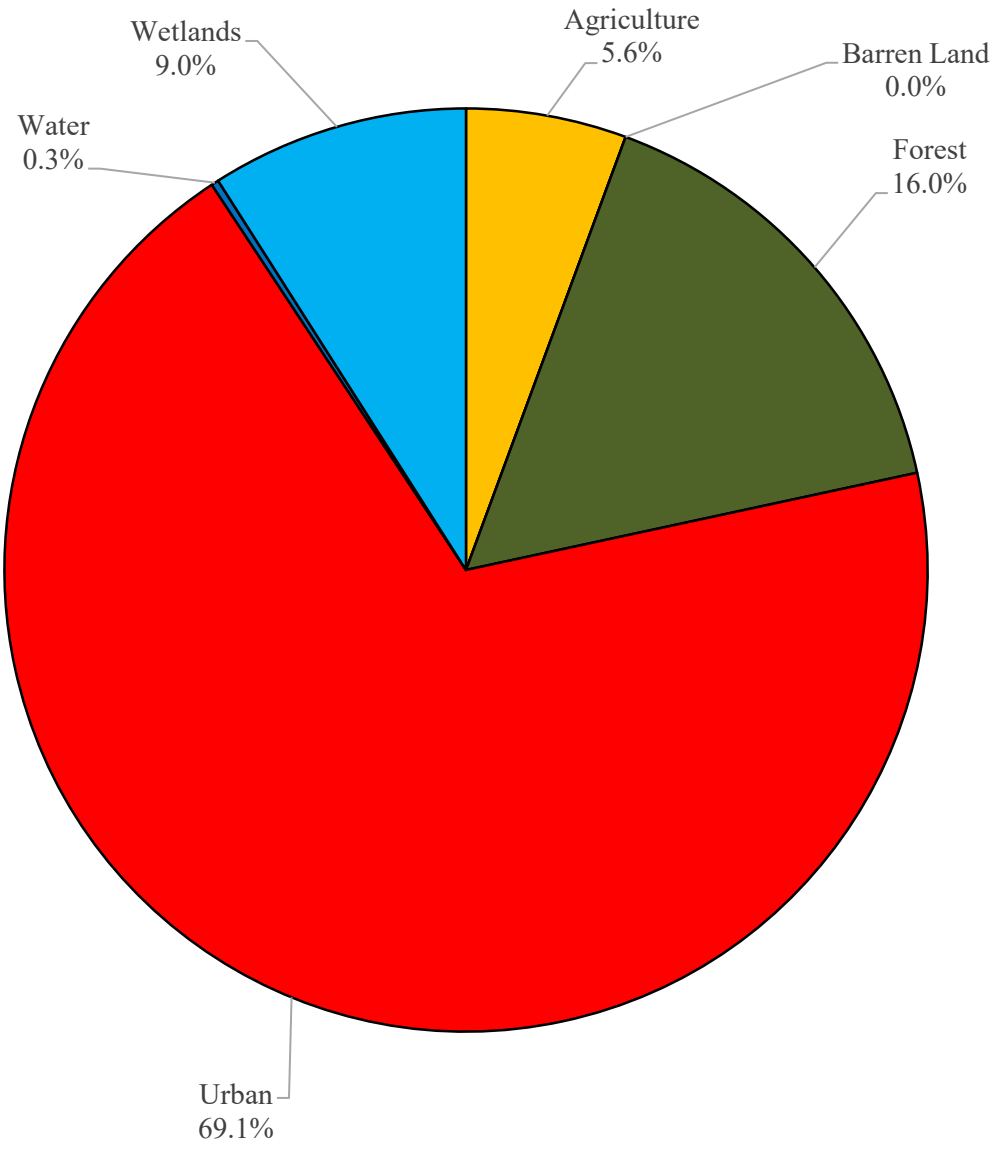


Figure 2: Pie chart illustrating the land use in Lebanon Borough

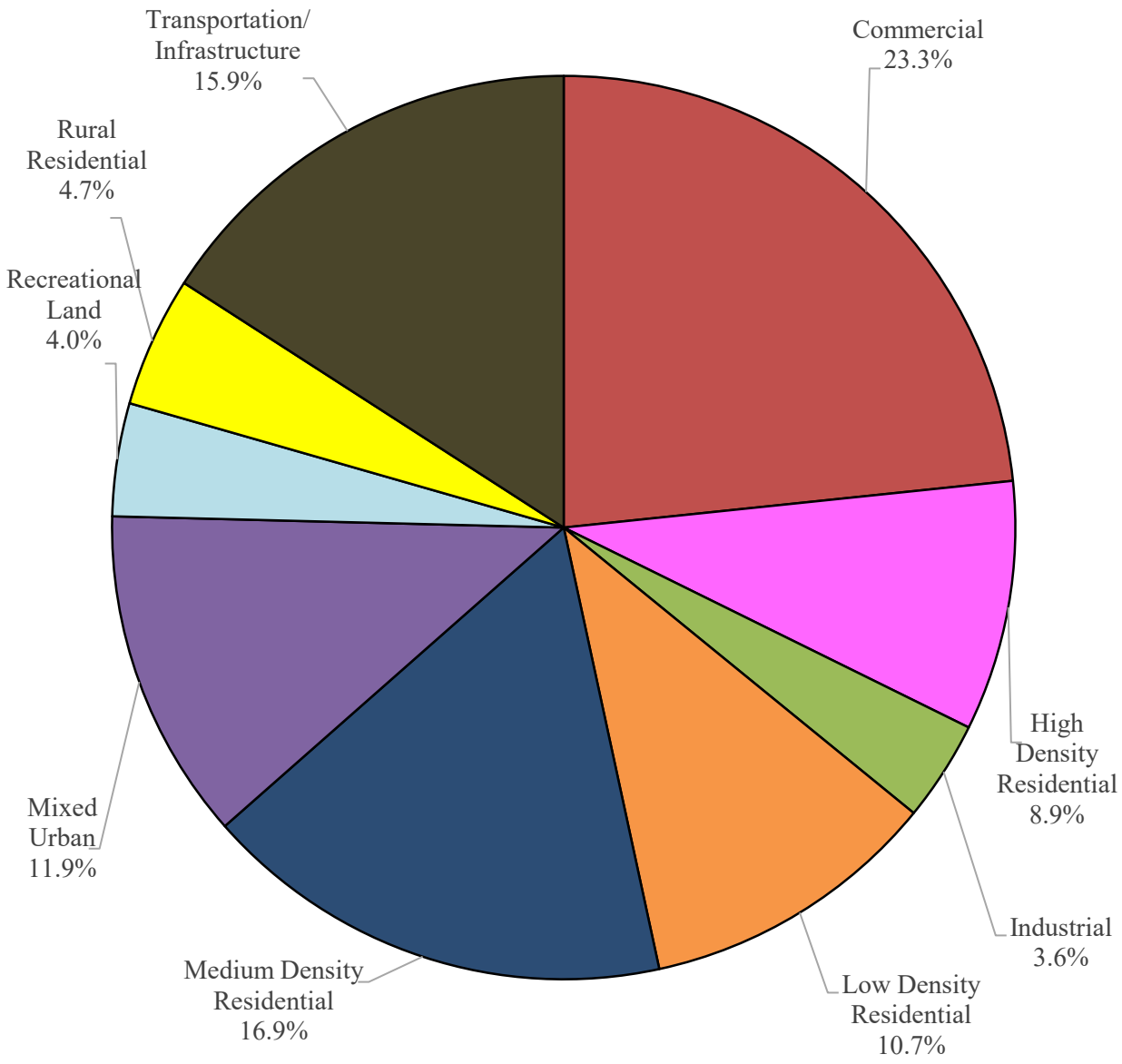


Figure 3: Pie chart illustrating the various types of urban land use in Lebanon Borough

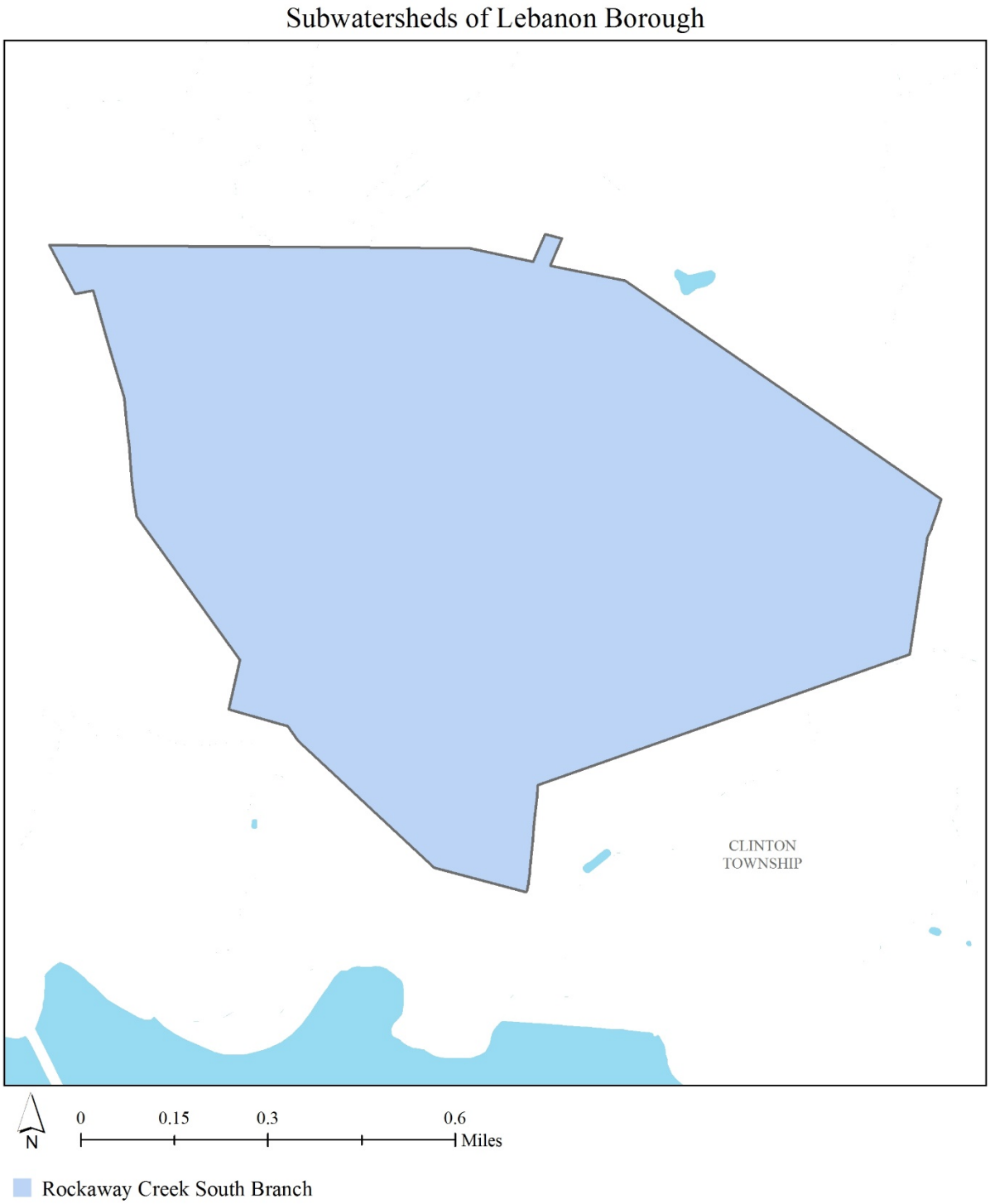


Figure 4: Map of the subwatersheds in Lebanon Borough

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 Lebanon 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 Lebanon 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.

