RUTGERS
New Jersey Agricultural
Experiment Station

Draft

Impervious Cover Reduction Action Plan
for
Bethlehem Township, Hunterdon County, New Jersey

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

June 24, 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 Bethlehem Township. We would like to thank the New Jersey Highlands Water Protection and Planning Council, the New Jersey Agricultural Experiment Station, and Bethlehem Township for their input and support in creating this document.

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New Jersey

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Introduction

Located in Hunterdon County, New Jersey, Bethlehem Township covers approximately 20.83 square miles. Figures 1 and 2 illustrate that Bethlehem Township is dominated by forest land use. A total of 19.9% of the municipality's land use is classified as urban. Of the urban land in Bethlehem Township, rural residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2015 land use/land cover geographical information system (GIS) data layer categorizes Bethlehem 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 Bethlehem Township. Based upon the 2015 NJDEP land use/land cover data, approximately 3.1% of Bethlehem Township has impervious cover. This level of impervious cover suggests that the streams in Bethlehem Township are likely sensitive streams. [1]

Methodology

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

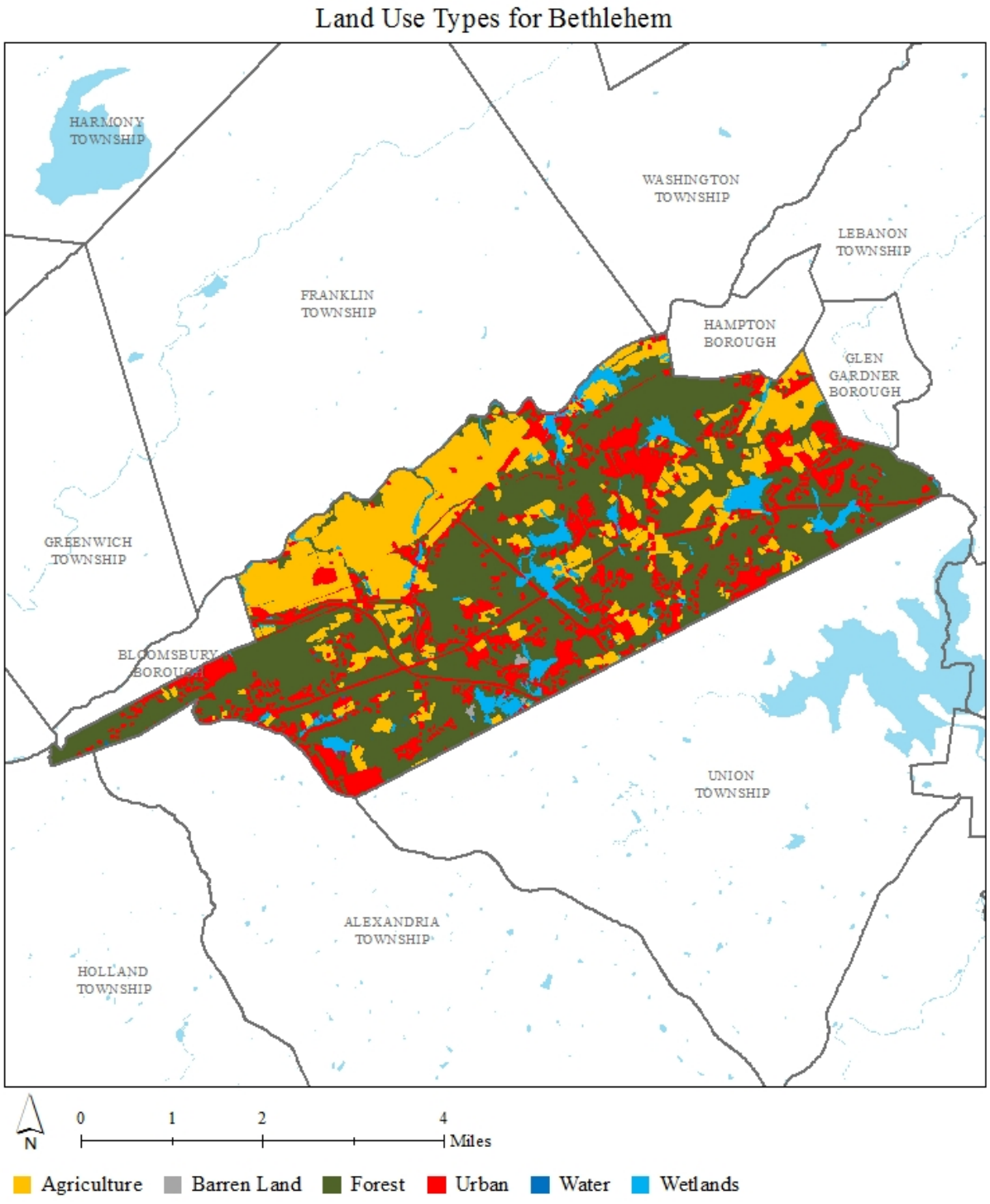


Figure 1: Map illustrating the land use in Bethlehem Township

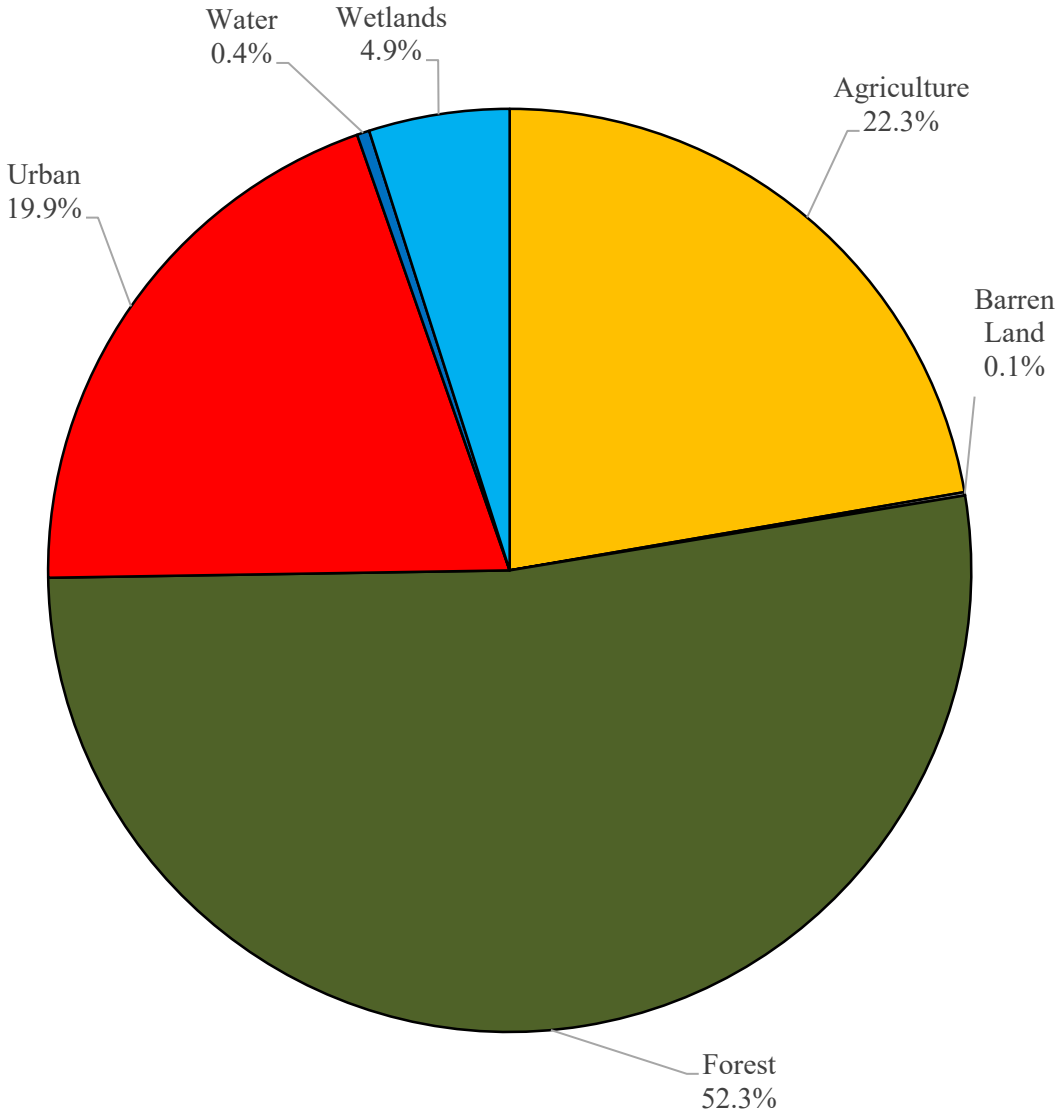


Figure 2: Pie chart illustrating the land use in Bethlehem Township

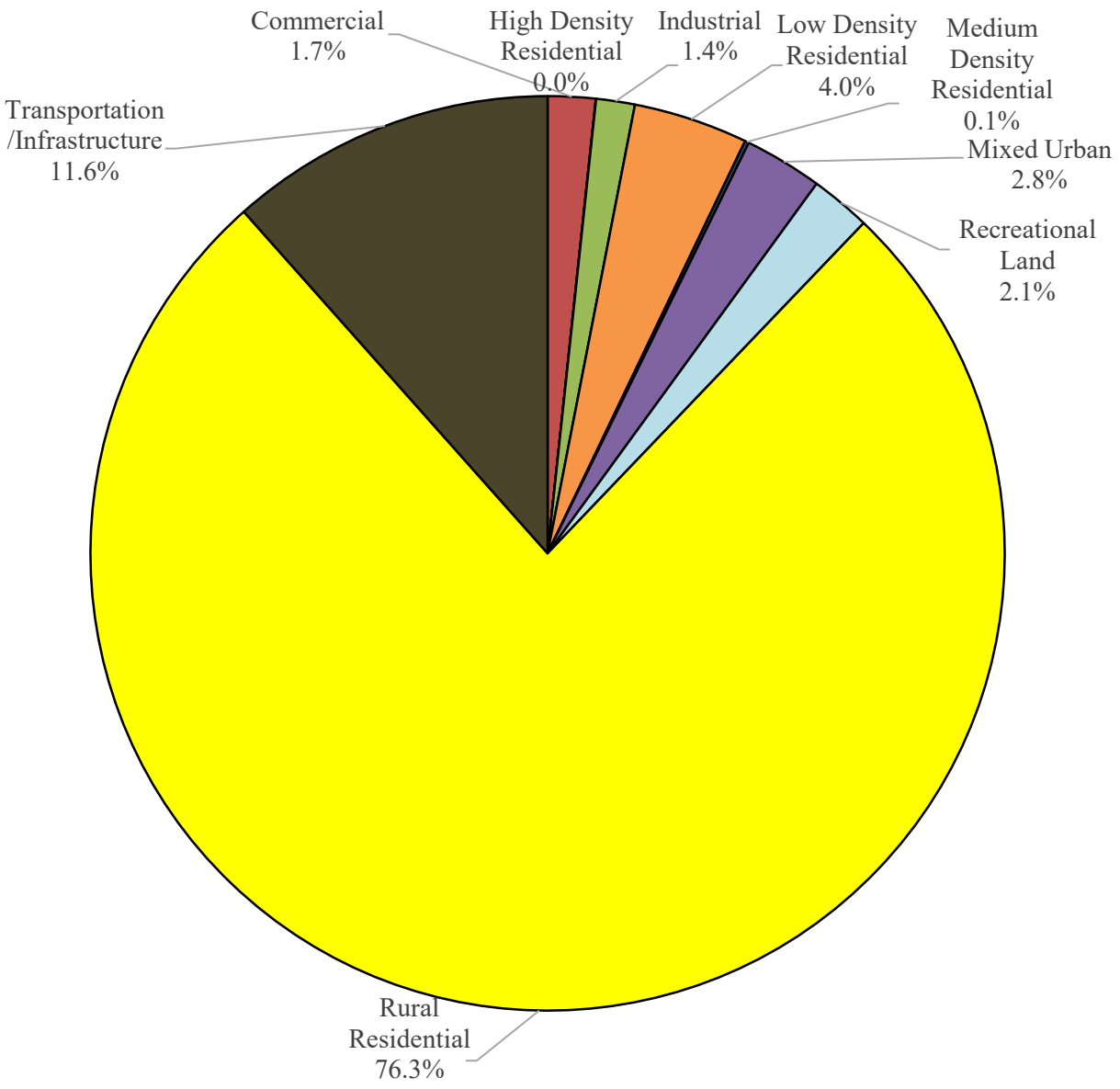


Figure 3: Pie chart illustrating the various types of urban land use in Bethlehem Township

