



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

*Prepared for Mendham Township by the
Rutgers Cooperative Extension Water Resources Program*

August 21, 2020

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



Table of Contents

Introduction	1
Methodology	1
Green Infrastructure Practices	8
Potential Project Sites	10
Conclusion	11

Appendix A: Climate Resilient Green Infrastructure

- a. Green Infrastructure Sites
- b. Proposed Green Infrastructure Concepts
- c. Summary of Existing Conditions
- d. Summary of Proposed Green Infrastructure Practices

Introduction

Located in Morris County, New Jersey, Mendham Township covers approximately 18.1 square miles. Figures 1 and 2 illustrate that Mendham Township is dominated by forest land use. A total of 32.7% of the municipality's land use is classified as urban. Of the urban land in Mendham 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 Mendham 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 Mendham Township. Based upon the 2015 NJDEP land use/land cover data, approximately 4.7% of Mendham Township has impervious cover. This level of impervious cover suggests that the streams in Mendham Township are likely sensitive streams.¹

Methodology

Mendham Township contains portions of six subwatersheds (Figure 4). For this impervious cover reduction action plan, projects have been identified in three 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.

Land Use Types for Mendham Township

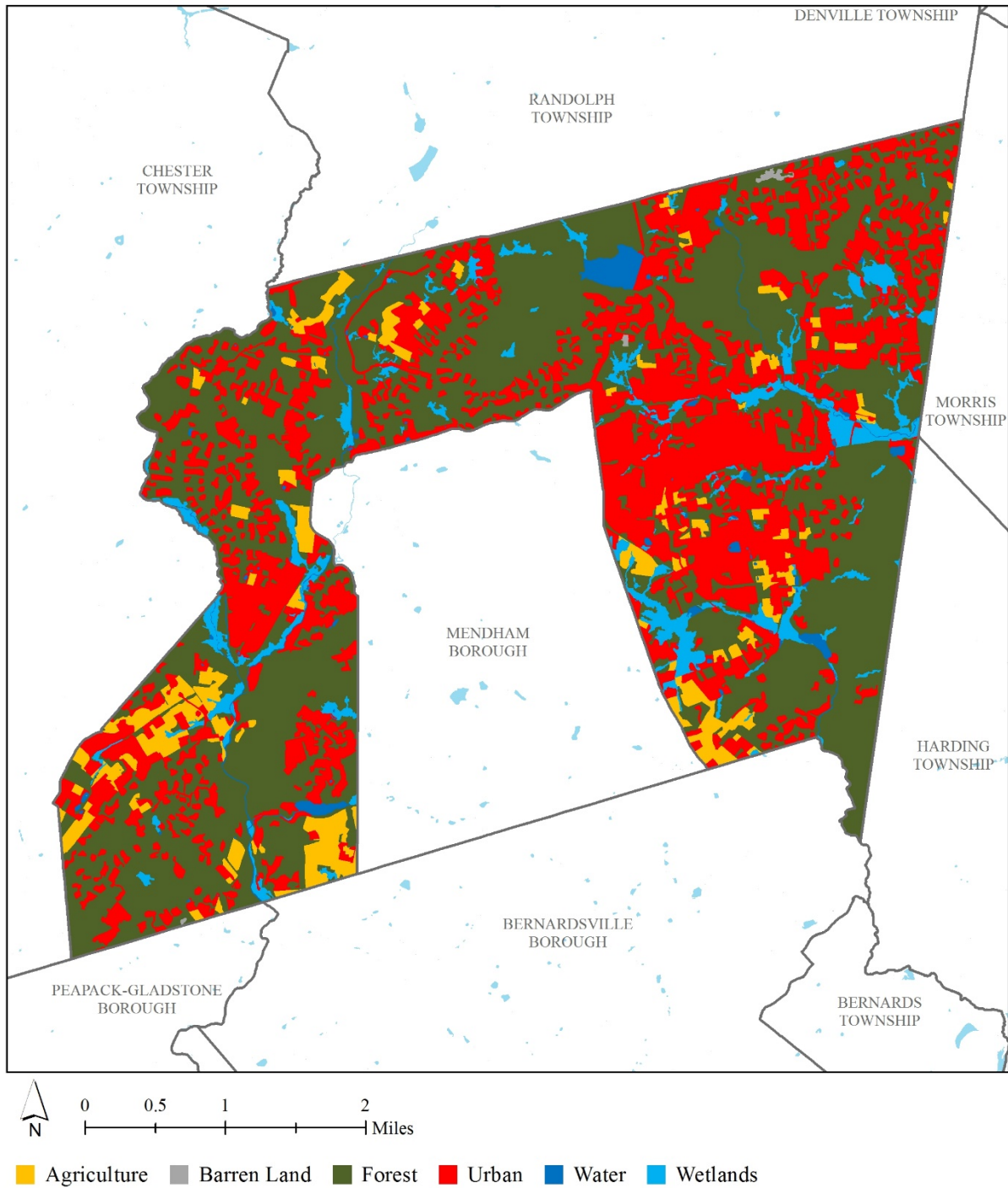


Figure 1: Map illustrating the land use in Mendham Township

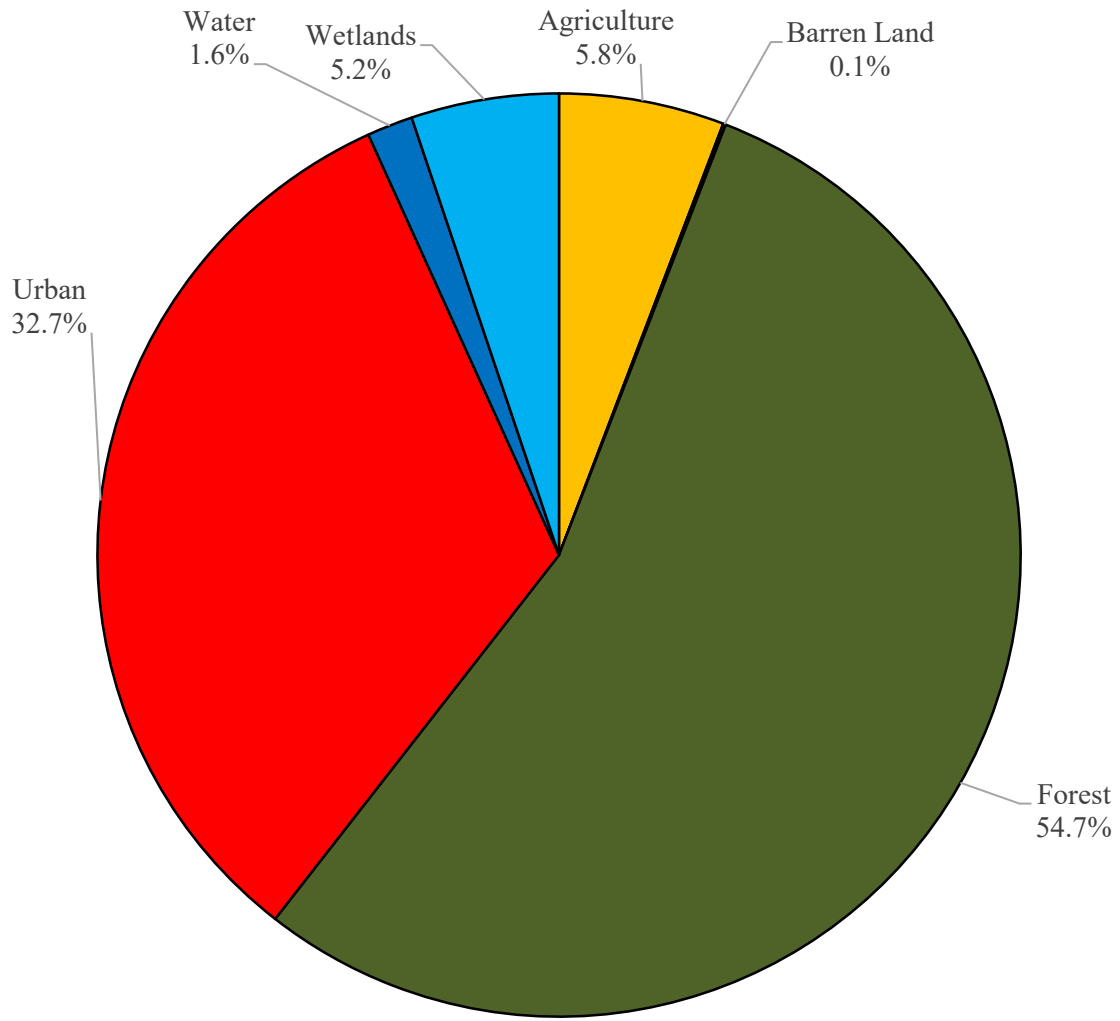


Figure 2: Pie chart illustrating the land use in Mendham Township

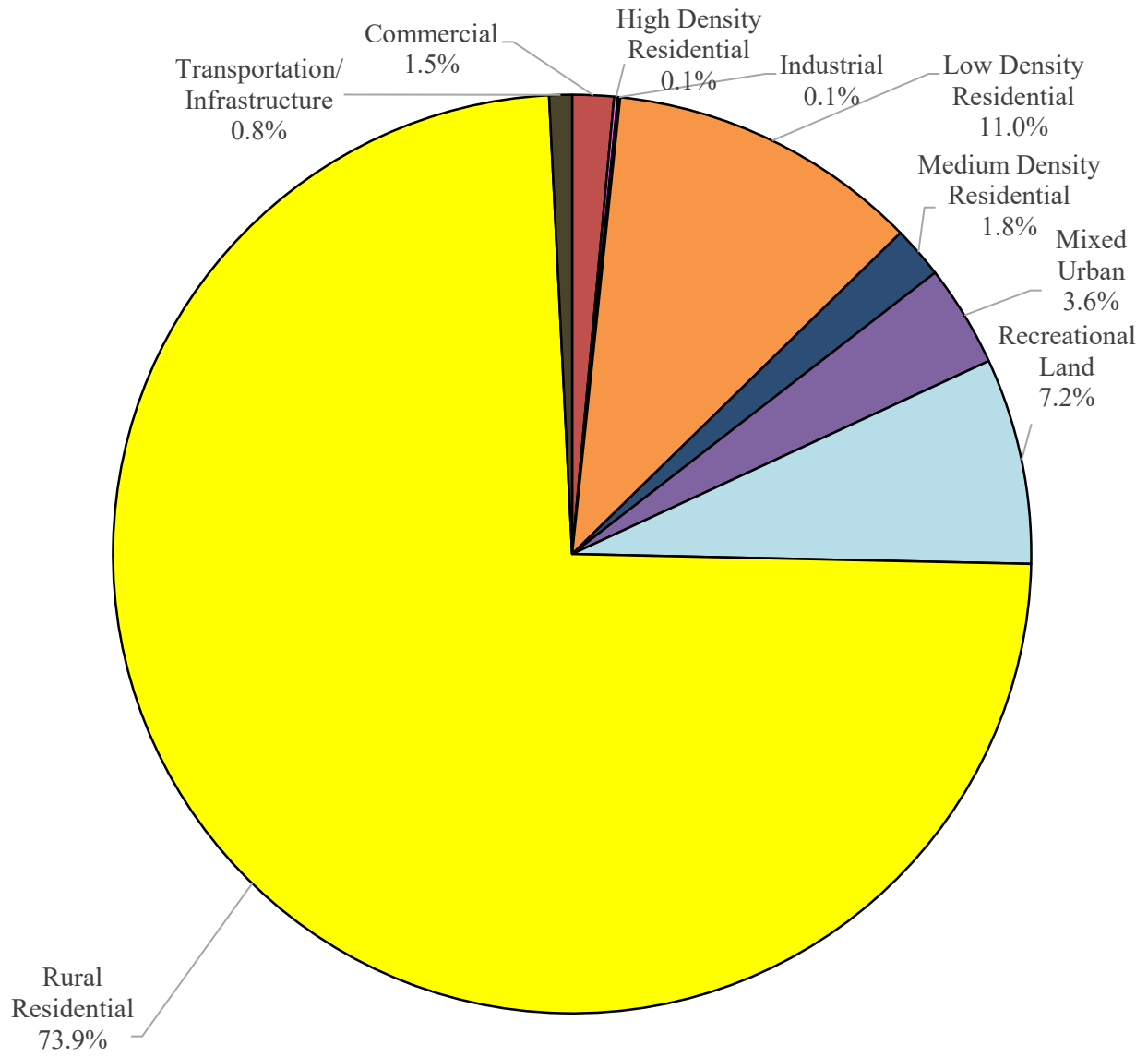


Figure 3: Pie chart illustrating the various types of urban land use in Mendham Township

Subwatersheds of Mendham Township

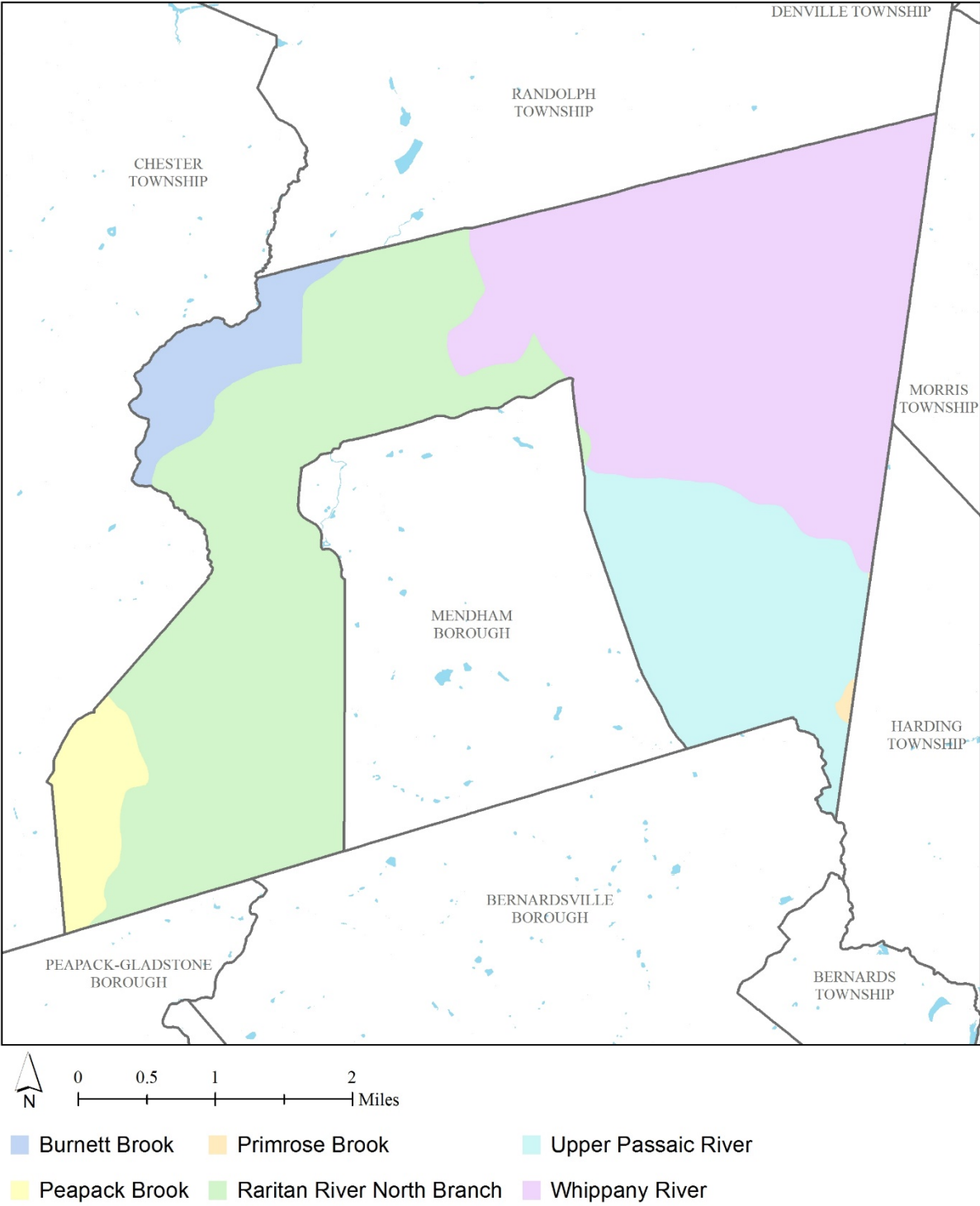


Figure 4: Map of the subwatersheds in Mendham Township

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 Mendham 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 Coefficients²

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 benefits³. A wide range of green infrastructure practices have been evaluated for the potential project sites in Mendham 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.



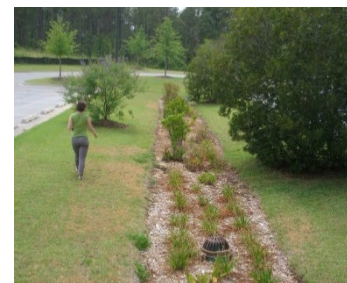
Rainwater harvesting systems (cistern or rain barrel)

