Draft

Impervious Cover Reduction Action Plan
for
Millstone Township, Monmouth County, New Jersey

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

September 5, 2015

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Introduction

Located in Monmouth County in central New Jersey, Millstone Township covers approximately 37.2 square miles. Figures 1 and 2 illustrate that Millstone Township is dominated by urban land uses. A total of 28% of the municipality's land use is classified as urban. Of the urban land in Millstone Township, rural residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2007 land use/land cover geographical information system (GIS) data layer categorizes Millstone 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 Millstone Township. Based upon the 2007 NJDEP land use/land cover data, approximately 4.5% of Millstone Township has impervious cover. This level of impervious cover suggests that the streams in Millstone Township are likely sensitive streams.[1]

Methodology

Millstone Township contains portions of ten subwatersheds (Figure 4). For this impervious cover reduction action plan, projects have been identified in each of these watersheds. Initially, aerial imagery was used to identify potential project sites that contain extensive impervious cover. Field visits were then conducted at each of these potential project sites to determine if a viable option exists to reduce impervious cover or to disconnect impervious surfaces from draining directly to the local waterway or storm sewer system. During the site visit, appropriate green infrastructure practices for the site were determined. Sites that already had stormwater management practices in place were not considered.

[1] Caraco, D., R. Claytor, P. Hinkle, H. Kwon, T. Schueler, C. Swann, S. Vysotsky, and J. Zielinski. 1998. Rapid Watershed Planning Handbook. A Comprehensive Guide for Managing Urbanizing Watersheds. Prepared by Center For Watershed Protection, Ellicott City, MD. Prepared for U.S. Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds and Region V. October 1998