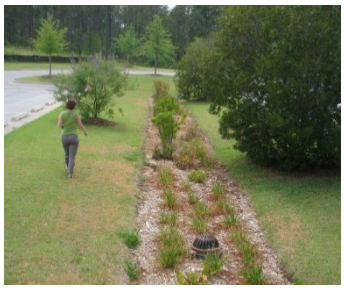
Downspout planter boxes

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

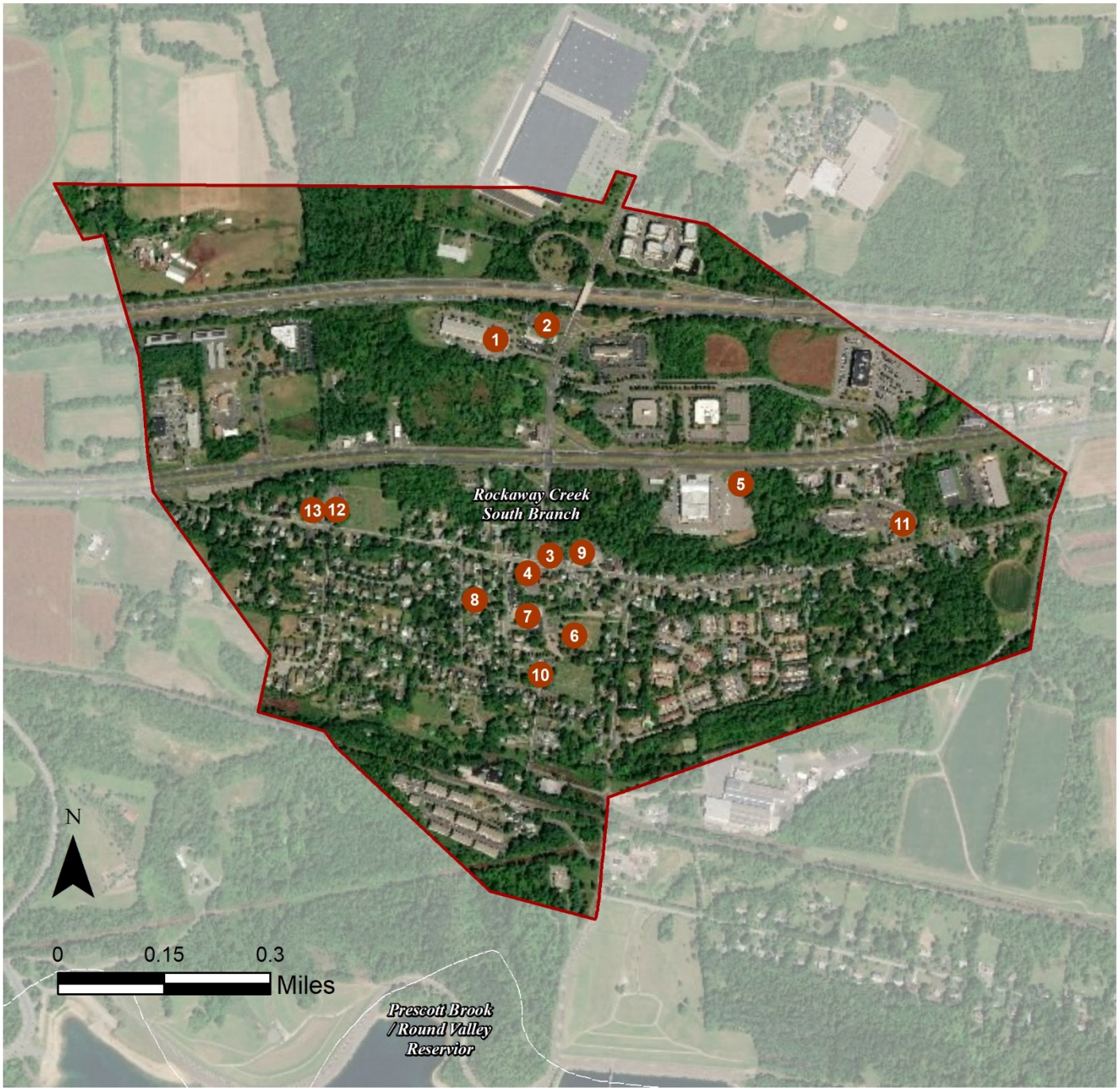
This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented by a wide variety of people such as boy scouts,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

LEBANON BOROUGH: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE ROCKAWAY CREEK SOUTH BRANCH SUBWATERSHED

1. Cokesbury Road Industrial Park
2. Cutshaw Construction
3. Dairy Technomics
4. Fox & Hound Tavern
5. Healthy Balance
6. Holjes-Sheppard Memorial Park
7. Lebanon Borough Elementary School
8. Lebanon Borough Municipal Office
9. Lebanon Fire Department
10. Lebanon Reformed Church
11. Oasis Commons
12. Round Valley United Methodist Church
13. Scarponi-Bright Funeral Home

b. Proposed Green Infrastructure Concepts

COKESBURY ROAD INDUSTRIAL PARK

Subwatershed: Rockaway Creek South Branch

Site Area: 727,164 sq. ft.

Address: 24 Cokesbury Road Lebanon, NJ 08833

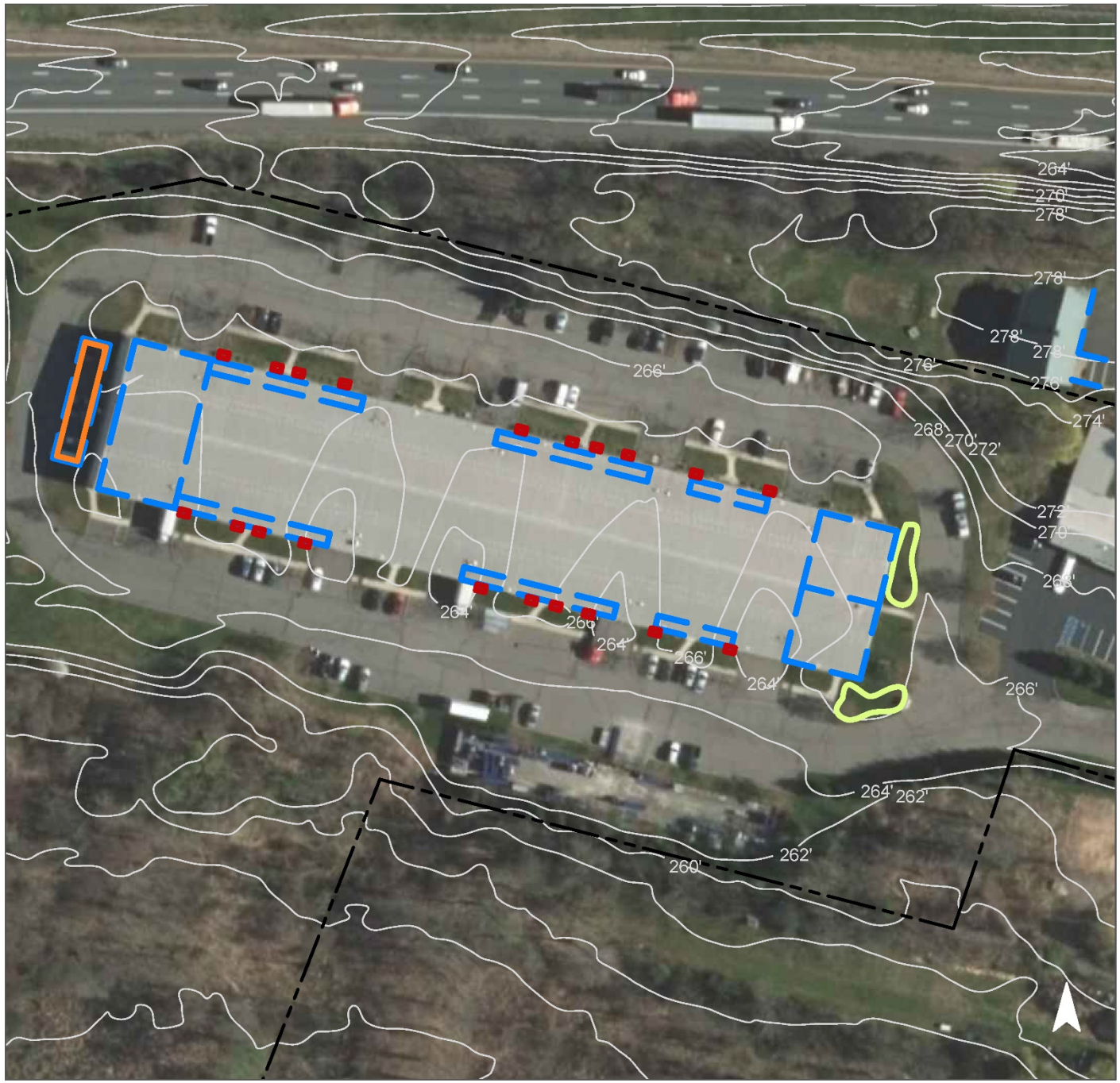
Block and Lot: Block 2 | Lot 14

A turfgrass area near the building to the southeast corner can be converted to a bioretention system to capture, treat, and infiltrate stormwater runoff from the building's roof. Downspouts around the building can be disconnected to install planter boxes. On the northwest side of the building, pervious pavement can be installed in parking spaces, and runoff from the roof can redirected to capture additional stormwater. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure. A detention basin is already present on the far west side of this property.

