



Draft

**Impervious Cover Reduction Action Plan
for
Freehold Borough, Monmouth County, New Jersey**

*Prepared for Freehold Borough by the
Rutgers Cooperative Extension Water Resources Program*

November 16, 2015



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Introduction

Located in Monmouth County in central New Jersey, Freehold Borough covers approximately 1.9 square miles. Figures 1 and 2 illustrate that Freehold Borough is dominated by urban land uses. A total of 96.2% of the municipality's land use is classified as urban. Of the urban land in Freehold Borough, 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 Freehold Borough into many unique land use areas, assigning a percent impervious cover for each delineated area. These impervious cover values were used to estimate the impervious coverage for Freehold Borough. Based upon the 2007 NJDEP land use/land cover data, approximately 41.6% of Freehold Borough has impervious cover. This level of impervious cover suggests that the streams in Freehold Borough are likely non-supporting streams.¹

Methodology

Freehold Borough contains portions of two 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

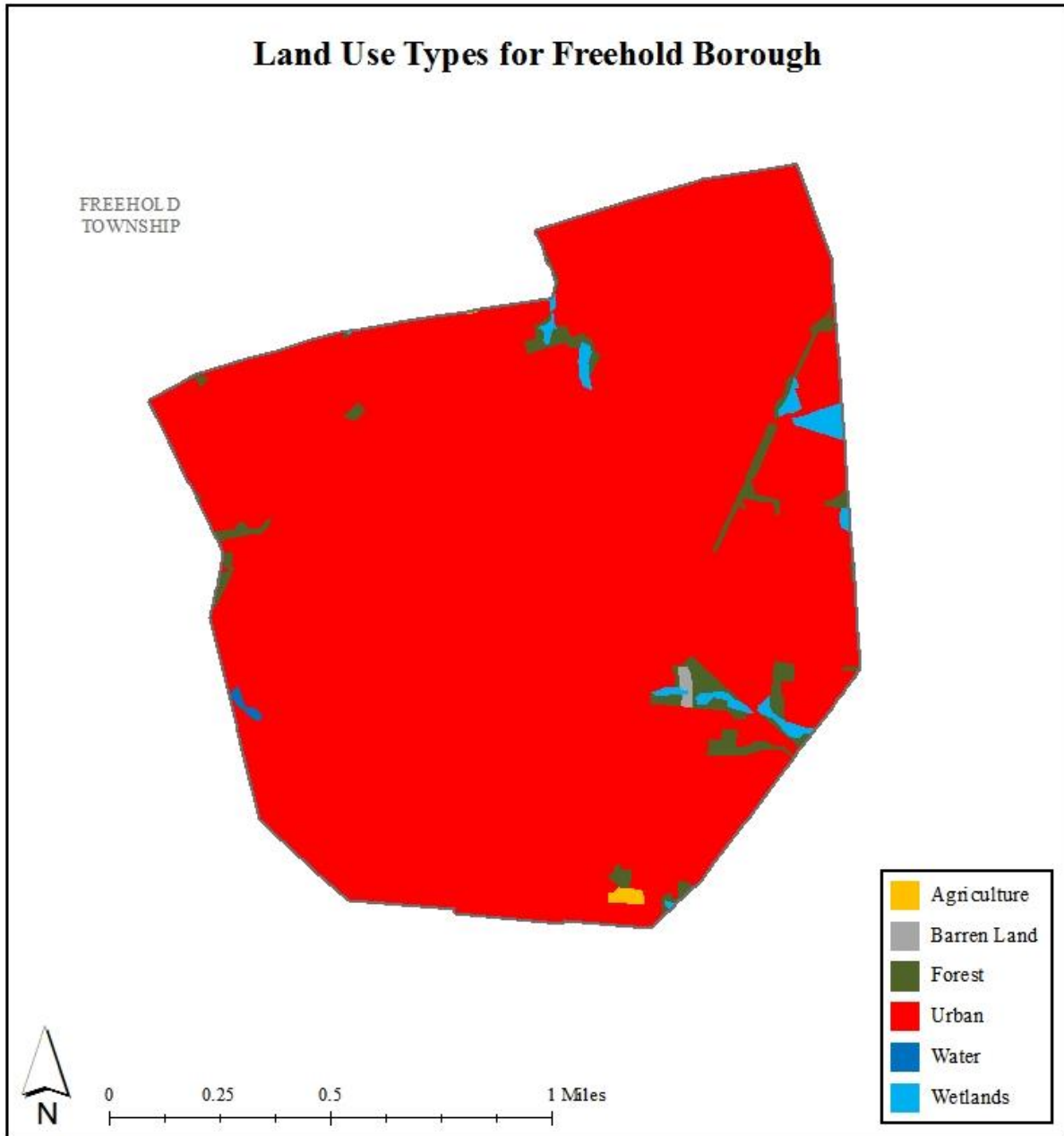


Figure 1: Map illustrating the land use in Freehold Borough

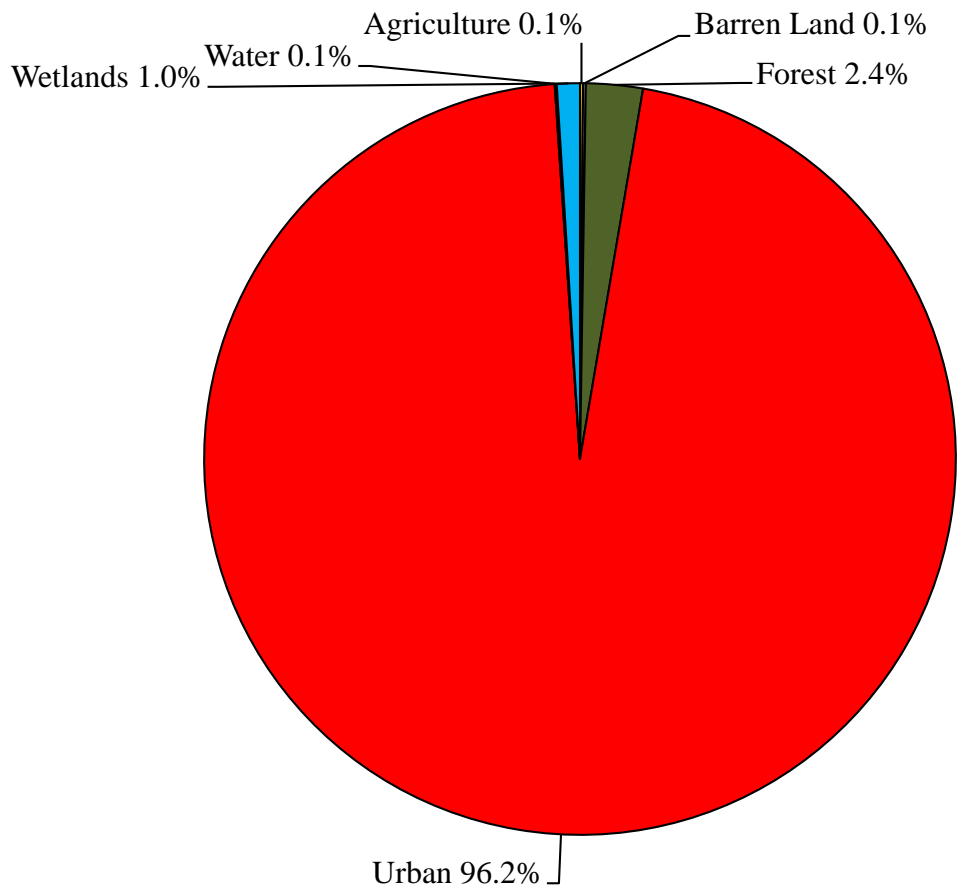


Figure 2: Pie chart illustrating the land use in Freehold Borough