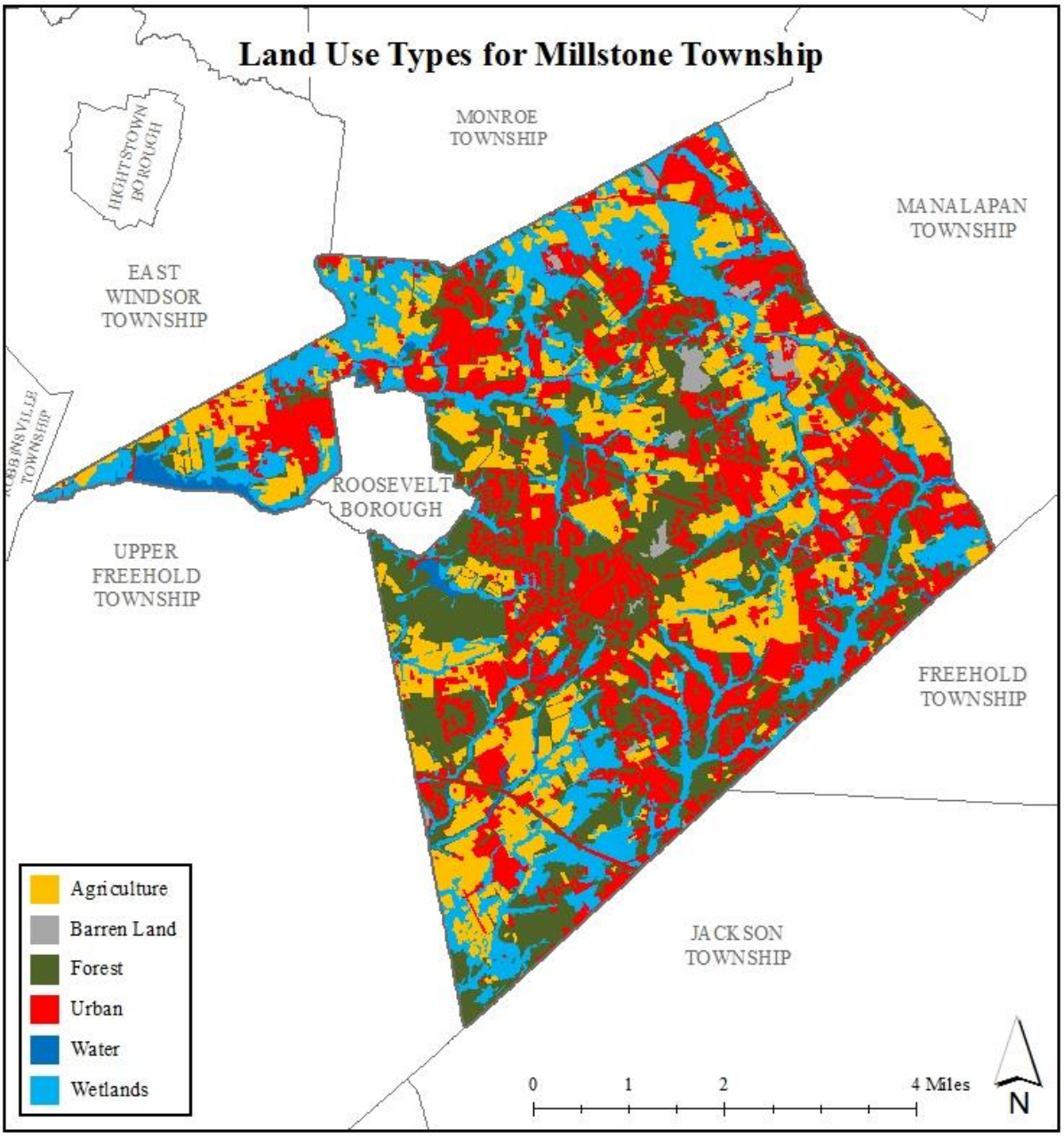


Figure 1: Map illustrating the land use in Millstone Township

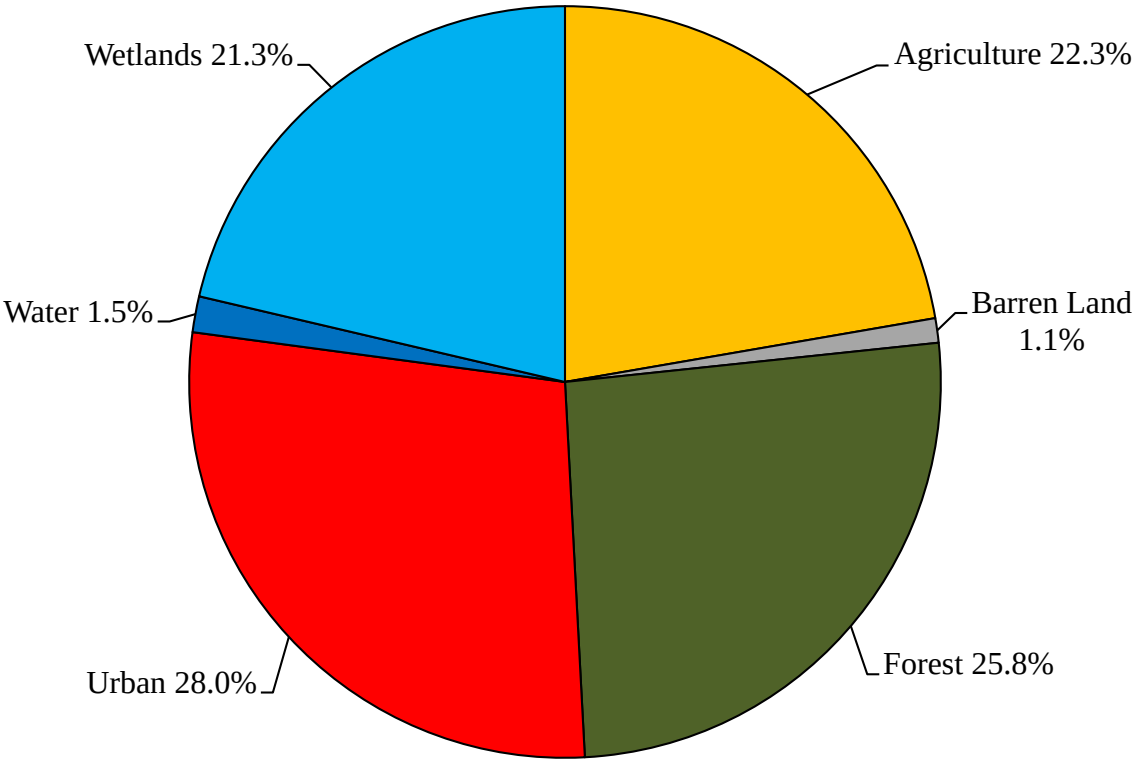


Figure 2: Pie chart illustrating the land use in Millstone Township

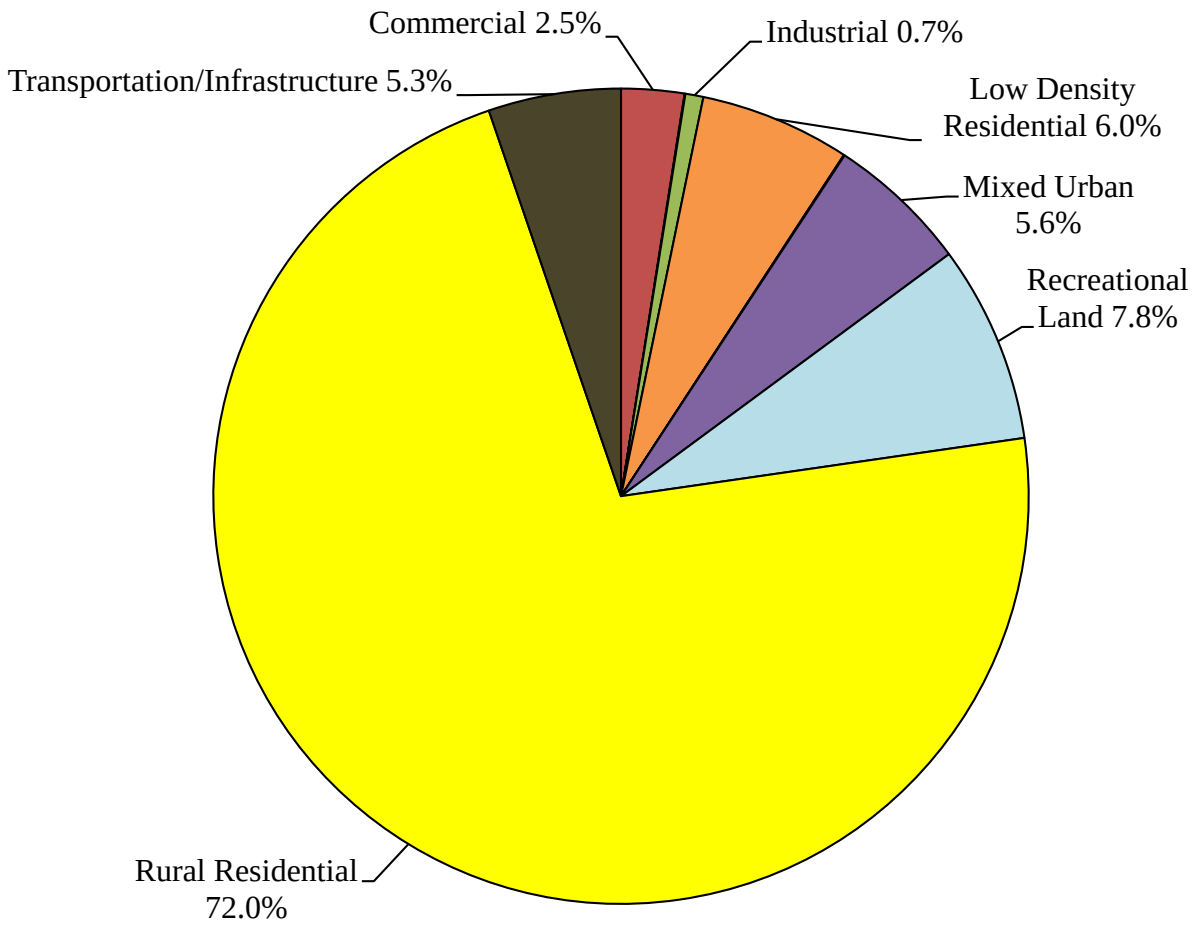


Figure 3: Pie chart illustrating the various types of urban land use in Millstone Township

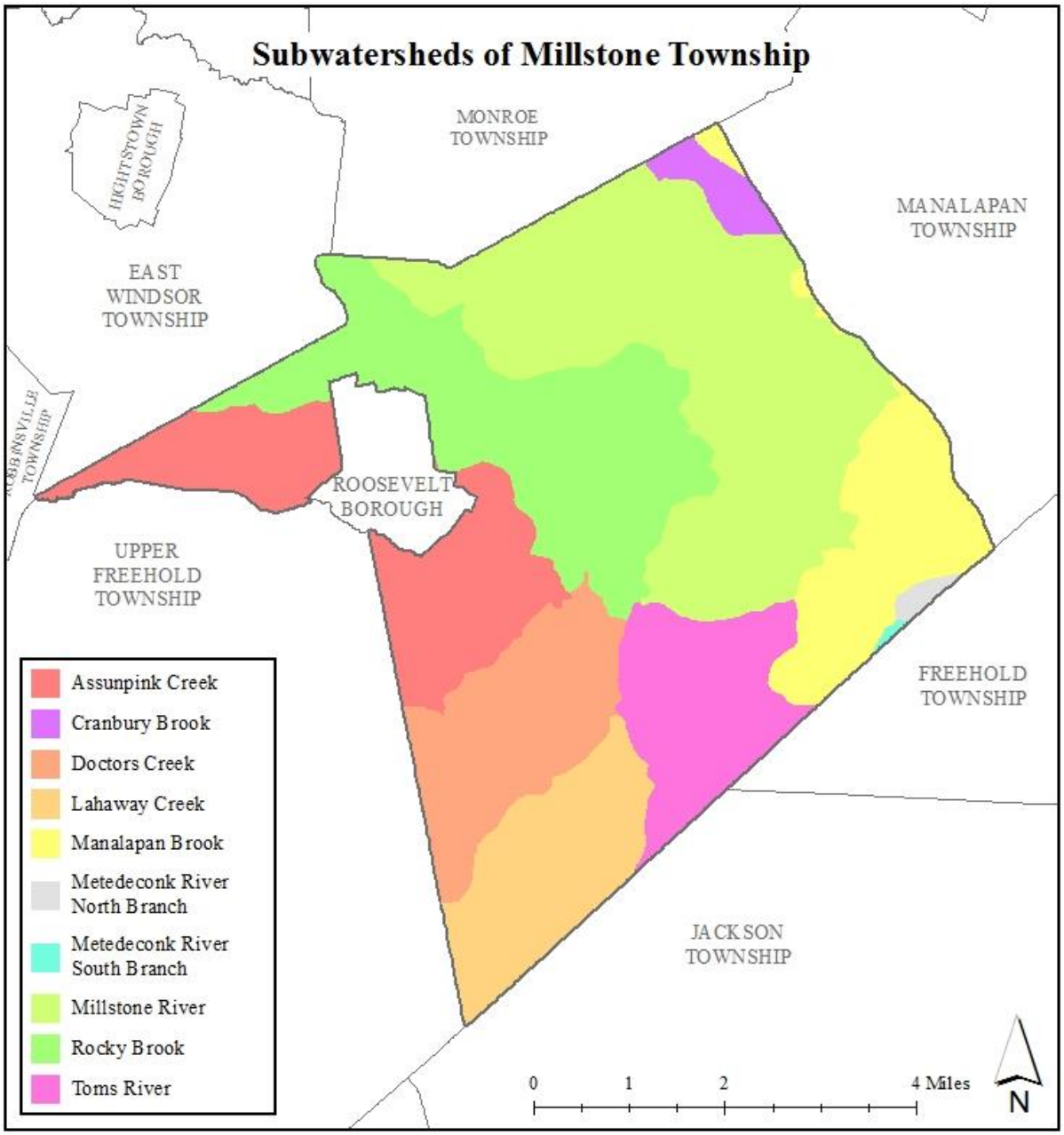


Figure 4: Map of the subwatersheds in Millstone Township

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 2007 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 Millstone 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 principal, green infrastructure practices use soil and vegetation to recycle stormwater runoff through infiltration and evapotranspiration. When used as components of a stormwater management system, green infrastructure practices such as bioretention, green roofs, porous pavement, rain gardens, and vegetated swales can produce a variety of environmental benefits. In addition to effectively retaining and infiltrating rainfall, these practices can simultaneously help filter air pollutants, reduce energy demands, mitigate urban heat islands, and sequester carbon while also providing communities with aesthetic and natural resource benefits[3]. A wide range of green infrastructure practices have been evaluated for the potential project sites in Millstone 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

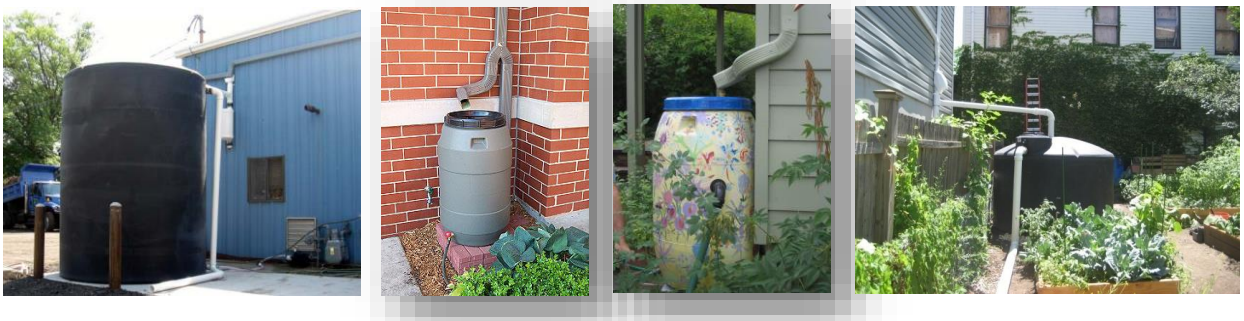
These are landscaped features that are designed to capture, treat, and infiltrate stormwater runoff. These systems can easily be incorporated into existing landscapes, improving aesthetics and creating a wildlife habitat while managing stormwater runoff. Bioretention systems also can be used in soils that do not quickly infiltrate by incorporating an underdrain into the system.