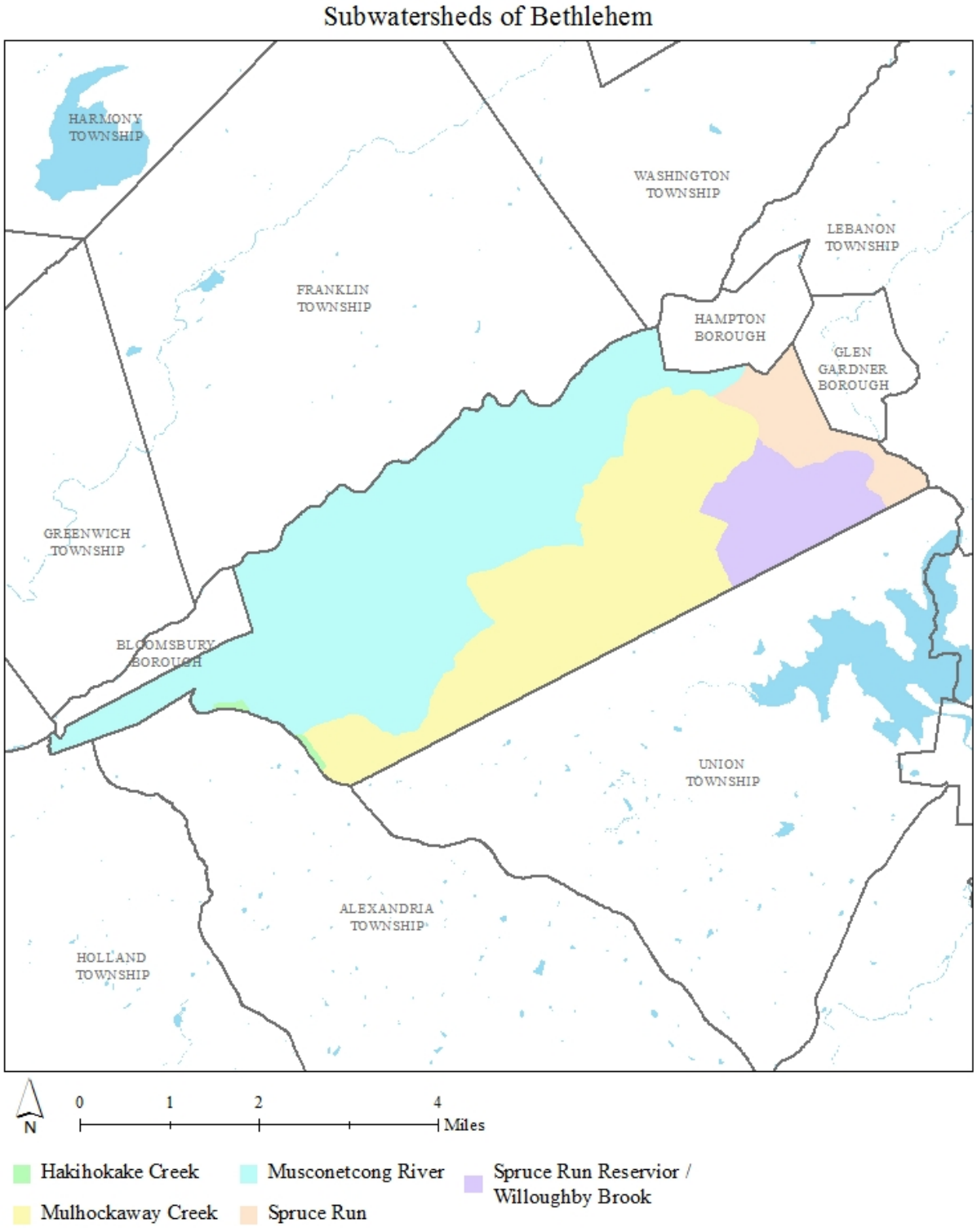


Figure 4: Map of the subwatersheds in Bethlehem Township

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 Bethlehem 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 Bethlehem 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.

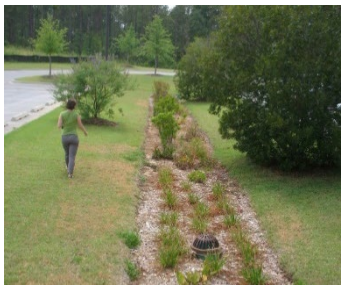
Downspout planter boxes

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

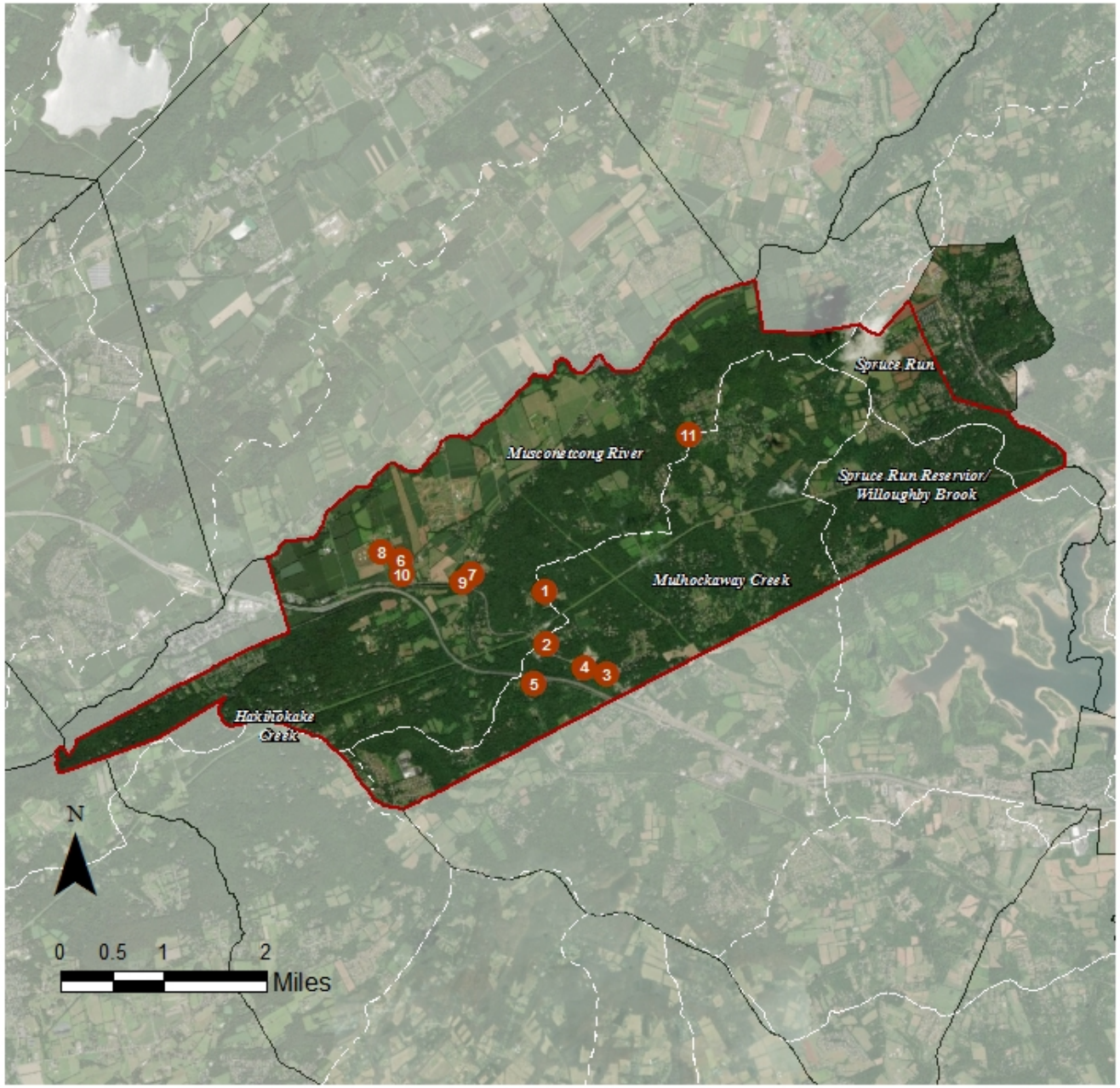
This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented by a wide variety of people such as boy scouts,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

BETHLEHEM TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE MULHOCKAWAY CREEK SUBWATERSHED

1. Bethlehem Township Municipal Court
2. DND Auto Group 2
3. Jugtown Tire Co
4. Reliable Small Engine Repair
5. Unity Spiritual Center

SITES WITHIN THE MUSCONETCONG RIVER SUBWATERSHED

6. Allgrind Plastics Inc
7. Ethel Hoppock Middle School
8. Heritage Park
9. Spain Inn 2
10. Summit Supply
11. Thomas B Conley School

b. Proposed Green Infrastructure Concepts

BETHLEHEM TOWNSHIP MUNICIPAL COURT

Subwatershed: Mulhockaway Creek

Site Area: 274,398 sq. ft.

