



**Impervious Cover Reduction Action Plan  
for  
The Town of Newton, Sussex County, New Jersey**

*Prepared for the Town of Newton by the  
Rutgers Cooperative Extension Water Resources Program*

December 9, 2016



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## **Introduction**

Located in Sussex County in central New Jersey, the Town of Newton covers approximately 3.38 square miles south of Hampton Township. Figures 1 and 2 illustrate that the Town of Newton is dominated by urban land uses. A total of 58.4% of the municipality's land use is classified as urban. Of the urban land in the Town of Newton, medium density 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 the Town of Newton 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 the Town of Newton. Based upon the 2007 NJDEP land use/land cover data, approximately 38.3% of the Town of Newton has impervious cover. This level of impervious cover suggests that the streams in the Town of Newton are likely non-supporting streams.<sup>1</sup>

## **Methodology**

The Town of Newton contains portions of three 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.

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<sup>1</sup> 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

# Land Use for The Town of Newton

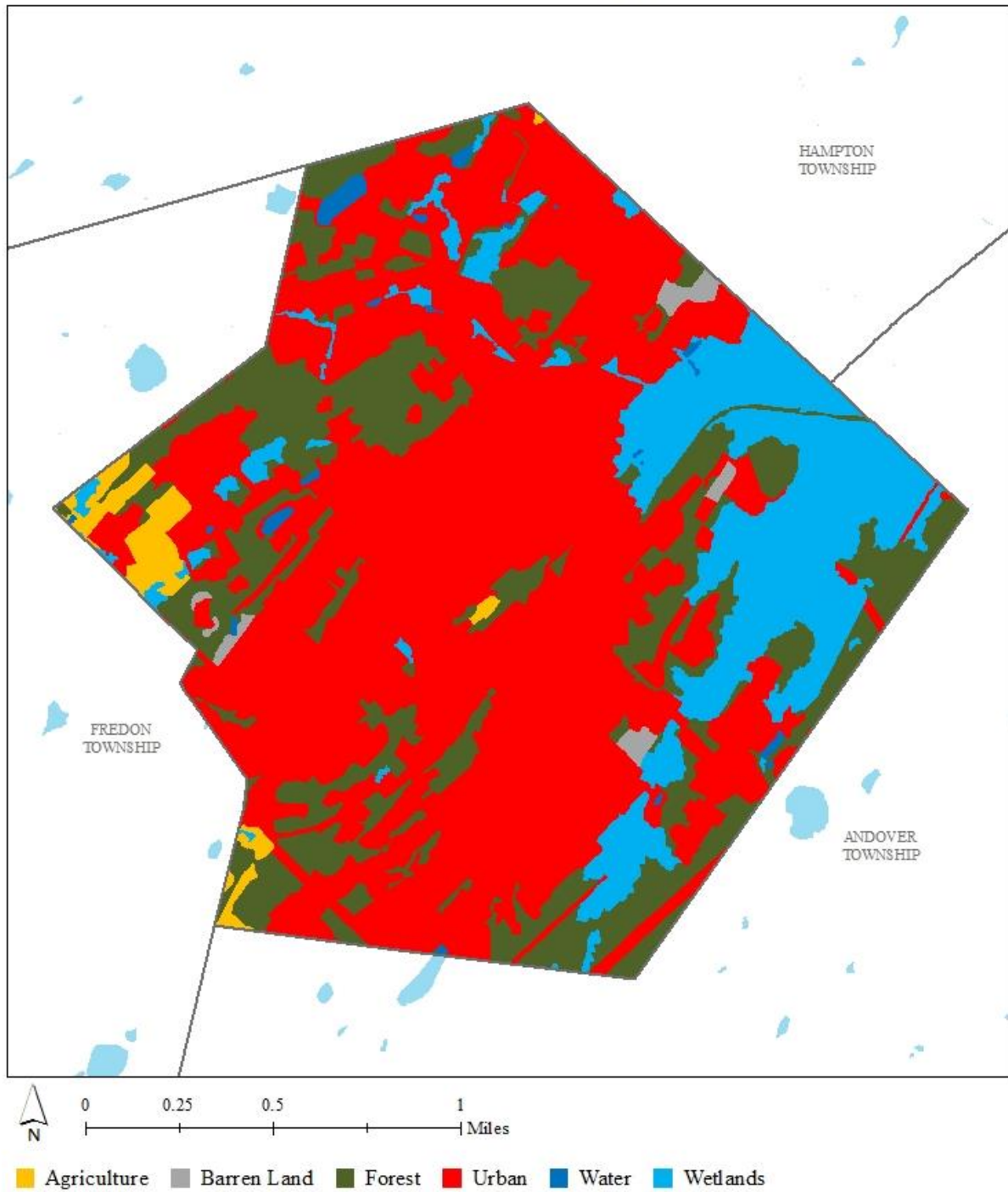


Figure 4: Map illustrating the land use in the Town of Newton

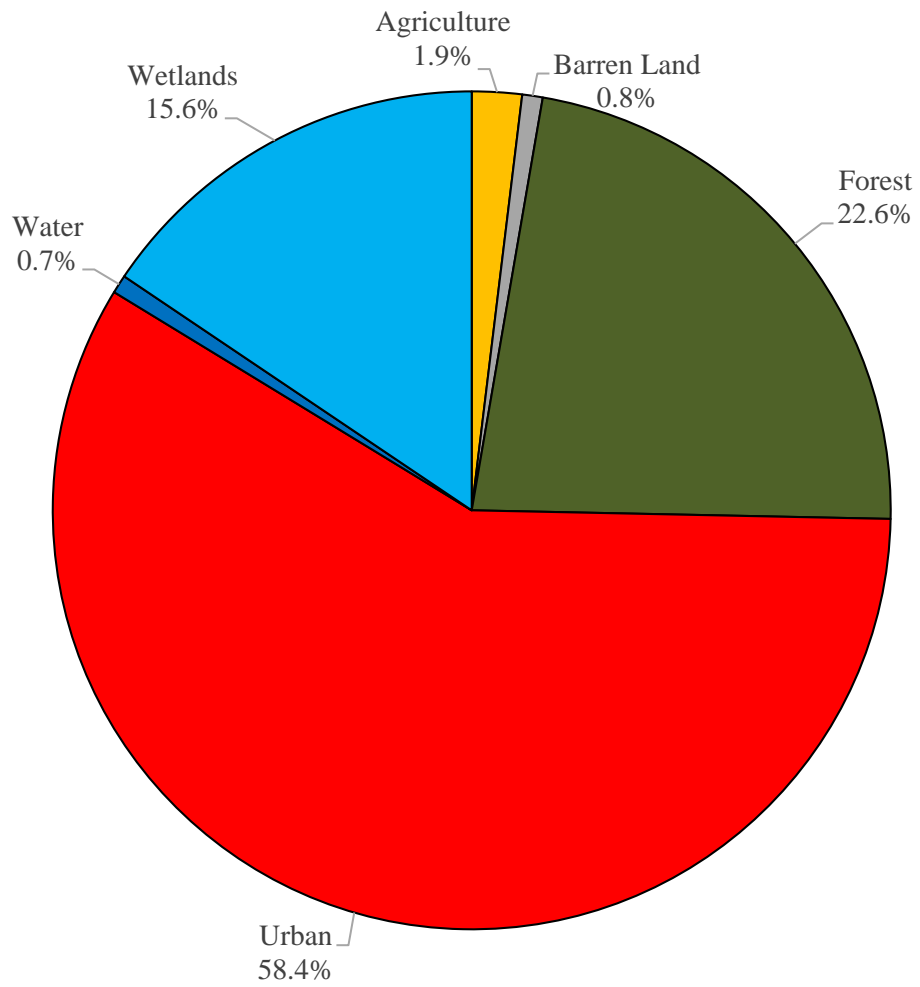


Figure 3: Pie chart illustrating the land use in the Town of Newton

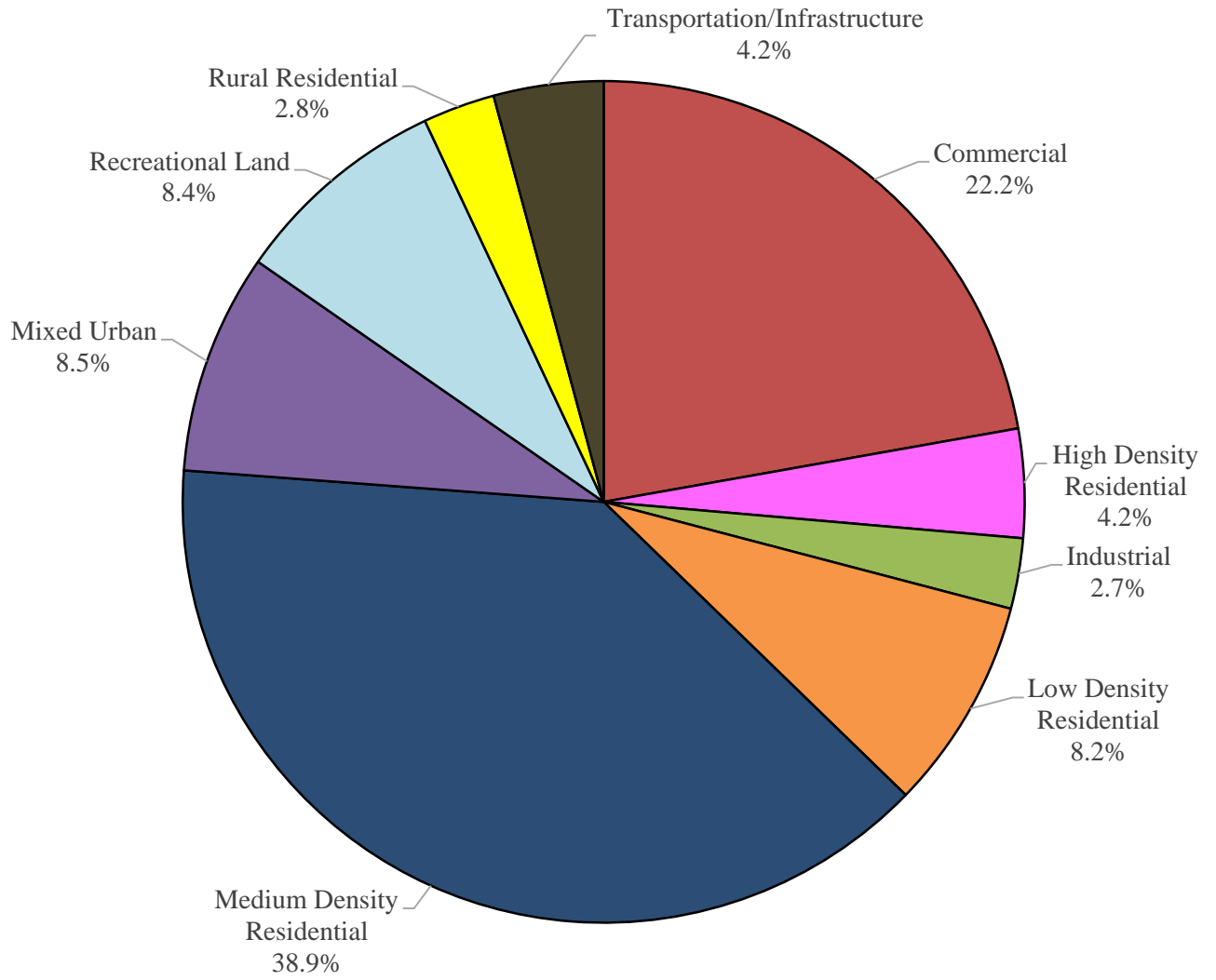


Figure 5: Pie chart illustrating the various types of urban land use in the Town of Newton