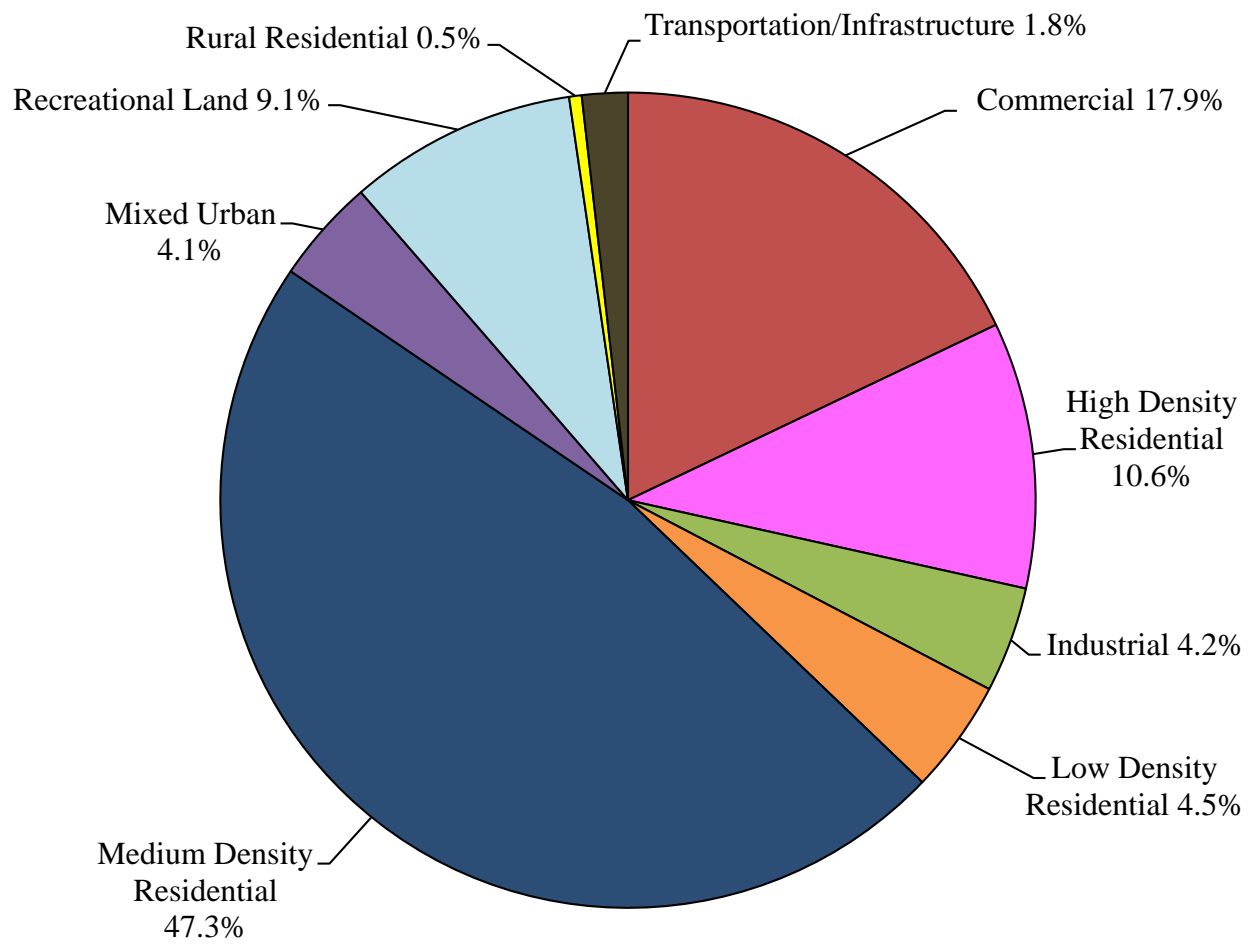


Figure 3: Pie chart illustrating the various types of urban land use in Freehold Borough

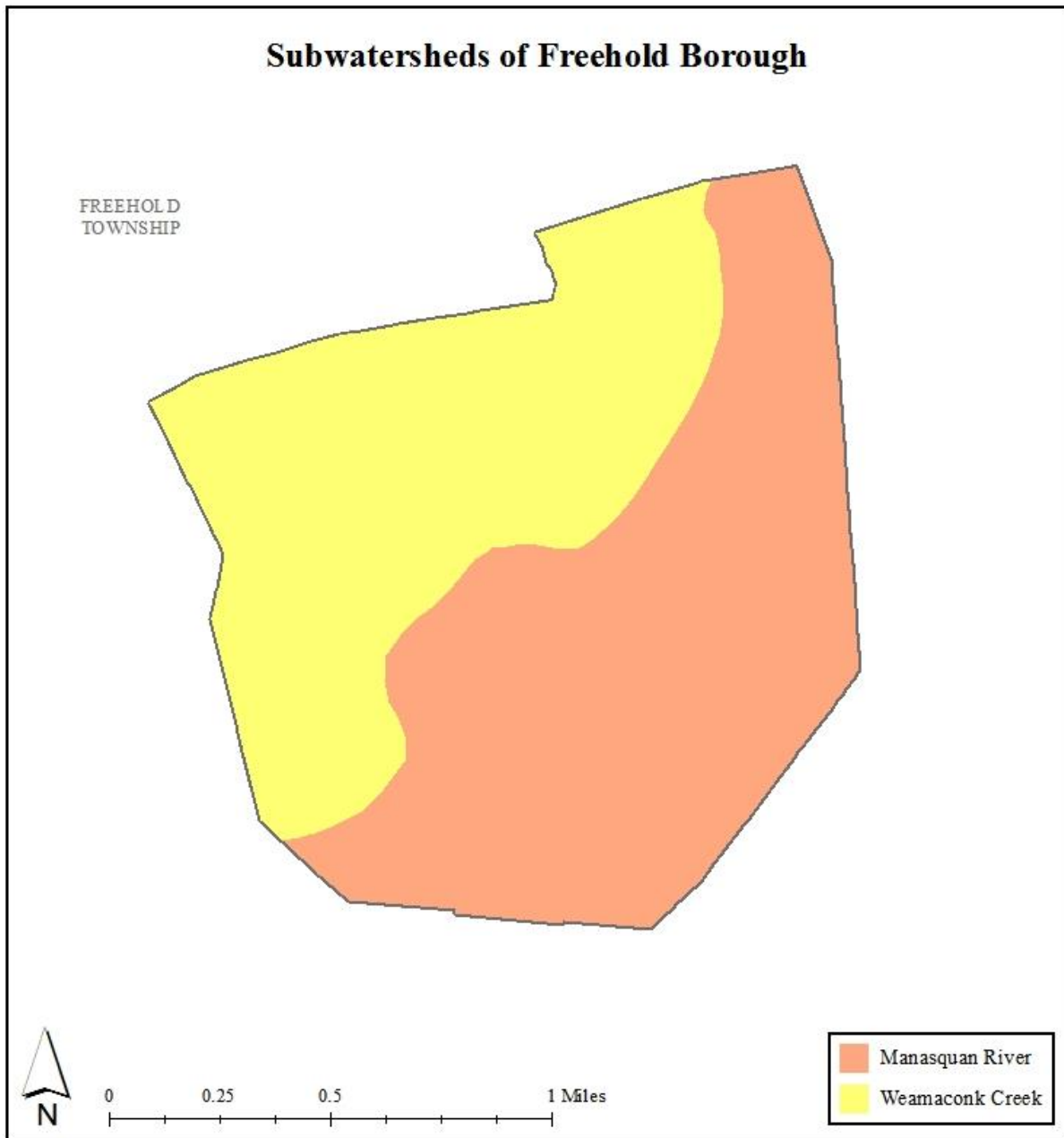


Figure 4: Map of the subwatersheds in Freehold Borough

For each potential project site, specific aerial loading coefficients for commercial land use were used to determine the annual runoff loads for total phosphorus (TP), total nitrogen (TN), and total suspended solids (TSS) from impervious surfaces (Table 1). These are the same aerial loading coefficients that NJDEP uses in developing total maximum daily loads (TMDLs) for impaired waterways of the state. The percentage of impervious cover for each site was extracted from the 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 Freehold Borough using the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey, which utilizes regional and statewide soil data to predict soil types in an area. Several key soil parameters were examined (e.g., natural drainage class, saturated hydraulic conductivity of the most limiting soil layer (K_{sat}), depth to water table, and hydrologic soil group) to evaluate the suitability of each site's soil for green infrastructure practices. In cases where multiple soil types were encountered, the key soil parameters were examined for each soil type expected at a site.