Address: 405 Mine Road
Asbury, NJ 08802

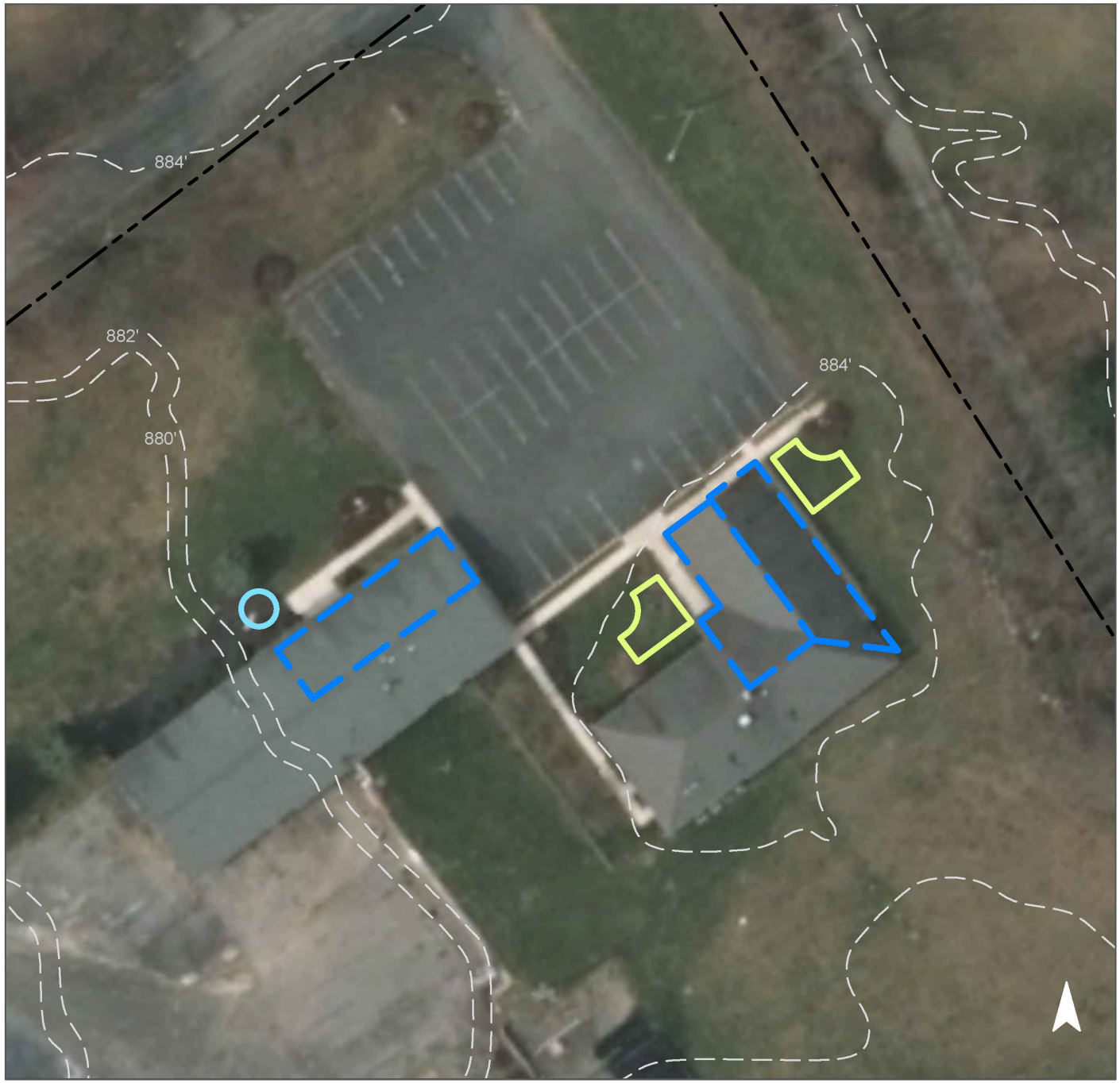
Block and Lot: Block 33, Lot 9

A cistern can be installed on the north side of the public works building near a connected downspout. The water from the cistern can then be used for watering gardens, washing vehicles, or for other non-potable uses. Rain gardens can be installed on the west and 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"
46	126,108	6.1	63.7	579.0	0.098	3.46

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	0.067	11	4,910	0.18	645	$3,225
Rainwater harvesting	0.033	6	1,000	0.04	1,000 (gal)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Bethlehem Township Municipal Court

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

0 25' 50'

DND AUTO GROUP 2

Subwatershed: Mulhockaway Creek

Site Area: 116,855 sq. ft.

Address: 1079 NJ-173 #1
Asbury, NJ 08802

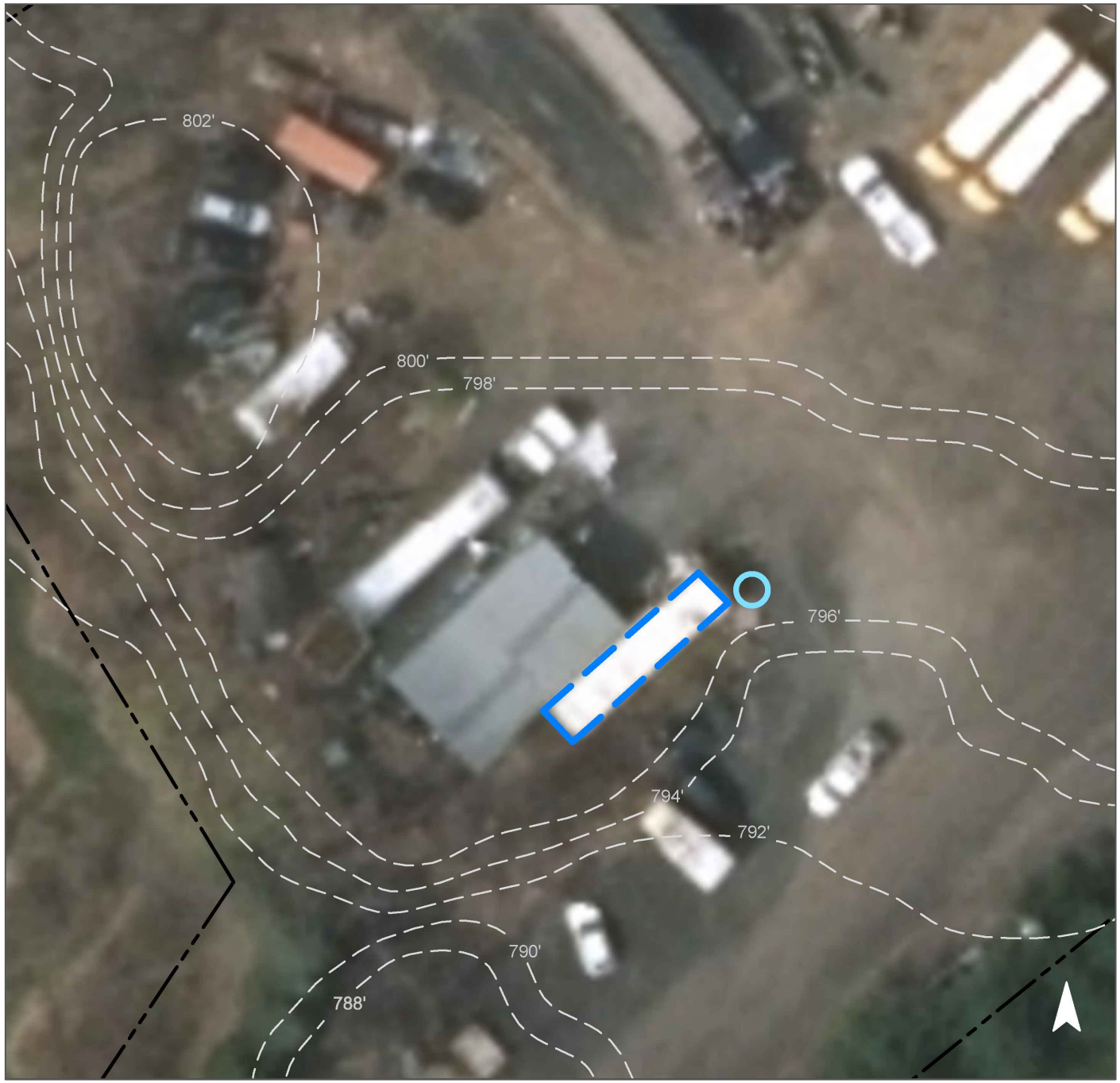
Block and Lot: Block 34, Lot 7.01

A cistern can be installed north of the building near a disconnected downspout. The water from the cistern can then be used for watering gardens, washing vehicles, or for other non-potable uses. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
56	65,265	3.1	33.0	299.7	0.051	1.79

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	0.009	2	275	0.01	275 (gal)	$550

GREEN INFRASTRUCTURE RECOMMENDATIONS



DND Auto Group 2

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

0 15' 30'

JUGTOWN TIRE COMPANY

Subwatershed: Mulhockaway Creek

Site Area: 82,033 sq. ft.