### Subwatersheds of The Town of Newton

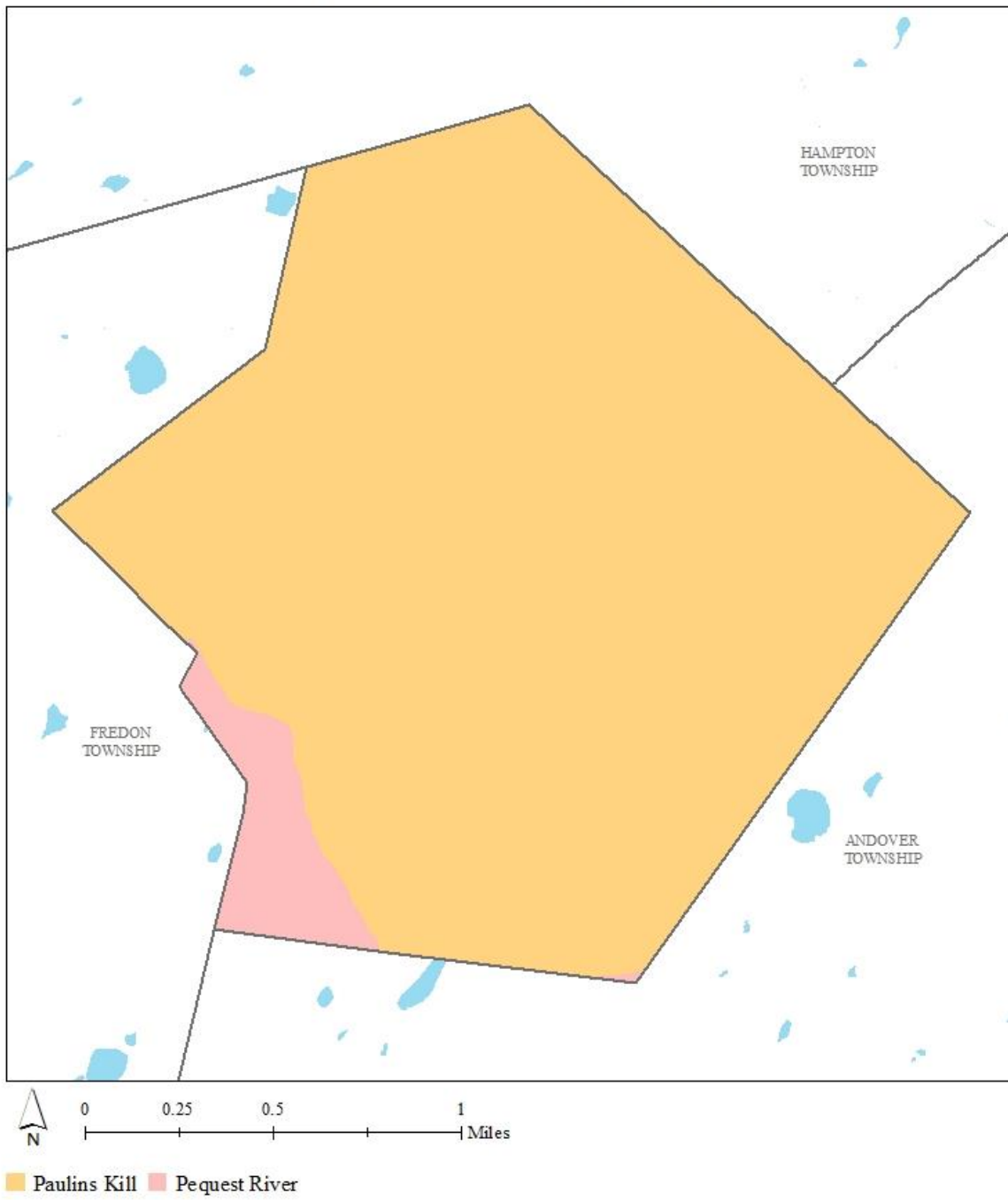


Figure 6: Map of the subwatersheds in the Town of Newton

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 the Town of Newton 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<sup>2</sup>

<b>Land Cover</b>	<b>TP load (lbs/acre/yr)</b>	<b>TN load (lbs/acre/yr)</b>	<b>TSS load (lbs/acre/yr)</b>
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

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<sup>2</sup> 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<sup>3</sup>. A wide range of green infrastructure practices have been evaluated for the potential project sites in the Town of Newton. 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.



<sup>3</sup> 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](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.



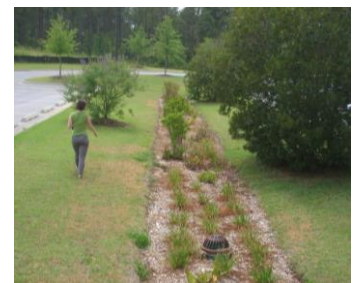
### ***Rainwater harvesting systems (cistern or rain barrel)***

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.<sup>4</sup>

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<sup>4</sup> 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.*

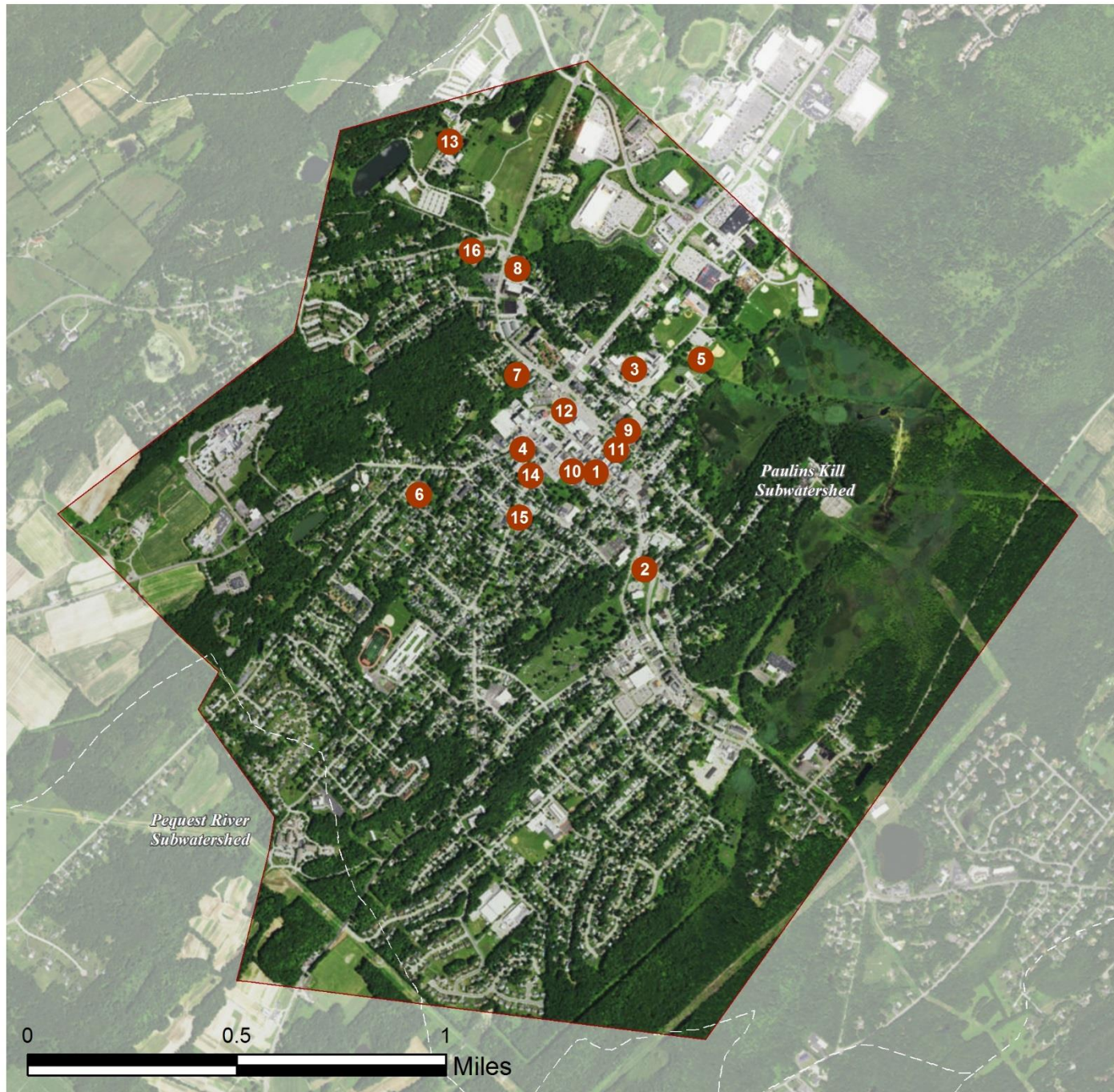
## **Conclusion**

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. Green Infrastructure Sites**

## NEWTON: GREEN INFRASTRUCTURE SITES



### SITES WITHIN THE PAULINS KILL SUBWATERSHED:

1. Adams Street Parking Lot
2. Christ Community Church
3. De Pasquale Plaza/Campbell's Small Engine Sales
4. First Presbyterian Church
5. Memory Park
6. Newton Covenant Reformed Church
7. Newton Firehouse #1
8. Newton Memorial Post 5360 VFW
9. Newton Police Department & Municipal Building
10. Newton Public Parking Lot #2
11. Newton Public Parking Lot #3 / Western Plaza Parking Lot
12. Sussex County Administration Building
13. Sussex County Community College
14. Sussex County Historical Memorial Museum
15. Sussex County Library- Dennis Branch
16. Swartwood Garden Apartments