Downspout planter boxes

These are wooden boxes with plants installed at the base of a downspout that provide an opportunity to beneficially reuse rooftop runoff.

Rainwater harvesting systems (cistern or rain barrel)

These systems capture rainwater, mainly from rooftops, in cisterns or rain barrels. The water can then be used for watering gardens, washing vehicles, or for other non-potable uses.



Bioswale

Bioswales are landscape features that convey stormwater from one location to another while removing pollutants and providing water an opportunity to infiltrate.

Stormwater planters

Stormwater planters are vegetated structures that are built into the sidewalk to intercept stormwater runoff from the roadway or sidewalk. Many of these planters are designed to allow the water to infiltrate into the ground while others are designed simply to filter the water and convey it back into the stormwater sewer system.

Tree filter boxes

These are pre-manufactured concrete boxes that contain a special soil mix and are planted with a tree or shrub. They filter stormwater runoff but provide little storage capacity. They are typically designed to quickly filter stormwater and then discharge it to the local sewer system.

Potential Project Sites

Attachment 1 contains information on potential project sites where green infrastructure practices could be installed. The recommended green infrastructure practice and the drainage area that the green infrastructure practice can treat are identified for each potential project site. For each practice, the recharge potential, TSS removal potential, maximum volume reduction potential per storm, and the peak reduction potential are provided. This information is also provided so that proposed development projects that cannot satisfy the New Jersey stormwater management requirements for major development can use one of the identified projects to offset a stormwater management deficit. [4]

[4] New Jersey Administrative Code, N.J.A.C. 7:8, Stormwater Management, Statutory Authority: N.J.S.A. 12:5-3, 13:1D-1 et seq., 13:9A-1 et seq., 13:19-1 et seq., 40:55D-93 to 99, 58:4-1 et seq., 58:10A-1 et seq., 58:11A-1 et seq. and 58:16A-50 et seq., *Date last amended: April 19, 2010*.

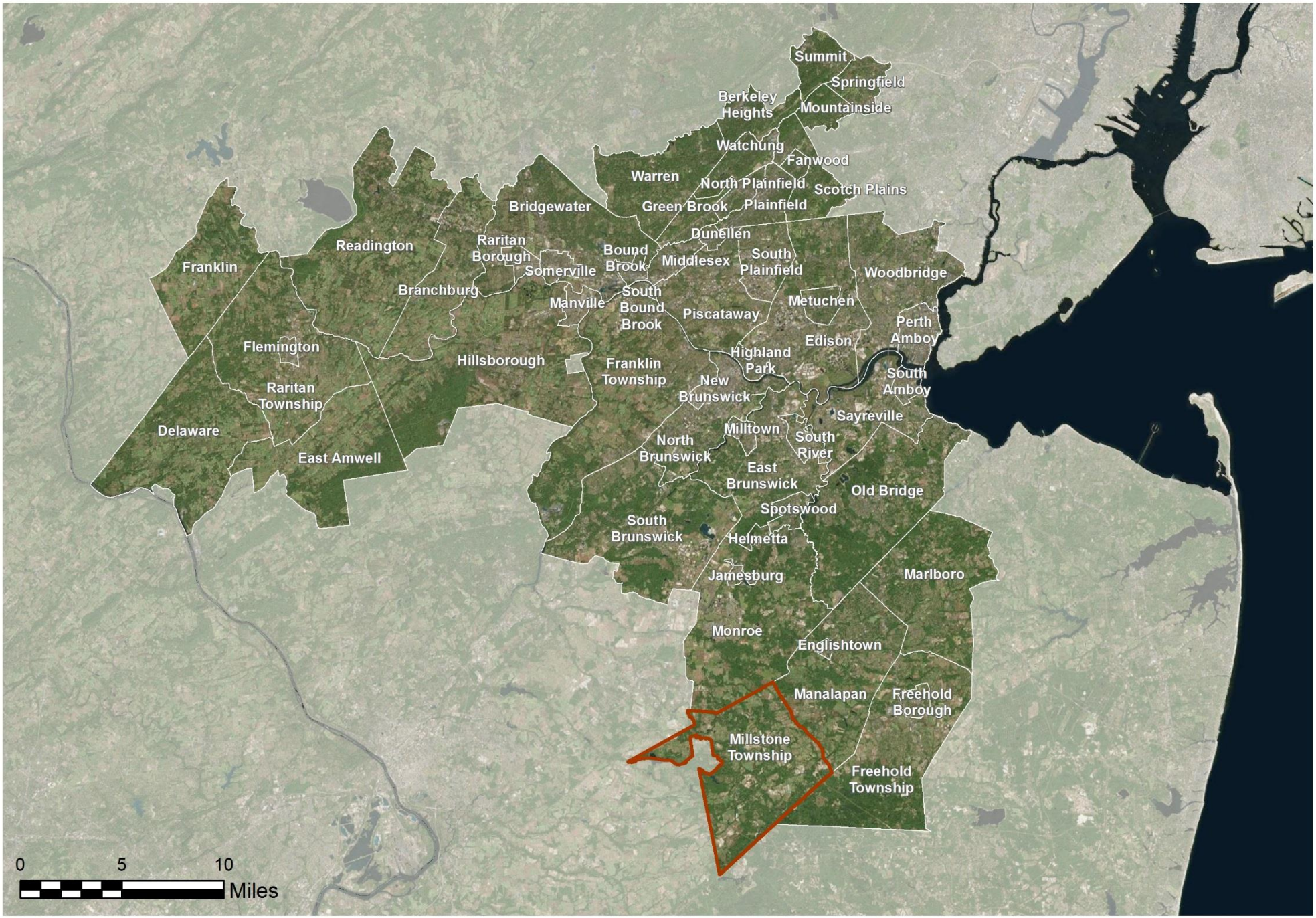
Conclusion

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

Additionally, development projects that are in need of providing off-site compensation for stormwater impacts can use the projects in this plan as a starting point. The municipality can quickly convert this impervious cover reduction action plan into a stormwater mitigation plan and incorporate it into the municipal stormwater control ordinance.