Address: 1074 NJ-173
Asbury, NJ 08802

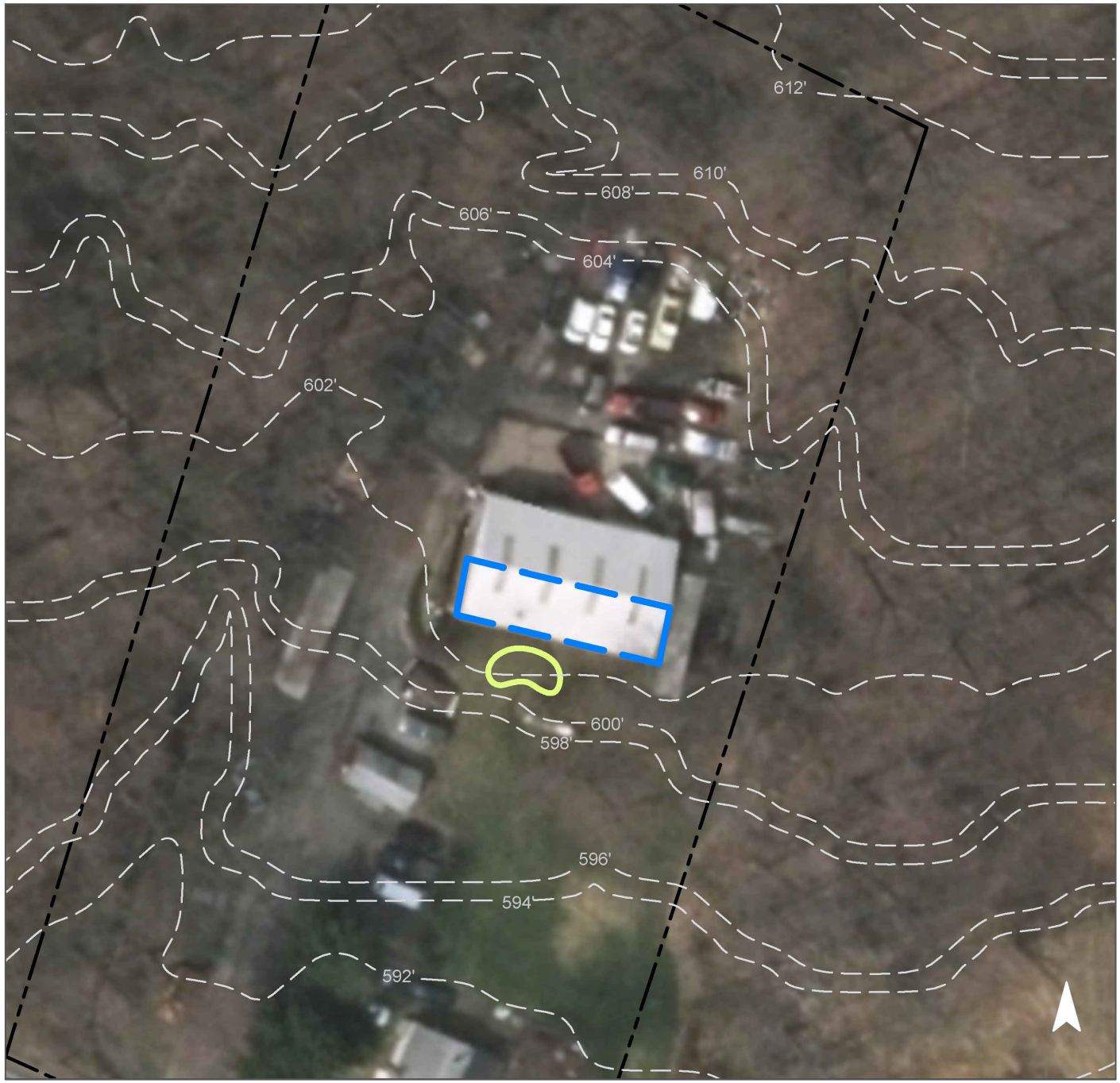
Block and Lot: Block 34, Lot 32

A rain garden can be installed south 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"
32	26,137	1.3	13.2	120.0	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	0.033	6	2,440	0.09	320	$1,600

GREEN INFRASTRUCTURE RECOMMENDATIONS



Jugtown Tire Company

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

0 25' 50'

RELIABLE SMALL ENGINE REPAIR

Subwatershed: Mulhockaway Creek

Site Area: 27,251 sq. ft.