## **b. Proposed Green Infrastructure Concepts**



# ADAMS STREET PARKING LOT



**Subwatershed:** Paulins Kill

**Site Area:** 32,783 sq. ft.

**Address:** 166 Spring Street  
Newton, NJ 07860

**Block and Lot:** Block 8.08, Lot  
19,30,31

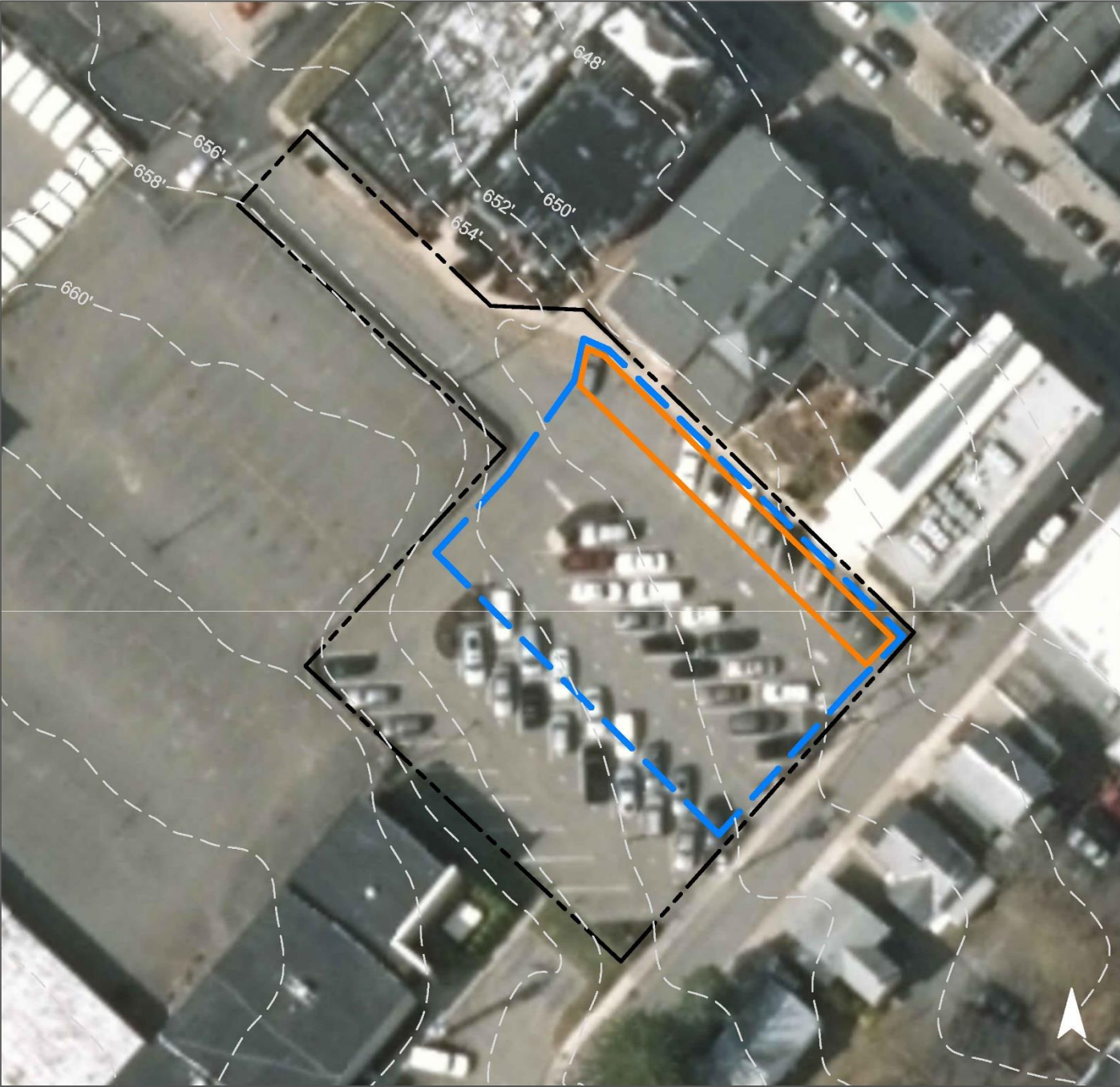


Parking spaces behind the shopping complex can be replaced with porous asphalt to infiltrate stormwater. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
90	21,858	1.1	11.0	110.4	0.017	0.60

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	0.283	47	20,727	0.78	1,938	\$48,450

# GREEN INFRASTRUCTURE RECOMMENDATIONS



**Adams Street Parking Lot**

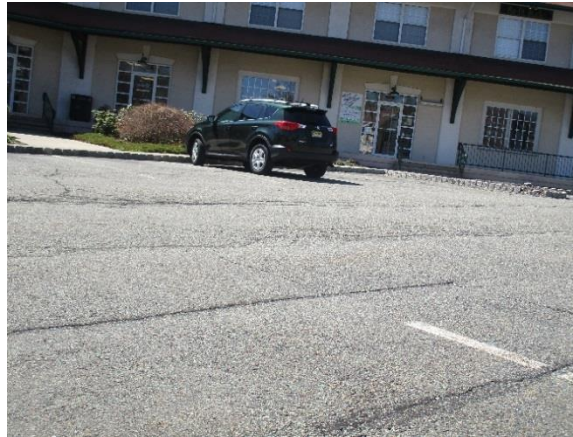
-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# CHRIST COMMUNITY CHURCH



**Subwatershed:** Paulins Kill  
**Site Area:** 118,997 sq. ft.  
**Address:** 274 Spring Street #1  
Newton, NJ 07860  
**Block and Lot:** Block 18.02, Lot 1

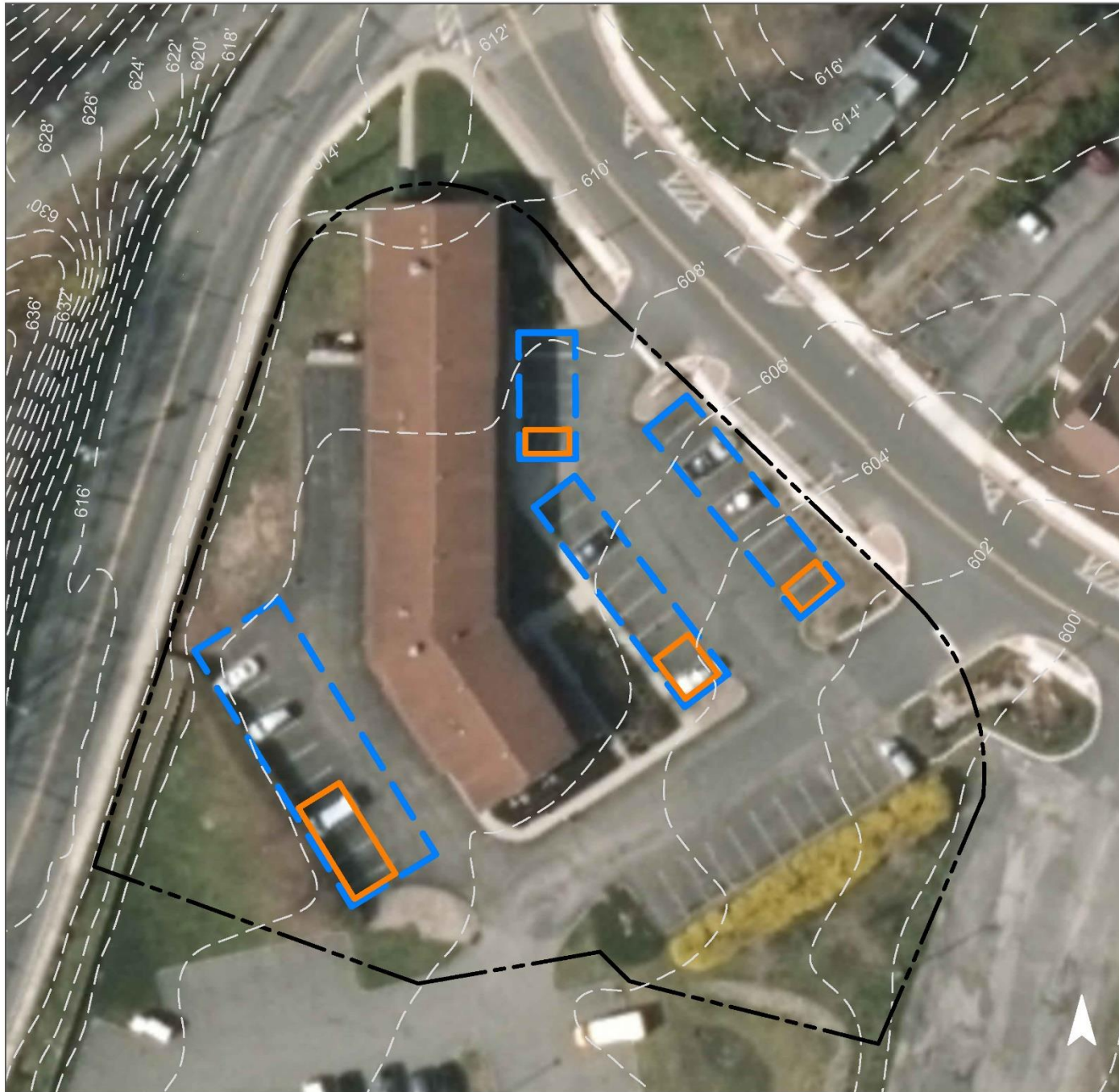


Parking spaces around the building can be replaced with pervious pavement to capture and infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





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"
74	37,346	1.8	18.9	171.5	0.029	1.02

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	0.172	29	12,192	0.49	1,180	\$29,500