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

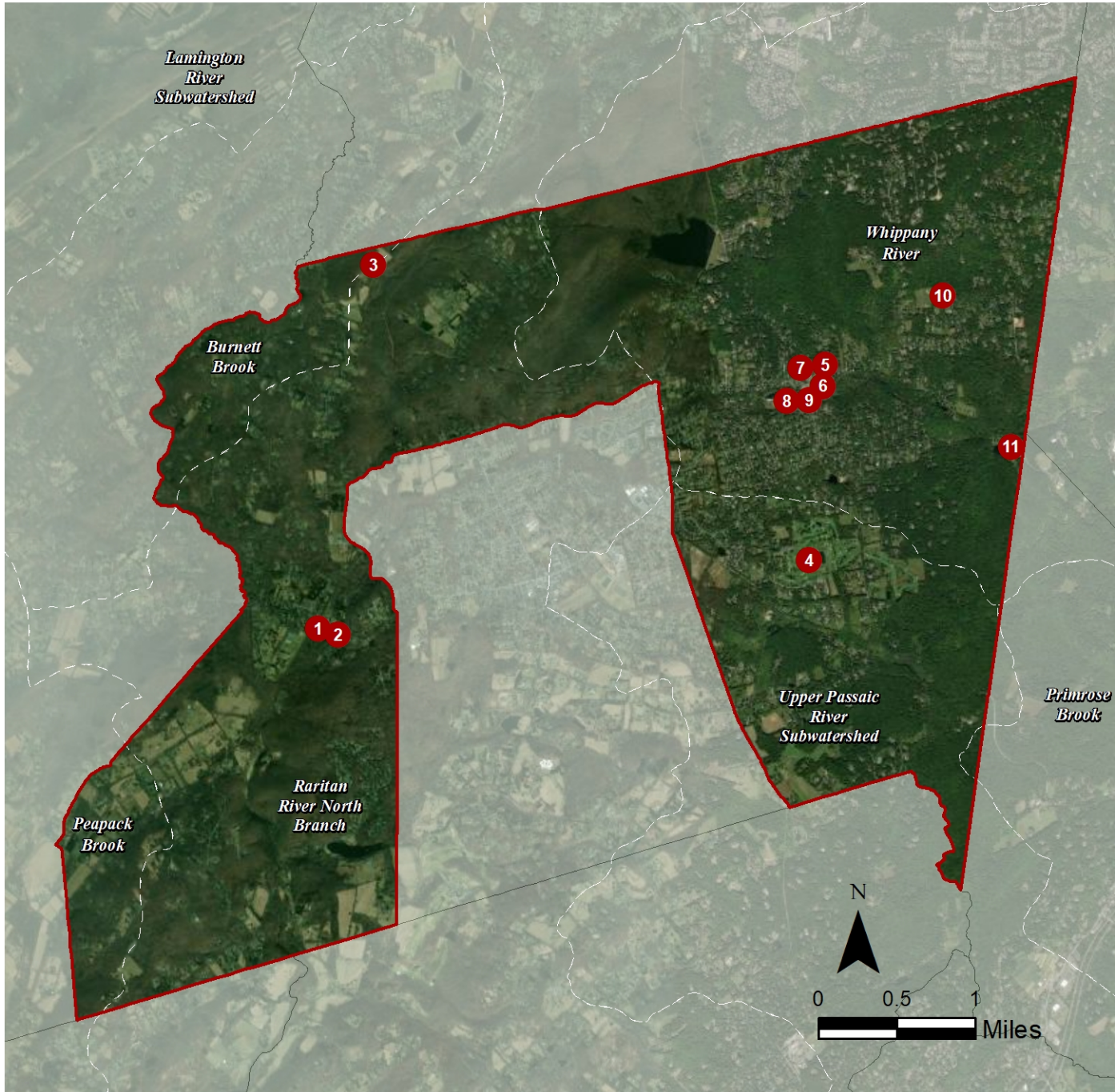
This impervious cover reduction action plan is meant to provide the municipality with a blueprint for implementing green infrastructure practices that will reduce the impact of stormwater runoff from impervious surfaces. These projects can be implemented by a wide variety of people such as boy scouts,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

MENDHAM TOWNSHIP: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE RARITAN RIVER NORTH BRANCH SUBWATERSHED

1. Ralston Engine Company No. 1
2. Ralston Field
3. Randolph Regional Animal Shelter

SITES WITHIN THE UPPER PASSAIC RIVER SUBWATERSHED

4. Mendham Golf & Tennis Club

SITES WITHIN THE WHIPPANY RIVER SUBWATERSHED

5. Brookside Community Church
6. Brookside Community Club
7. Brookside Post Office
8. Mendham Township Elementary School
9. Mendham Township Fire Department & Library
10. Mendham Township Middle School
11. Parque

b. Proposed Green Infrastructure Concepts

RALSTON ENGINE COMPANY NO. 1



Subwatershed: Raritan River North Branch

Site Area: 1,050,733 sq. ft.

Address: 322 Mendham Road West
Mendham, NJ 07945

Block and Lot: Block 107, Lot 33



A cistern can be installed along the building to allow stormwater runoff from the roof to be reused for activities such as washing fire engines. To capture runoff from the parking lot, a section of parking spaces can be converted to porous pavement. Downspout planter boxes can be placed on the front of the building to help capture 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"
6	61,226	3.0	30.9	281.1	0.048	1.68

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	0.210	35	15,420	0.58	1,440	\$36,000
Planter boxes	n/a	2	n/a	n/a	2 (boxes)	\$2,000
Rainwater harvesting	0.039	7	1,170	0.04	1,170 (gal)	\$2,340

GREEN INFRASTRUCTURE RECOMMENDATIONS



Ralston Engine Company No. 1

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



RALSTON FIELD



Subwatershed: Raritan River North Branch

Site Area: 35,929 sq. ft.

Address: 326 Mendham Road West
Mendham, NJ 07945

Block and Lot: Block 107, Lot 23

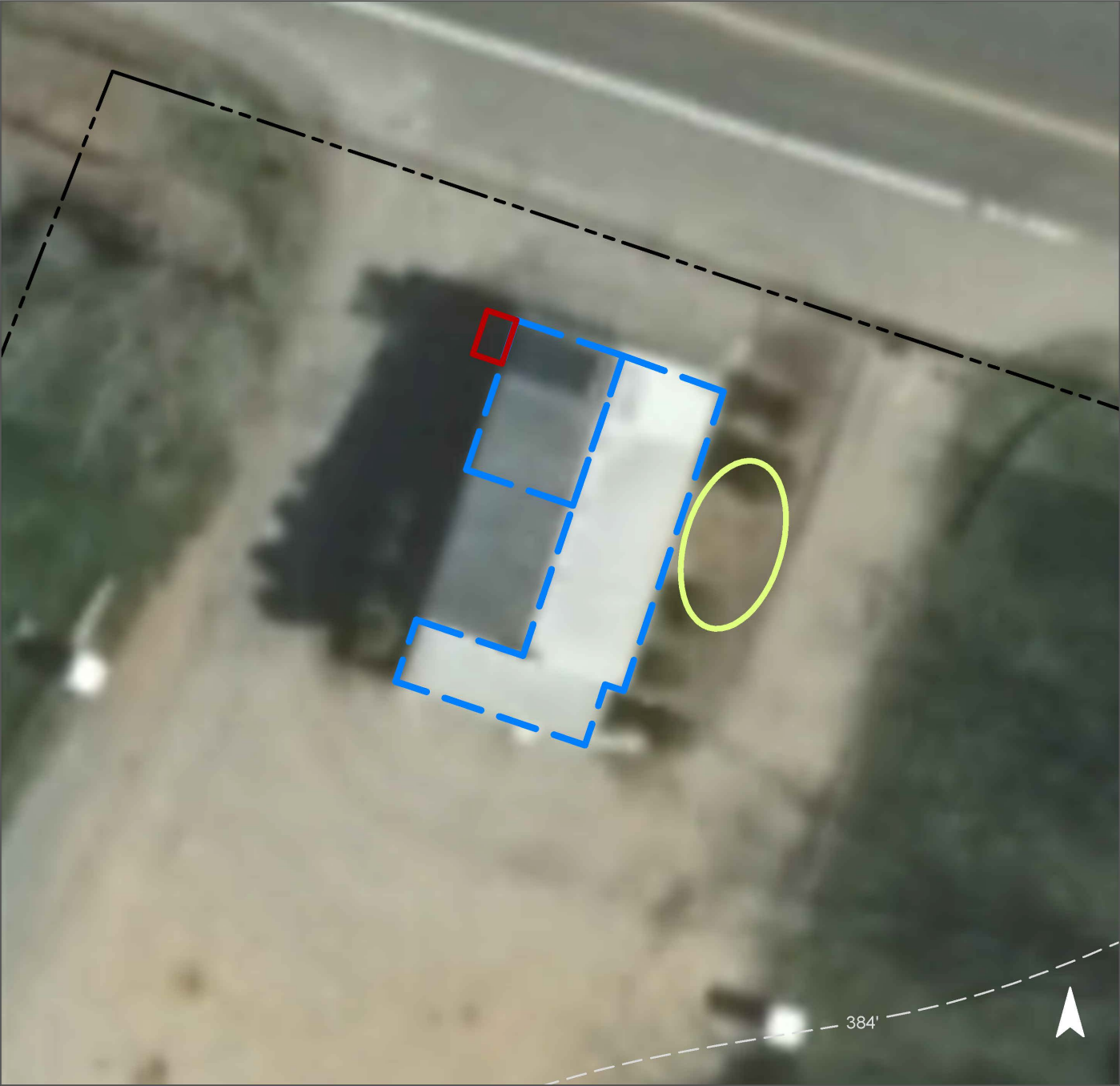


A rain garden can be installed on the east side of the building to capture, treat, and infiltrate rooftop runoff. Along the western side of the building a downspout planter box can be installed to help capture stormwater runoff. A preliminary soil assessment suggests that more soil testing would be required 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"
19	6,884	0.3	3.5	31.6	0.005	0.19

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	0.021	3	1,510	0.06	200	\$1,000
Planter box	n/a	1	n/a	n/a	1 (box)	\$1,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Ralston Field

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



RANDOLPH REGIONAL ANIMAL SHELTER



Subwatershed: Raritan River North Branch

Site Area: 3,813,302 sq. ft.