Address: 1093 NJ-173
Asbury, NJ 08802

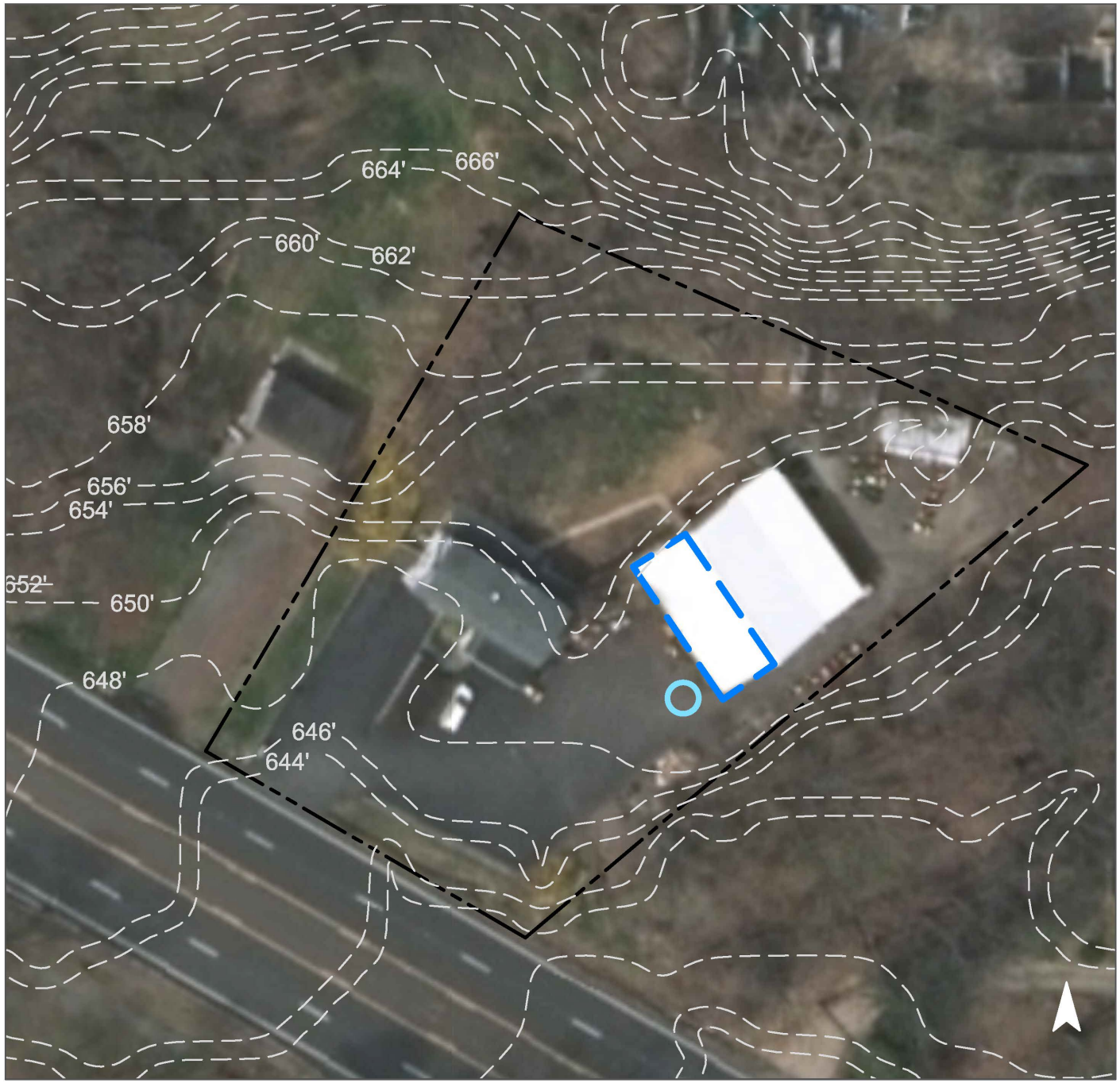
Block and Lot: Block 34, Lot 13.01

A cistern can be installed on the south corner of the building near a connected downspout to capture rainwater. The water can then be used for watering gardens, washing vehicles, or for other non-potable uses. 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"
34	9,158	0.4	4.6	42.0	0.007	0.25

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Rainwater harvesting	0.028	5	825	0.03	825 (gal)	$1,650

GREEN INFRASTRUCTURE RECOMMENDATIONS



Reliable Small Engine Repair

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

0 25' 50'

UNITY SPIRITUAL CENTER

Subwatershed: Mulhockaway Creek

Site Area: 446,101 sq. ft.

Address: 453 Bellwood Avenue
Asbury, NJ 08802

Block and Lot: Block 12, Lot 10

A rain garden can be installed east 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"
10	43,795	2.1	22.1	201.1	0.034	1.20

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	4	1,570	0.06	205	$1,025

GREEN INFRASTRUCTURE RECOMMENDATIONS

Unity Spiritual Center

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

0 25' 50'

ALLGRIND PLASTICS, INC.

Subwatershed: Musconetcong River

Site Area: 230,125 sq. ft.

Address: 6 Vliet Farm Road
Asbury, NJ 08802

Block and Lot: Block 26, Lot 3.01

A rain garden can be installed north of the building to capture, treat, and infiltrate rooftop runoff. A cistern can be installed on the turfgrass in the middle of the two buildings. The water from the cistern can be used for watering gardens, washing vehicles, or for other non-potable uses. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
46	105,110	5.1	53.1	482.6	0.082	2.88

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 system	0.272	45	19,930	0.75	2,605	$13,025
Rainwater harvesting	0.033	6	1,000	0.04	1,000 (gal)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Allgrind Plastics, Inc.

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

0 25' 50'

ETHEL HOPPOCK MIDDLE SCHOOL

Subwatershed: Musconetcong River

Site Area: 384,831 sq. ft.

Address: 280 Asbury West Portal Road
Asbury, NJ 08802

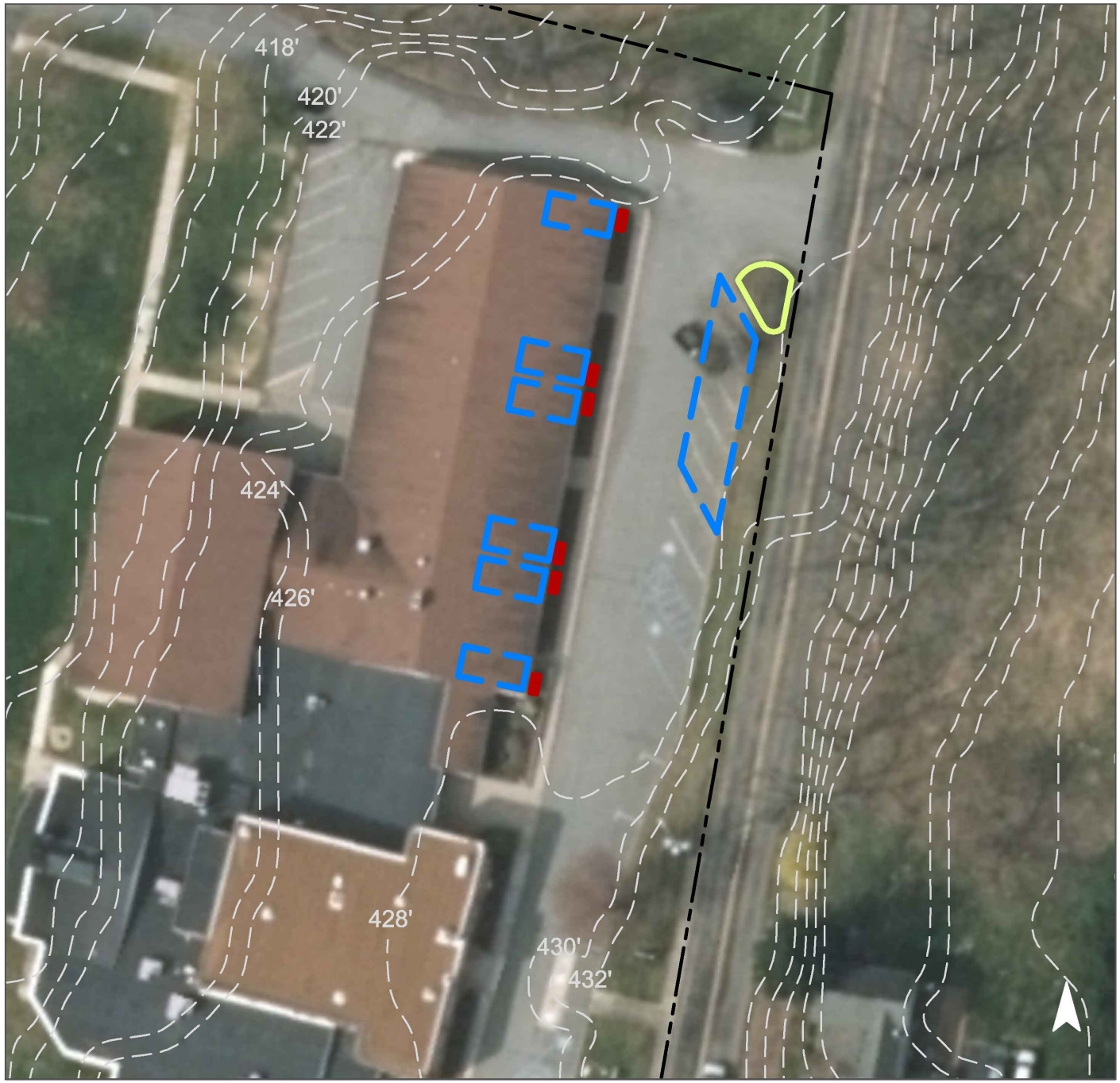
Block and Lot: Block 27, Lot 9

A small parking lot island can be converted to a bioretention system to capture, treat, and infiltrate stormwater runoff from the parking lot. Downspout planter boxes can be constructed along the east side of the building to allow roof runoff to be reused. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
27	102,705	5.0	51.9	471.6	0.080	2.82

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	0.027	4	1,950	0.07	255	$1,275
Planter boxes	n/a	4	n/a	n/a	6 (boxes)	$6,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Ethel Hoppock Middle School

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

0 25' 50'

HERITAGE PARK

Subwatershed: Musconetcong River

Site Area: 8,149,409 sq. ft.