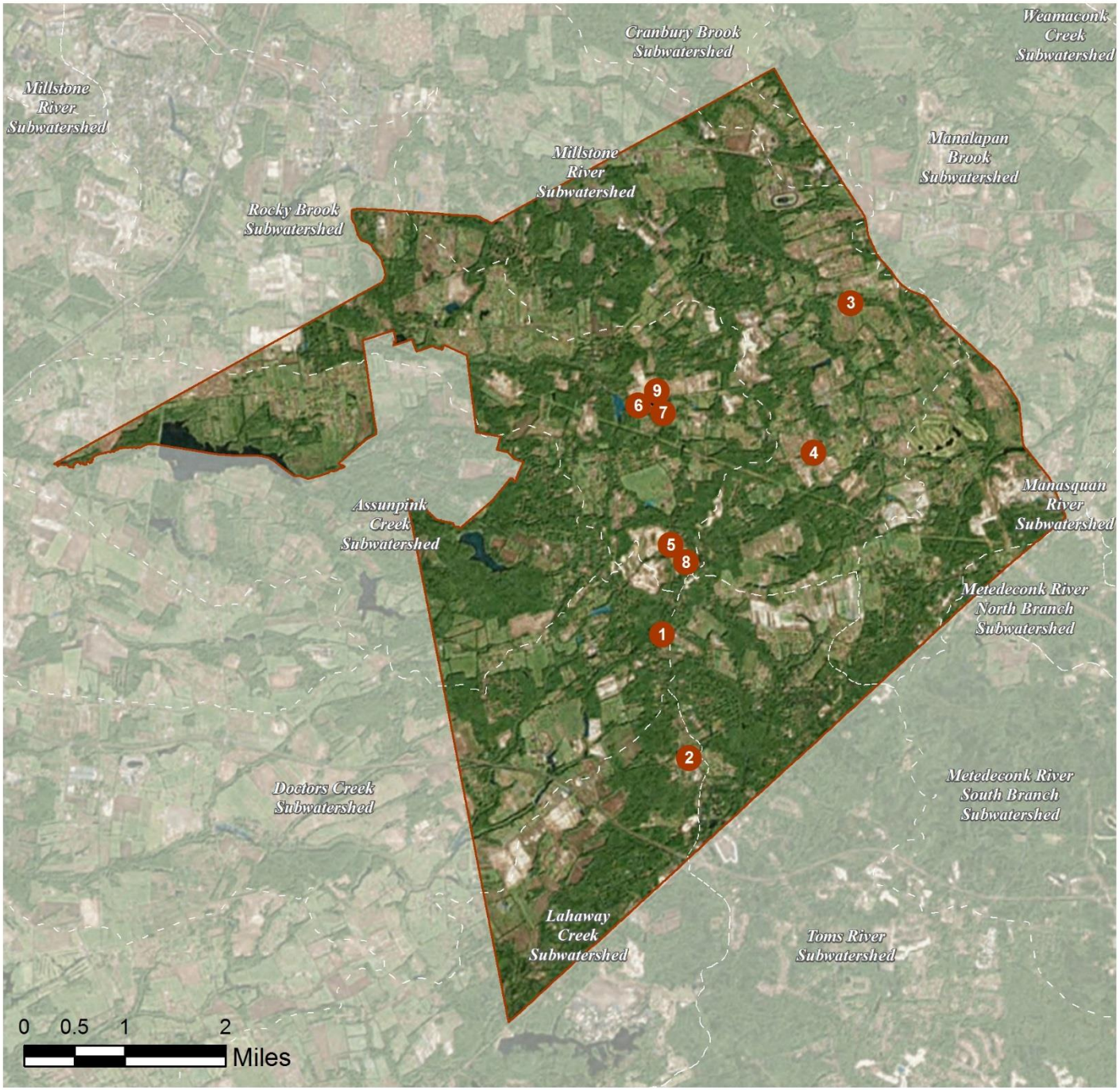
a. Overview Map of the Project

MILLSTONE: CLIMATE RESILIENT GREEN INFRASTRUCTURE FOR THE RARITAN BASIN



b. Green Infrastructure Sites

MILLSTONE: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE DOCTORS CREEK SUBWATERSHED:

1. U.S. Post Office

SITES WITHIN THE LAHAWAY CREEK SUBWATERSHED:

2. KinderCare at Millstone Township

SITES WITHIN THE MILLSTONE RIVER SUBWATERSHED:

3. Millstone Township Middle School
4. Saint Joseph Catholic Church

SITES WITHIN THE ROCKY BROOK SUBWATERSHED:

5. Millstone Township Elementary School
6. Millstone Township First Aid Squad / Public Works / Rocky Brook Park
7. Millstone Township Municipal Court
8. Millstone Township Primary School
9. United Presbyterian Church & Sunshine Schoolhouse

c. Proposed Green Infrastructure Concepts

U.S. POST OFFICE

Subwatershed: Doctors Creek

Site Area: 43,551 sq. ft.

Address: 424 Stagecoach Road
Clarksburg, NJ 08510

Block and Lot: Block 49, Lot 20.19

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

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
40	17,596	0.8	8.9	80.8	0.014	0.48

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	0.102	17	7,697	0.29	1,700	$8,500
Pervious pavements	0.102	17	7,697	0.29	2,000	$50,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

U.S. Post Office

- disconnected downspouts
- pervious pavements
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 25' 50'

KINDERCARE AT MILLSTONE TOWNSHIP

Subwatershed: Lahaway Creek

Site Area: 110,793 sq. ft.

Address: 36 Trenton-Lakewood Road
Clarksburg, NJ 08510

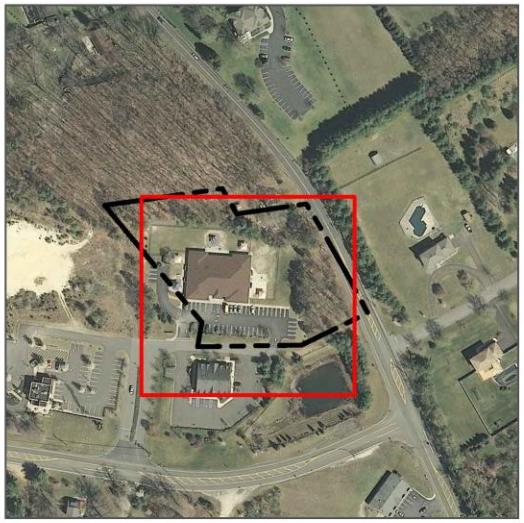
Block and Lot: Block 58, Lot 4.02

Parking spots can be replaced with porous asphalt to capture and infiltrate stormwater runoff. Installing a rain garden adjacent to the parking lot can also be built to capture, treat, and infiltrate parking lot runoff. Additionally, the paved play area on the eastern side of the learning canter can be replaced with porous pavement to capture and infiltrate runoff. A preliminary soil assessment suggests that more soil testing would be required before determining soil 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"
44	49,104	2.4	24.8	225.5	0.038	1.35

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.026	4	1,975	0.07	250	$1,250
Pervious pavements	0.341	57	25,858	0.97	3,900	$97,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



KinderCare at Millstone Township

- disconnected downspouts
- pervious pavements
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 30' 60'

MILLSTONE TOWNSHIP MIDDLE SCHOOL

Subwatershed: Millstone River

Site Area: 4,985,727 sq. ft.