Address: 97 Iroina Road
Mendham, NJ 07945

Block and Lot: Block 116, Lot 6

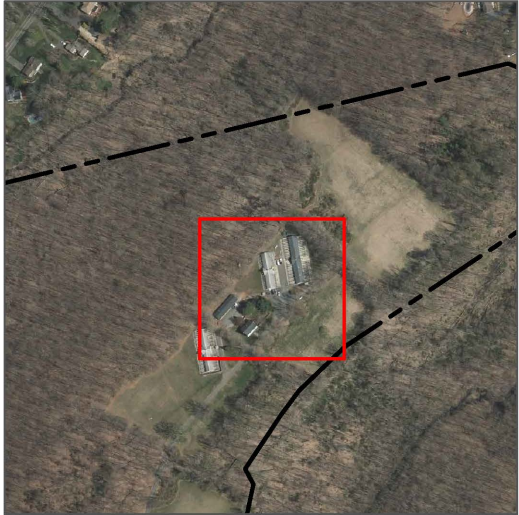
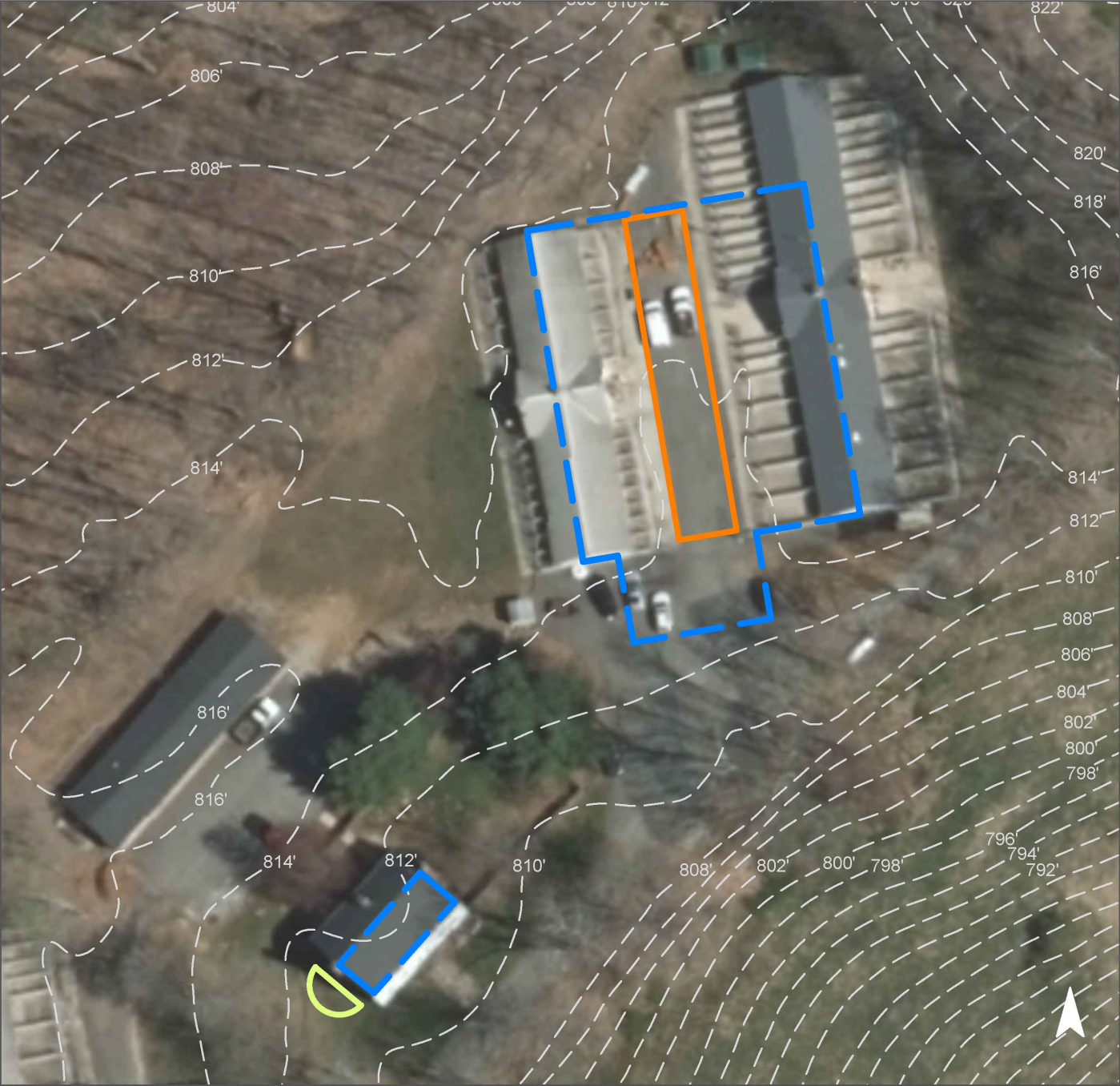


A rain garden can be installed adjacent to the main building to capture, treat, and infiltrate rooftop runoff. The gated pavement area can be replaced with pervious pavement to capture and infiltrate stormwater from the nearby buildings and the lot. A preliminary soil assessment suggests that the soils 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"
5	208,114	10.0	105.1	955.5	0.162	5.71

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	0.022	4	1,620	0.06	215	\$1,075
Pervious pavement	0.422	71	30,940	1.16	2,890	\$72,250

GREEN INFRASTRUCTURE RECOMMENDATIONS



Randolph Regional Animal Shelter

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



MENDHAM GOLF & TENNIS CLUB



Subwatershed: Passaic River Upper

Site Area: 5,269,808 sq. ft.

Address: 2 Golf Lane
Mendham, NJ 07945

Block and Lot: Block 137, Lot 48

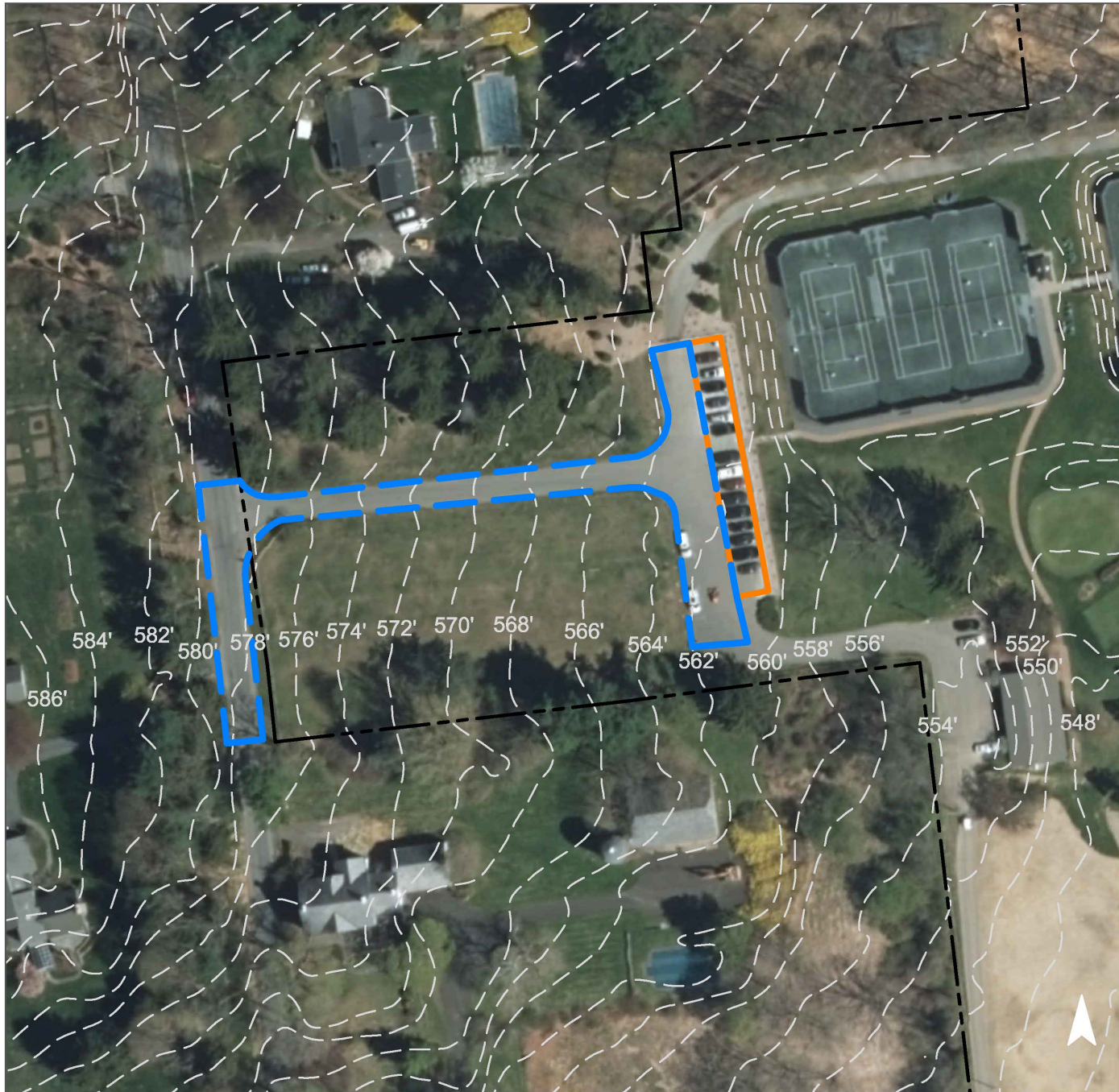


Pervious pavement can be installed in the west parking lot of the tennis courts to treat the runoff from the driveway and parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