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	214,530	10.3	108.3	985.0	0.167	5.88

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	0.134	22	9,840	0.37	1,300	$6,500
Pervious pavement	0.172	29	12,630	0.47	1,460	$36,500
Planter boxes	n/a	16	n/a	n/a	20 (boxes)	$20,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Cokesbury Road Industrial Park

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

0 50' 100'

CUTSHAW CONSTRUCTION

Subwatershed: Rockaway Creek South Branch

Site Area: 50,850 sq. ft.

Address: 28 Cokesbury Road Lebanon, NJ 08833

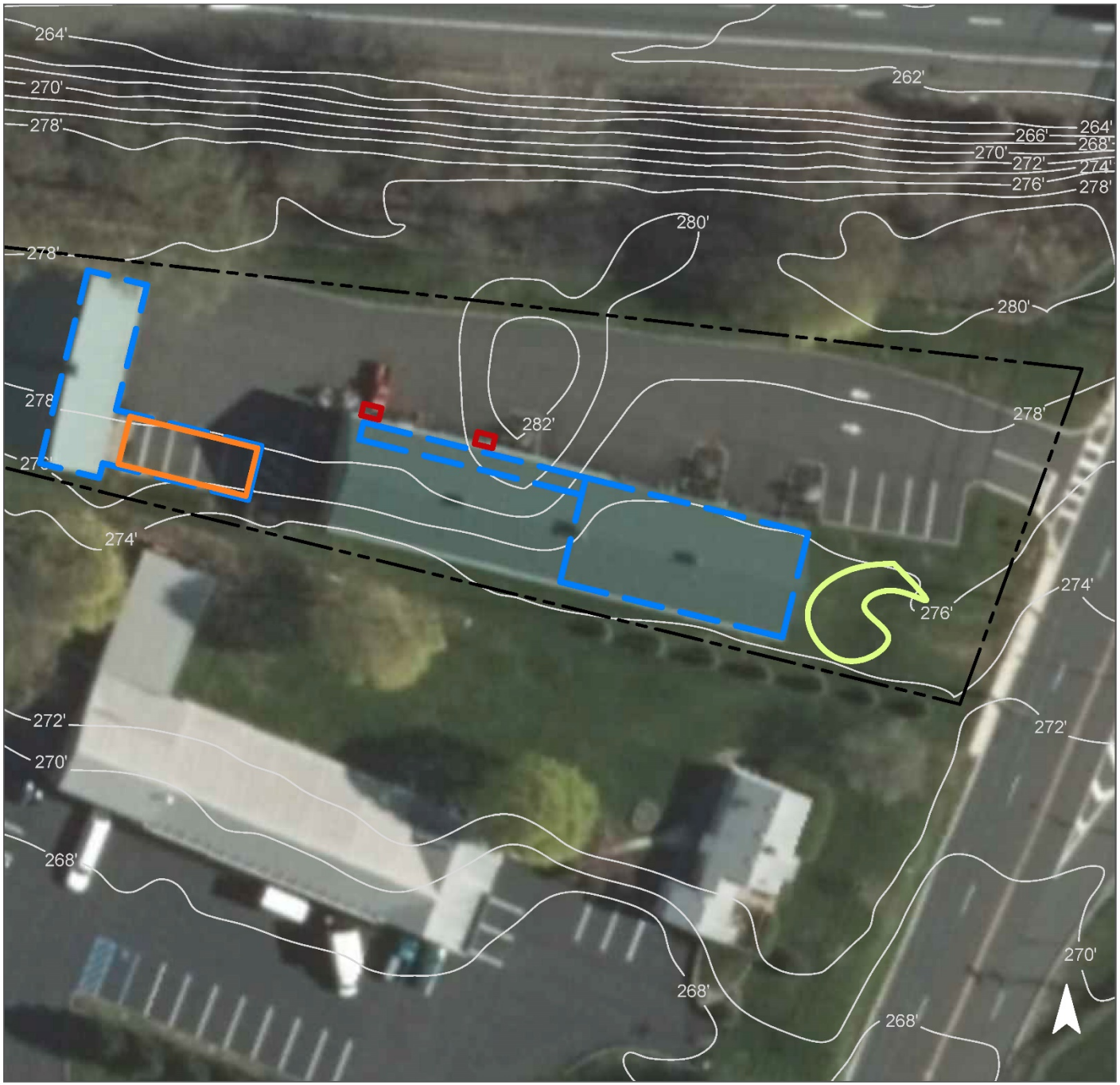
Block and Lot: Block 2 | Lot 15

A turfgrass area near the building's southeast corner can be converted to a bioretention system to capture, treat, and infiltrate stormwater runoff from the building's roof. Pervious pavement can be installed between the two buildings, and planter boxes can be installed on the northern side of the east building. 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"
45	22,975	1.1	11.6	105.5	0.018	0.63

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	0.069	12	5,090	0.19	665	$3,325
Pervious pavement	0.055	9	4,030	0.15	810	$20,250
Planter boxes	n/a	2	n/a	n/a	2 (boxes)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Cutshaw Construction

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

0 25' 50'

DAIRY TECHNOMICS

Subwatershed: Rockaway Creek South Branch

Site Area: 18,961 sq. ft.

Address: 74 Main Street
Lebanon, NJ 08833

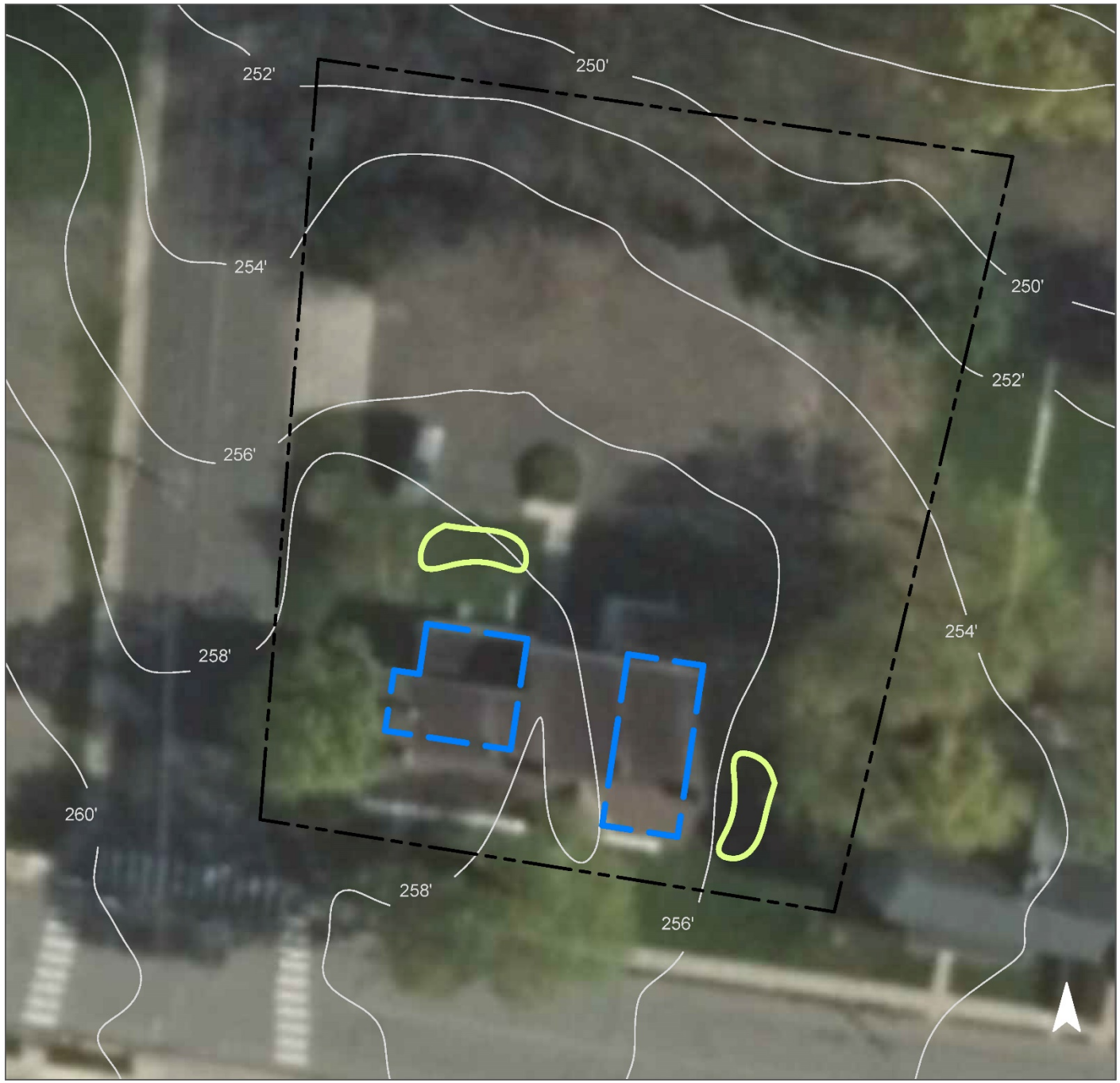
Block and Lot: Block 5 | Lot 4

The turfgrass area north of the building can be converted to a bioretention system to capture, treat, and infiltrate stormwater runoff from the building's roof. 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"
66	12,607	0.6	6.4	57.9	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 systems	0.026	4	1,930	0.07	255	$1,275

GREEN INFRASTRUCTURE RECOMMENDATIONS



Dairy Technomics

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

0 15' 30'

FOX & HOUND TAVERN

Subwatershed: Rockaway Creek South Branch

Site Area: 48,267 sq. ft.