For each potential project site, drainage areas were determined for each of the green infrastructure practices proposed at the site. These green infrastructure practices were designed to manage the 2-year design storm, enabling these practices to capture 95% of the annual rainfall. Runoff volumes were calculated for each proposed green infrastructure practice. The reduction in TSS loading was calculated for each drainage area for each proposed green infrastructure practice using the aerial loading coefficients in Table 1. The maximum volume reduction in stormwater runoff for each green infrastructure practice for a storm was determined by calculating the volume of runoff captured from the 2-year design storm. For each green infrastructure practice, peak discharge reduction potential was determined through hydrologic modeling in HydroCAD. For each green infrastructure practice, a cost estimate is provided. These costs are based upon the square footage of the green infrastructure practice and the real cost of green infrastructure practice implementation in New Jersey.

Table 1: Aerial Loading 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 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 benefits³. A wide range of green infrastructure practices have been evaluated for the potential project sites in Freehold Borough. Each practice is discussed below.

Disconnected downspouts

This is often referred to as simple disconnection. A downspout is simply disconnected, and 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.



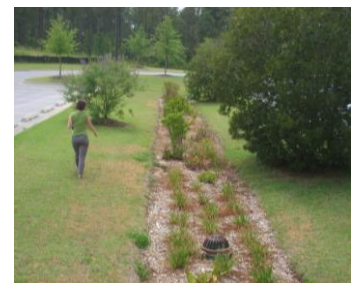
Rainwater harvesting systems (cistern or rain barrel)

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

FREEHOLD BOROUGH: CLIMATE RESILIENT GREEN INFRASTRUCTURE FOR THE RARITAN BASIN



b. Green Infrastructure Sites

FREEHOLD BOROUGH: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE MANASQUAN RIVER SUBWATERSHED:

1. First Baptist Church of Freehold
2. First Presbyterian Church of Freehold
3. First United Methodist Church
4. Freehold Borough Municipal Building
5. Hudson Manor
6. Park Avenue Elementary School and Freehold Intermediate School
7. Saint Rose of Lima Parish
8. Sunshine Schoolhouse

SITES WITHIN THE WEAMACONK CREEK SUBWATERSHED:

9. Borough Plaza
10. Church of God – Freehold
11. Court Street School Education Community Center
12. Faith Tabernacle United Holiness Church
13. Freehold Raceway Parking Lot
14. Grace Lutheran Church
15. Hall of Records
16. Kingdom Hall of Jehova's Witnesses
17. Monmouth County Vocational School

c. Proposed Green Infrastructure Concepts

FIRST BAPTIST CHURCH OF FREEHOLD



Subwatershed: Manasquan River

Site Area: 76,179 sq. ft.

Address: 81 W Main Street
Freehold, NJ 07728

Block and Lot: Block 35, Lot 1-3,41,42



Some parking spots can be replaced with porous asphalt to capture and infiltrate stormwater runoff. A rain garden can be installed in the turf grass located northeast of the church to capture, treat, and infiltrate additional parking lot 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"
83	62,942	3.0	31.8	289.0	0.049	1.73

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	0.028	5	2,154	0.08	457	\$2,285
Pervious pavements	0.819	137	62,017	2.33	6,004	\$150,100

GREEN INFRASTRUCTURE RECOMMENDATIONS



First Baptist Church of Freehold

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



FIRST PRESBYTERIAN CHURCH OF FREEHOLD



Subwatershed: Manasquan River
Site Area: 61,824 sq. ft.
Address: 118 W Main Street
Freehold, NJ 07728
Block and Lot: Block 95, Lot 1

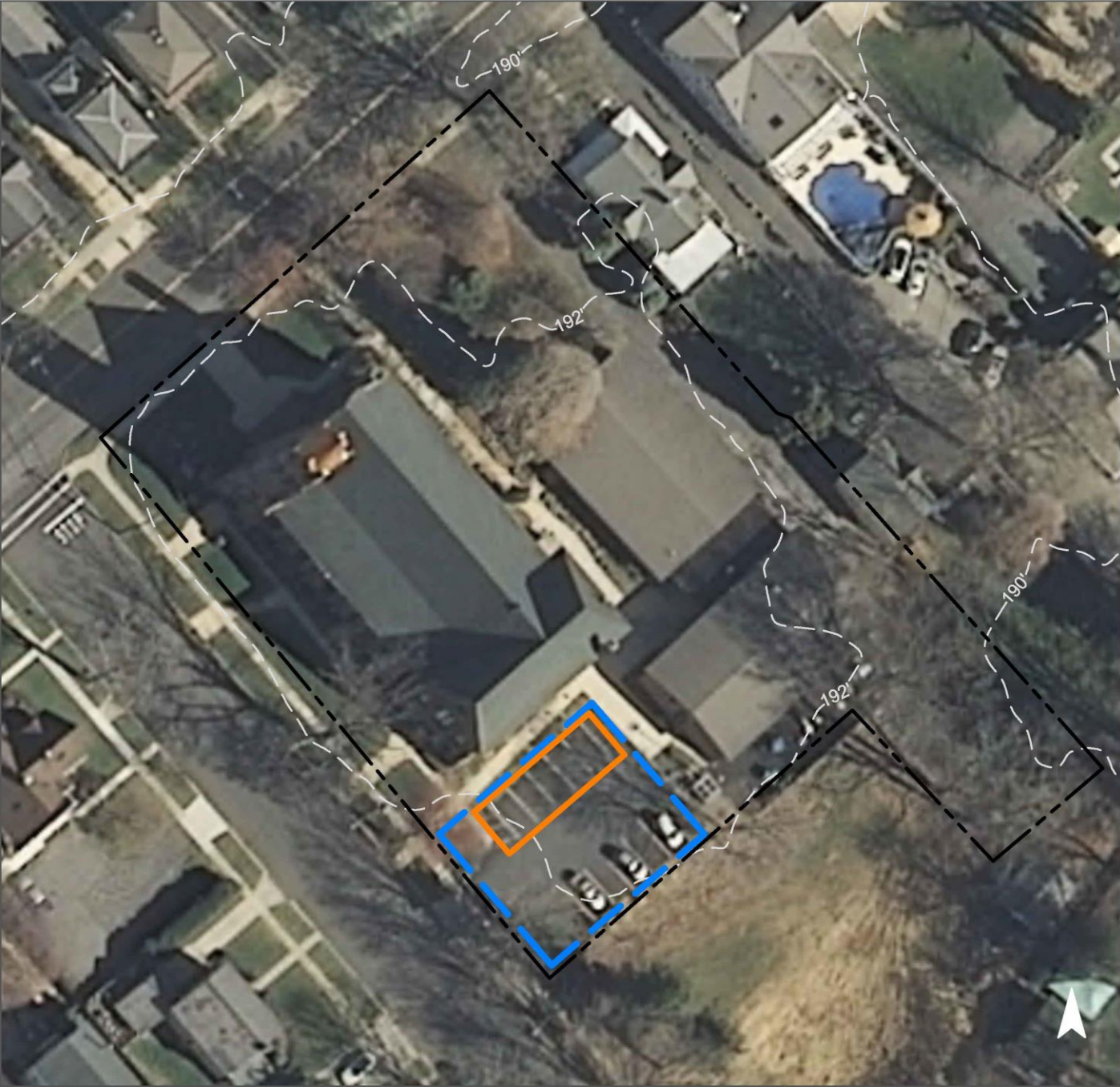


Parking spots can be replaced with porous asphalt to capture and infiltrate stormwater. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