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"
7	389,983	18.8	197.0	1,790.6	0.304	10.70

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	0.389	65	28,570	1.07	3,750	\$93,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Mendham Golf & Tennis Club

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



BROOKSIDE COMMUNITY CHURCH



Subwatershed: Whippany River
Site Area: 50,228 sq. ft.
Address: 8 East Main Street
Morristown, NJ 07960
Block and Lot: Block 128, Lot 4

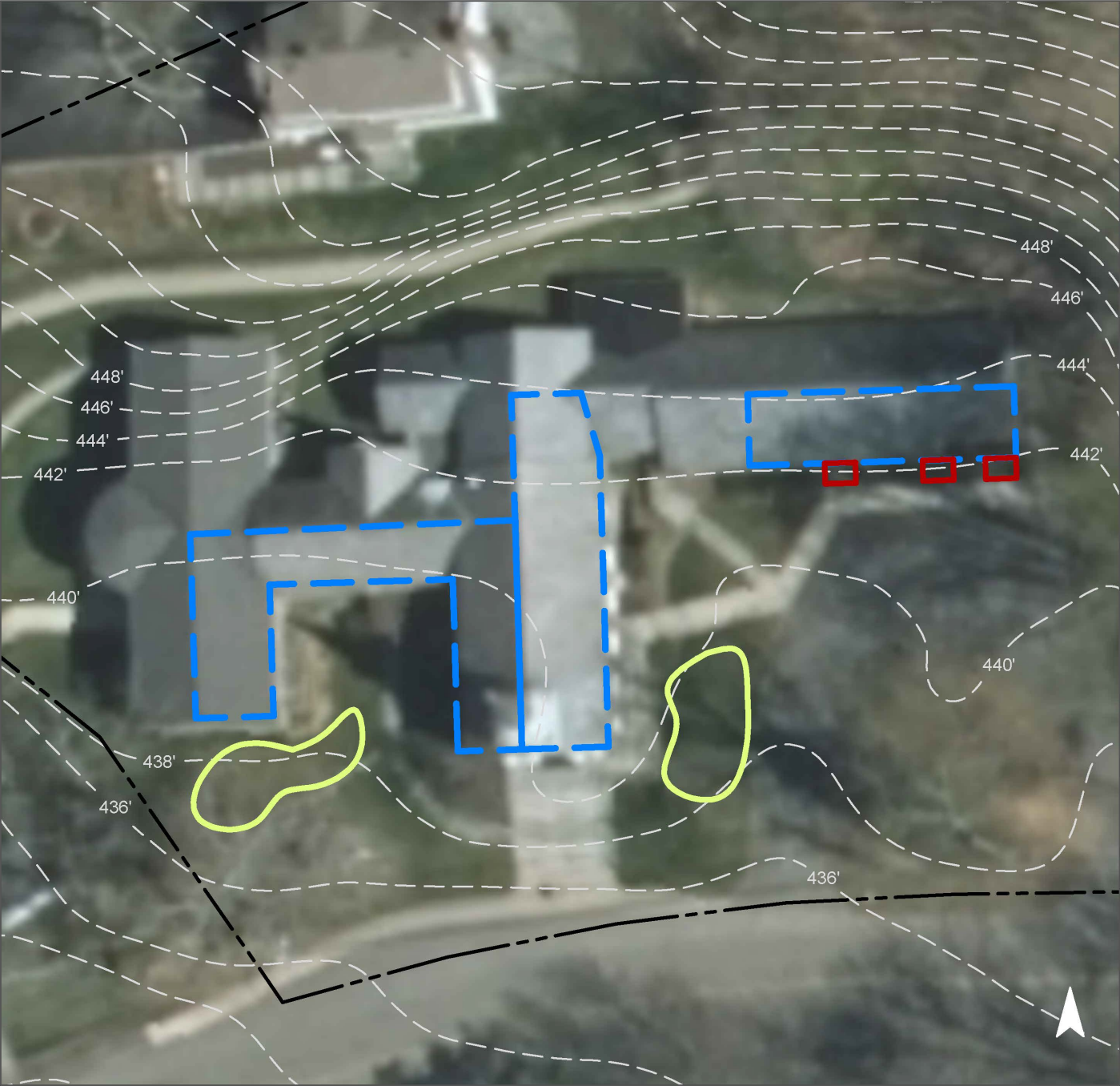


Bioretention systems can be installed on the southeast and southwest side of the building to capture, treat, and infiltrate rooftop runoff. To help with stormwater capture, downspout planter boxes can be placed along the southwestern part of the building. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.






Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
26	13,292	0.6	6.7	61.0	0.010	0.36

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	0.068	11	5,020	0.19	655	\$3,275
Planter boxes	n/a	2	n/a	n/a	3 (boxes)	\$3,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Brookside Community Church

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



BROOKSIDE COMMUNITY CLUB



Subwatershed: Whippany River
Site Area: 179,780 sq. ft.
Address: 1 East Main Street
Morristown, NJ 07960
Block and Lot: Block 139, Lot 1

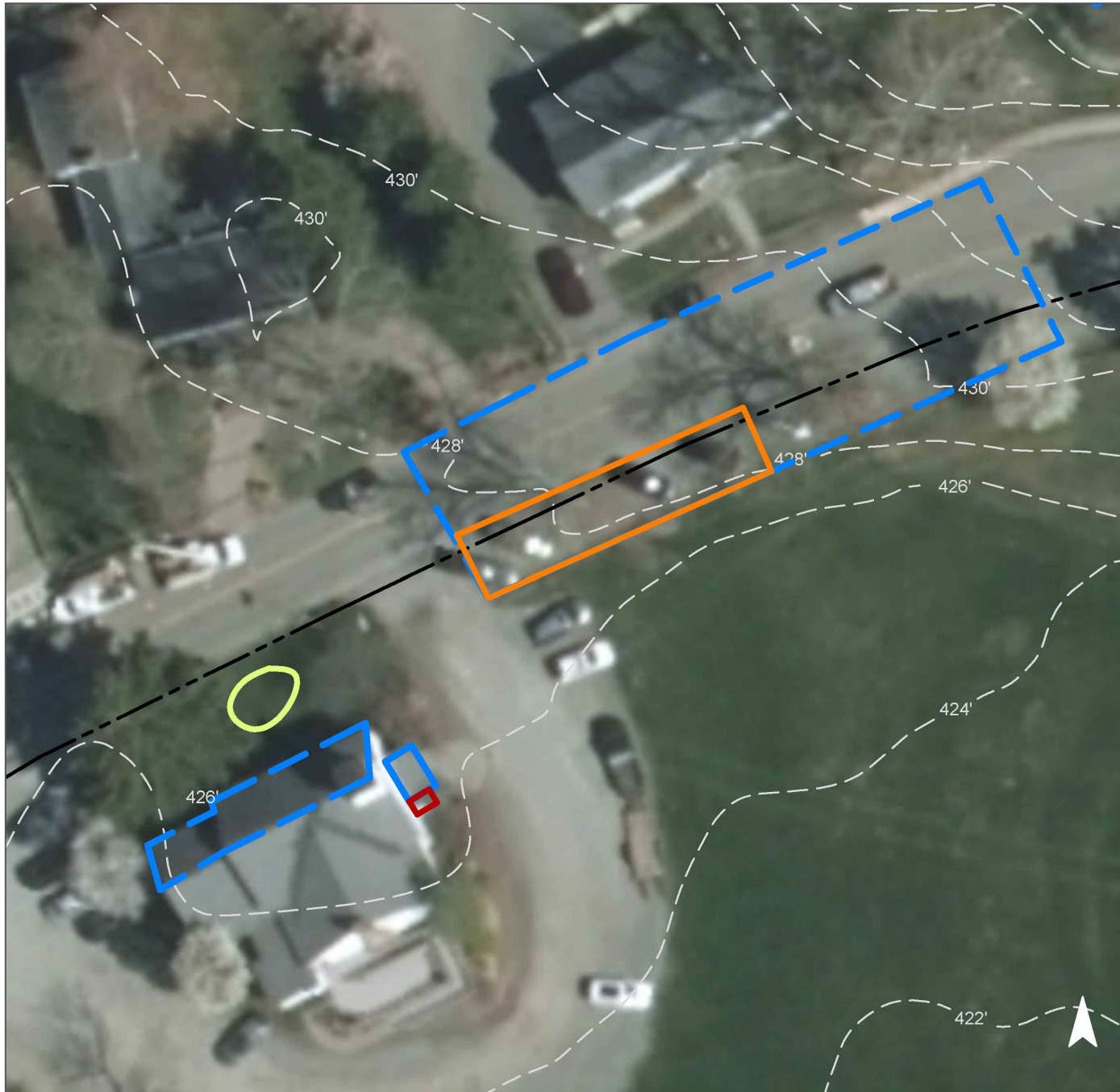


A rain garden can be installed on the north side of the building to capture, treat, and infiltrate rooftop runoff. Parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the road. A downspout planter box can be installed on the building to capture rooftop runoff as well. 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"
14	25,416	1.2	12.8	116.7	0.020	0.70

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.020	3	1,480	0.06	195	\$975
Pervious pavement	0.198	33	14,520	0.55	1,450	\$36,250
Planter box	n/a	0	n/a	n/a	1 (box)	\$1,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Brookside Community Club

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



BROOKSIDE POST OFFICE



Subwatershed: Whippany River

Site Area: 10,693 sq. ft.