Address: 69 Main Street
Lebanon, NJ 08833

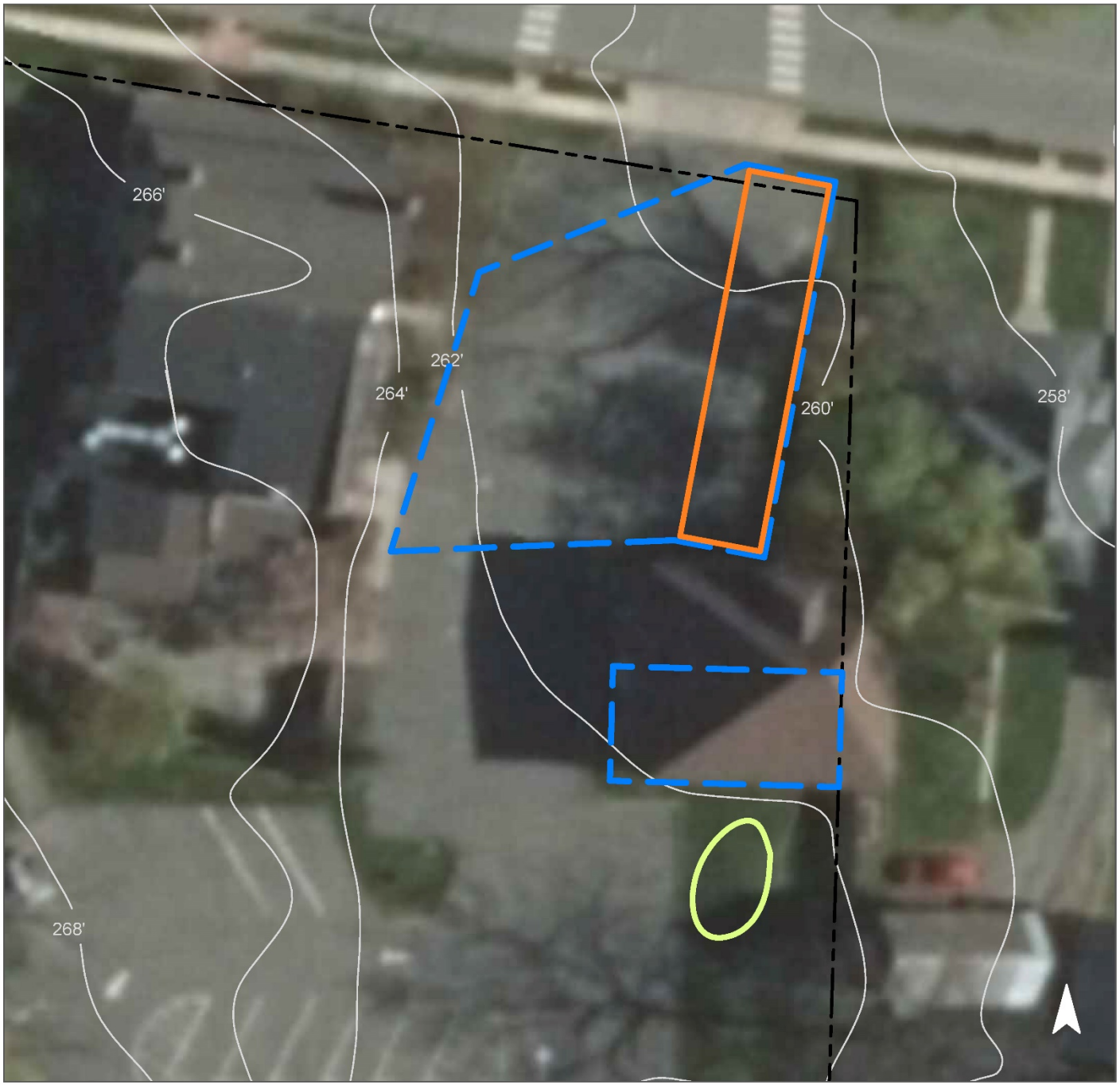
Block and Lot: Block 12 | Lot 2

A bioretention system can be installed in the turfgrass area near the brick building to capture, treat, and infiltrate stormwater runoff from the parking lot. The parking spaces east of the entrance can be converted to pervious pavement to help capture additional stormwater runoff. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
71	34,268	1.7	17.3	157.3	0.027	0.94

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	1,930	0.07	255	$1,275
Pervious pavement	0.121	20	8,860	0.33	1,350	$33,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Fox & Hound Tavern

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

0 15' 30'

HEALTHY BALANCE

Subwatershed: Rockaway Creek South Branch

Site Area: 43,766 sq. ft.

Address: 1265 US Highway 22 Lebanon, NJ 08833

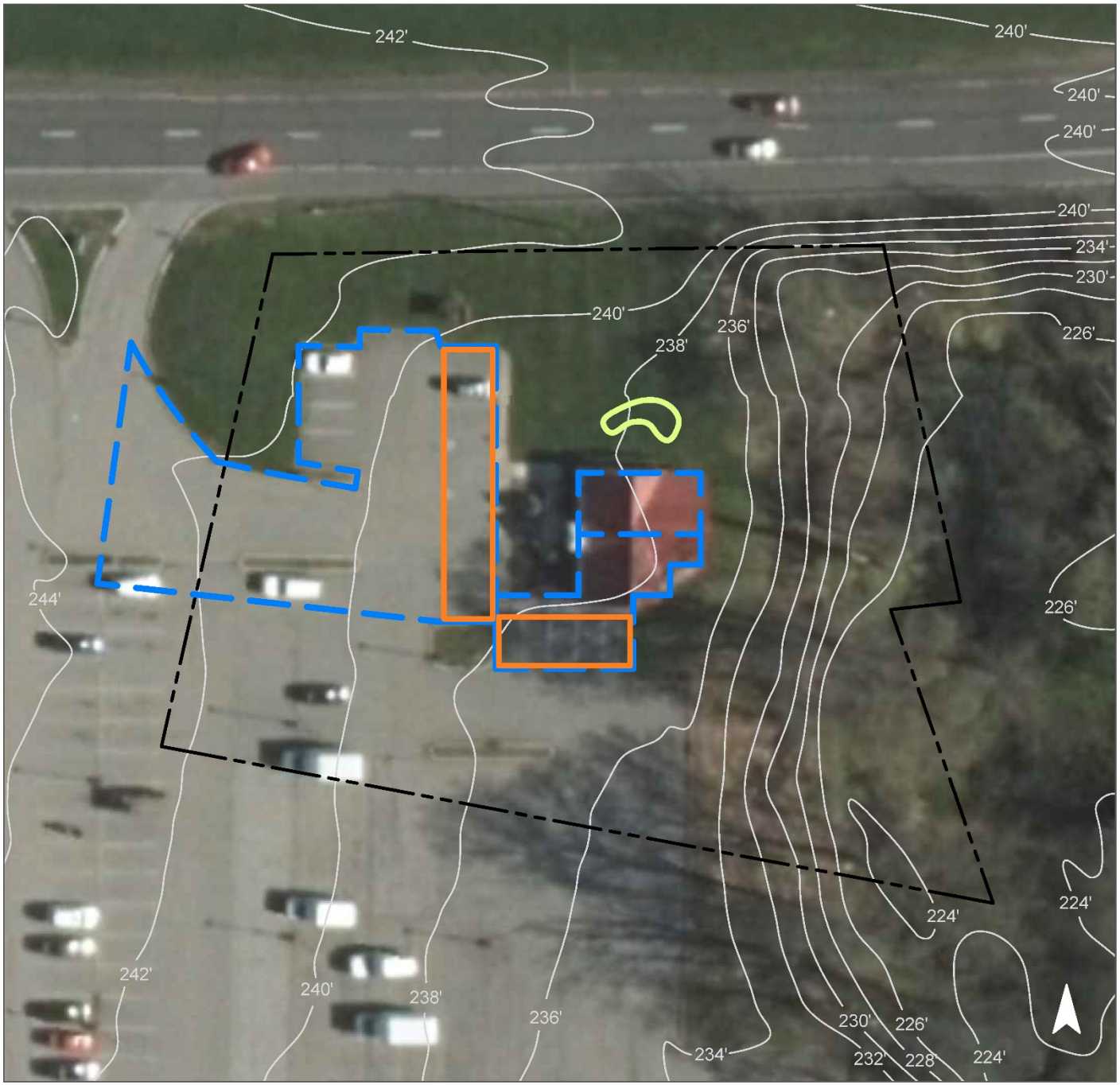
Block and Lot: Block 5 | Lot 26

A rain garden can be installed to the north of the building to capture, treat, and infiltrate stormwater runoff from the building. Parking spots on the south and west side of the building can be converted to pervious pavement to help infiltrate stormwater runoff from the parking lot and rooftop. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
60	26,281	1.3	13.3	120.7	0.020	0.72

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	0.021	3	1,530	0.06	200	$1,000
Pervious pavement	0.274	46	20,110	0.76	2,430	$60,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Healthy Balance

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

0 25' 50'

HOLJES-SHEPPARD MEMORIAL PARK

Subwatershed: Rockaway Creek South Branch

Site Area: 180,030 sq. ft.