Address: 5 Dawson Court
Millstone, NJ 08535

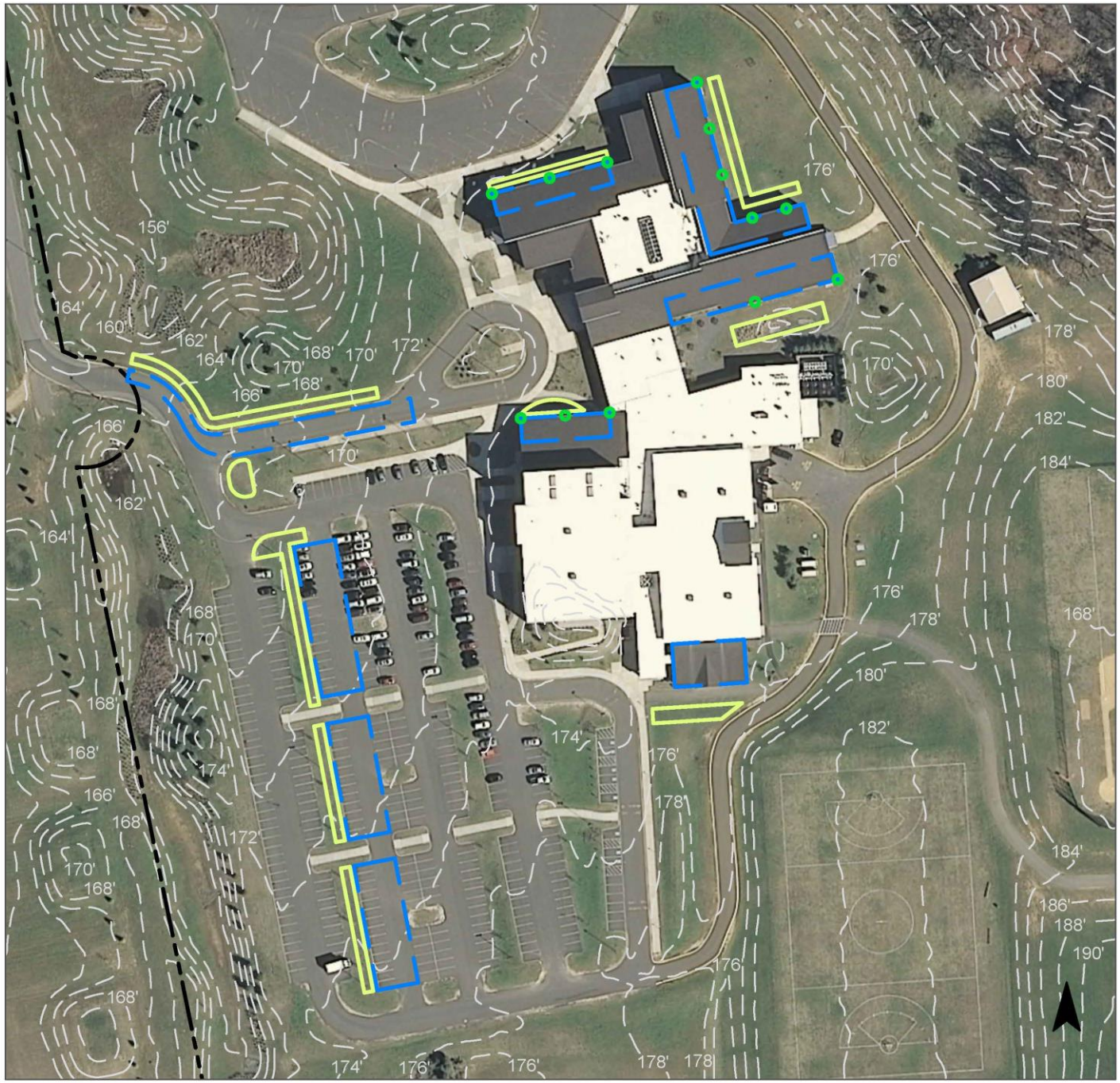
Block and Lot: Block 25, Lot 1.06

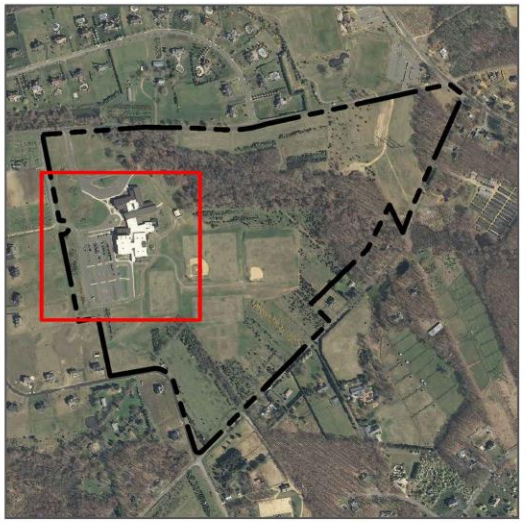
Rain gardens can be installed to capture, treat, and infiltrate parking lot and roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
4	206,151	9.9	104.1	946.5	0.161	5.65

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	0.907	152	68,696	2.58	13,500	$67,500

GREEN INFRASTRUCTURE RECOMMENDATIONS





Millstone Township Middle School

- disconnected downspouts
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 75' 150'

SAINT JOSEPH CATHOLIC CHURCH

Subwatershed: Millstone River

Site Area: 403,504 sq. ft.

Address: 91 Stillhouse Road
Millstone, NJ 08510

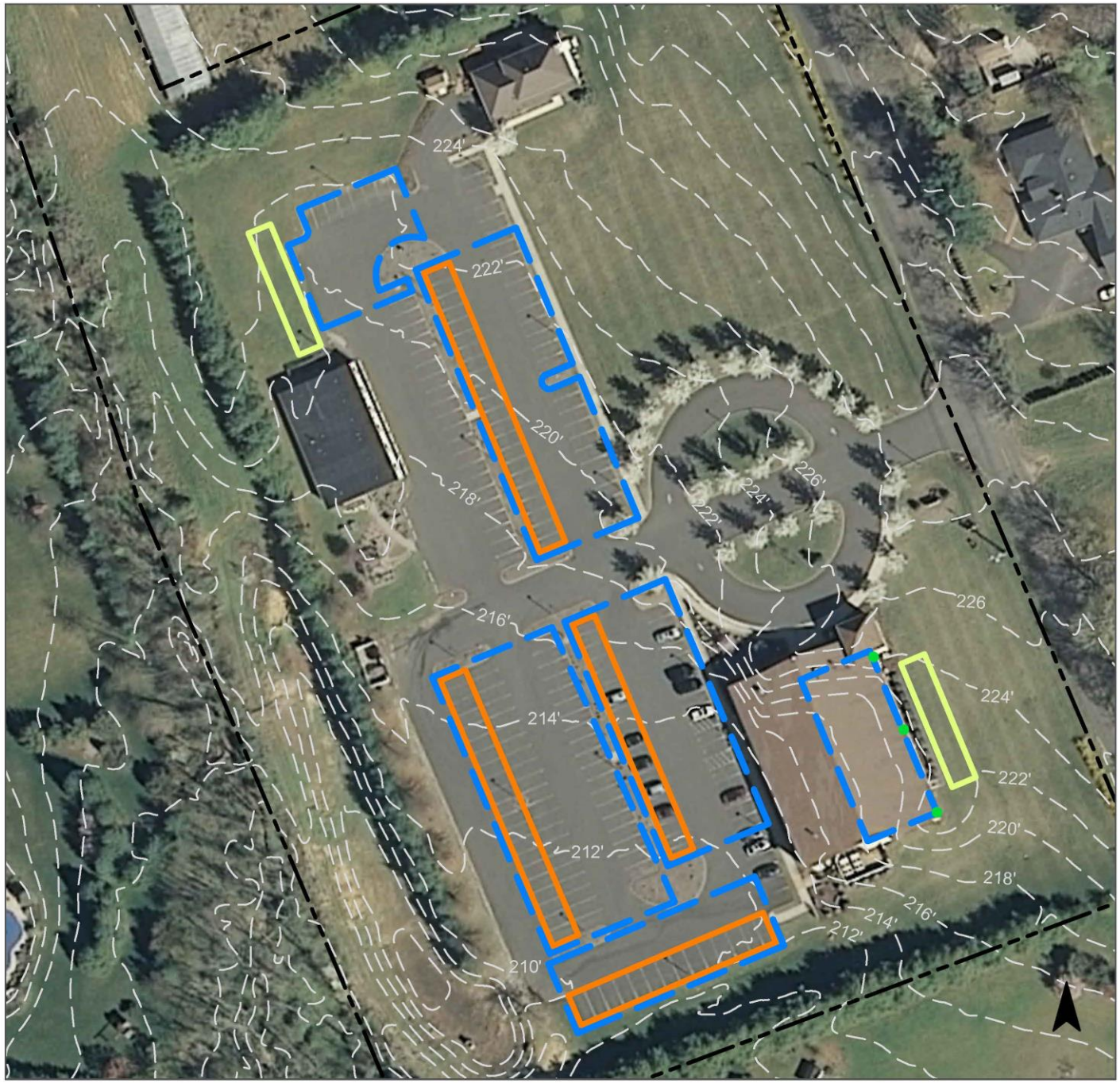
Block and Lot: Block 40.01, Lot 20

Rain gardens can be installed to capture, treat, and infiltrate runoff. Parking spaces can be replaced with porous asphalt to capture and infiltrate stormwater runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
38	152,229	7.3	76.9	698.9	0.119	4.18

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	0.284	48	21,520	0.81	2,800	$14,000
Pervious pavements	1.339	224	101,459	3.81	9,500	$237,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Saint Joseph Catholic Church

- disconnected downspouts
- pervious pavements
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 50' 100'