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"
54	33,148	1.6	16.7	152.2	0.026	0.91

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
Pervious pavements	0.137	23	10,412	0.39	1,255	\$31,375

GREEN INFRASTRUCTURE RECOMMENDATIONS



**First Presbyterian
Church of Freehold**

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



FIRST UNITED METHODIST CHURCH



Subwatershed: Manasquan River
Site Area: 37,053 sq. ft.
Address: 91 W Main Street
Freehold, NJ 07728
Block and Lot: Block 28, Lot 19

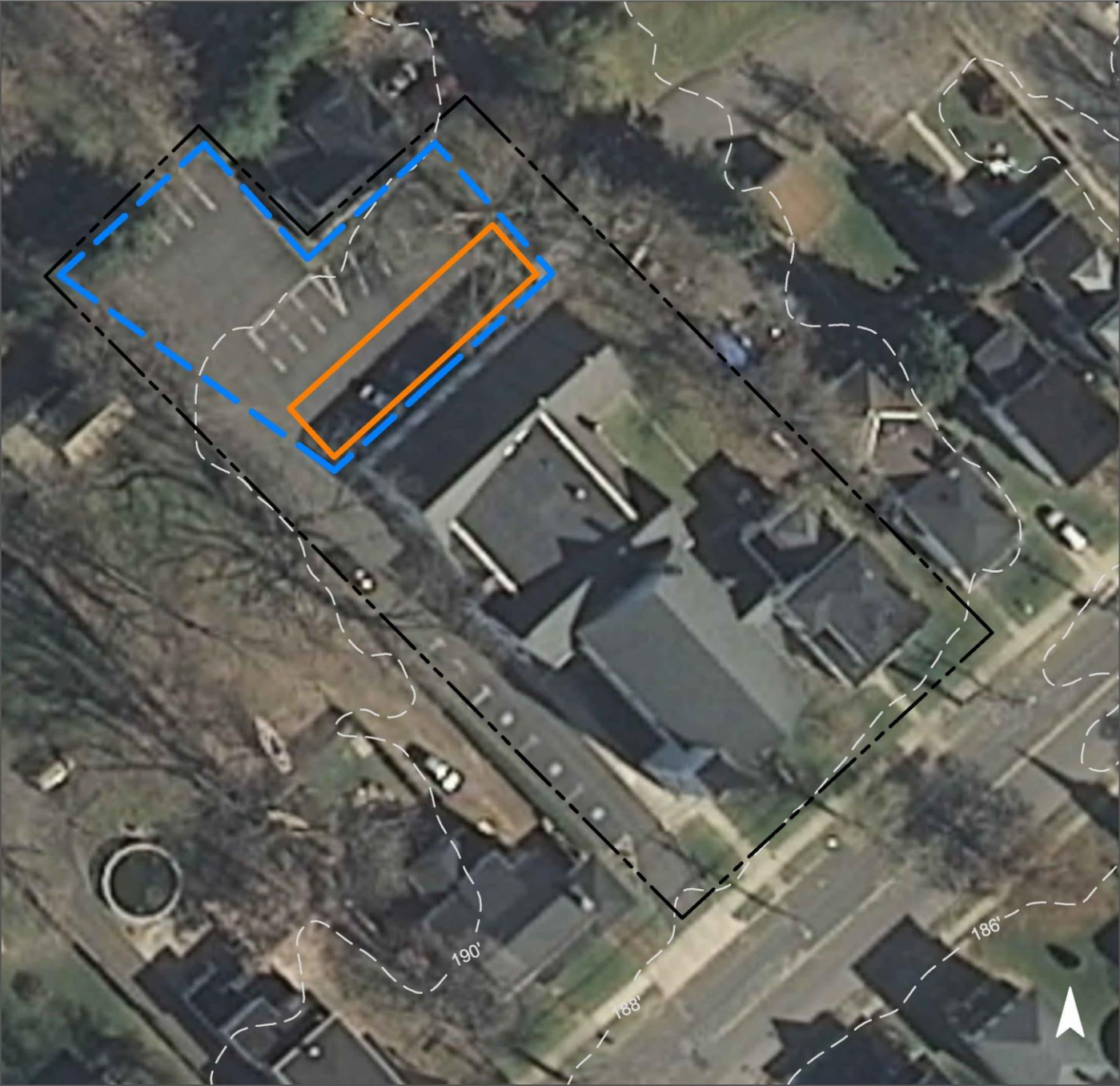


Parking spots can be replaced with porous asphalt to capture and infiltrate runoff from the roof and parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





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"
69	25,454	1.2	12.9	116.9	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
Pervious pavements	0.227	38	17,182	0.64	1,902	\$47,550

GREEN INFRASTRUCTURE RECOMMENDATIONS



First United Methodist Church

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



FREEHOLD BOROUGH MUNICIPAL BUILDING



Subwatershed: Manasquan River

Site Area: 41,670 sq. ft.