Address: Sutton Place
Lebanon, NJ 08833

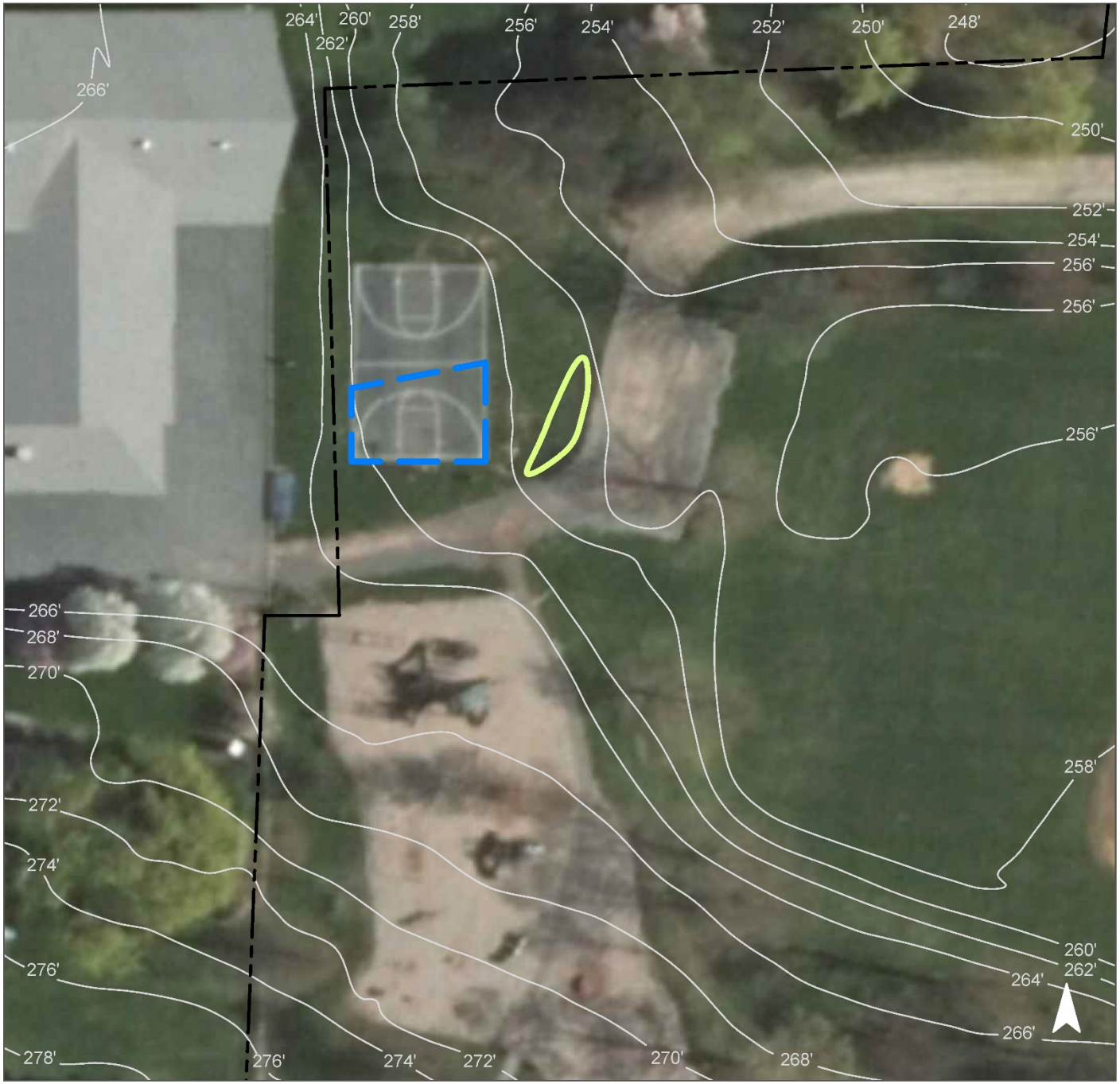
Block and Lot: Block 12 | Lot 18

A turfgrass area between the parking lot and the basketball court can be converted to a bioretention system to capture, treat, and infiltrate stormwater runoff from the basketball court. 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"
21	38,694	1.9	19.5	177.7	0.030	1.06

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	0.032	5	2,370	0.09	310	$1,550

GREEN INFRASTRUCTURE RECOMMENDATIONS



Holjes-Sheppard Memorial Park

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

0 25' 50'

LEBANON BOROUGH ELEMENTARY SCHOOL

Subwatershed: Rockaway Creek South Branch

Site Area: 83,595 sq. ft.

Address: 6 Maple Street Lebanon, NJ 08833

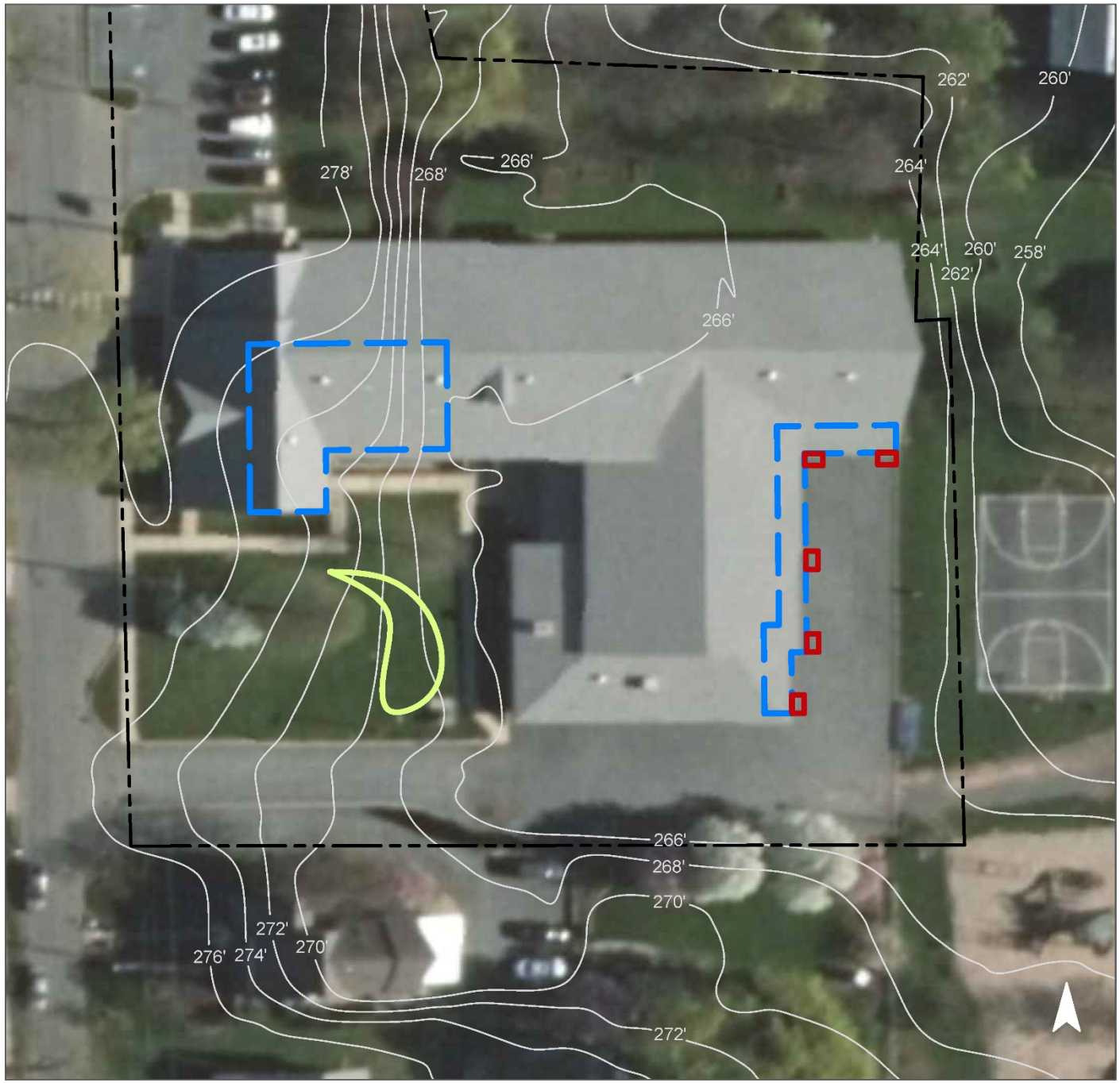
Block and Lot: Block 12 | Lot 19

A bioretention system can be installed in the southwest courtyard to capture, treat, and infiltrate stormwater runoff from the building's roof. Planter boxes can be installed on the west side of the building to manage stormwater and beautify the area. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
69	57,478	2.8	29.0	263.9	0.045	1.58

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.072	12	5,300	0.20	700	$3,500
Planter boxes	n/a	4	n/a	n/a	5 (boxes)	$5,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Lebanon Borough Elementary School

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

0 25' 50'

LEBANON BOROUGH MUNICIPAL OFFICE

Subwatershed: Rockaway Creek South Branch

Site Area: 37,661 sq. ft.

Address: 6 High Street
Lebanon, NJ 08833

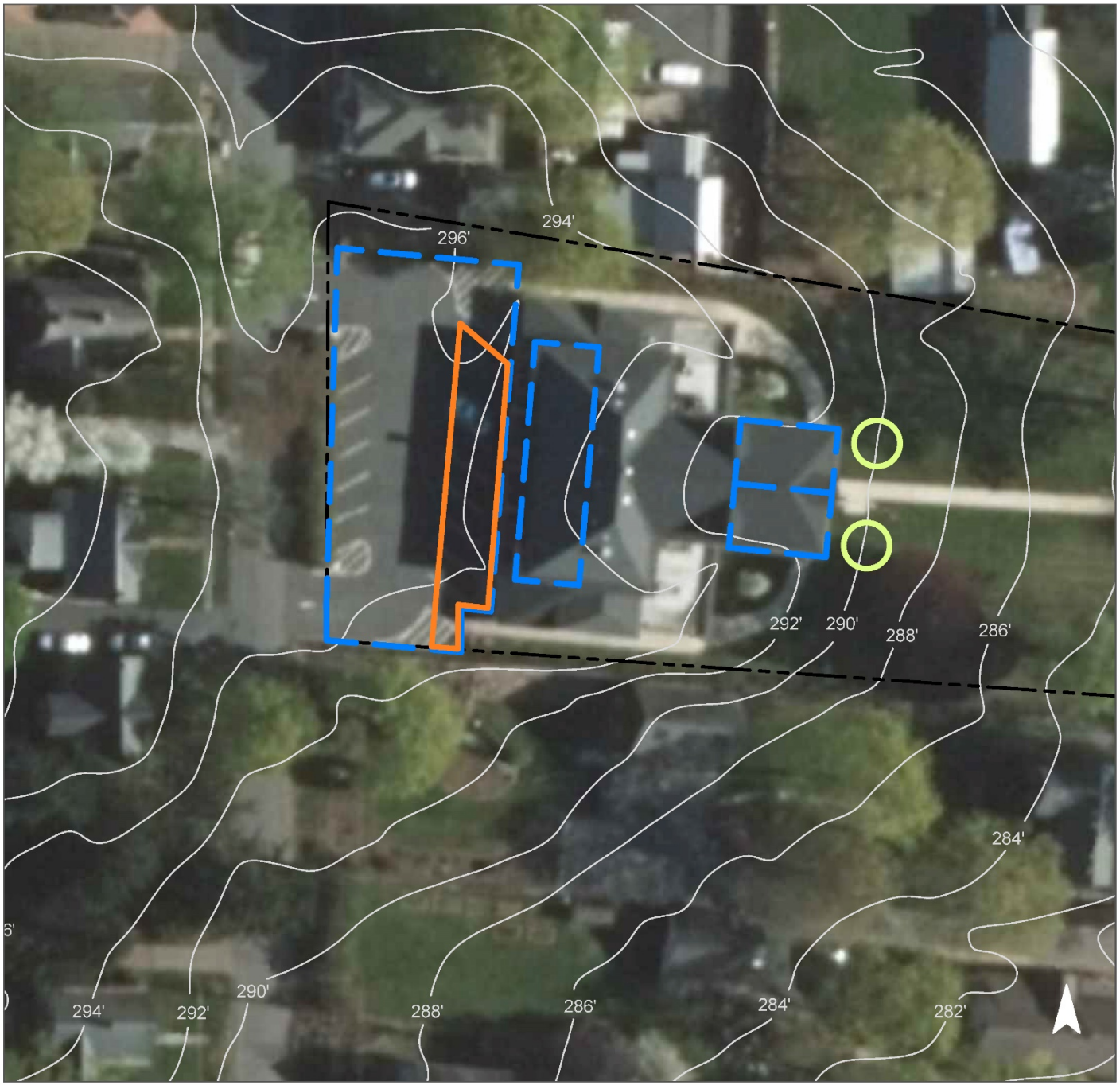
Block and Lot: Block 9 | Lot 7

Parking spots on the west side of the building can be converted to pervious pavement to capture and infiltrate stormwater runoff from the building's roof and the parking lot. Mirrored bioretention systems can be installed to the east of the building to help capture, filter, and infiltrate stormwater runoff. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
71	26,706	1.3	13.5	122.6	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 systems	0.227	38	16,670	0.63	1,815	$45,375
Pervious pavement	0.035	6	2,560	0.10	340	$1,700

GREEN INFRASTRUCTURE RECOMMENDATIONS



Lebanon Borough Municipal Office

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

0 25' 50'

LEBANON FIRE DEPARTMENT

Subwatershed: Rockaway Creek South Branch

Site Area: 129,827 sq. ft.