MILLSTONE TOWNSHIP ELEMENTARY SCHOOL

Subwatershed: **Rocky Brook**

Site Area: **1,123,211 sq. ft.**

Address: **308 Millstone Road**
Millstone, NJ 08510

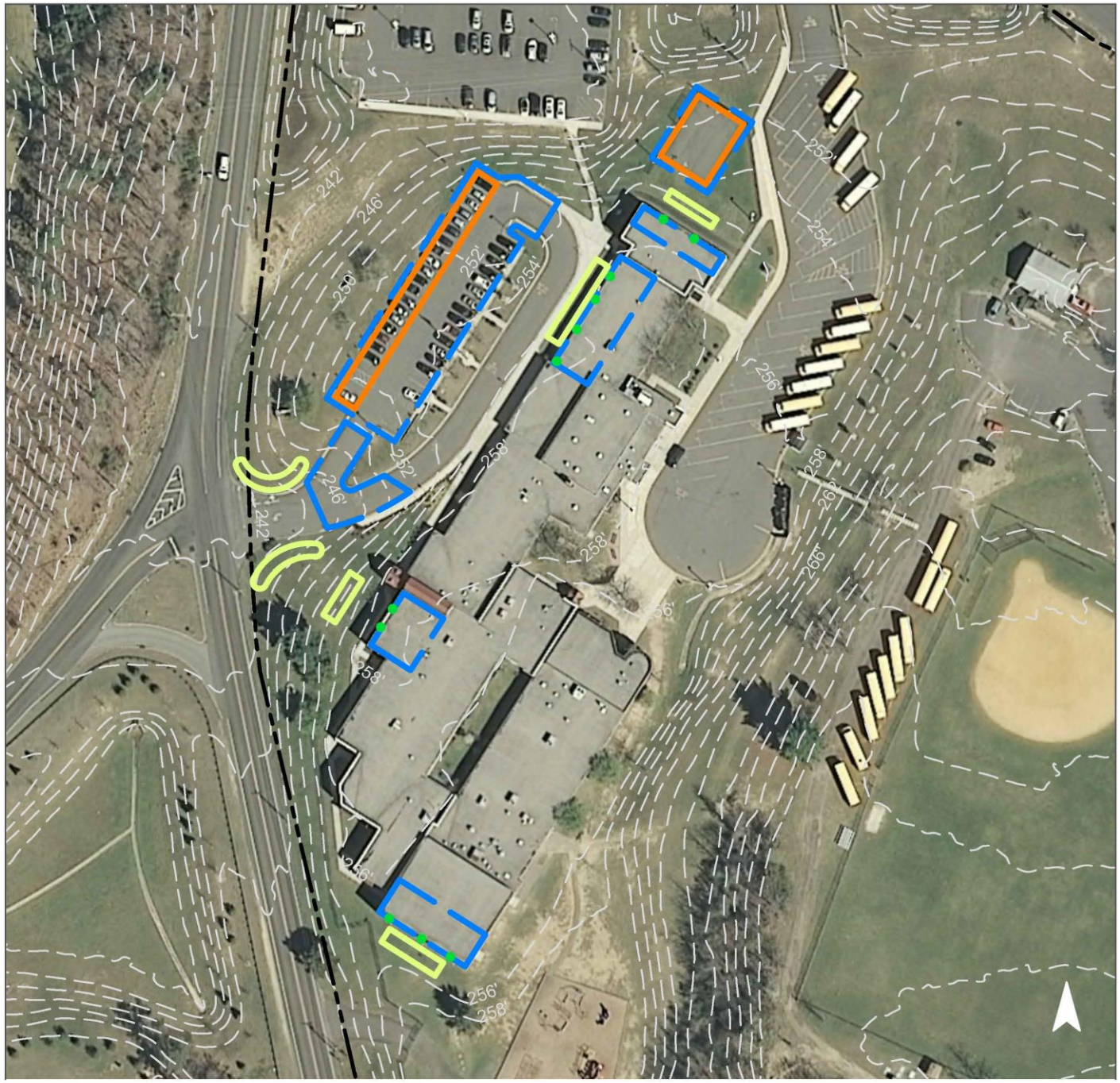
Block and Lot: **Block 49, Lot 1**

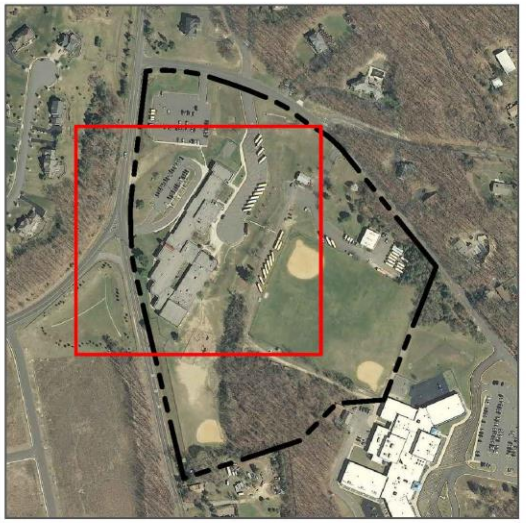
Parking spaces and the basketball court can be converted into pervious pavement to infiltrate runoff. Rain gardens can also be installed to capture, treat, and infiltrate roof and driveway runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
29	324,760	15.7	164.0	1,491.1	0.253	8.91

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	0.297	50	22,500	0.84	3,400	$17,000
Pervious pavements	0.464	78	35,134	1.32	6,100	$152,500

GREEN INFRASTRUCTURE RECOMMENDATIONS





Millstone Township Elementary School

- disconnected downspouts
- pervious pavements
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 60' 120'

MILLSTONE TOWNSHIP FIRST AID SQUAD / PUBLIC WORKS / ROCKY BROOK PARK

Subwatershed: Rocky Brook

Site Area: 207,912 sq. ft.

Address: 911 Perrineville Road
Millstone, NJ 08535

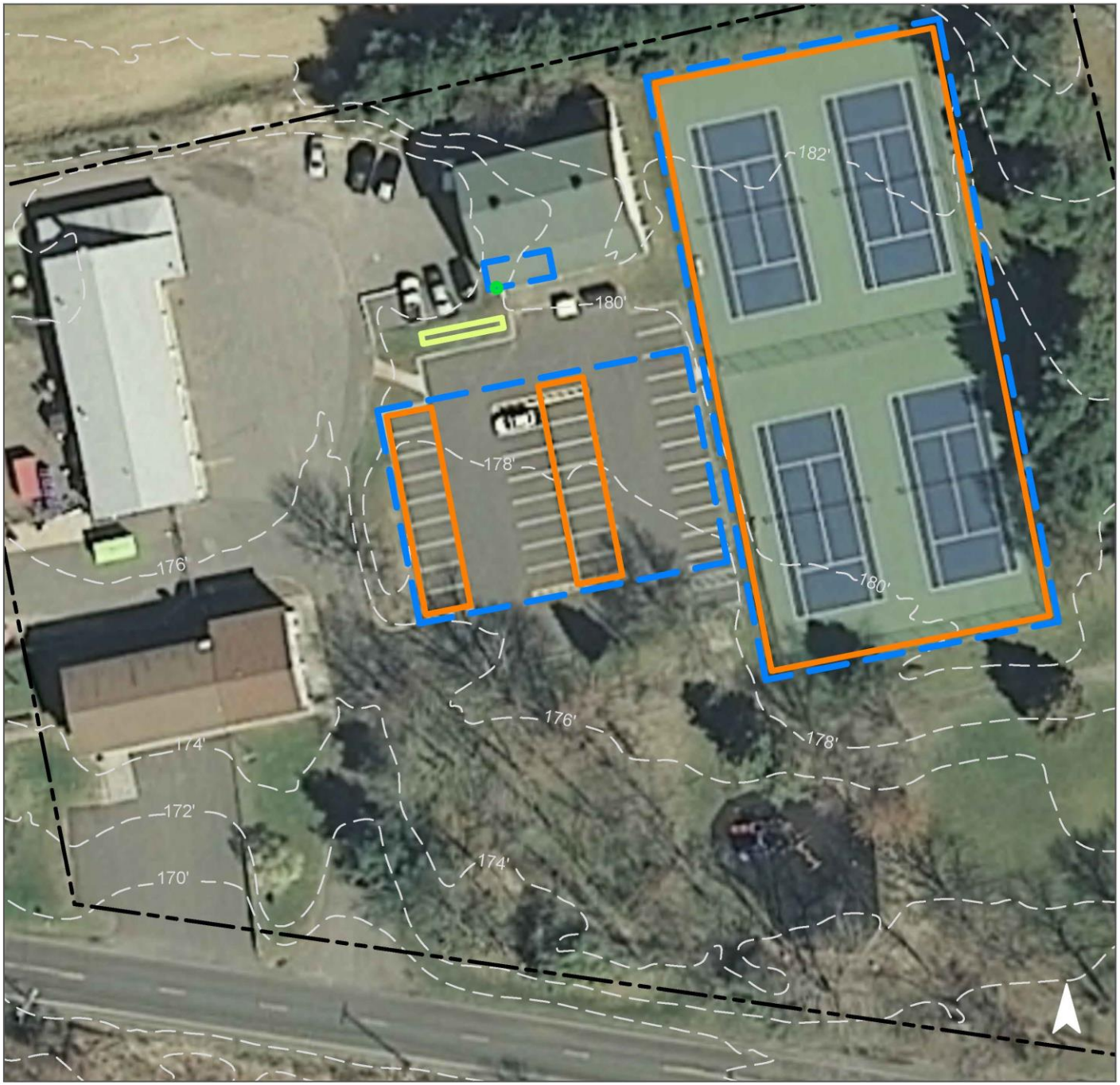
Block and Lot: Block 29, Lot 13

Tennis courts and parking spaces can be replaced with pervious pavement to capture and infiltrate runoff. A rain garden can be installed to capture, treat, and infiltrate roof 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"
48	99,140	4.8	50.1	455.2	0.077	2.72

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 systems	0.007	1	546	0.02	130	$650
Pervious pavements	1.011	169	76,588	2.88	29,000	$725,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Millstone Township First Aid Squad / Public Works / Rocky Brook Park

- disconnected downspouts
- pervious pavements
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 30' 60'

MILLSTONE TOWNSHIP MUNICIPAL COURT

Subwatershed: Rocky Brook

Site Area: 21,579 sq. ft.