Address: 6 Vliet Farm Road
Asbury, NJ 08802

Block and Lot: Block 23, Lot 2

Pervious pavement can be installed in parking spaces to capture and infiltrate stormwater runoff from the parking lot. A rain garden can be installed in the turfgrass next to a shed, and two rain gardens can be installed adjacent to the pavilion near multiple connected downspouts 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"
1	107,793	5.2	54.4	494.9	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 systems	0.141	24	10,330	0.39	1,350	$6,750
Pervious pavement	0.940	157	68,950	2.59	6,440	$161,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Heritage Park

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

0 100' 200'

SPAIN INN 2

Subwatershed: Musconetcong River

Site Area: 217,901 sq. ft.

Address: 1045 NJ-173
Asbury, NJ 08802

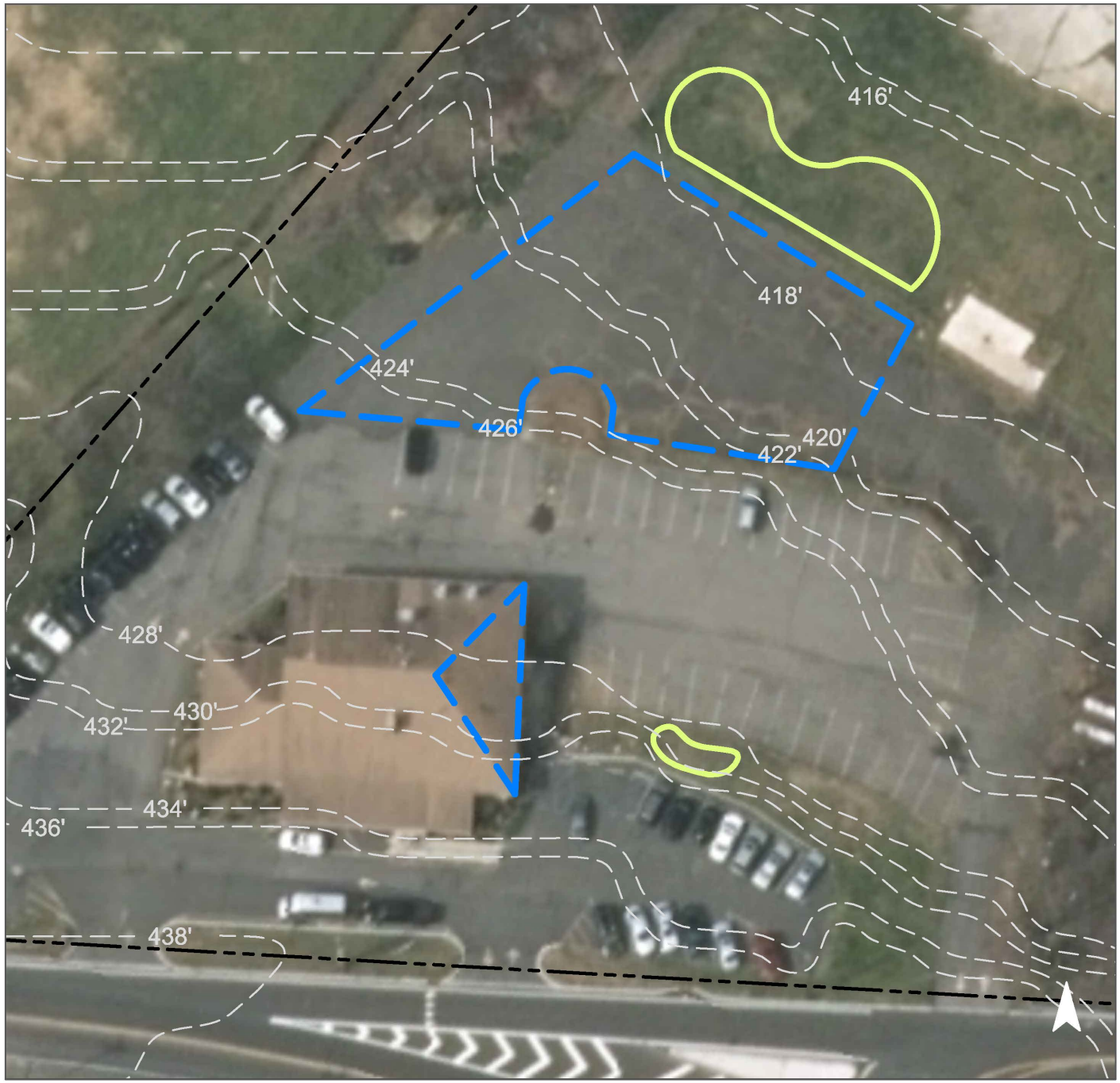
Block and Lot: Block 27, Lot 10

A rain garden can be installed in the turfgrass between the two parking lots near multiple disconnected downspouts to capture, treat, and infiltrate rooftop runoff. Another rain garden can be installed in the turfgrass adjacent to the parking lot to capture, treat, and infiltrate runoff from the parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
30	65,273	3.1	33.0	299.7	0.051	1.79

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	0.296	50	21,700	0.82	2,840	$14,200

GREEN INFRASTRUCTURE RECOMMENDATIONS



Spain Inn 2

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

0 25' 50'

SUMMIT SUPPLY

Subwatershed: Musconetcong River

Site Area: 635,343 sq. ft.

Address: 2 Vliet Farm Road
Asbury, NJ 08802

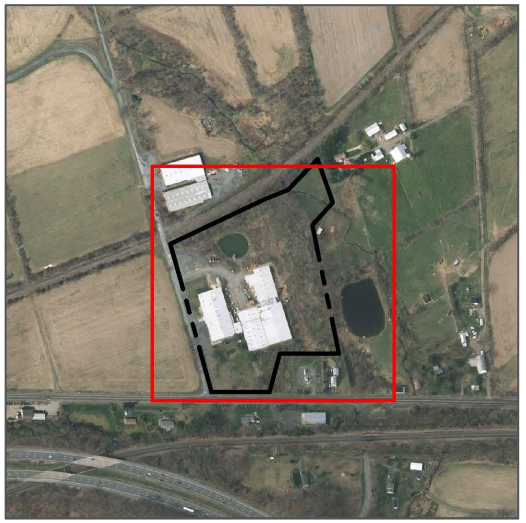
Block and Lot: Block 19, Lot 3

A rain garden can be installed along the front of the building near multiple disconnected downspouts 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	225,589	10.9	113.9	1,035.8	0.176	6.19

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	0.184	31	13,540	0.51	1,770	$8,850

GREEN INFRASTRUCTURE RECOMMENDATIONS



Summit Supply

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

0 25' 50'

THOMAS B. CONLEY SCHOOL

Subwatershed: Musconetcong River

Site Area: 1,146,004 sq. ft.