Address: 88 Main Street
Lebanon, NJ 08833

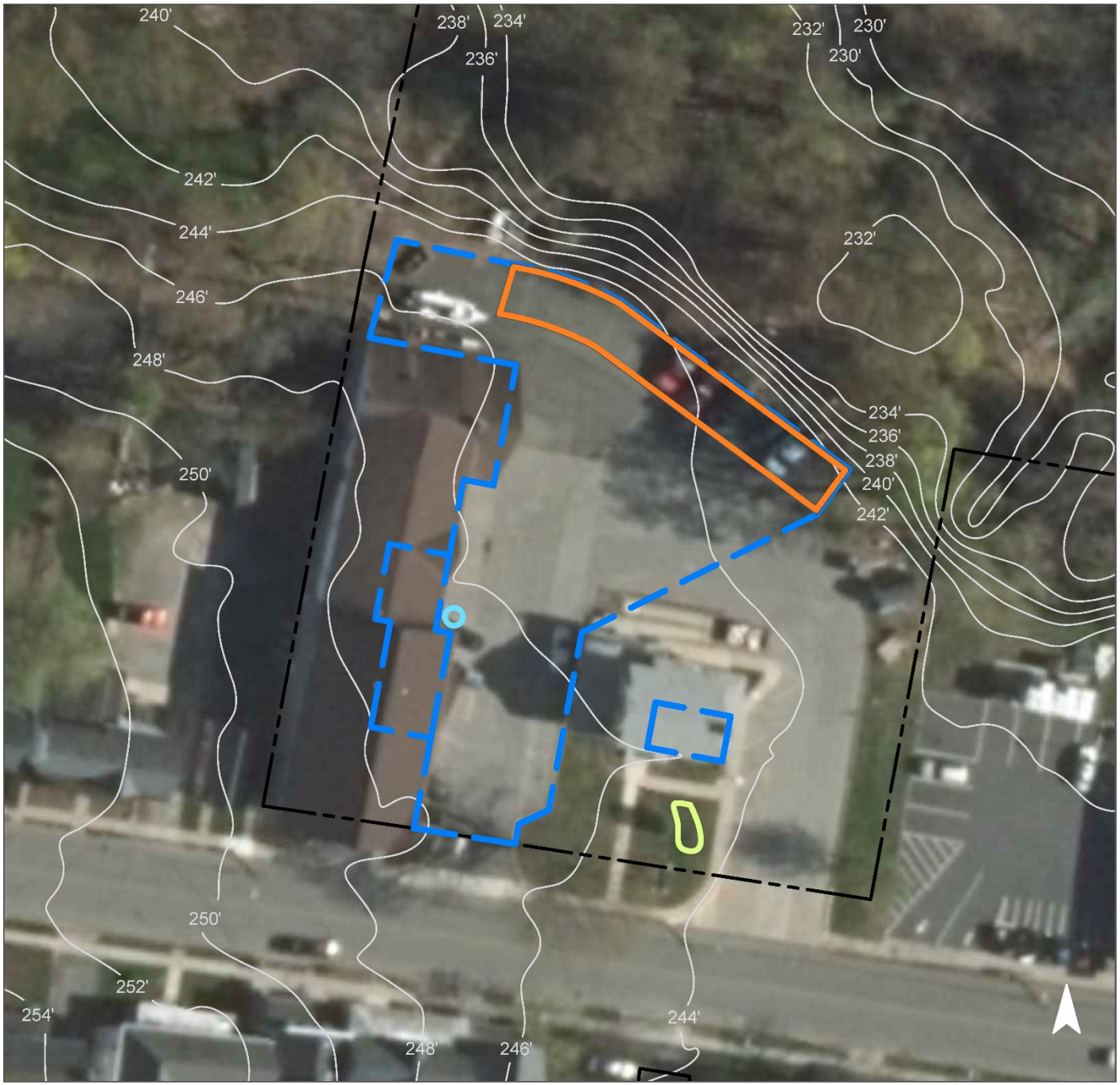
Block and Lot: Block 5 | Lot 7, 8, 24.01

A rainwater harvesting cistern can be placed on the east side of the building to capture stormwater runoff from the building's roof. Parking spaces can be installed at the north end of the site to capture large volumes of stormwater from the parking lot. A rain garden can be installed in the turfgrass area near the front of the smaller building. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
22	29,036	1.4	14.7	133.3	0.023	0.80

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	0.010	2	720	0.03	100	$500
Pervious pavement	0.336	56	24,620	0.93	2,300	$57,500
Rainwater harvesting	0.031	5	1,000	0.04	1,000 (gal)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Lebanon Fire Department

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

0 25' 50'

LEBANON REFORMED CHURCH

Subwatershed: Rockaway Creek South Branch

Site Area: 70,484 sq. ft.

Address: 100 Brunswick Avenue Lebanon, NJ 08833

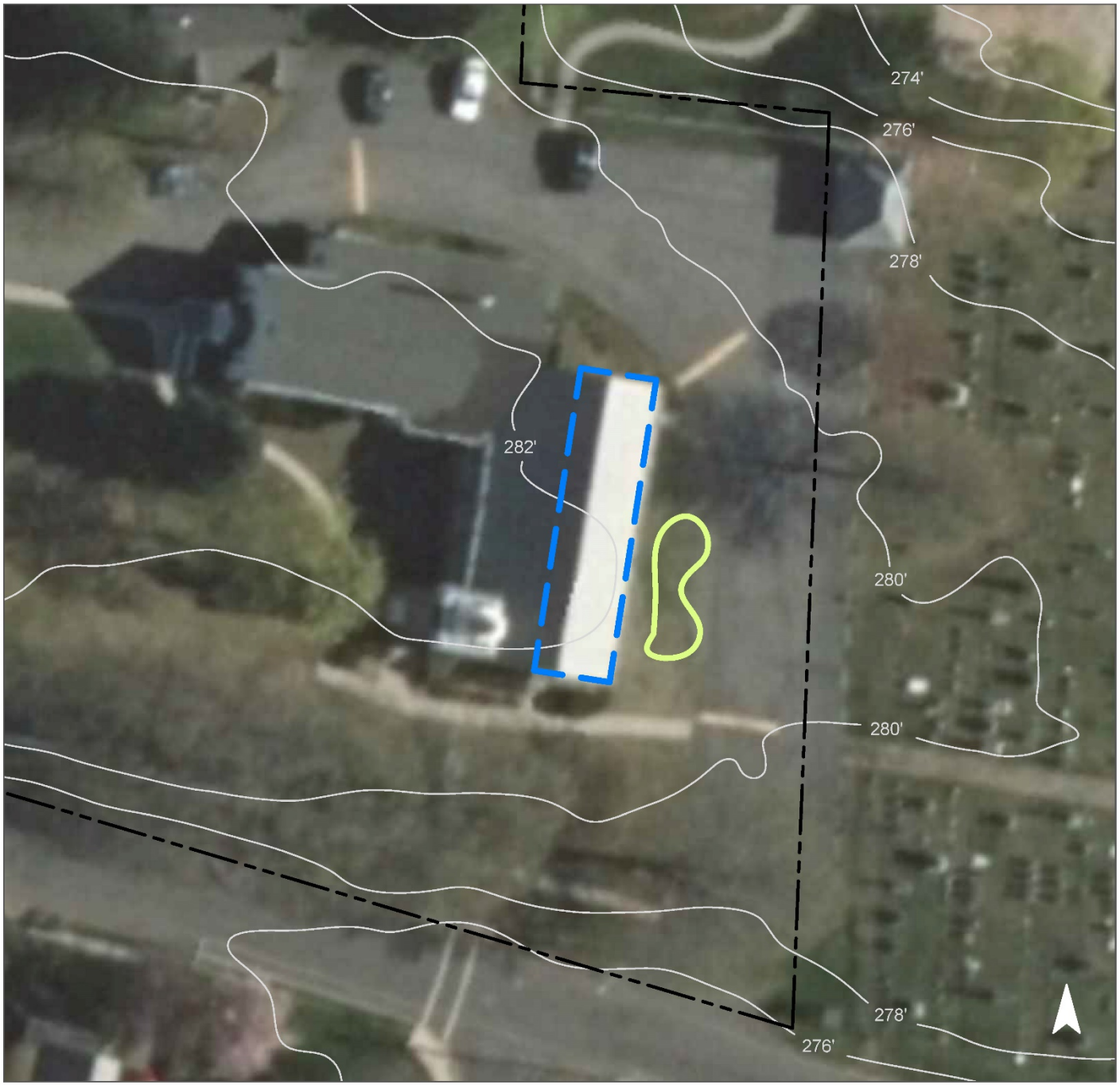
Block and Lot: Block 12 | Lot 23, 24

A turfgrass area to the east of the building can be converted to a bioretention system to capture, treat, and infiltrate stormwater runoff from the building's roof. 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"
61	43,347	2.1	21.9	199.0	0.034	1.19

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 system	0.042	7	3,060	0.11	400	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Lebanon Reformed Church

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

0 20' 40'

OASIS COMMONS

Subwatershed: Rockaway Creek South Branch

Site Area: 132,657 sq. ft.