Address: 2 East Main Street
Morristown, NJ 07960

Block and Lot: Block 128, Lot 1

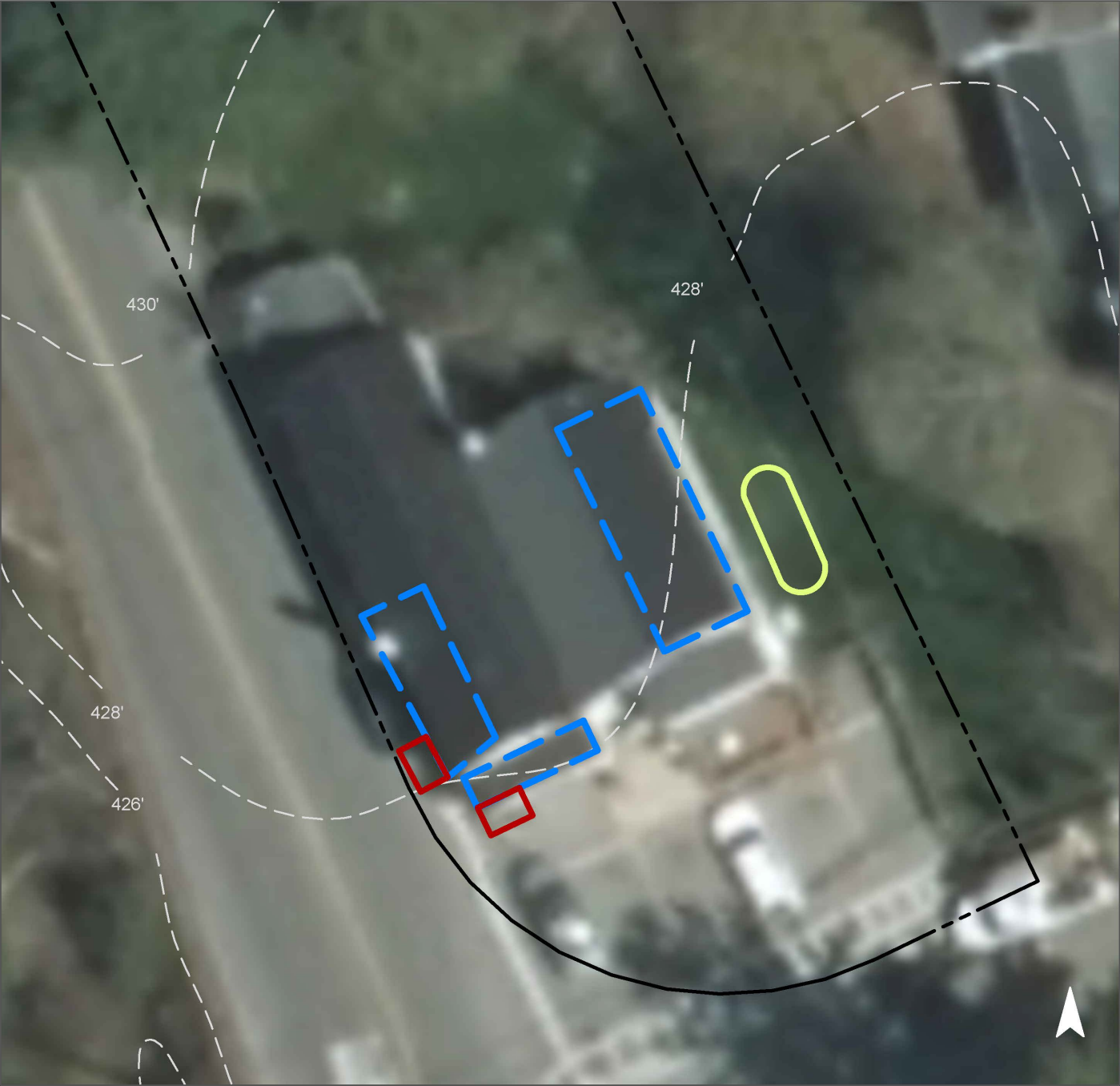


Downspout planter boxes can be installed along the southwest corner of the building to allow roof runoff to be reused and to spread awareness about green infrastructure programs. Along the eastern side of the building a bioretention system can be installed to help capture, treat, and infiltrate stormwater 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"
26	2,829	0.1	1.4	13.0	0.002	0.08

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.010	2	730	0.03	95	\$475
Planter boxes	n/a	1	n/a	n/a	2 (boxes)	\$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Brookside Post Office

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



MENDHAM TOWNSHIP ELEMENTARY SCHOOL



Subwatershed: Whippany River

Site Area: 605,450 sq. ft.

Address: 18 W Main Street
Brookside, NJ 07926

Block and Lot: Block 144, Lot 24

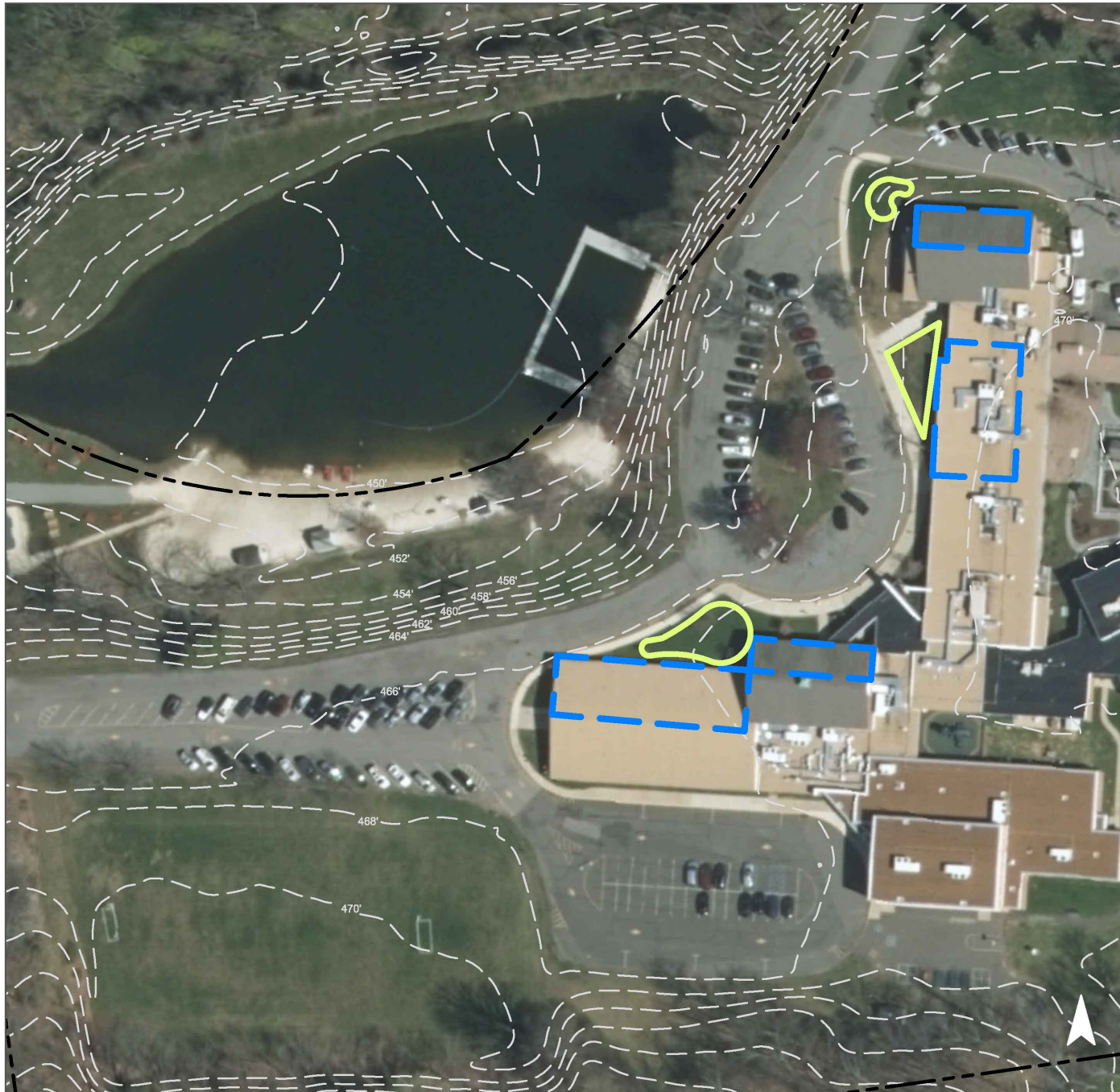


Three bioretention systems can be installed along the front entrance of the school to treat the school's rooftop drainage area. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