# GREEN INFRASTRUCTURE RECOMMENDATIONS



## Christ Community Church

-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# DE PASQUALE PLAZA / CAMPBELL'S SMALL ENGINE SALES



**Subwatershed:** Paulins Kill

**Site Area:** 588,614 sq. ft.

**Address:** 10 East Clinton Street  
Newton, NJ 07860

**Block and Lot:** Block 9.03, Lot  
25,26,27

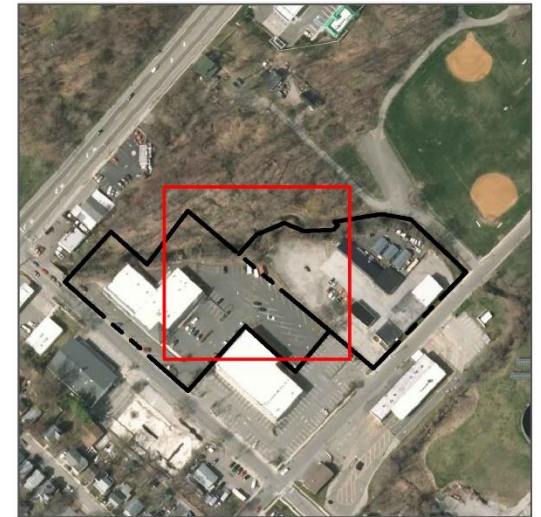
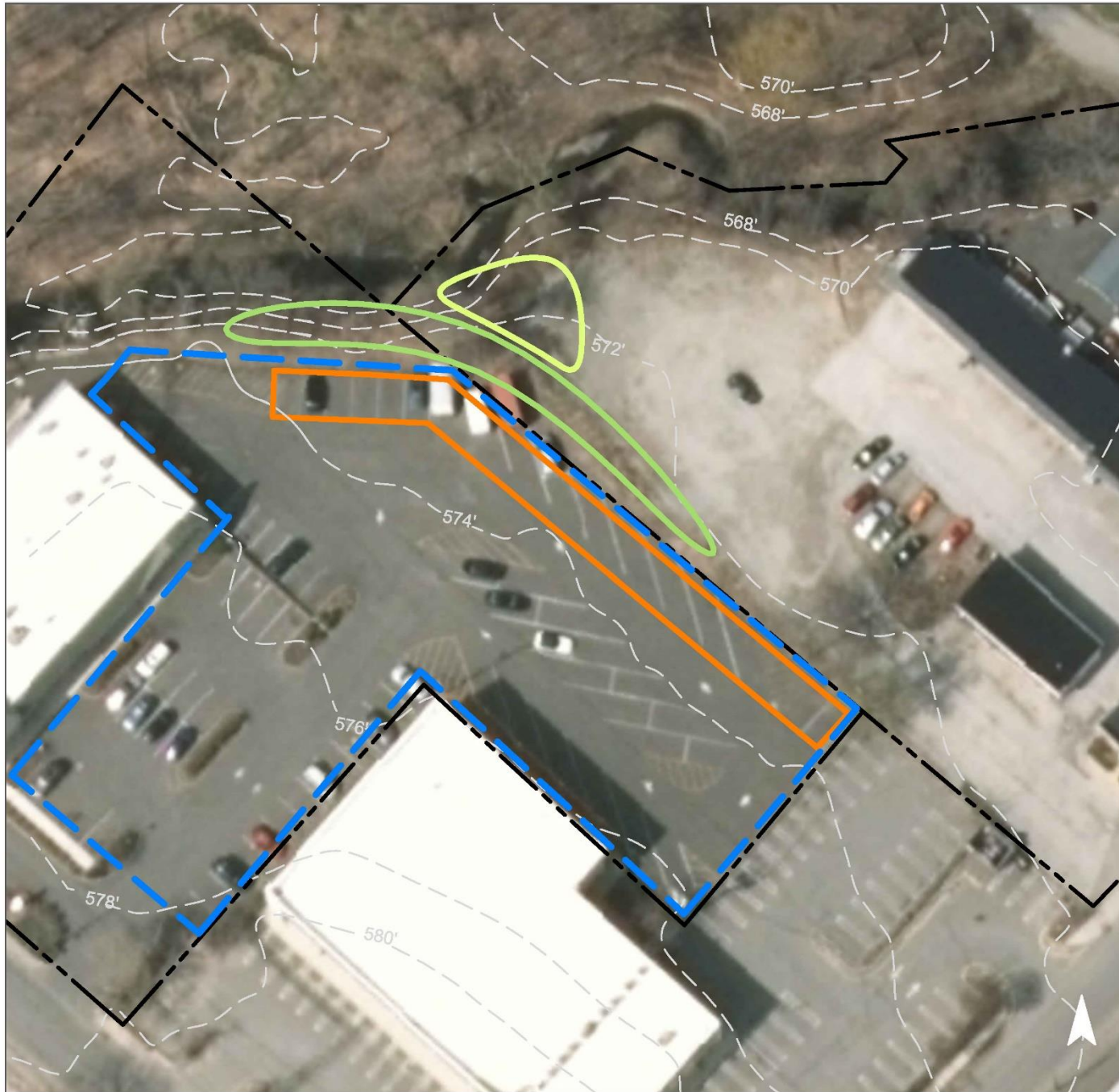


Parking spots in the north end of the lot can be replaced with porous asphalt to help reduce runoff from the lot. Rain gardens and bioswales adjacent to the building can serve as overflow containment to further capture, treat, and infiltrate runoff. A preliminary soil assessment suggests that the soils 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"
77	150,552	7.3	76.0	691.2	0.117	4.13

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	0.109	18	7,989	0.30	1,430	\$7,150
Bioswale	0.221	37	16,187	0.61	2,900	\$14,500
Pervious pavement	0.360	60	26,367	0.99	4,721	\$118,025

# GREEN INFRASTRUCTURE RECOMMENDATIONS



**De Pasquale Plaza /  
Campbell's Small Engine  
Sales**

-  bioretention system
-  bioswale
-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# FIRST PRESBYTERIAN CHURCH



**Subwatershed:** Paulins Kill  
**Site Area:** 25,849 sq. ft.  
**Address:** 54 High Street  
Newton, NJ 07860  
**Block and Lot:** Block 8.01, Lot 1

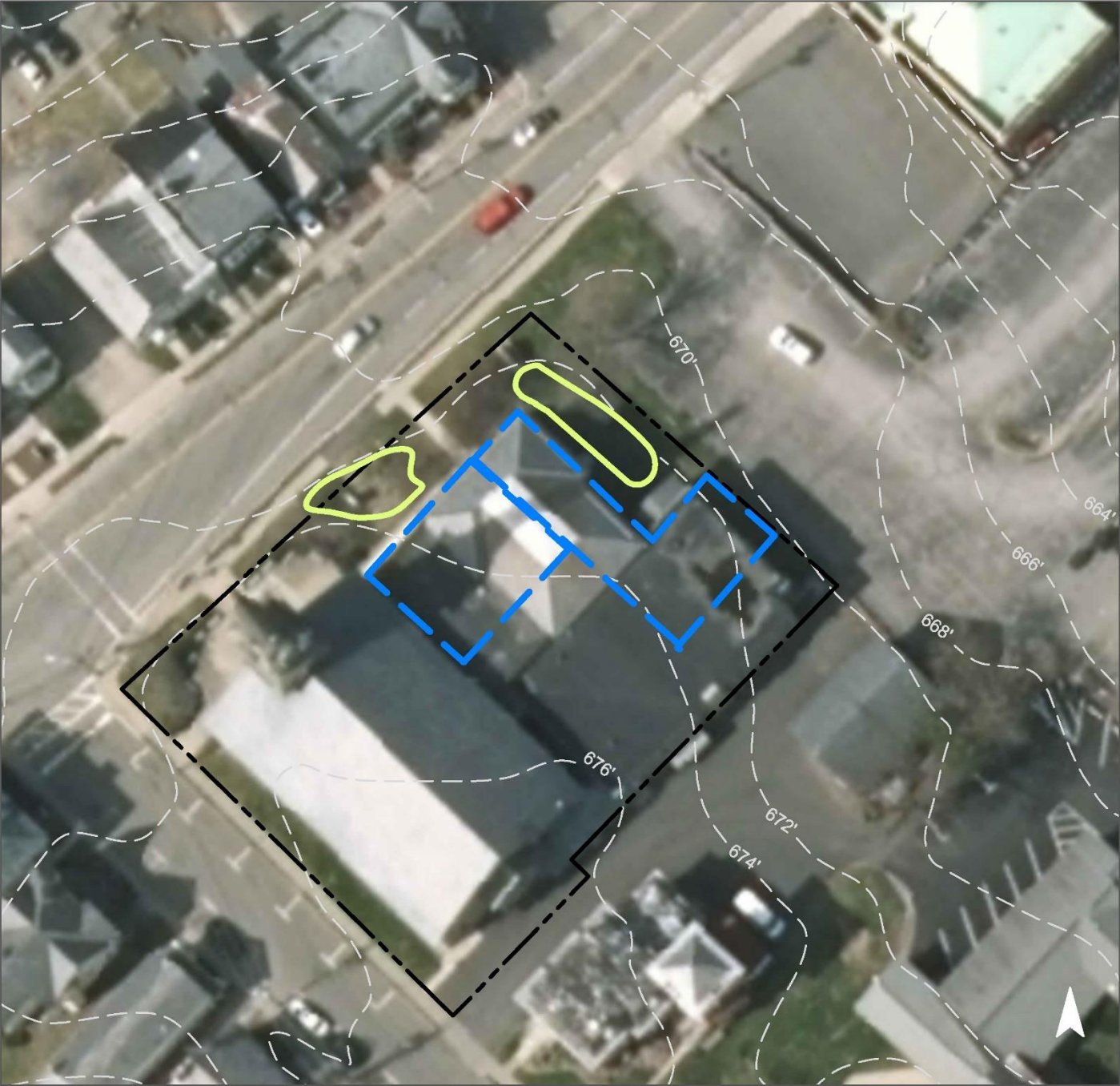


Rain gardens adjacent to the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





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"
90	23,264	1.1	11.7	106.8	0.018	0.64

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	0.122	20	8,976	0.34	1,175	\$72,850

# GREEN INFRASTRUCTURE RECOMMENDATIONS



## First Presbyterian Church

-  bioretention system
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS





# MEMORY PARK



**Subwatershed:** Paulins Kill  
**Site Area:** 9,886,292 sq. ft.  
**Address:** 111 Moran Street  
Newton, NJ 07860  
**Block and Lot:** Block 5.06, Lot 1



Rain gardens adjacent parking lot can capture, treat, and infiltrate roof runoff. Parking spots in the lot to the west of the field can be replaced with porous asphalt to help capture 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"
14	223,348	10.8	112.8	1,025.5	0.174	6.13

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	0.641	107	47,004	1.77	6,150	\$30,750
Pervious pavement	0.222	37	16,262	0.61	1,100	\$27,500

# GREEN INFRASTRUCTURE RECOMMENDATIONS



## Memory Park

-  bioretention system
-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# NEWTON COVENANT REFORMED CHURCH



**Subwatershed:** Paulins Kill

**Site Area:** 71,044 sq. ft.

**Address:** 23 Thompson Street  
Newton, NJ 07860

**Block and Lot:** Block 7.03, Lot 1

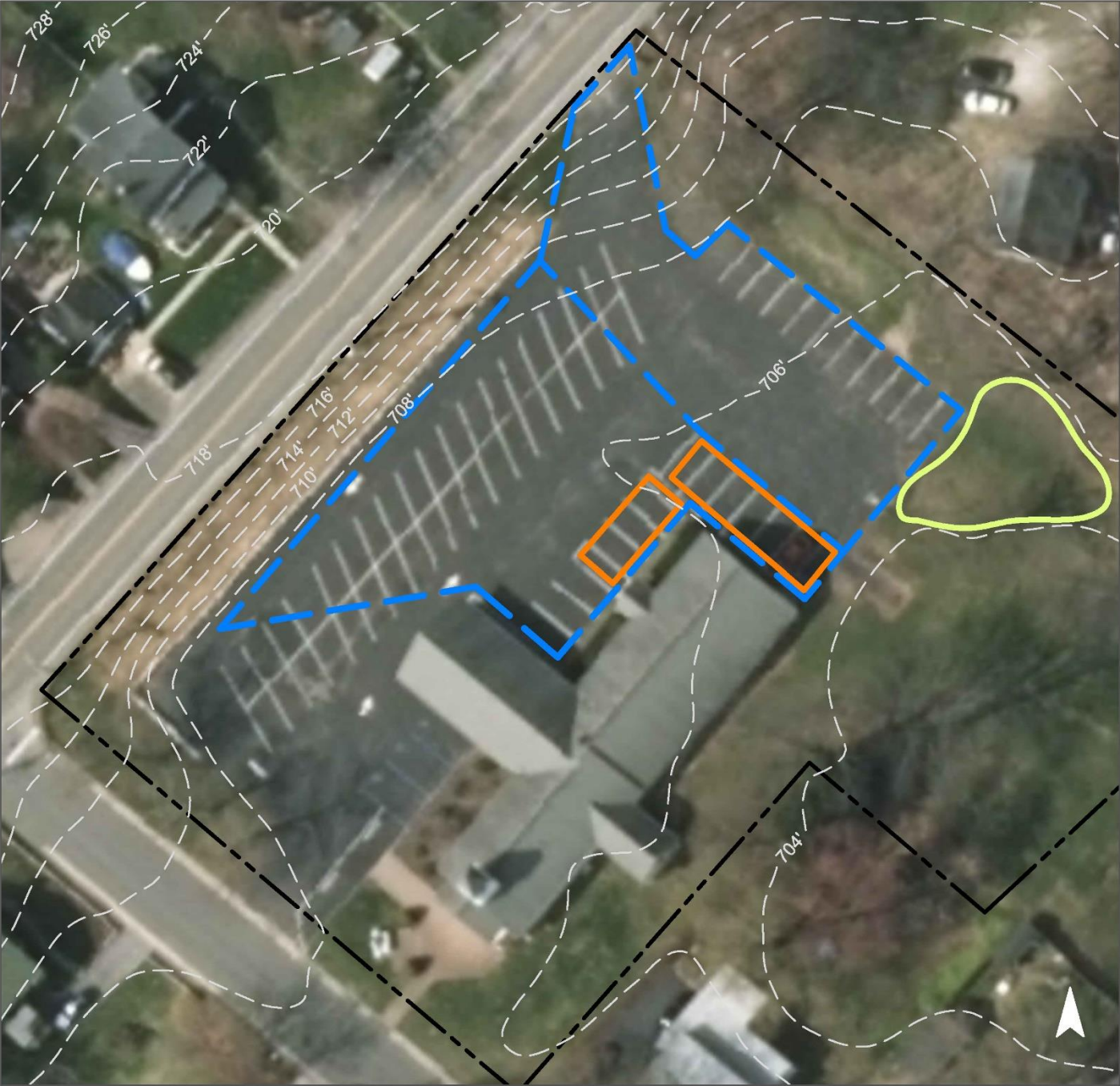


Parking spaces in front of the building can be replaced with porous asphalt to infiltrate stormwater. Rain gardens adjacent to the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.