Address: 51 W Main Street
Freehold, NJ 07728

Block and Lot: Block 35, Lot 27,28

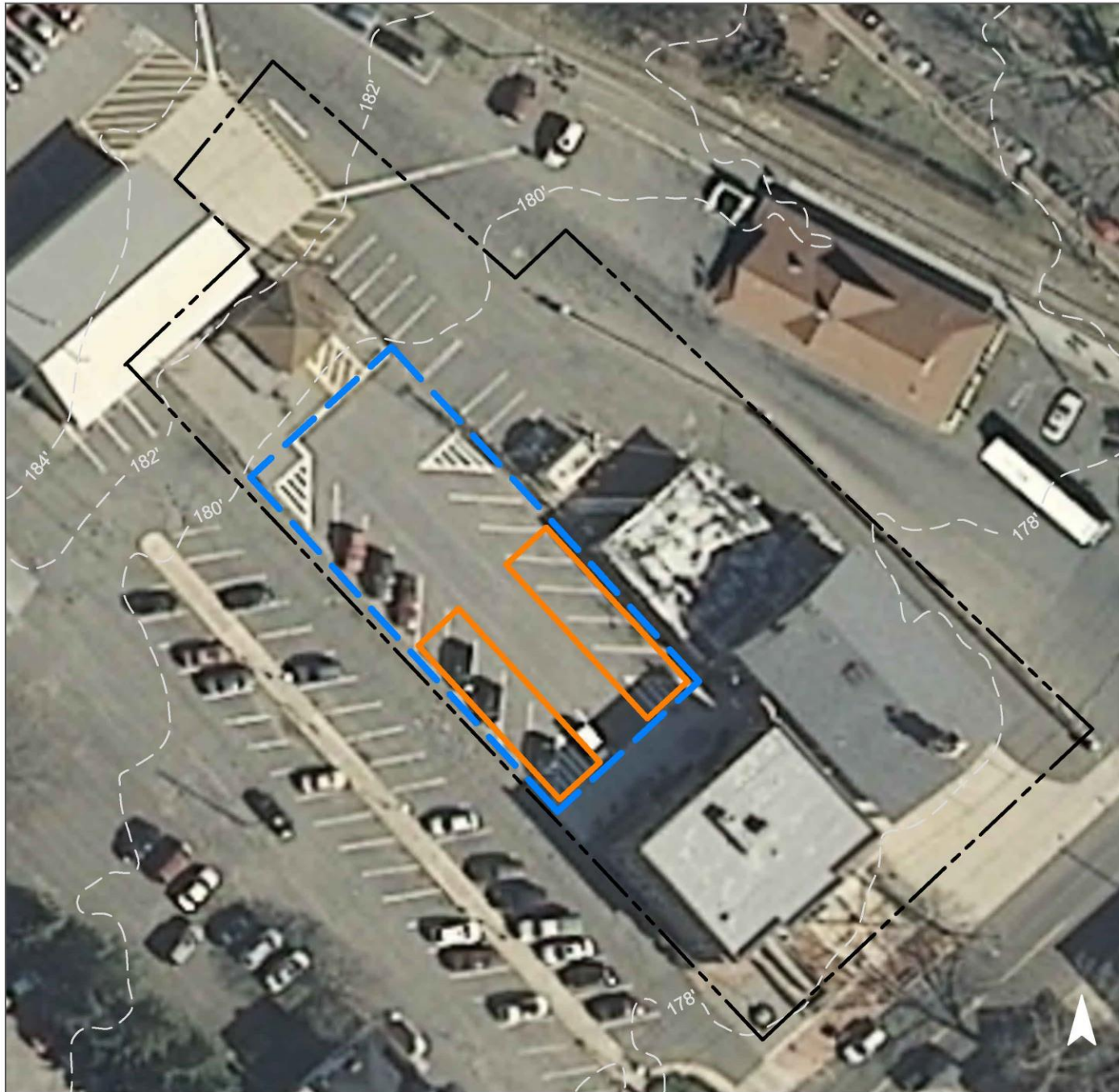


Parking spots north of the building can be replaced with porous asphalt to capture and infiltrate stormwater runoff. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





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"
95	39,487	1.9	19.7	181.3	0.031	1.08

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
Pervious pavements	0.237	40	17,967	0.67	2,381	\$59,525

GREEN INFRASTRUCTURE RECOMMENDATIONS



**Freehold Borough
Municipal Building**

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



HUDSON MANOR



Subwatershed: Manasquan River

Site Area: 122,016 sq. ft.

Address: 21 Center Street
Freehold, NJ 07728

Block and Lot: Block 63, Lot 8.01



Some parking spots can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
72	87,857	4.2	44.4	403.4	0.068	2.41

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 pavements	1.043	175	78,989	2.96	12,139	\$303,475

GREEN INFRASTRUCTURE RECOMMENDATIONS



Hudson Manor

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



PARK AVENUE ELEMENTARY SCHOOL AND FREEHOLD INTERMEDIATE SCHOOL



Subwatershed: Manasquan River

Site Area: 860,821 sq. ft.

Address: 280 Park Road
Freehold, NJ 07728

Block and Lot: Block 116, Lot 1

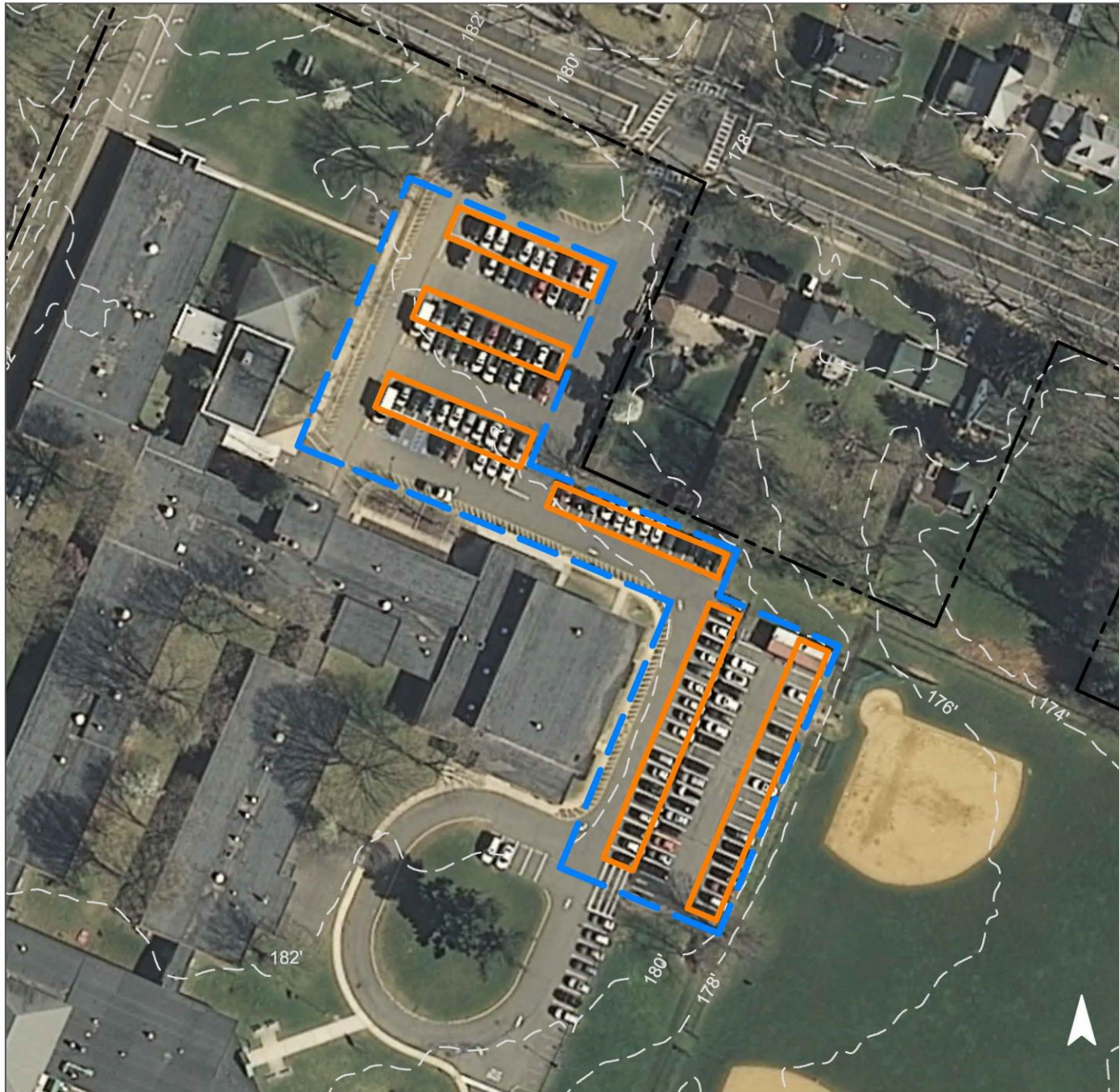


Parking spots by the north and northeast side of the building can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
33	280,041	13.5	141.4	1,285.8	0.218	7.68

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 pavements	0.651	109	49,308	1.85	6,687	\$167,187

GREEN INFRASTRUCTURE RECOMMENDATIONS



Park Avenue Elementary School & Freehold Intermediate School

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



SAINT ROSE OF LIMA PARISH



Subwatershed: Manasquan River

Site Area: 259,867 sq. ft.