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"
34	208,865	10.1	105.5	959.0	0.163	5.73

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	0.335	56	24,590	0.92	3,215	\$16,075

GREEN INFRASTRUCTURE RECOMMENDATIONS



**Mendham Township
Elementary School**

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



MENDHAM TOWNSHIP FIRE DEPARTMENT & LIBRARY



Subwatershed: Whippany River
Site Area: 80,649 sq. ft.
Address: 1 Cherry Lane
Morristown, NJ 07960
Block and Lot: Block 137, Lot 16

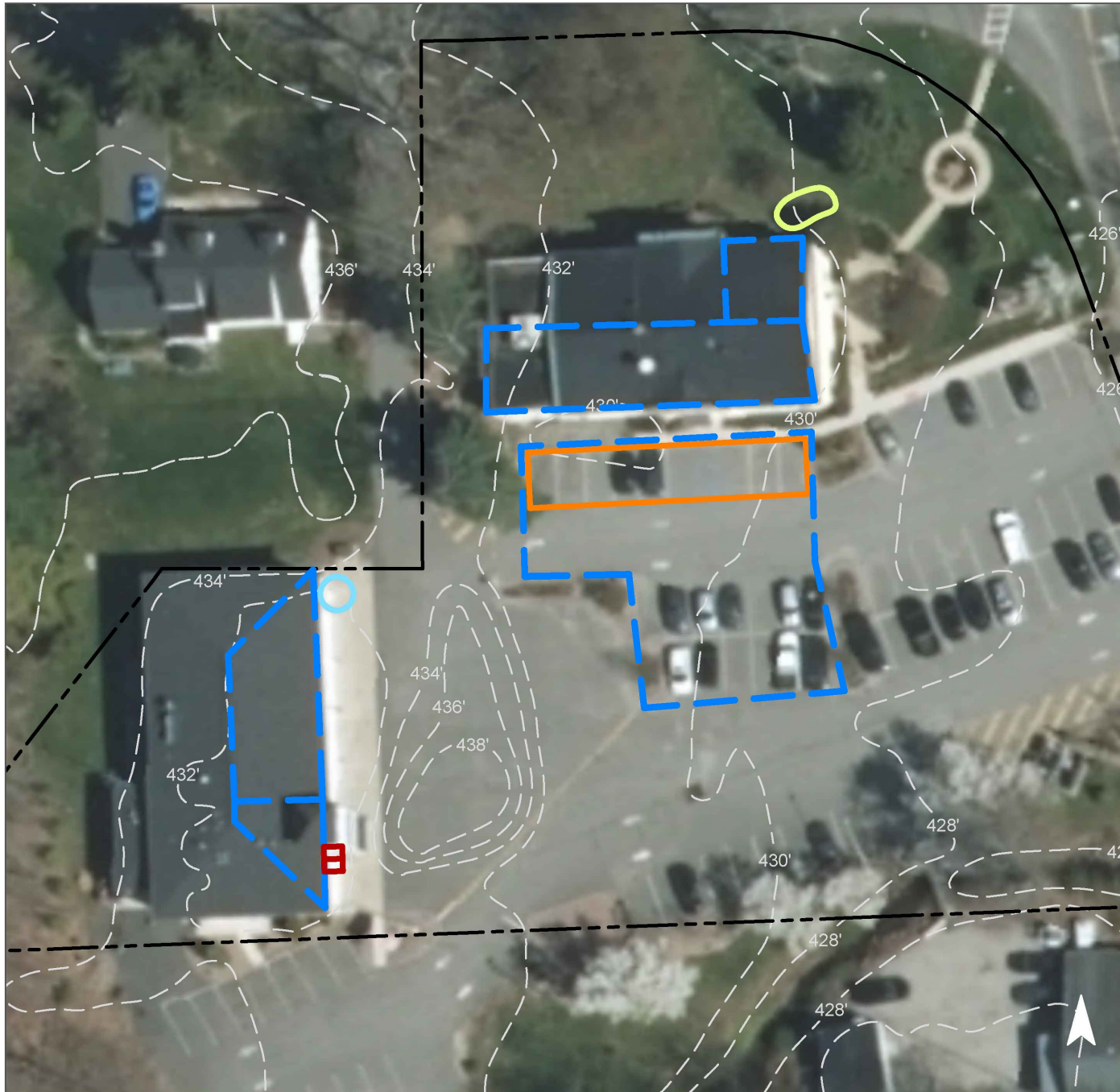


A rain garden can be installed at the library to capture, treat, and infiltrate rooftop runoff. Runoff from the front section of the library roof can be managed by a section of porous pavement parking spaces. A cistern can be installed on the fire department building to allow roof runoff to be reused for activities such as washing fire engines. To help capture stormwater runoff, a downspout planter box can be placed south of the eastern entrance of the fire department. 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	55,351	2.7	28.0	254.1	0.043	1.52

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	0.017	3	1,260	0.05	165	\$825
Pervious pavement	0.236	40	17,340	0.65	1,620	\$40,500
Planter boxes	n/a	2	n/a	n/a	2 (boxes)	\$2,000
Rainwater harvesting	0.044	7	1,310	0.05	1,310 (gal)	\$2,620

GREEN INFRASTRUCTURE RECOMMENDATIONS



Mendham Township Fire Department & Library

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



MENDHAM TOWNSHIP MIDDLE SCHOOL



Subwatershed: Whippany River

Site Area: 927,597 sq. ft.

Address: 16 Washington Valley Road
Morristown, NJ 07960

Block and Lot: Block 127, Lot 152



Bioretention systems can be installed on the east side of the building to capture, treat, and infiltrate rooftop runoff. To help with stormwater runoff from the parking lot, the low northeastern section of parking spaces can be converted to pervious pavement to help capture and infiltrate the 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"
22	204,394	9.9	103.2	938.4	0.159	5.61

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	0.148	25	10,880	0.41	1,420	\$7,100
Pervious pavement	0.686	115	50,320	1.89	4,700	\$117,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Mendham Township Middle School

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



PARQUE



Subwatershed: Whippany River

Site Area: 6,182,106 sq. ft.