Address: 148 Main Street
Lebanon, NJ 08833

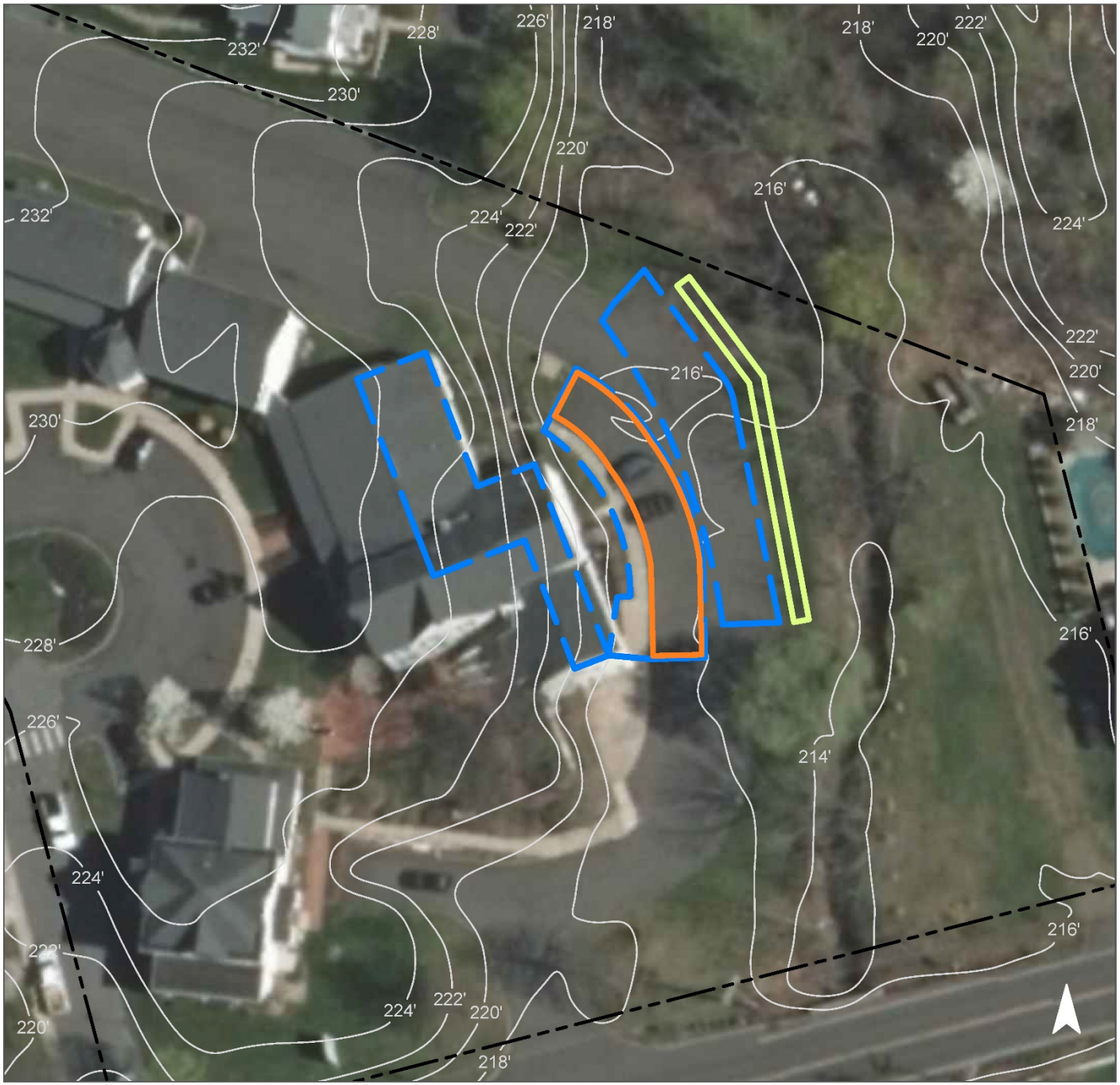
Block and Lot: Block 5 | Lot 35

Parking spots on the north side of the building can be converted to pervious pavement to capture and infiltrate stormwater runoff from the building's roof. A bioretention system can be installed at the edge of the parking lot to capture, filter, and infiltrate additional 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"
65	86,392	4.2	43.6	396.7	0.067	2.37

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	0.063	10	4,590	0.17	600	$3,000
Pervious pavement	0.132	22	9,690	0.36	1,800	$45,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Oasis Commons

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

ROUND VALLEY UNITED METHODIST CHURCH

Subwatershed: Rockaway Creek South Branch

Site Area: 61,279 sq. ft.

Address: 30 Main Street
Lebanon, NJ 08833

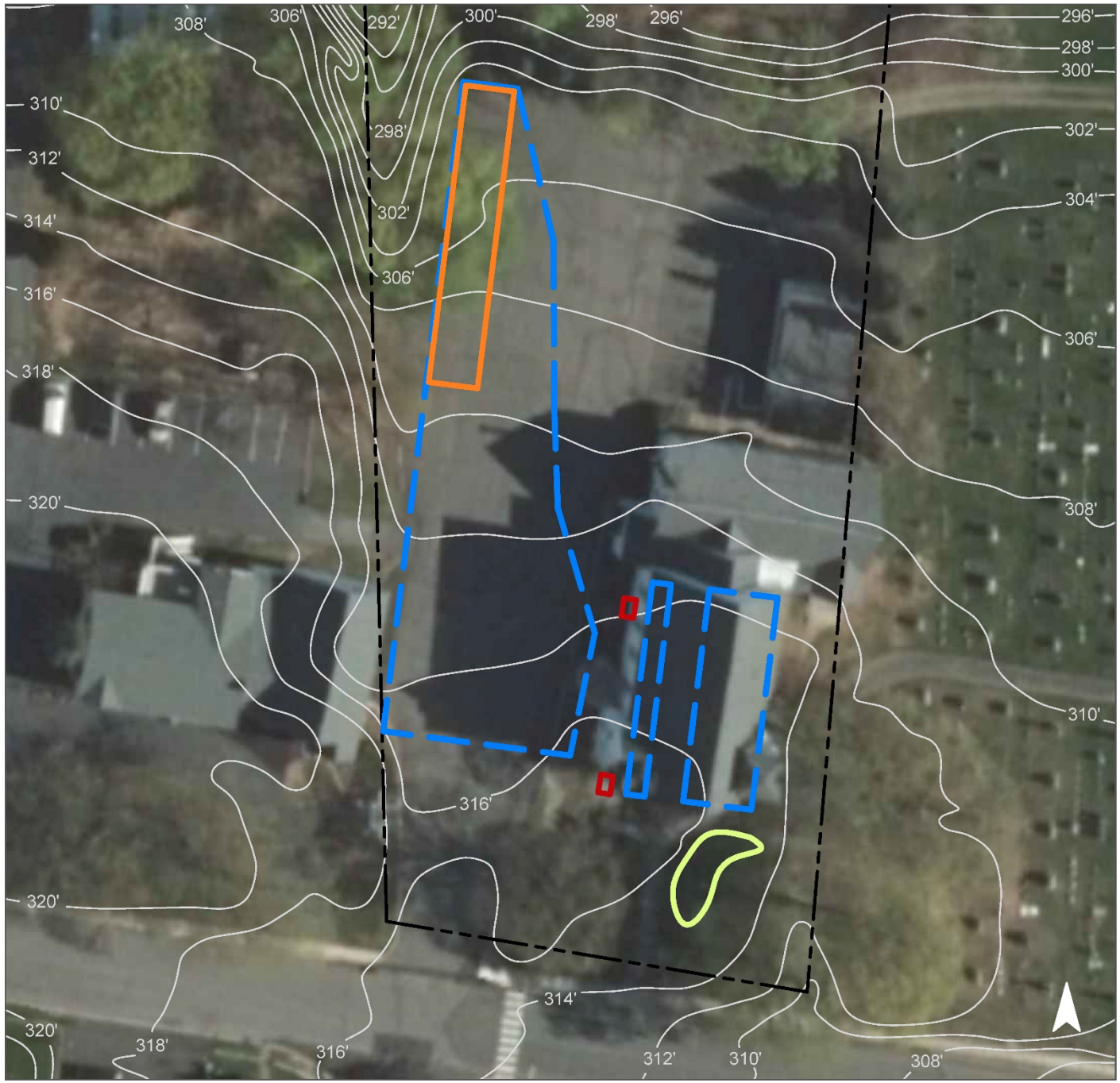
Block and Lot: Block 6 | Lot 9

Parking spots on the northwest side of the parking lot can be converted to pervious pavement to capture and infiltrate stormwater runoff from the parking lot. Planter boxes can be installed on the west side of the building to help filter stormwater runoff. A bioretention system can be installed on the south side of the building to capture, treat, and infiltrate additional stormwater runoff from the roof. 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"
49	30,218	1.5	15.3	138.7	0.024	0.83

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	0.041	7	3,010	0.11	350	$1,750
Pervious pavement	0.252	42	18,490	0.69	1,800	$45,000
Planter boxes	n/a	2	n/a	n/a	2 (boxes)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Round Valley United Methodist Church

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

0 25' 50'

SCARPONI-BRIGHT FUNERAL HOME

Subwatershed: Rockaway Creek South Branch

Site Area: 86,550 sq. ft.