Address: 215 Millstone Road
Millstone, NJ 08535

Block and Lot: Block 29, Lot 12.01

Parking spots can be replaced with porous asphalt to capture and infiltrate stormwater runoff. A preliminary soil assessment suggests that more soil testing would be required before determining soil 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	14,026	0.7	7.1	64.4	0.011	0.38

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	0.096	16	7,300	0.27	1,200	$30,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Millstone Township Municipal Court

- pervious pavements
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 10' 20'

MILLSTONE TOWNSHIP PRIMARY SCHOOL

Subwatershed: **Rocky Brook**

Site Area: **918,073 sq. ft.**

Address: **Schoolhouse Road**
Clarksburg, NJ 08510

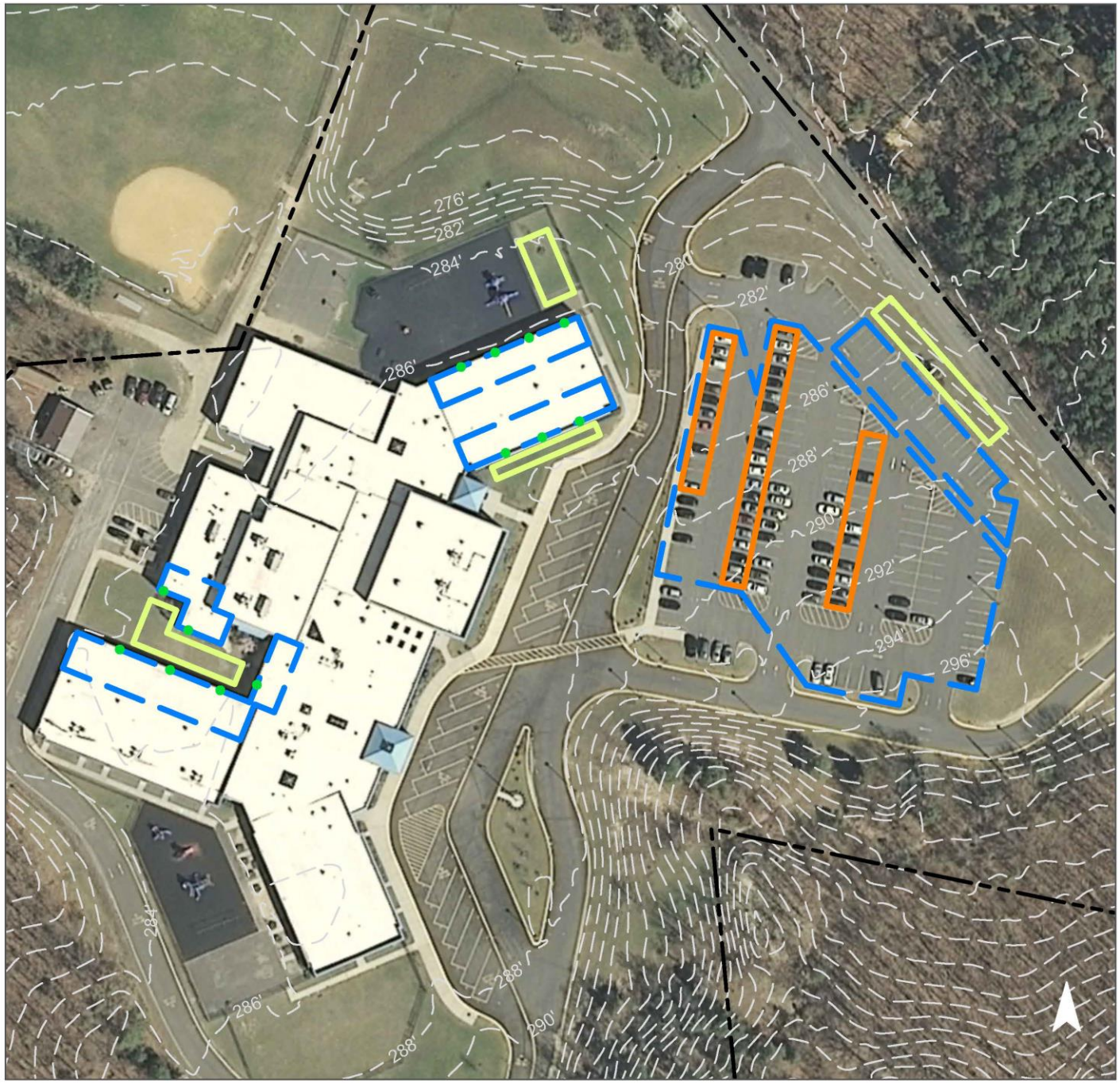
Block and Lot: **Block 49, Lot 2.01**

Rain gardens can be installed in the northeast of the parking lot to capture, treat, and infiltrate parking lot runoff. Additional rain gardens can be installed around the perimeter of the school to capture, treat, and infiltrate roof runoff. The disconnection of downspouts will be needed to redirect water to these rain gardens. Downspout planter boxes can be set up at the southern end of the school to reuse roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
35	319,780	15.4	161.5	1,468.2	0.249	8.77

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.511	85	38,687	1.45	6,500	$32,500
Pervious pavements	1.303	218	98,699	3.70	8,500	$212,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Millstone Township Primary School

- disconnected downspouts
- pervious pavements
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 60' 120'

UNITED PRESBYTERIAN CHURCH & SUNSHINE SCHOOLHOUSE

Subwatershed: Rocky Brook

Site Area: 107,641 sq. ft.

Address: 211 Millstone Road
Millstone, NJ 08510

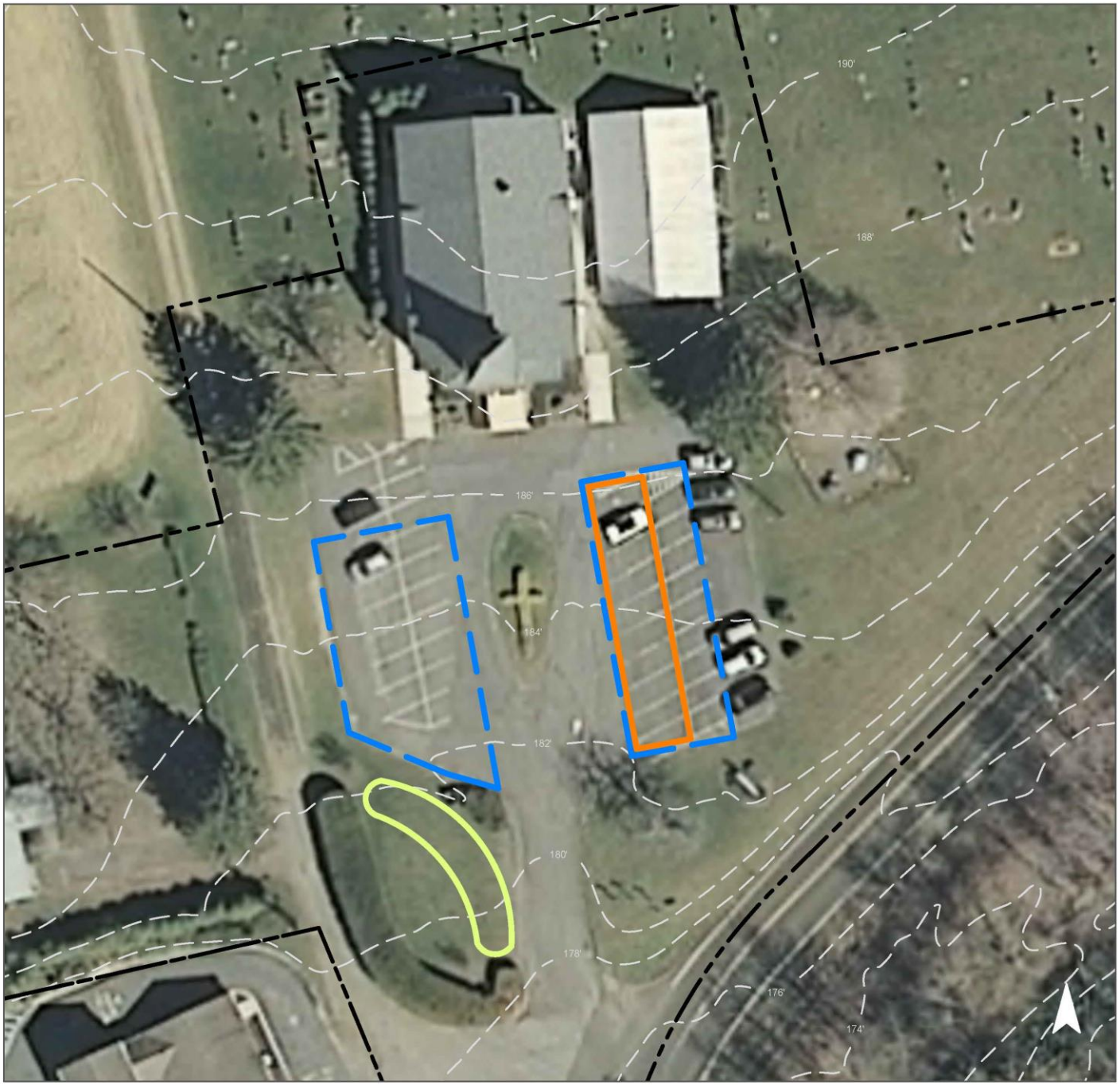
Block and Lot: Block 29, Lot 11

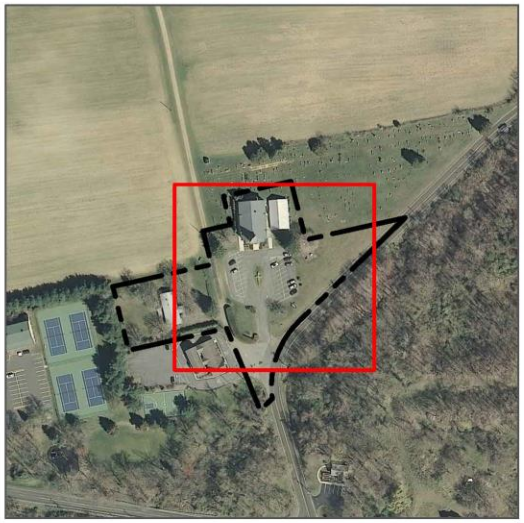
A rain garden can be built to capture, treat, and infiltrate parking lot runoff. Parking spaces can be replaced with porous asphalt to capture and infiltrate additional runoff. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for 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"
42	44,767	2.2	22.6	205.5	0.035	1.23