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"
66	46,847	2.3	23.7	215.1	0.037	1.28

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	0.215	36	15,745	0.59	2,061	\$10,305
Pervious pavement	0.277	46	20,278	0.76	1,895	\$47,375

# GREEN INFRASTRUCTURE RECOMMENDATIONS



**Newton Covenant Reformed Church**

-  bioretention system
-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# NEWTON FIREHOUSE #1



**Subwatershed:** Paulins Kill  
**Site Area:** 72,574 sq. ft.  
**Address:** 22 Mill Street  
Newton, NJ 07860  
**Block and Lot:** Block 5.01, Lot 9

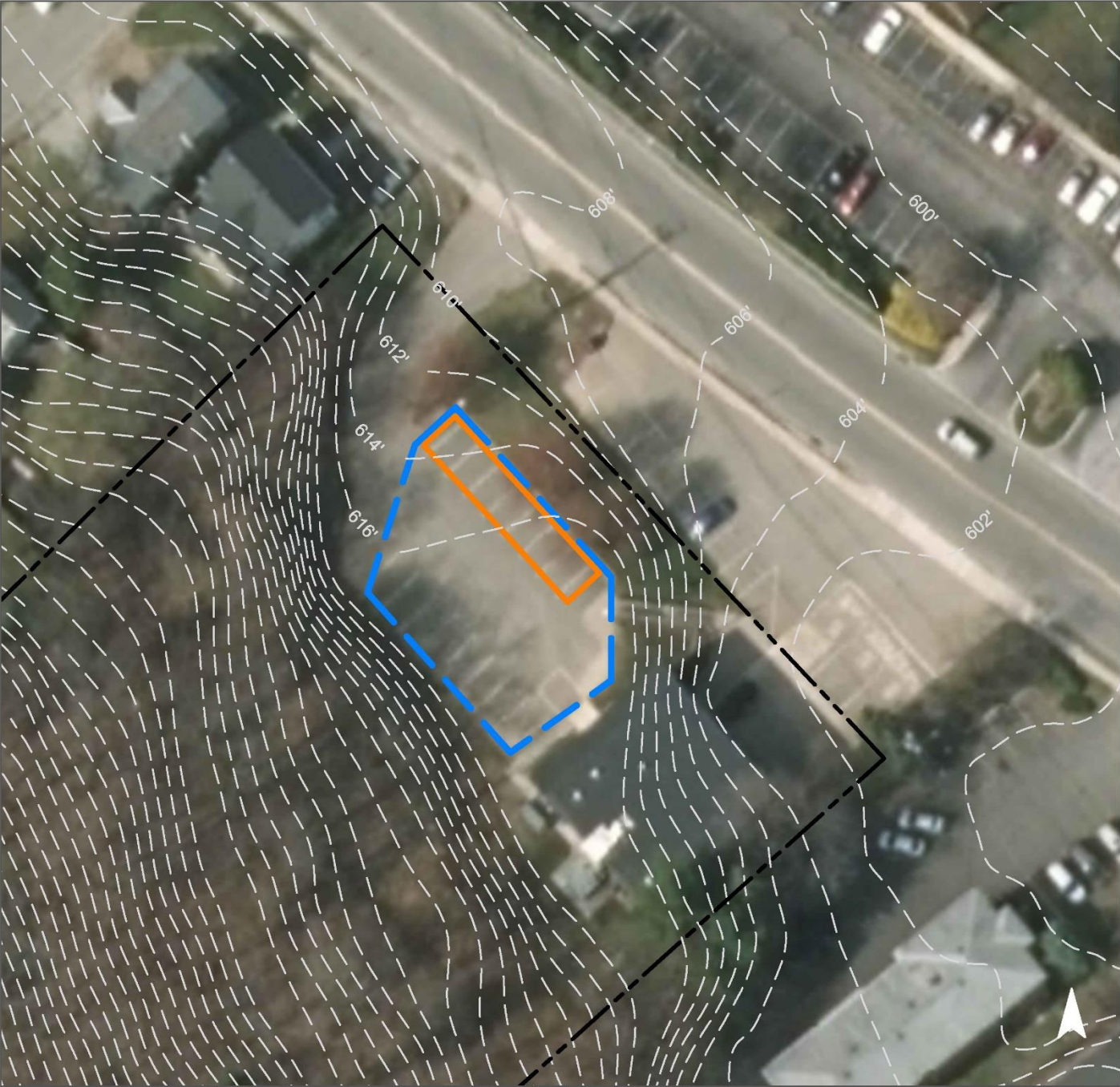


Parking spaces in front of the building can be replaced with porous asphalt to infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





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"
27	21,371	1.0	10.8	98.1	0.017	0.59

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	0.137	23	10,031	0.38	938	\$23,450

# GREEN INFRASTRUCTURE RECOMMENDATIONS



## Newton Firehouse #1

-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# NEWTON MEMORIAL POST 5360 VFW



**Subwatershed:** Paulins Kill  
**Site Area:** 74,355 sq. ft.  
**Address:** 85 Mill Street  
Newton, NJ 07860  
**Block and Lot:** Block 5.06, Lot 1



Parking spaces can be replaced with porous asphalt to infiltrate stormwater. 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"
90	66,920	3.2	33.8	307.3	0.052	1.84

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	0.647	108	47,453	1.78	4,435	\$110,875

# GREEN INFRASTRUCTURE RECOMMENDATIONS



**Newton Memorial Post  
5360 VFW**

-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS





# NEWTON POLICE DEPARTMENT & MUNICIPAL BUILDING



**Subwatershed:** Paulins Kill  
**Site Area:** 90,111 sq. ft.  
**Address:** 39 Trinity Street  
Newton, NJ 07860  
**Block and Lot:** Block 9.06, Lot 13

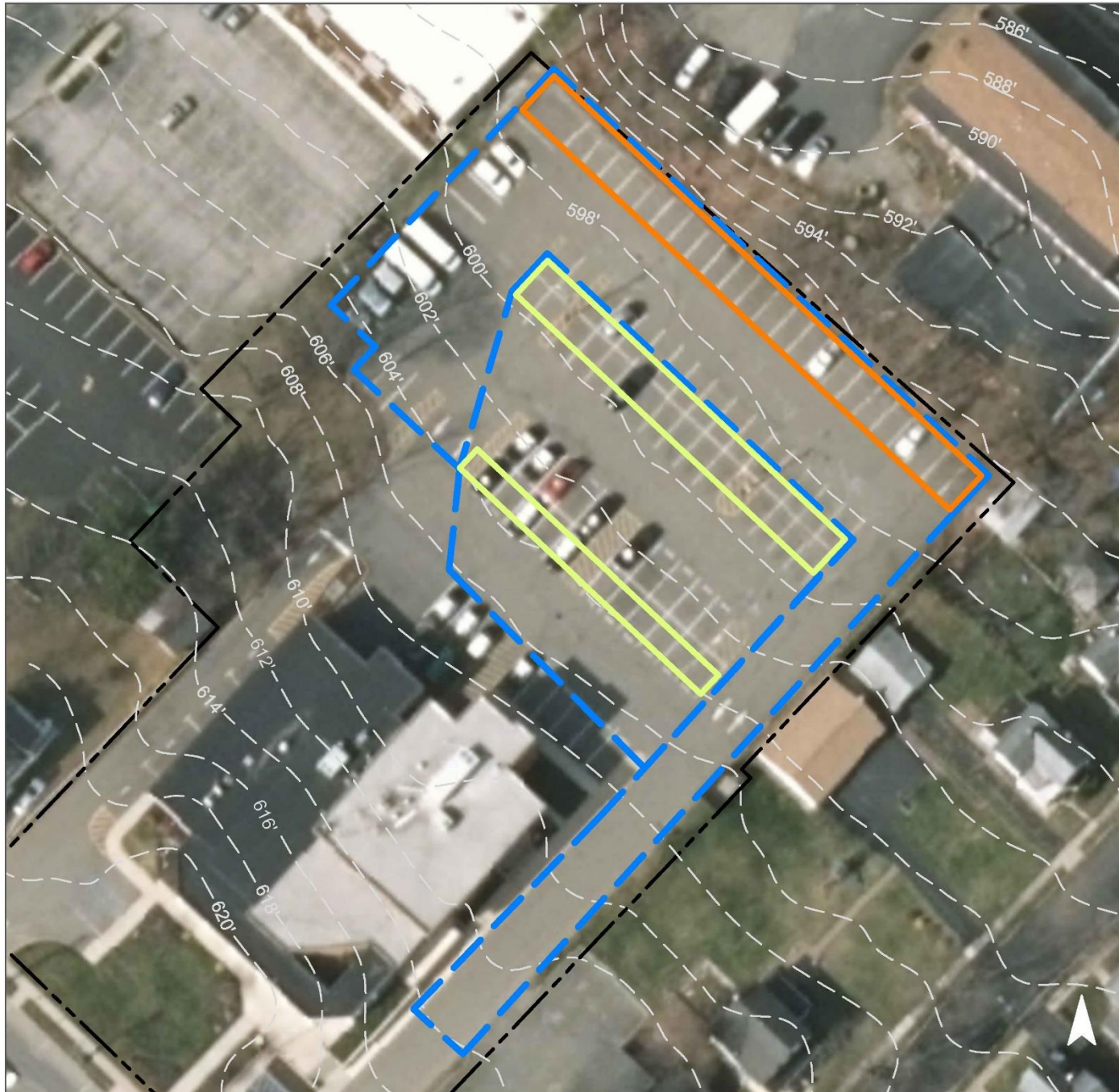


Bioretention systems parking islands can be implemented in the parking lot by converting the parking lot into one way angled parking. This will allow reduced aisle widths to provide room necessary for them. Parking spaces on the north side of the parking lot can be replaced with porous asphalt to infiltrate stormwater. 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"
85	76,628	3.7	38.7	351.8	0.060	2.10