Address: 16 Mclean Street
Freehold, NJ 07728

Block and Lot: Block 82, Lot 8-
10,12,18-21,23

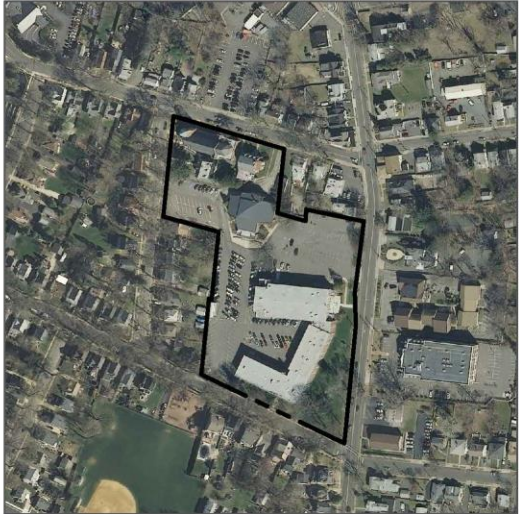
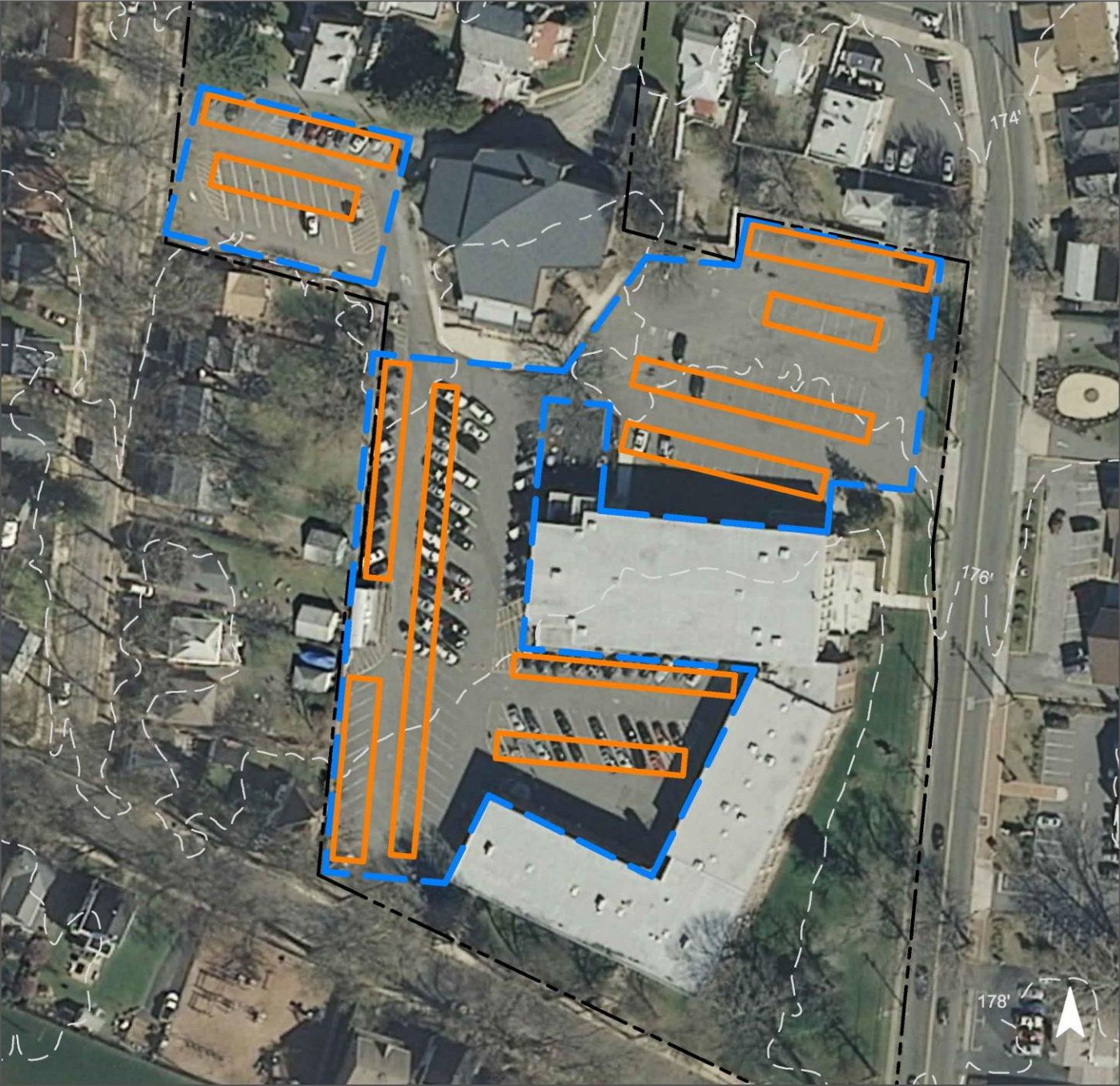


Parking can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
80	207,555	10.0	104.8	953.0	0.162	5.69

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 pavements	2.681	449	203,089	7.62	26,345	\$658,625

GREEN INFRASTRUCTURE RECOMMENDATIONS



Saint Rose of Lima Parish

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



SUNSHINE SCHOOLHOUSE



Subwatershed: Manasquan River

Site Area: 44,953 sq. ft.

Address: 67 W Main Street
Freehold, NJ 07728

Block and Lot: Block 35, Lot 34,35

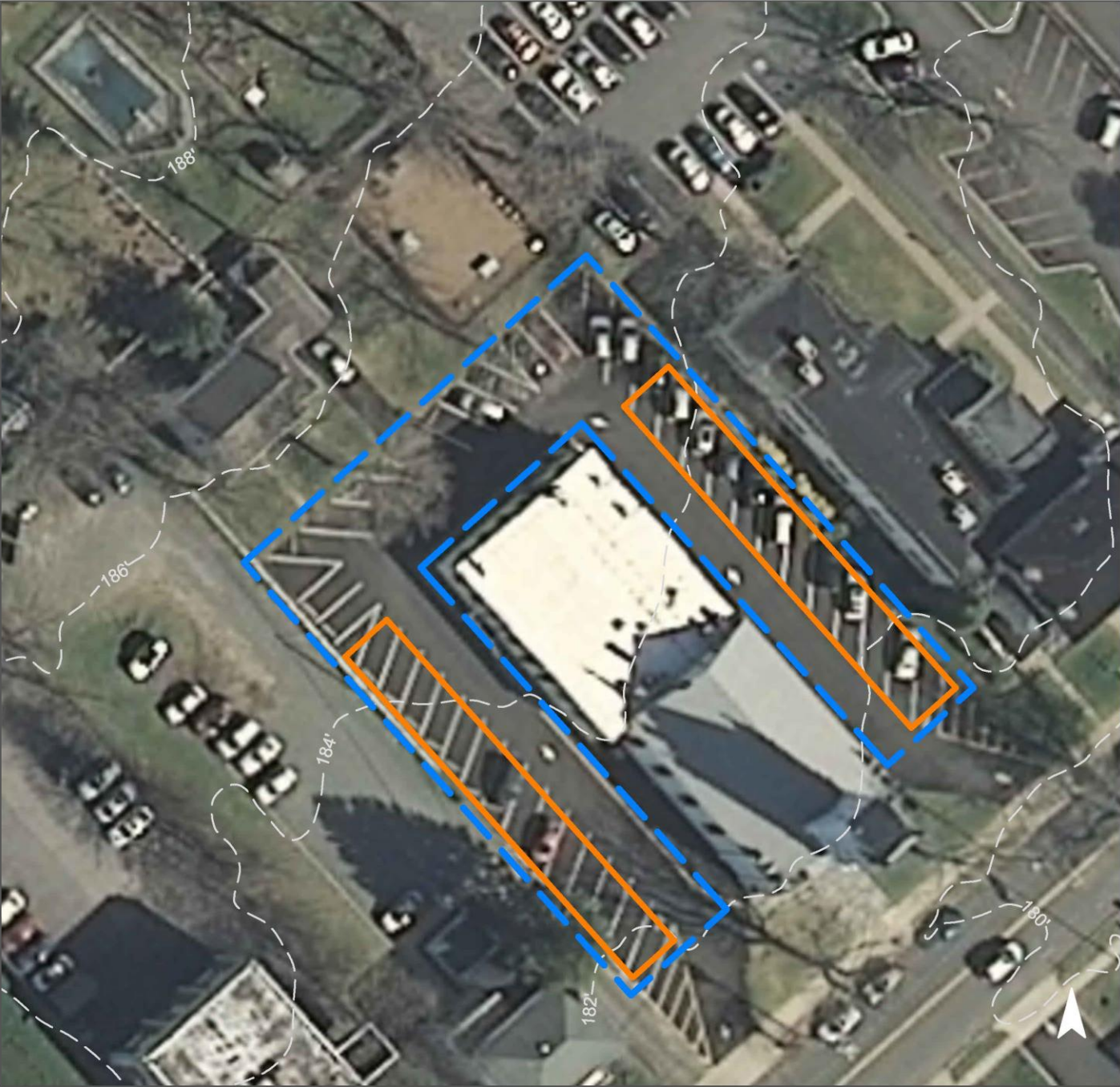


Parking spots on the southwest and northeast sides of the building can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
55	24,724	1.2	12.5	113.5	0.019	0.68

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 pavements	0.461	77	34,962	1.31	5,262	\$131,550

GREEN INFRASTRUCTURE RECOMMENDATIONS



Sunshine Schoolhouse

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



BOROUGH PLAZA



Subwatershed: Weamaconk Creek

Site Area: 85,166 sq. ft.