Address: 26 Main Street
Lebanon, NJ 08833

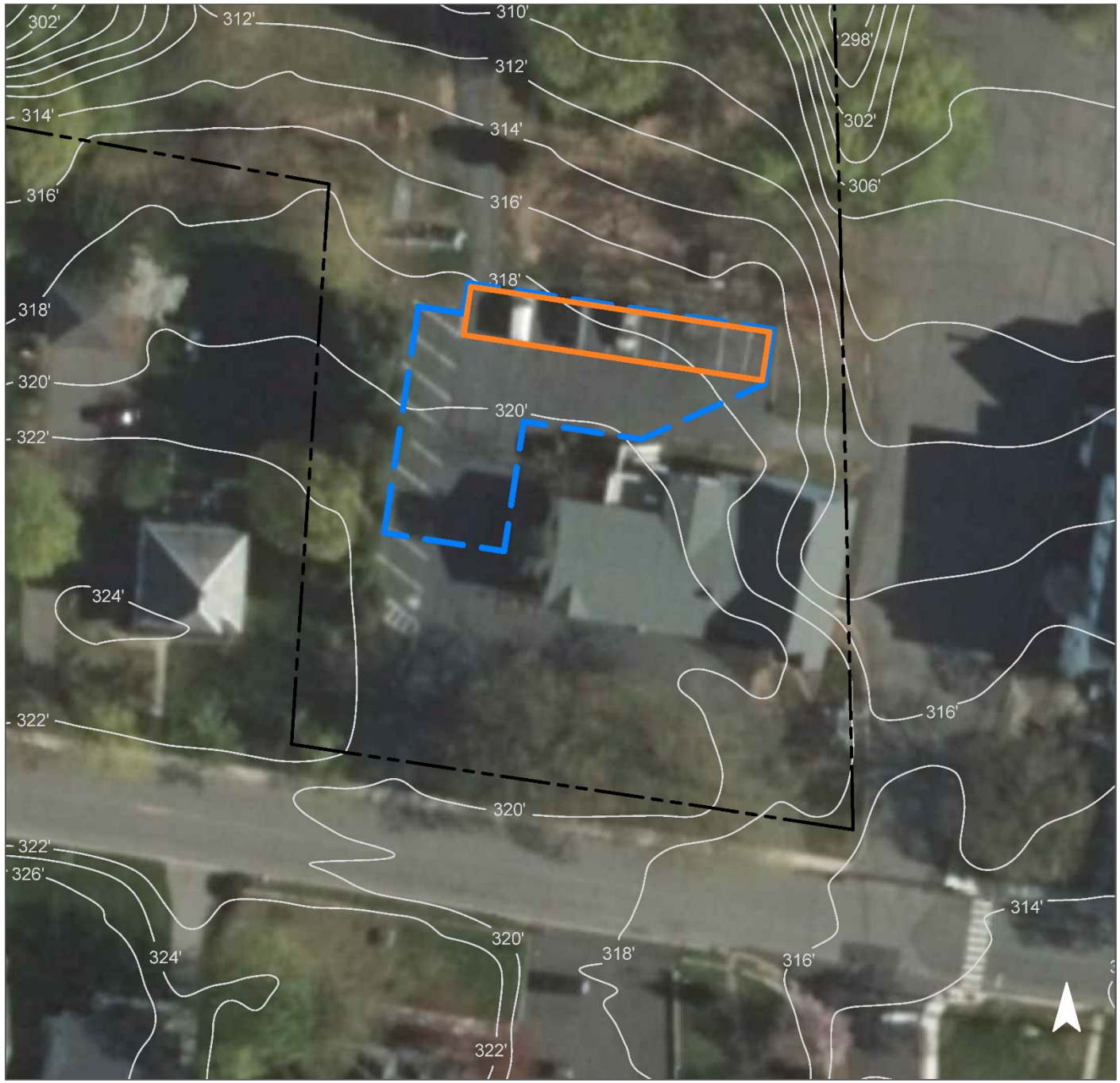
Block and Lot: Block 6 | Lot 7, 8

Pervious pavement can be installed in the north parking lot to help capture and infiltrate stormwater runoff from the parking lot 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"
40	34,410	1.7	17.4	158.0	0.027	0.94

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	0.156	26	11,450	0.43	1,820	$45,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Scarponi-Bright Funeral Home

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

0 25' 50'

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) TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (cu.ft.)	Annual (cu.ft.)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
	Rockaway Creek South Branch	**38.36**	**1,671,092**				**15.08**	**656,941**	**31.7**	**331.8**	**3,016.3**	**68,431**	**2,408,785**	**0.512**	**18.02**
1	**Cokesbury Road Industrial Park**														
	Total Site Info	16.69	727,164	2	14	30	4.92	214,530	10.3	108.3	985.0	22,347	786,611	0.167	5.88
2	**Cutshaw Construction**														
	Total Site Info	1.17	50,850	2	15	45	0.53	22,975	1.1	11.6	105.5	2,393	84,240	0.018	0.63
3	**Dairy Technomics**														
	Total Site Info	0.44	18,961	5	4	66	0.29	12,607	0.6	6.4	57.9	1,313	46,226	0.010	0.35
4	**Fox & Hound Tavern**														
	Total Site Info	1.11	48,267	12	2	71	0.79	34,268	1.7	17.3	157.3	3,570	125,650	0.027	0.94
5	**Healthy Balance**														
	Total Site Info	1.00	43,766	5	26	60	0.60	26,281	1.3	13.3	120.7	2,738	96,365	0.020	0.72
6	**Holjes-Sheppard Memorial Park**														
	Total Site Info	4.13	180,030	12	18	21	0.89	38,694	1.9	19.5	177.7	4,031	141,877	0.030	1.06
7	**Lebanon Borough Elementary School**														
	Total Site Info	1.92	83,595	12	19	69	1.32	57,478	2.8	29.0	263.9	5,987	210,751	0.045	1.58
8	**Lebanon Borough Municipal Office**														
	Total Site Info	0.86	37,661	9	7	71	0.61	26,706	1.3	13.5	122.6	2,782	97,920	0.021	0.73
9	**Lebanon Fire Department**														
	Total Site Info	2.98	129,827	5	7, 8, 24.01	22	0.67	29,036	1.4	14.7	133.3	3,025	106,465	0.023	0.80
10	**Lebanon Reformed Church**														
	Total Site Info	1.62	70,484	12	23, 24	61	1.00	43,347	2.1	21.9	199.0	4,515	158,939	0.034	1.19
11	**Oasis Commons**														
	Total Site Info	3.05	132,657	5	35	65	1.98	86,392	4.2	43.6	396.7	8,999	316,771	0.067	2.37
12	**Round Valley United Methodist Church**														
	Total Site Info	1.41	61,279	6	9	49	0.69	30,218	1.5	15.3	138.7	3,148	110,801	0.024	0.83
13	**Scarponi-Bright Funeral Home**														
	Total Site Info	1.99	86,550	6	7, 8	40	0.79	34,410	1.7	17.4	158.0	3,584	126,168	0.027	0.94

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 (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 %
		Area (SF)	Area (ac)									
	Rockaway Creek South Branch	**95,570**	**2.19**	**2.328**	**413**	**164,890**	**6.19**				**445,000**	**14.5%**
1	**Cokesbury Road Industrial Park**											
	Bioretention systems	5,150	0.12	0.134	22	9,840	0.37	1,300	$5	SF	$6,500	2.4%
	Pervious pavement	6,610	0.15	0.172	29	12,630	0.47	1,460	$25	SF	$36,500	3.1%
	Planter boxes	4,300	0.10	n/a	16	n/a	n/a	20	$1,000	box	$20,000	2.0%
	Total Site Info	**16,060**	**0.37**	**0.306**	**67**	**22,470**	**0.84**				**$63,000**	**7.5%**
2	**Cutshaw Construction**											
	Bioretention system	2,660	0.06	0.069	12	5,090	0.19	665	$5	SF	$3,325	11.6%
	Pervious pavement	2,110	0.05	0.055	9	4,030	0.15	810	$25	SF	$20,250	9.2%
	Planter boxes	430	0.01	n/a	2	n/a	n/a	2	$1,000	box	$2,000	1.9%
	Total Site Info	**5,200**	**0.12**	**0.124**	**22**	**9,120**	**0.34**				**$25,575**	**22.6%**
3	**Dairy Technomics**											
	Bioretention systems	1,010	0.02	0.026	4	1,930	0.07	255	$5	SF	$1,275	8.0%
	Total Site Info	**1,010**	**0.02**	**0.026**	**4**	**1,930**	**0.07**				**$1,275**	**8.0%**
4	**Fox & Hound Tavern**											
	Bioretention system	1,010	0.02	0.026	4	1,930	0.07	255	$5	SF	$1,275	2.9%
	Pervious pavement	4,635	0.11	0.121	20	8,860	0.33	1,350	$25	SF	$33,750	13.5%
	Total Site Info	**5,645**	**0.13**	**0.147**	**25**	**10,790**	**0.40**				**$35,025**	**16.5%**
5	**Healthy Balance**											
	Bioretention system	800	0.02	0.021	3	1,530	0.06	200	$5	SF	$1,000	3.0%
	Pervious pavement	10,520	0.24	0.274	46	20,110	0.76	2,430	$25	SF	$60,750	40.0%
	Total Site Info	**11,320**	**0.26**	**0.295**	**49**	**21,640**	**0.82**				**$61,750**	**43.1%**
6	**Holjes-Sheppard Memorial Park**											
	Bioretention system	1,240	0.03	0.032	5	2,370	0.09	310	$5	SF	$1,550	3.2%
	Total Site Info	**1,240**	**0.03**	**0.032**	**5**	**2,370**	**0.09**				**$1,550**	**3.2%**
7	**Lebanon Borough Elementary School**											
	Bioretention system	2,775	0.06	0.072	12	5,300	0.20	700	$5	SF	$3,500	4.8%
	Planter boxes	1,075	0.02	n/a	4	n/a	n/a	5	$1,000	box	$5,000	1.9%
	Total Site Info	**3,850**	**0.09**	**0.072**	**16**	**5,300**	**0.20**				**$8,500**	**6.7%**

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP	Unit Cost ($/unit)	Unit	Total Cost ($)	I.C. Treated %
8	**Lebanon Borough Municipal Office**											
	Pervious pavement	8,720	0.20	0.227	38	16,670	0.63	1,815	$25	SF	$45,375	32.7%
	Bioretention systems	1,340	0.03	0.035	6	2,560	0.10	340	$5	SF	$1,700	5.0%
	Total Site Info	**10,060**	**0.23**	**0.262**	**44**	**19,230**	**0.73**				**$47,075**	**37.7%**
9	**Lebanon Fire Department**											
	Bioretention system	375	0.01	0.010	2	720	0.03	100	$5	SF	$500	1.3%
	Pervious pavement	12,880	0.30	0.336	56	24,620	0.93	2,300	$25	SF	$57,500	44.4%
	Rainwater harvesting	1,200	0.03	0.031	5	1,000	0.04	1,000	$2	gal	$2,000	4.1%
	Total Site Info	**14,455**	**0.33**	**0.377**	**63**	**26,340**	**1.00**				**$60,000**	**49.8%**
10	**Lebanon Reformed Church**											
	Bioretention system	1,600	0.04	0.042	7	3,060	0.11	400	$5	SF	$2,000	3.7%
	Total Site Info	**1,600**	**0.04**	**0.042**	**7**	**3,060**	**0.11**				**$2,000**	**3.7%**
11	**Oasis Commons**											
	Bioretention system	2,400	0.06	0.063	10	4,590	0.17	600	$5	SF	$3,000	2.8%
	Pervious pavement	5,065	0.12	0.132	22	9,690	0.36	1,800	$25	SF	$45,000	5.9%
	Total Site Info	**7,465**	**0.17**	**0.195**	**33**	**9,690**	**0.36**				**$45,000**	**5.9%**
12	**Round Valley United Methodist Church**											
	Bioretention system	1,575	0.04	0.041	7	3,010	0.11	350	$5	SF	$1,750	4.6%
	Pervious pavement	9,670	0.22	0.252	42	18,490	0.69	1,800	$25	SF	$45,000	28.1%
	Planter boxes	430	0.01	n/a	2	n/a	n/a	2	$1,000	box	$2,000	1.2%
	Total Site Info	**11,675**	**0.27**	**0.293**	**51**	**21,500**	**0.80**				**$48,750**	**33.9%**
13	**Scarponi-Bright Funeral Home**											
	Pervious pavement	5,990	0.14	0.156	26	11,450	0.43	1,820	$25	SF	$45,500	17.4%
	Total Site Info	**5,990**	**0.14**	**0.156**	**26**	**11,450**	**0.43**				**$45,500**	**17.4%**