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	0.430	72	31,528	1.19	4,125	\$20,625
Pervious pavement	0.596	100	43,706	1.64	4,085	\$102,125

# GREEN INFRASTRUCTURE RECOMMENDATIONS



**Newton Police  
Department & Municipal  
Building**

-  bioretention system
-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# NEWTON PUBLIC PARKING LOT #2

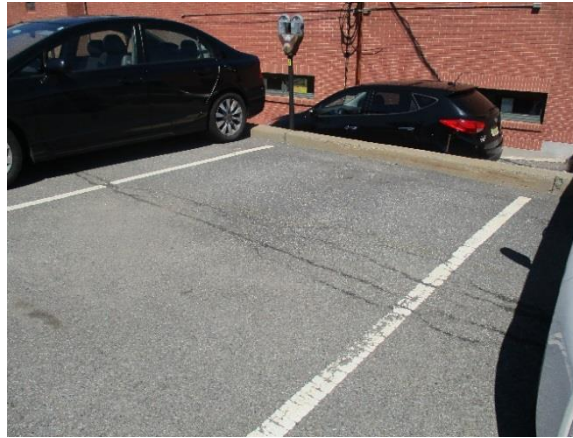


**Subwatershed:** Paulins Kill

**Site Area:** 120,267 sq. ft.

**Address:** 63 Main Street  
Newton, NJ 07860

**Block and Lot:** Block 8.08, Lot 10-22



Parking spaces at the back of the post office can be replaced with porous asphalt to infiltrate stormwater. 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"
90	62,048	3.0	31.3	284.9	0.048	1.70

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	0.622	104	45,606	1.72	4,263	\$106,575

# GREEN INFRASTRUCTURE RECOMMENDATIONS



**Newton Public Parking Lot #2**

-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# NEWTON PUBLIC PARKING LOT #3 / WESTERN PLAZA PARKING LOT



**Subwatershed:** Paulins Kill

**Site Area:** 172,378 sq. ft.

**Address:** 22, 40 Trinity Street  
Newton, NJ 07860

**Block and Lot:** Block 8.04, Lots 3 & 4  
Block 8.03, Lots 3 & 4



Parking spaces can be replaced with porous asphalt to infiltrate stormwater. 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"
90	154,948	7.5	78.3	711.4	0.121	4.25

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
Pervious pavement	1.886	316	138,290	5.20	12,925	\$323,125

# GREEN INFRASTRUCTURE RECOMMENDATIONS



**Newton Public Parking Lot #3**





-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# GREEN INFRASTRUCTURE RECOMMENDATIONS



**Western Plaza Parking Lot**

-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# SUSSEX COUNTY ADMINISTRATIVE BUILDING



**Subwatershed:** Paulins Kill  
**Site Area:** 48,596 sq. ft.  
**Address:** 1 Spring Street  
Newton, NJ 07860  
**Block and Lot:** Block 8.03, Lot 1



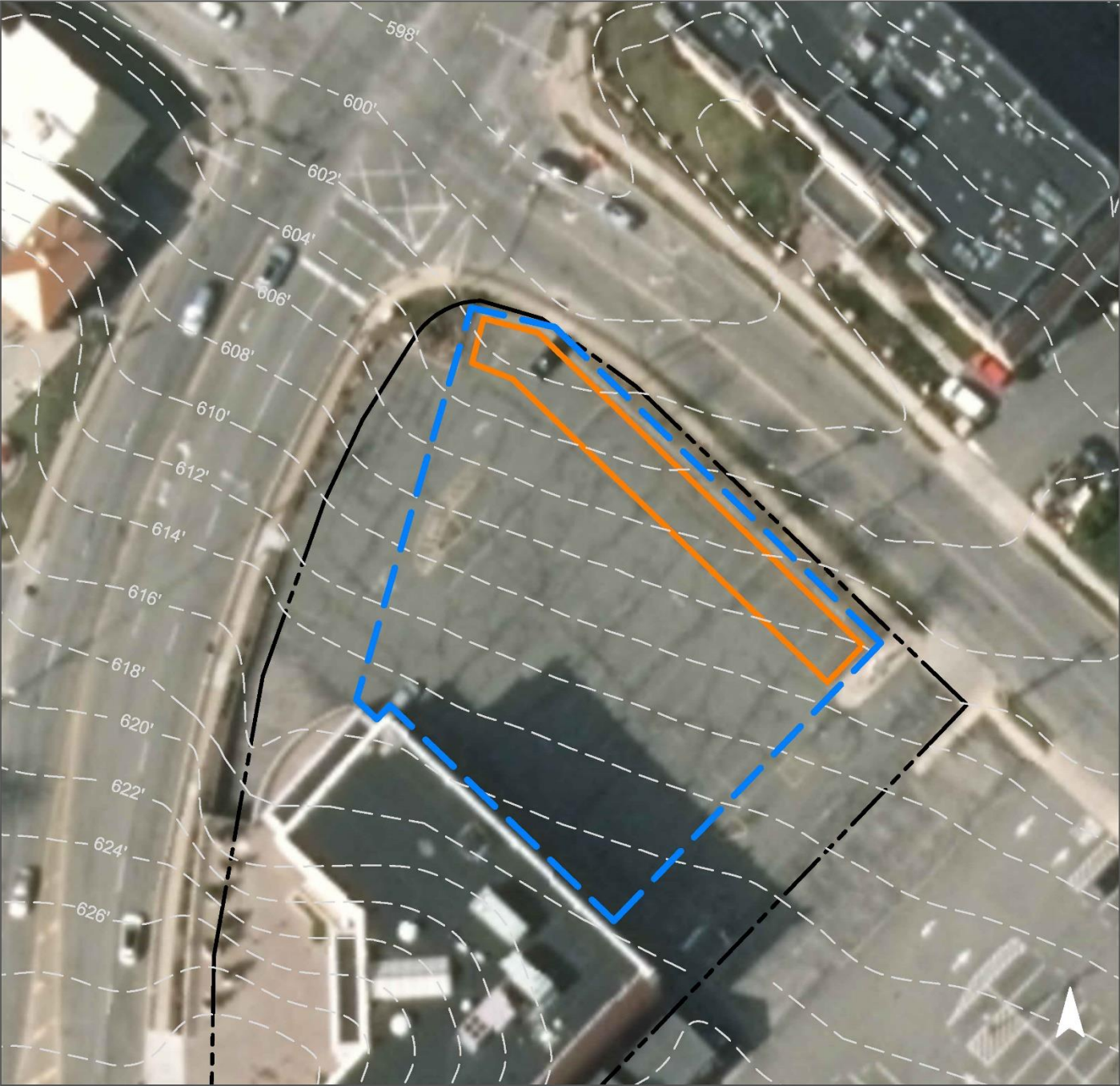
Parking spaces can be replaced with porous asphalt to infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

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"
90	43,736	2.1	22.1	200.8	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
Pervious pavement	0.456	76	433,556	1.26	3,125	\$78,125



# GREEN INFRASTRUCTURE RECOMMENDATIONS



**Sussex County  
Administrative Building**

-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# SUSSEX COUNTY COMMUNITY COLLEGE



**Subwatershed:** Paulins Kill

**Site Area:** 3,890,500 sq. ft.

**Address:** 1 College Hill Road  
Newton, NJ 07860

**Block and Lot:** Block 3.01, Lot 19

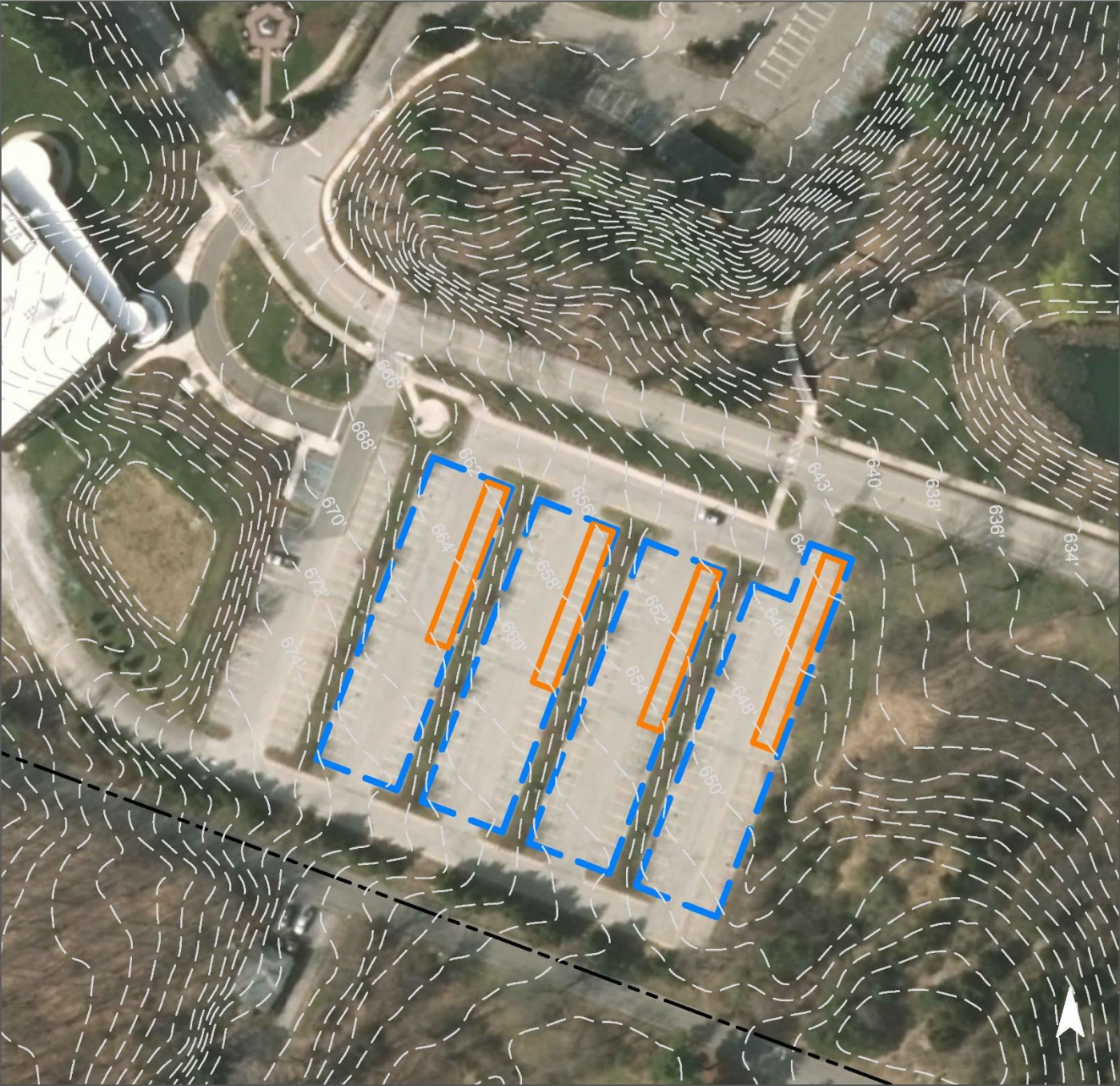


Strips of pervious pavements can be installed in the parking lot at the south end of the property to capture, treat, and infiltrate runoff from the parking lot before entering the sewer system. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.