Address: 21 Broad Street
Freehold, NJ 07728

Block and Lot: Block 34, Lot 31

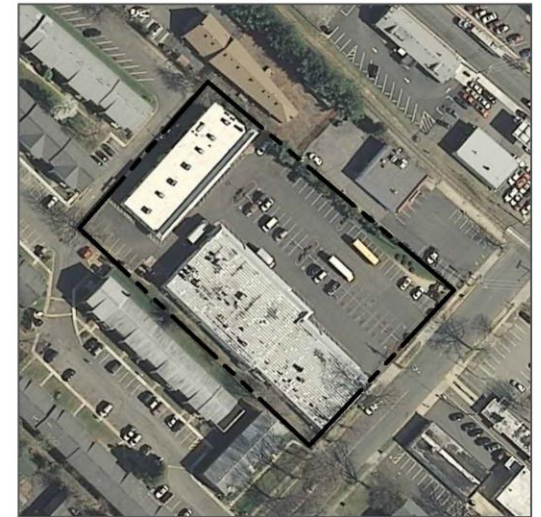
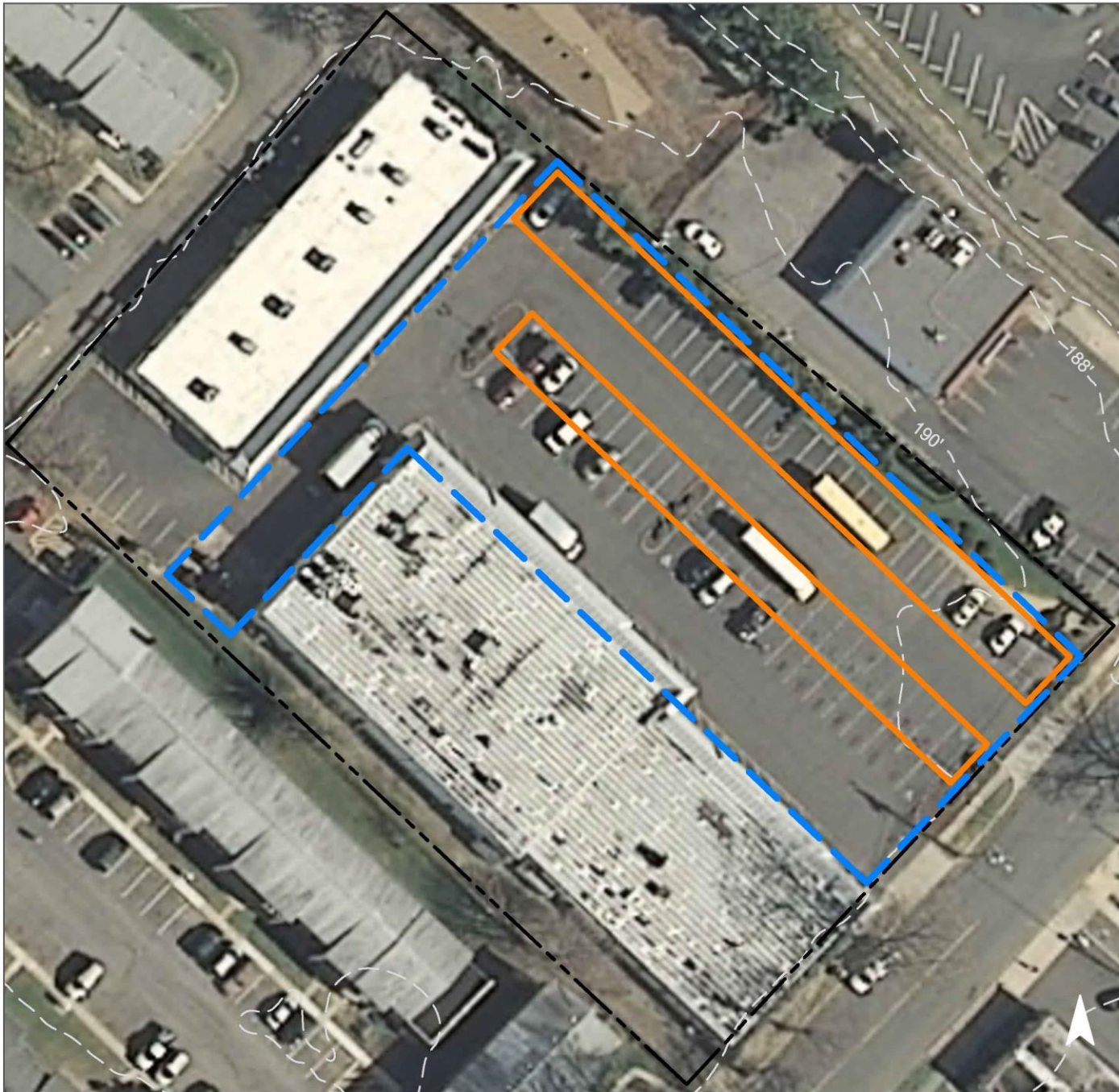


Two rows of parking spaces can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
95	80,887	3.9	40.9	371.4	0.063	2.22

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 pavements	0.967	162	73,274	2.75	11,796	\$294,900

GREEN INFRASTRUCTURE RECOMMENDATIONS



Borough Plaza

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



CHURCH OF GOD - FREEHOLD



Subwatershed: Weamaconk Creek

Site Area: 22,334 sq. ft.