Address: 940 Iron Bridge Road
Asbury, NJ 08802

Block and Lot: Block 43, Lot 4

A rain garden can be installed northeast of the building near a disconnected downspout to capture, treat, and infiltrate rooftop runoff. Downspout planter boxes can be constructed along the building to allow roof runoff to be reused. 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"
19	217,939	10.5	110.1	1,000.6	0.170	5.98

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	0.182	30	13,320	0.50	1,745	$8,725
Planter boxes	n/a	2	n/a	n/a	2 (boxes)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Thomas B. Conley School

- bioretention system
- planter box
- 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)
	MULHOCKAWAY CREEK SITES	**21.73**	**946,638**				**6.21**	**270,462**	**13.0**	**136.6**	**1,241.8**	**28,173**	**991,695**	**0.211**	**7.42**
1	**Bethlehem Township Municipal Court**														
	Total Site Info	6.30	274,398	33	9	46	2.90	126,108	6.1	63.7	579.0	13,136	462,395	0.098	3.46
2	**DND Auto Group 2**														
	Total Site Info	2.68	116,855	34	7.01	56	1.50	65,265	3.1	33.0	299.7	6,798	239,305	0.051	1.79
3	**Jugtown Tire Company**														
	Total Site Info	1.88	82,033	34	32	32	0.60	26,137	1.3	13.2	120.0	2,723	95,834	0.020	0.72
4	**Reliable Small Engine Repair**														
	Total Site Info	0.63	27,251	34	13.01	34	0.21	9,158	0.4	4.6	42.0	954	33,579	0.007	0.25
5	**Unity Spiritual Center**														
	Total Site Info	10.24	446,101	12	10	10	1.01	43,795	2.1	22.1	201.1	4,562	160,582	0.034	1.20
	MUSCONETCONG RIVER SITES	**247.11**	**10,763,948**				**23.93**	**824,409**	**39.7**	**416.4**	**3,785.2**	**85,876**	**3,022,833**	**0.642**	**22.61**
6	**Allgrind Plastics, Inc.**														
	Total Site Info	5.28	230,125	26	3.01	46	2.41	105,110	5.1	53.1	482.6	10,949	385,402	0.082	2.88
7	**Ethel Hoppock Middle School**														
	Total Site Info	8.83	384,831	27	9	27	2.36	102,705	5.0	51.9	471.6	10,698	376,585	0.080	2.82
8	**Heritage Park**														
	Total Site Info	187.08	8,149,409	23	2	1	2.47	107,793	5.2	54.4	494.9	11,228	395,243	0.084	2.96
9	**Spain Inn 2**														
	Total Site Info	5.01	218,235	27	10	30	1.50	65,273	3.1	33.0	299.7	6,799	239,334	0.051	1.79
10	**Summit Supply**														
	Total Site Info	14.59	635,343	19	3	36	5.18	225,589	10.9	113.9	1,035.8	23,499	827,159	0.176	6.19
11	**Thomas B. Conley School**														
	Total Site Info	26.31	1,146,004	43	4	19	5.00	217,939	10.5	110.1	1,000.6	22,702	799,110	0.170	5.98

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP	Unit Cost ($/unit)	Unit	Total Cost ($)	I.C. Treated %
	MULHOCKAWAY CREEK SITES	**7,360**	**0.17**	**0.192**	**32**	**11,020**	**0.41**				**$10,050**	**2.7%**
1	**Bethlehem Township Municipal Court**											
	Bioretention systems	2,570	0.06	0.067	11	4,910	0.18	645	$5	SF	$3,225	2.0%
	Rainwater harvesting	1,285	0.03	0.033	6	1,000	0.04	1,000	$2	gal	$2,000	1.0%
	Total Site Info	**3,855**	**0.09**	**0.100**	**17**	**5,910**	**0.22**				**$5,225**	**3.1%**
2	**DND Auto Group 2**											
	Rainwater harvesting	350	0.01	0.009	2	275	0.01	275	$2	gal	$550	0.5%
	Total Site Info	**350**	**0.01**	**0.009**	**2**	**275**	**0.01**				**$550**	**0.5%**
3	**Jugtown Tire Company**											
	Bioretention system	1,275	0.03	0.033	6	2,440	0.09	320	$5	SF	$1,600	4.9%
	Total Site Info	**1,275**	**0.03**	**0.033**	**6**	**2,440**	**0.09**				**$1,600**	**4.9%**
4	**Reliable Small Engine Repair**											
	Rainwater harvesting	1,060	0.02	0.028	5	825	0.03	825	$2	gal	$1,650	11.6%
	Total Site Info	**1,060**	**0.02**	**0.028**	**5**	**825**	**0.03**				**$1,650**	**11.6%**
5	**Unity Spiritual Center**											
	Bioretention system	820	0.02	0.021	4	1,570	0.06	205	$5	SF	$1,025	1.9%
	Total Site Info	**820**	**0.02**	**0.021**	**4**	**1,570**	**0.06**				**$1,025**	**1.9%**
	MUSCONETCONG RIVER SITES	**79,600**	**1.83**	**2.074**	**347**	**150,720**	**5.67**				**$221,825**	**9.7%**
6	**Allgrind Plastics, Inc.**											
	Bioretention system	10,425	0.24	0.272	45	19,930	0.75	2,605	$5	SF	$13,025	9.9%
	Rainwater harvesting	1,285	0.03	0.033	6	1,000	0.04	1,000	$2	gal	$2,000	1.2%
	Total Site Info	**11,710**	**0.27**	**0.305**	**51**	**20,930**	**0.79**				**$15,025**	**11.1%**
7	**Ethel Hoppock Middle School**											
	Bioretention system	1,020	0.02	0.027	4	1,950	0.07	255	$5	SF	$1,275	1.0%
	Planter boxes	1,075	0.02	n/a	4	n/a	n/a	6	$1,000	box	$6,000	1.0%
	Total Site Info	**1,020**	**0.02**	**0.027**	**4**	**1,950**	**0.07**				**$7,275**	**2.0%**
8	**Heritage Park**											
	Bioretention systems	5,405	0.12	0.141	24	10,330	0.39	1,350	$5	SF	$6,750	5.0%
	Pervious pavement	36,065	0.83	0.940	157	68,950	2.59	6,440	$25	SF	$161,000	33.5%
	Total Site Info	**41,470**	**0.95**	**1.081**	**181**	**79,280**	**2.98**				**$167,750**	**38.5%**

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 %
9	**Spain Inn 2**											
	Bioretention systems	11,350	0.26	0.296	50	21,700	0.82	2,840	$5	SF	$14,200	17.4%
	Total Site Info	**11,350**	**0.26**	**0.296**	**50**	**21,700**	**0.82**				**$14,200**	**17.4%**
10	**Summit Supply**											
	Bioretention system	7,080	0.16	0.184	31	13,540	0.51	1,770	$5	SF	$8,850	3.1%
	Total Site Info	**7,080**	**0.16**	**0.184**	**31**	**13,540**	**0.51**				**$8,850**	**3.1%**
11	**Thomas B. Conley School**											
	Bioretention system	6,970	0.16	0.182	30	13,320	0.50	1,745	$5	SF	$8,725	3.2%
	Planter boxes	430	0.01	n/a	2	n/a	n/a	2	$1,000	box	$2,000	0.2%
	Total Site Info	**6,970**	**0.16**	**0.182**	**30**	**13,320**	**0.50**				**$8,725**	**3.2%**