Address: 197 Mendham Road East
Mendham, NJ 07945

Block and Lot: Block 142, Lot 29

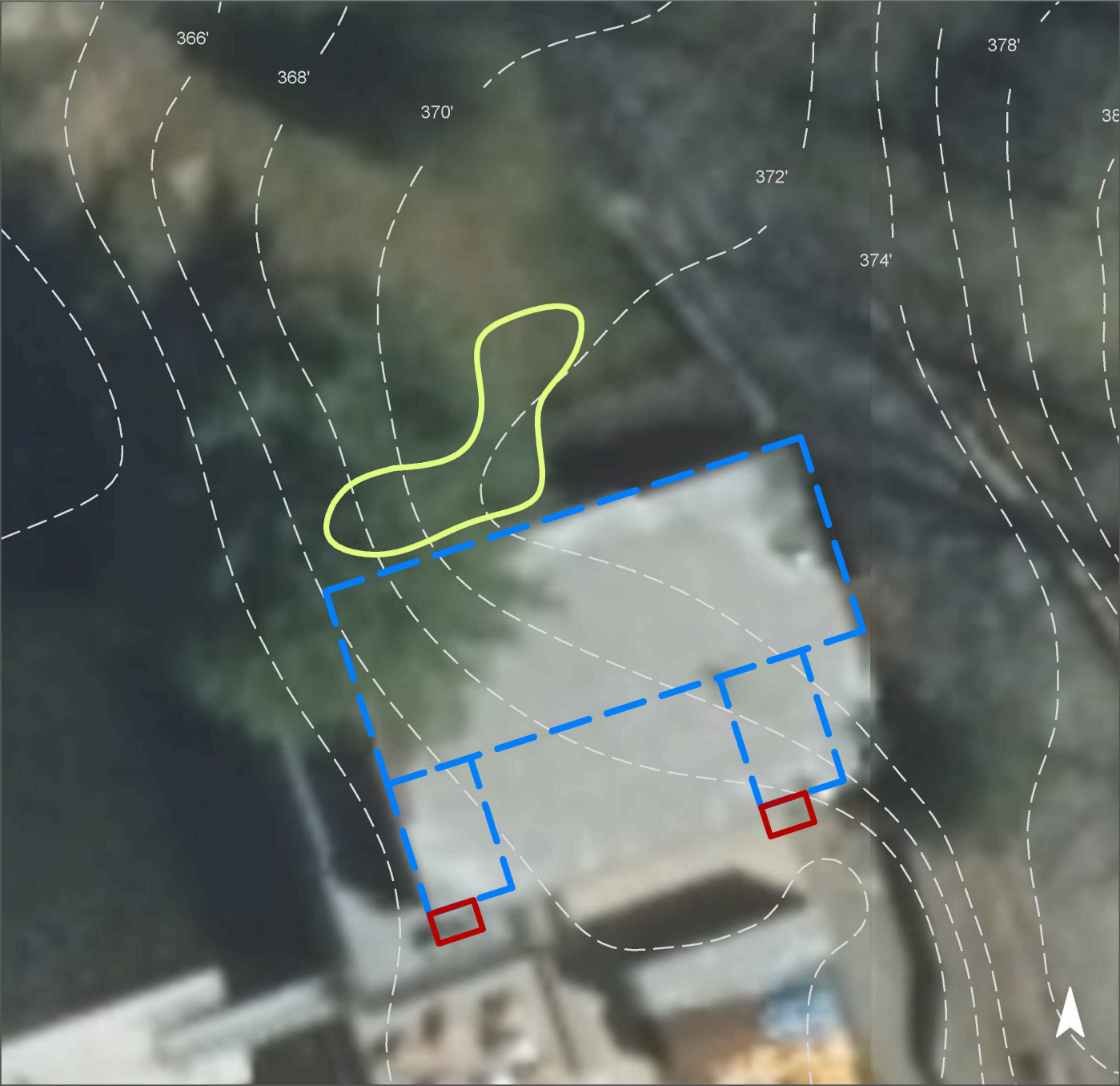


Bioretention systems can be installed in the back of the building to capture, treat, and infiltrate rooftop runoff. Downspout planter boxes can be constructed at the entrance of the building to allow roof runoff to be reused and to spread awareness about green infrastructure programs. A preliminary soil 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"
4	238,942	11.5	120.7	1,097.1	0.186	6.55

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	0.045	7	3,280	0.12	430	\$2,150
Planter boxes	n/a	1	n/a	n/a	2 (boxes)	\$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Parque

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



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)	Annual (cu.ft.)	Water Quality Storm (1.25" over 2-hours)	Annual (Mgal)
											(cu.ft.)		(Mgal)	
Raritan River North Branch	233.47	10,169,772				15.29	666,207	32.1	336.5	3,058.8	69,397	2,442,759	0.519	18.27
1 Ralston Engine Company No. 1 Total Site Info	24.12	1,050,733	107	33	6	1.41	61,226	3.0	30.9	281.1	6,378	224,495	0.048	1.68
2 Ralston Field Total Site Info	0.82	35,929	107	23	19	0.16	6,884	0.3	3.5	31.6	717	25,242	0.005	0.19
3 Randolph Regional Animal Shelter Total Site Info	87.54	3,813,302	116	6	5	4.78	208,114	10.0	105.1	955.5	21,679	763,086	0.162	5.71
Upper Passaic River														
4 Mendham Golf & Tennis Club Total Site Info	120.98	5,269,808	137	48	7	8.95	389,983	18.8	197.0	1,790.6	40,623	1,429,936	0.304	10.70
Whippany River	184.49	8,036,503				17.20	749,088	36.1	378.3	3,439.3	78,030	2,746,657	0.584	20.54
5 Brookside Community Church Total Site Info	1.15	50,228	128	4	26	0.31	13,292	0.6	6.7	61.0	1,385	48,736	0.010	0.36
6 Brookside Community Club Total Site Info	4.13	179,780	139	1	14	0.58	25,416	1.2	12.8	116.7	2,648	93,193	0.020	0.70
7 Brookside Post Office Total Site Info	0.25	10,693	128	1	26	0.06	2,829	0.1	1.4	13.0	295	10,375	0.002	0.08
8 Mendham Township Elementary School Total Site Info	13.90	605,450	144	24	34	4.79	208,865	10.1	105.5	959.0	21,757	765,837	0.163	5.73
9 Mendham Township Fire Department & Library Total Site Info	1.85	80,649	137	16	69	1.27	55,351	2.7	28.0	254.1	5,766	202,952	0.043	1.52
10 Mendham Township Middle School Total Site Info	21.29	927,597	127	152	22	4.69	204,394	9.9	103.2	938.4	21,291	749,444	0.159	5.61
11 Parque Total Site Info	141.92	6,182,106	142	29	4	5.49	238,942	11.5	120.7	1,097.1	24,890	876,121	0.186	6.55

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	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)									
Raritan River North Branch	233.47	27,640	0.63	0.703	120	49,910	1.87				\$138,240	4.1%
1 Ralston Engine Company No. 1												
Pervious pavement		8,065	0.19	0.210	35	15,420	0.58	1,440	\$25	SF	\$36,000	13.2%
Planter boxes		430	0.01	n/a	2	n/a	n/a	2	\$1,000	box	\$2,000	0.7%
Rainwater harvesting		1,500	0.03	0.039	7	1,170	0.04	1,170	\$2	gal	\$2,340	2.4%
Total Site Info	24.12	9,995	0.23	0.249	43	16,590	0.62				\$40,340	16.3%
2 Ralston Field												
Bioretention system		790	0.02	0.021	3	1,510	0.06	200	\$5	SF	\$1,000	11.5%
Planter box		215	0.00	n/a	1	n/a	n/a	1	\$1,000	box	\$1,000	3.1%
Total Site Info	0.82	1,005	0.02	0.021	4	1,510	0.06				\$2,000	14.6%
3 Randolph Regional Animal Shelter												
Pervious pavement		16,185	0.37	0.422	71	30,940	1.16	2,890	\$25	SF	\$72,250	7.8%
Bioretention system		850	0.02	0.022	4	1,620	0.06	215	\$5	SF	\$1,075	0.4%
Total Site Info	87.54	850	0.02	0.022	4	1,620	0.06				\$1,075	0.4%
Upper Passaic River												
4 Mendham Golf & Tennis Club												
Pervious pavement		14,940	0.34	0.389	65	28,570	1.07	3,750	\$25	SF	\$93,750	3.8%
Total Site Info	120.98	15,790	0.36	0.411	69	30,190	1.13				\$94,825	4.2%
Whippany River	184.49	70,195	1.61	1.770	305	126,050	4.75				\$267,615	9.4%
5 Brookside Community Church												
Bioretention systems		2,625	0.06	0.068	11	5,020	0.19	655	\$5	SF	\$3,275	19.7%
Planter boxes		645	0.01	n/a	2	n/a	n/a	3	\$1,000	box	\$3,000	4.9%
Total Site Info	1.15	3,270	0.08	0.068	14	5,020	0.19				\$6,275	24.6%
6 Brookside Community Club												
Bioretention system		775	0.02	0.020	3	1,480	0.06	195	\$5	SF	\$975	3.0%
Pervious pavement		7,595	0.17	0.198	33	14,520	0.55	1,450	\$25	SF	\$36,250	29.9%
Planter box		100	0.00	n/a	0	n/a	n/a	1	\$1,000	box	\$1,000	0.4%
Total Site Info	4.13	8,470	0.19	0.218	37	16,000	0.61				\$38,225	33.3%
7 Brookside Post Office												
Bioretention system		385	0.01	0.010	2	730	0.03	95	\$5	SF	\$475	13.6%
Planter boxes		265	0.01	n/a	1	n/a	n/a	2	\$1,000	box	\$2,000	9.4%

Summary of Proposed Green Infrastructure Practices

Total Site Info	0.25	650	0.01	0.010	3	730	0.03				\$2,475	23.0%
8 Mendham Township Elementary School												
Bioretention systems		12,860	0.30	0.335	56	24,590	0.92	3,215	\$5	SF	\$16,075	6.2%
Total Site Info	13.90	11,840	0.27	0.297	51	19,910	0.75				\$45,945	21.4%
9 Mendham Township Fire Department & Library												
Bioretention system		660	0.02	0.017	3	1,260	0.05	165	\$5	SF	\$825	1.2%
Pervious pavement		9,070	0.21	0.236	40	17,340	0.65	1,620	\$25	SF	\$40,500	16.4%
Planter boxes		430	0.01	n/a	2	n/a	n/a	2	\$1,000	box	\$2,000	0.8%
Rainwater harvesting		1,680	0.04	0.044	7	1,310	0.05	1,310	\$2	gal	\$2,620	3.0%
Total Site Info	1.85	11,840	0.27	0.297	51	19,910	0.75				\$45,945	21.4%
10 Mendham Township Middle School												
Bioretention systems		5,690	0.13	0.148	25	10,880	0.41	1,420	\$5	SF	\$7,100	2.8%
Pervious pavement		26,320	0.60	0.686	115	50,320	1.89	4,700	\$25	SF	\$117,500	12.9%
Total Site Info	21.29	32,010	0.73	0.834	140	61,200	2.30				\$124,600	15.7%
11 Parque												
Bioretention system		1,715	0.04	0.045	7	3,280	0.12	430	\$5	SF	\$2,150	0.7%
Planter boxes		400	0.01	n/a	1	n/a	n/a	2	\$1,000	box	\$2,000	0.2%
Total Site Info	141.92	2,115	0.05	0.045	9	3,280	0.12				\$4,150	0.9%