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"
14	526,044	25.4	265.7	2,415.3	0.410	14.43

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavement	1,240	208	88,025	3.31	8,500	\$212,500

# GREEN INFRASTRUCTURE RECOMMENDATIONS



## Sussex County Community College

-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# SUSSEX COUNTY HISTORICAL MEMORIAL MUSEUM



**Subwatershed:** Paulins Kill

**Site Area:** 30,654 sq. ft.

**Address:** 82 Main Street  
Newton, NJ 07860

**Block and Lot:** Block 7.06 Lot  
5,6,7,8,9

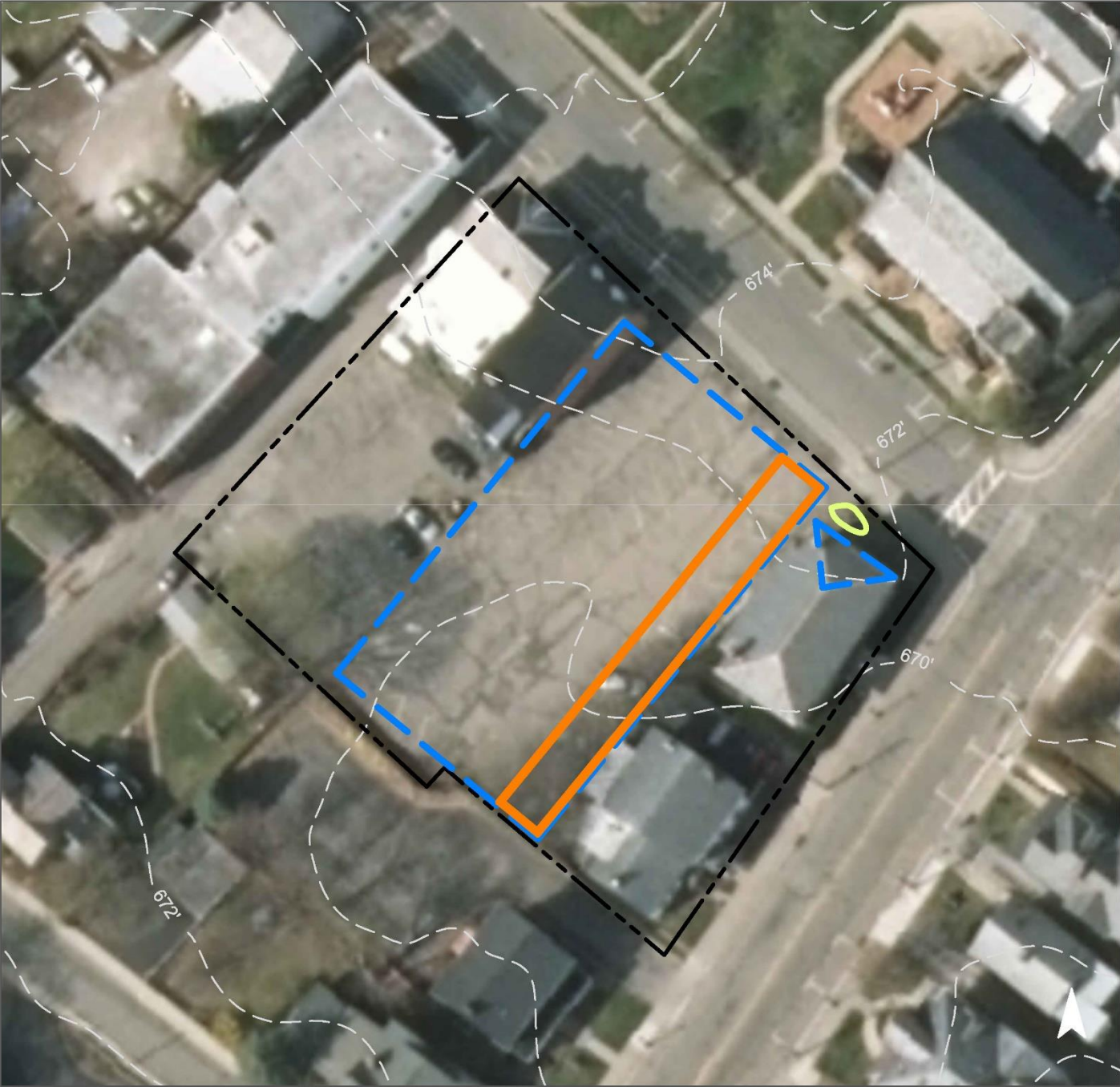


Parking spaces next to the building can be replaced with porous asphalt to infiltrate stormwater. Rain gardens adjacent to the building can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.






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"
90	27,589	1.3	13.9	126.7	0.021	0.76

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	0.007	1	486	0.02	64	\$320
Pervious pavement	0.354	59	25,948	0.98	2,425	\$60,625

# GREEN INFRASTRUCTURE RECOMMENDATIONS



## Sussex County Historical Memorial Museum

-  bioretention system
-  pervious pavement
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# SUSSEX COUNTY LIBRARY-DENNIS BRANCH



**Subwatershed:** Paulins Kill  
**Site Area:** 22,557 sq. ft.  
**Address:** 101 Main Street  
Newton, NJ 07860  
**Block and Lot:** Block 14.03, Lot 1,19

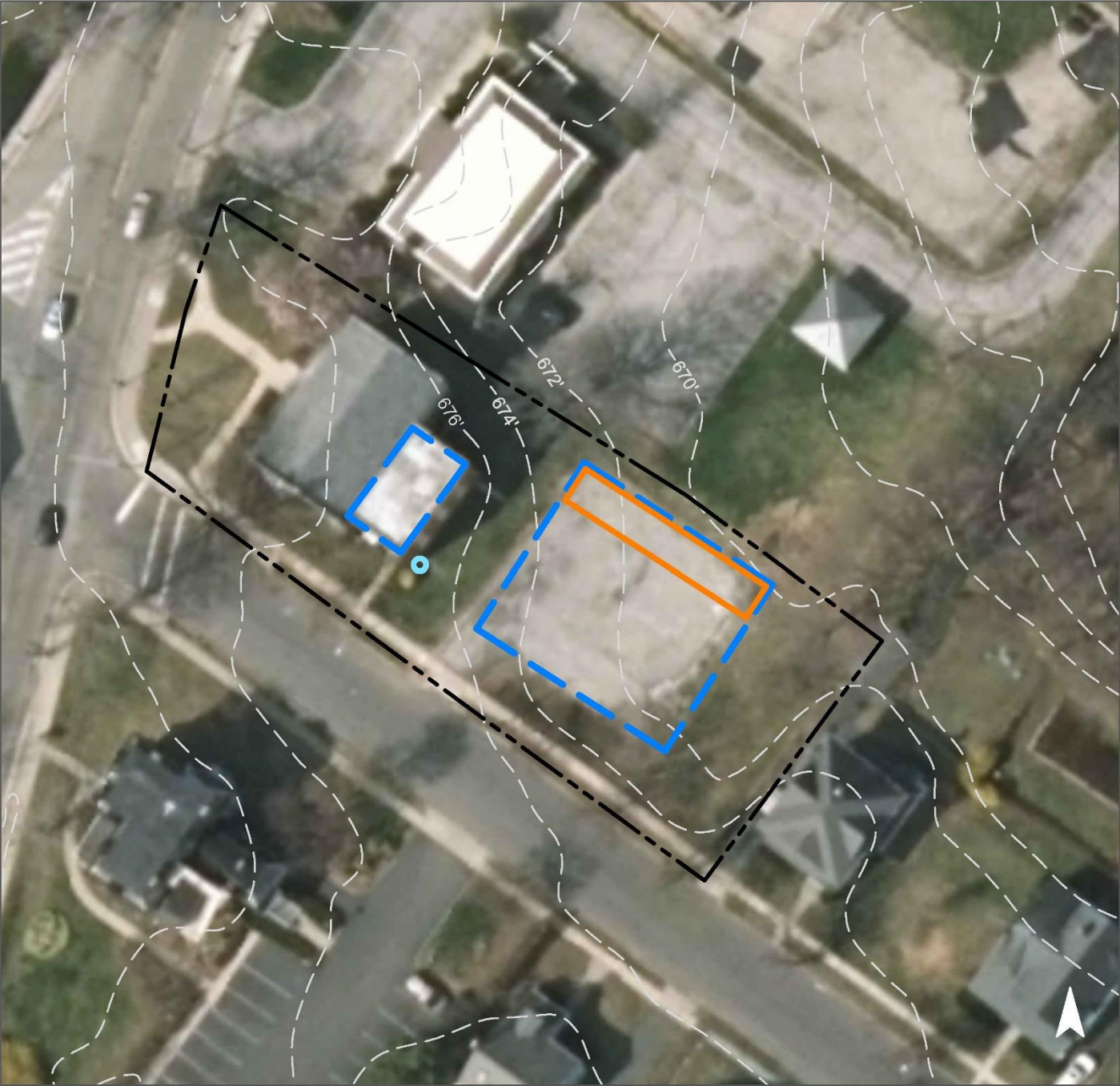


Parking spaces by the building can be replaced with porous asphalt to infiltrate stormwater. Rainwater can be harvested by installing a cistern at the garage in the northwest corner of the site for cleaning school busses or for conducting car wash fundraisers. A preliminary soil assessment suggests that 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"
55	8,163	0.4	4.1	37.5	0.006	0.22

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	0.122	21	8,983	0.34	854	\$21,350
Rainwater harvesting	0.019	3	800	0.05	800 (gal)	\$1,600

# GREEN INFRASTRUCTURE RECOMMENDATIONS



**Sussex County Library -  
Dennis Branch**

-  pervious pavement
-  rainwater harvesting
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



# SWARTSWOOD GARDEN APARTMENTS



**Subwatershed:** Paulins Kill  
**Site Area:** 217,754 sq. ft.  
**Address:** 2A Swartswood Road  
Newton, NJ 07860  
**Block and Lot:** Block 2.02, Lot 12-14



Rain gardens adjacent to both building can capture, treat, and infiltrate 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"
36	57,981	2.8	29.3	266.2	0.045	1.59





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	0.238	40	17,428	0.66	2,280	\$11,400



# GREEN INFRASTRUCTURE RECOMMENDATIONS



## Swartswood Garden Apartments

-  bioretention system
-  drainage area
-  property line
-  2012 Aerial: NJOIT, OGIS