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	0.091	15	6,912	0.26	900	$4,500
Pervious pavements	0.078	13	5,924	0.22	1,500	$37,500

GREEN INFRASTRUCTURE RECOMMENDATIONS





United Presbyterian Church & Sunshine Schoolhouse

- pervious pavements
- bioretention / rain gardens
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 25' 50'

d. Summary of Existing Conditions

Summary of Existing Site Conditions

Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	Existing Annual Loads TP (lb/yr)	Existing Annual Loads TN (lb/yr)	Existing Annual Loads TSS (lb/yr)	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Runoff Volumes from I.C. Annual (Mgal)
DOCTORS CREEK SUBWATERSHED	**1.00**	**43,551**			**0.8**	**8.9**	**80.8**		**0.40**	**17,596**	**0.014**	**0.48**
U.S. Post Office												
Total Site Info	1.00	43,551	49	20.19	0.8	8.9	80.8	40	0.40	17,596	0.014	0.48
LAHAWAY CREEK SUBWATERSHED	**2.54**	**110,793**			**2.4**	**24.8**	**225.5**		**1.13**	**49,104**	**0.038**	**1.35**
KinderCare at Millstone Township												
Total Site Info	2.54	110,793	58	4.02	2.4	24.8	225.5	44	1.13	49,104	0.038	1.35
MILLSTONE RIVER SUBWATERSHED	**123.72**	**5,389,231**			**17.3**	**181.0**	**1,645.5**		**8.23**	**358,380**	**0.279**	**9.83**
Millstone Township Middle School												
Total Site Info	114.46	4,985,727	25	1.06	9.9	104.1	946.5	4	4.73	206,151	0.161	5.65
Saint Joseph Catholic Church												
Total Site Info	9.26	403,504	40.01	20	7.3	76.9	698.9	38	3.49	152,229	0.119	4.18
ROCKY BROOK SUBWATERSHED	**54.60**	**2,378,416**			**38.7**	**405.3**	**3,684.4**		**18.42**	**802,473**	**0.625**	**22.01**
Millstone Township Elementary School												
Total Site Info	25.79	1,123,211	49	1	15.7	164.0	1,491.1	29	7.46	324,760	0.253	8.91
Millstone Township First Aid Squad / Public Works / Rocky Brook Park												
Total Site Info	4.77	207,912	29	13	4.8	50.1	455.2	48	2.28	99,140	0.077	2.72
Millstone Township Municipal Court												
Total Site Info	0.50	21,579	29	12.01	0.7	7.1	64.4	65	0.32	14,026	0.011	0.38
Millstone Township Primary School												
Total Site Info	21.08	918,073	49	2.01	15.4	161.5	1,468.2	35	7.34	319,780	0.249	8.77

Summary of Existing Site Conditions

Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	Existing Annual Loads TP (lb/yr)	Existing Annual Loads TN (lb/yr)	Existing Annual Loads TSS (lb/yr)	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C. Water Quality Storm (1.25" over 2-hours) (Mgal)	Runoff Volumes from I.C. Annual (Mgal)
United Presbyterian & Sunshine Schoolhouse												
Total Site Info	2.47	107,641	29	11	2.2	22.6	205.5	42	1.03	44,767	0.035	1.23

e. 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 (SF)	Unit Cost ($)	Unit	Total Cost ($)	I.C. Treated %
		Area (SF)	Area (ac)									
	DOCTORS CREEK SUBWATERSHED	**7,800**	**0.18**	**0.203**	**34**	**15,394**	**0.58**	**3,700**			**$58,500**	**44.3%**
1	**U.S. Post Office**											
	Bioretention systems/rain gardens	3,900	0.09	0.102	17	7,697	0.29	1,700	5	SF	$8,500	22.2%
	Pervious pavements	3,900	0.09	0.102	17	7,697	0.29	2,000	25	SF	$50,000	22.2%
	Total Site Info	**7,800**	**0.18**	**0.203**	**34**	**15,394**	**0.58**	**3,700**			**$58,500**	**44.3%**
	LAHAWAY CREEK SUBWATERSHED	**14,100**	**0.32**	**0.367**	**62**	**27,833**	**1.04**	**4,150**			**$98,750**	**28.7%**
2	**KinderCare at Millstone Township**											
	Bioretention systems/rain gardens	1,000	0.02	0.026	4	1,975	0.07	250	5	SF	$1,250	2.0%
	Pervious pavements	13,100	0.30	0.341	57	25,858	0.97	3,900	25	SF	$97,500	26.7%
	Total Site Info	**14,100**	**0.32**	**0.367**	**62**	**27,833**	**1.04**	**4,150**			**$98,750**	**28.7%**
	MILLSTONE RIVER SUBWATERSHED	**97,100**	**2.23**	**2.530**	**424**	**191,675**	**7.20**	**25,800**			**$319,000**	**27.1%**
3	**Millstone Township Middle School**											
	Bioretention systems/rain gardens	34,800	0.80	0.907	152	68,696	2.58	13,500	5	SF	$67,500	16.9%
	Total Site Info	**34,800**	**0.80**	**0.907**	**152**	**68,696**	**2.58**	**13,500**			**$67,500**	**16.9%**
4	**Saint Joseph Catholic Church**											
	Bioretention systems/rain gardens	10,900	0.25	0.284	48	21,520	0.81	2,800	5	SF	$14,000	7.2%
	Pervious pavements	51,400	1.18	1.339	224	101,459	3.81	9,500	25	SF	$237,500	33.8%
	Total Site Info	**62,300**	**1.43**	**1.623**	**272**	**122,979**	**4.62**	**12,300**			**$251,500**	**40.9%**
	ROCKY BROOK SUBWATERSHED	**148,075**	**3.40**	**3.858**	**646**	**292,288**	**10.96**	**57,230**			**$1,212,150**	**18.5%**
4	**Millstone Township Elementary School**											
	Bioretention systems/rain gardens	11,400	0.26	0.297	50	22,500	0.84	3,400	5	SF	$17,000	3.5%
	Pervious pavements	17,800	0.41	0.464	78	35,134	1.32	6,100	25	SF	$152,500	5.5%
	Total Site Info	**29,200**	**0.67**	**0.761**	**127**	**57,633**	**2.16**	**9,500**			**$169,500**	**9.0%**

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 (SF)	Unit Cost ($)	Unit	Total Cost ($)	I.C. Treated %
		Area (SF)	Area (ac)									
6	**Millstone Township First Aid Squad / Public Works / Rocky Brook Park**											
	Bioretention systems/rain gardens	275	0.01	0.007	1	546	0.02	130	5	SF	$650	0.3%
	Pervious pavements	38,800	0.89	1.011	169	76,588	2.88	29,000	25	SF	$725,000	39.1%
	Total Site Info	**39,075**	**0.90**	**1.018**	**170**	**77,134**	**2.90**	**29,130**			**$725,650**	**39.4%**
7	**Millstone Township Municipal Court**											
	Pervious pavements	3,700	0.08	0.096	16	7,300	0.27	1,200	25	SF	$30,000	26.4%
	Total Site Info	**3,700**	**0.08**	**0.096**	**16**	**7,300**	**0.27**	**1,200**			**$30,000**	**26.4%**
8	**Millstone Township Primary School**											
	Bioretention systems/rain gardens	19,600	0.45	0.511	85	38,687	1.45	6,500	5	SF	$32,500	6.1%
	Pervious pavements	50,000	1.15	1.303	218	98,699	3.70	8,500	25	SF	$212,500	15.6%
	Total Site Info	**69,600**	**1.60**	**1.813**	**304**	**137,385**	**5.15**	**15,000**			**$245,000**	**21.8%**
9	**United Presbyterian & Sunshine Schoolhouse**											
	Bioretention systems/rain gardens	3,500	0.08	0.091	15	6,912	0.26	900	5	SF	$4,500	7.8%
	Pervious pavements	3,000	0.07	0.078	13	5,924	0.22	1,500	25	SF	$37,500	6.7%
	Total Site Info	**6,500**	**0.15**	**0.169**	**28**	**12,836**	**0.48**	**2,400**			**$42,000**	**14.5%**