**c. 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			I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C.	
					TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)				Volumes 2-hours) (Mgal)	Annual (Mgal)
<b>PAULINS KILL SUBWATERSHED</b>	<b>150.19</b>	<b>6,542,298</b>			<b>74.7</b>	<b>782.1</b>	<b>7,110.4</b>		<b>35.55</b>	<b>1,548,643</b>	<b>1.207</b>	<b>42.47</b>
<b>Adams Street Parking Lot</b>												
<b>Total Site Info</b>	0.56	24,286	8.08	29,30,31	1.1	11.0	100.4	90	0.50	21,858	0.017	0.60
<b>Christ Community Church</b>												
<b>Total Site Info</b>	1.16	50,542	18.02	1	1.8	18.9	171.5	74	0.86	37,346	0.029	1.02
<b>De Pasquale Plaza / Campbell's Small Engine Sales</b>												
<b>Total Site Info</b>	4.49	195,427	9.03	25,27	7.3	76.0	691.2	77	3.46	150,552	0.117	4.13
<b>First Presbyterian Church</b>												
<b>Total Site Info</b>	0.59	25,849	8.01	1	1.1	11.7	106.8	90	0.53	23,264	0.018	0.64
<b>Memory Park</b>												
<b>Total Site Info</b>	35.49	1,546,119	10.01	1	10.8	112.8	1,025.5	14	5.13	223,348	0.174	6.13
<b>Newton Covenant Reformed Church</b>												
<b>Total Site Info</b>	1.63	71,044	7.03	1	2.3	23.7	215.1	66	1.08	46,847	0.037	1.28
<b>Newton Firehouse #1</b>												
<b>Total Site Info</b>	1.80	78,456	5.01	9	1.0	10.8	98.1	27	0.49	21,371	0.017	0.59
<b>Newton Memorial Post 5360 VFW</b>												
<b>Total Site Info</b>	1.71	74,374	5.06	1	3.2	33.8	307.3	90	1.54	66,920	0.052	1.84
<b>Newton Police Department &amp; Municipal Building</b>												
<b>Total Site Info</b>	2.07	90,111	9.06	13	3.7	38.7	351.8	85	1.76	76,628	0.060	2.10
<b>Newton Public Parking Lot #2</b>												
<b>Total Site Info</b>	1.59	69,233	8.08	10	3.0	31.3	284.9	90	1.42	62,048	0.048	1.70
<b>Newton Public Parking Lot #3 / Western Plaza Parking Lot</b>												
<b>Total Site Info</b>	3.96	172,378	8.04	3, 4	7.5	78.3	711.4	90	3.56	154,948	0.121	4.25
<b>Sussex County Administrative Building</b>												
<b>Total Site Info</b>	1.12	48,596	8.03	1	2.1	22.1	200.8	90	1.00	43,736	0.034	1.20

**Summary of Existing Site Conditions**

Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	Existing Annual Loads			I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C.	
					TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)				Volumes 2-hours) (Mgal)	Annual (Mgal)
<b>Sussex County Community College Total Site Info</b>	89.31	3,890,501	3.01	19	25.4	265.7	2,415.3	14	12.08	526,044	0.410	14.43
<b>Sussex County Historical Memorial Museum Total Site Info</b>	0.70	30,654	7.06	4,5,6,7,8,9	1.3	13.9	126.7	90	0.63	27,589	0.021	0.76
<b>Sussex County Library-Dennis Branch Total Site Info</b>	0.34	14,843	14.03	1	0.4	4.1	37.5	55	0.19	8,163	0.006	0.22
<b>Swartswood Garden Apartments Total Site Info</b>	3.67	159,885	2.02	12	2.8	29.3	266.2	36	1.33	57,981	0.045	1.59

#### **d. Summary of Proposed Green Infrastructure Practices**

**Summary of Proposed Green Infrastructure Practices**

Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area		Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Max Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cfs)	Size of BMP (SF)	Unit Cost (\$)	Unit	Total Cost (\$)	I.C. Treated %
	Area (SF)	Area (ac)									
<b>PAULINS KILL SUBWATERSHED</b>	<b>359,756</b>	<b>8.26</b>	<b>9.374</b>	<b>1,569</b>	<b>1,087,488</b>	<b>25.86</b>	<b>73,364</b>			<b>\$1,412,000</b>	<b>23.2%</b>
<b>1 Adams Street Parking Lot</b>											
Pervious pavement	10,853	0.25	0.283	47	20,727	0.78	1,938	25	SF	\$48,450	49.7%
<b>Total Site Info</b>	<b>10,853</b>	<b>0.25</b>	<b>0.283</b>	<b>47</b>	<b>20,727</b>	<b>0.78</b>	<b>1,938</b>			<b>\$48,450</b>	<b>49.7%</b>
<b>2 Christ Community Church</b>											
Pervious pavement	6,590	0.15	0.172	29	12,589	0.47	1,177	25	SF	\$29,425	17.6%
<b>Total Site Info</b>	<b>6,590</b>	<b>0.15</b>	<b>0.172</b>	<b>29</b>	<b>12,589</b>	<b>0.47</b>	<b>1,177</b>			<b>\$29,425</b>	<b>17.6%</b>
<b>3 De Pasquale Plaza / Campbell's Small Engine Sales</b>											
Bioretention system	4,180	0.10	0.109	18	7,989	0.30	1,430	5	SF	\$7,150	2.8%
Bioswale	8,470	0.19	0.221	37	16,187	0.61	2,900	5	SF	\$14,500	5.6%
Pervious pavement	13,800	0.32	0.360	60	26,367	0.99	4,721	25	SF	\$118,025	9.2%
<b>Total Site Info</b>	<b>26,450</b>	<b>0.61</b>	<b>0.689</b>	<b>115</b>	<b>50,543</b>	<b>1.90</b>	<b>9,051</b>			<b>\$139,675</b>	<b>17.6%</b>
<b>4 First Presbyterian Church</b>											
Bioretention systems	4,699	0.11	0.122	20	8,976	0.34	1,175	5	SF	\$5,875	20.2%
<b>Total Site Info</b>	<b>4,699</b>	<b>0.11</b>	<b>0.122</b>	<b>20</b>	<b>8,976</b>	<b>0.34</b>	<b>1,175</b>			<b>\$5,875</b>	<b>20.2%</b>
<b>5 Memory Park</b>											
Bioretention system	24,600	0.56	0.641	107	47,004	1.77	6,150	5	SF	\$30,750	11.0%
Pervious pavement	8,510	0.20	0.222	37	16,262	0.61	1,100	25	SF	\$27,500	3.8%
<b>Total Site Info</b>	<b>33,110</b>	<b>0.76</b>	<b>0.863</b>	<b>144</b>	<b>63,266</b>	<b>2.38</b>	<b>7,250</b>			<b>\$58,250</b>	<b>14.8%</b>
<b>6 Newton Covenant Reformed Church</b>											
Bioretention system	8,242	0.19	0.215	36	15,745	0.59	2,061	5	SF	\$10,305	17.6%
Pervious pavement	10,613	0.24	0.277	46	20,278	0.76	1,895	25	SF	\$47,375	22.7%
<b>Total Site Info</b>	<b>18,855</b>	<b>0.43</b>	<b>0.491</b>	<b>82</b>	<b>36,024</b>	<b>1.35</b>	<b>3,956</b>			<b>\$57,680</b>	<b>40.2%</b>
<b>7 Newton Firehouse #1</b>											
Pervious pavement	5,250	0.12	0.137	23	10,031	0.38	938	25	SF	\$23,450	24.6%
<b>Total Site Info</b>	<b>5,250</b>	<b>0.12</b>	<b>0.137</b>	<b>23</b>	<b>10,031</b>	<b>0.38</b>	<b>938</b>			<b>\$23,450</b>	<b>24.6%</b>
<b>8 Newton Memorial Post 5360 VFW</b>											
Pervious pavement	24,836	0.57	0.647	108	47,453	1.78	4,435	25	SF	\$110,875	37.1%
<b>Total Site Info</b>	<b>24,836</b>	<b>0.57</b>	<b>0.647</b>	<b>108</b>	<b>47,453</b>	<b>1.78</b>	<b>4,435</b>			<b>\$110,875</b>	<b>37.1%</b>

**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)									
<b>9 Newton Police Department &amp; Municipal Building</b>											
Bioretention systems	16,500	0.38	0.430	72	31,528	1.19	4,125	5	SF	\$20,625	21.5%
Pervious pavement	22,875	0.53	0.596	100	43,706	1.64	4,085	25	SF	\$102,125	29.9%
<b>Total Site Info</b>	<b>39,375</b>	<b>0.90</b>	<b>1.026</b>	<b>172</b>	<b>75,234</b>	<b>2.83</b>	<b>8,210</b>			<b>\$122,750</b>	<b>51.4%</b>
<b>10 Newton Public Parking Lot #2</b>											
Pervious pavement	23,870	0.55	0.622	104	45,606	1.72	4,263	25	SF	\$106,575	38.5%
<b>Total Site Info</b>	<b>23,870</b>	<b>0.55</b>	<b>0.622</b>	<b>104</b>	<b>45,606</b>	<b>1.72</b>	<b>4,263</b>			<b>\$106,575</b>	<b>38.5%</b>
<b>11 Newton Public Parking Lot #3 / Western Plaza Parking Lot</b>											
Pervious pavement	72,380	1.66	1.886	316	138,290	5.20	12,925	25	SF	\$323,125	46.7%
<b>Total Site Info</b>	<b>72,380</b>	<b>1.66</b>	<b>1.886</b>	<b>316</b>	<b>138,290</b>	<b>5.20</b>	<b>12,925</b>			<b>\$323,125</b>	<b>46.7%</b>
<b>12 Sussex County Administrative Building</b>											
Pervious pavement	17,500	0.40	0.456	76	433,556	1.26	3,125	25	SF	\$78,125	40.0%
<b>Total Site Info</b>	<b>17,500</b>	<b>0.40</b>	<b>0.456</b>	<b>76</b>	<b>433,556</b>	<b>1.26</b>	<b>3,125</b>			<b>\$78,125</b>	<b>40.0%</b>
<b>13 Sussex County Community College</b>											
Pervious pavement	47,588	1.09	1.240	208	90,927	3.42	8,498	25	SF	\$212,450	9.0%
<b>Total Site Info</b>	<b>47,588</b>	<b>1.09</b>	<b>1.240</b>	<b>208</b>	<b>90,927</b>	<b>3.42</b>	<b>8,498</b>			<b>\$212,450</b>	<b>9.0%</b>
<b>14 Sussex County Historical Memorial Museum</b>											
Bioretention system	255	0.01	0.007	1	486	0.02	64	5	SF	\$320	0.9%
Pervious pavement	13,580	0.31	0.354	59	25,948	0.98	2,425	25	SF	\$60,625	49.2%
<b>Total Site Info</b>	<b>13,835</b>	<b>0.32</b>	<b>0.360</b>	<b>60</b>	<b>26,434</b>	<b>1.00</b>	<b>2,489</b>			<b>\$60,945</b>	<b>50.1%</b>
<b>15 Sussex County Library-Dennis Branch</b>											
Pervious pavement	4,700	0.11	0.122	21	8,983	0.34	854	25	SF	\$21,350	57.6%
Rainwater harvesting	745	0.02	0.019	3	1,421	0.05	800	2	gal	\$1,600	9.1%
<b>Total Site Info</b>	<b>5,445</b>	<b>0.13</b>	<b>0.142</b>	<b>24</b>	<b>10,405</b>	<b>0.39</b>	<b>1,654</b>			<b>\$22,950</b>	<b>66.7%</b>
<b>16 Swartswood Garden Apartments</b>											
Bioretention systems	9,120	0.21	0.238	40	17,428	0.66	2,280	5	SF	\$11,400	15.7%
<b>Total Site Info</b>	<b>9,120</b>	<b>0.21</b>	<b>0.238</b>	<b>40</b>	<b>17,428</b>	<b>0.66</b>	<b>2,280</b>			<b>\$11,400</b>	<b>15.7%</b>