Address: 26 Avenue A
Freehold, NJ 07728

Block and Lot: Block 7, Lot 4

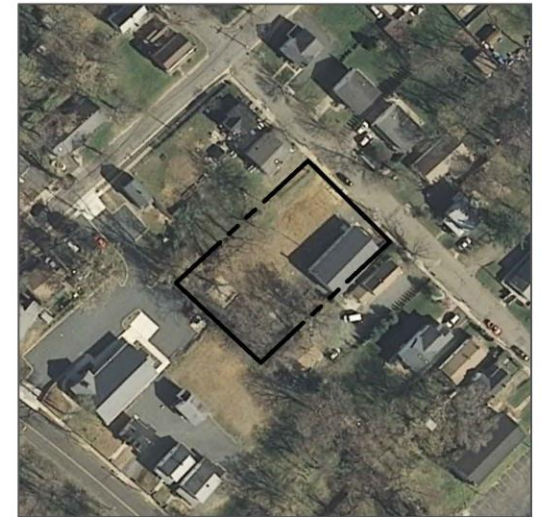
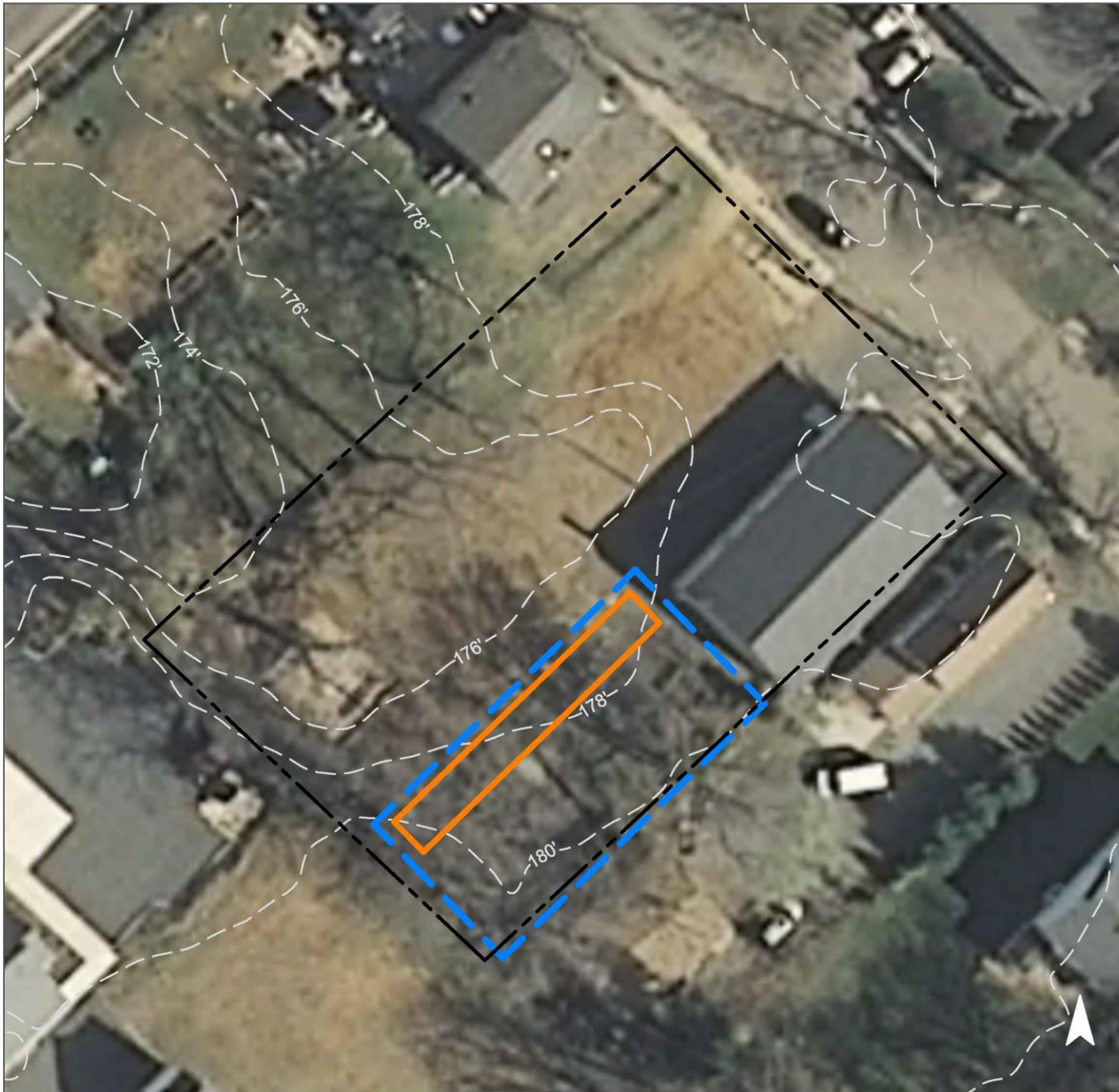


Parking spaces can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
33	7,268	0.4	3.7	33.4	0.006	0.20

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 pavements	0.118	20	8,931	0.34	927	\$23,175

GREEN INFRASTRUCTURE RECOMMENDATIONS



Church of God - Freehold

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



COURT STREET SCHOOL EDUCATION COMMUNITY CENTER



Subwatershed: Weamaconk Creek

Site Area: 95,188 sq. ft.

Address: 140 Court Street
Freehold, NJ 07728

Block and Lot: Block 5, Lot 1,2,3

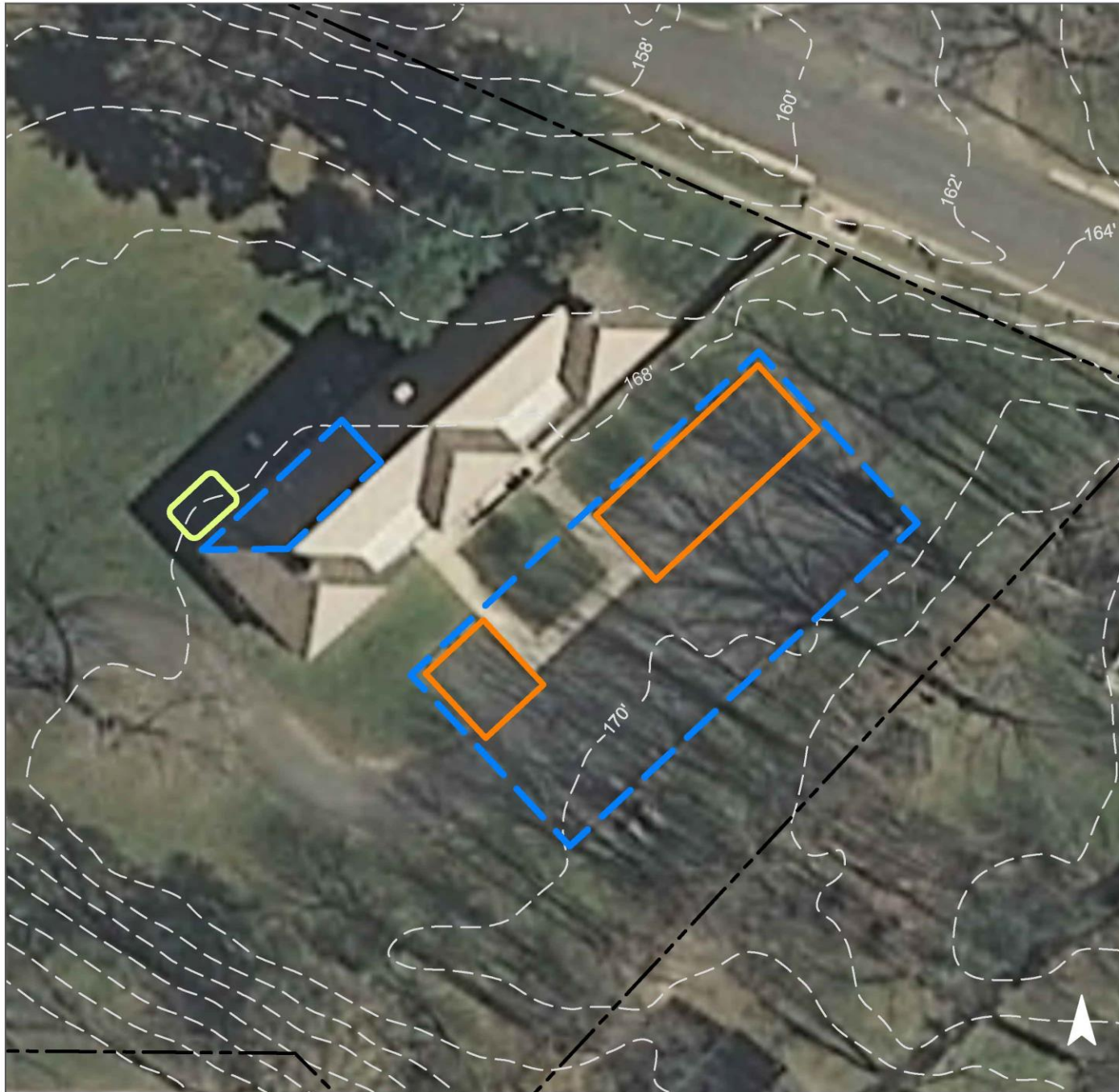


Parking spots can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the parking lot. A rain garden can be installed on the northwest corner of the building to capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that more soil testing would 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"
21	20,379	1.0	10.3	93.6	0.016	0.56

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	0.016	3	1,204	0.05	163	\$815
Pervious pavements	0.193	32	14,631	0.55	1,764	\$44,100

GREEN INFRASTRUCTURE RECOMMENDATIONS



**Court Street School
Education Community
Center**

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



FAITH TABERNACLE UNITED HOLINESS CHURCH



Subwatershed: Weamaconk Creek
Site Area: 13,207 sq. ft.
Address: 11 Avenue A
Freehold, NJ 07728
Block and Lot: Block 6, Lot 23.01

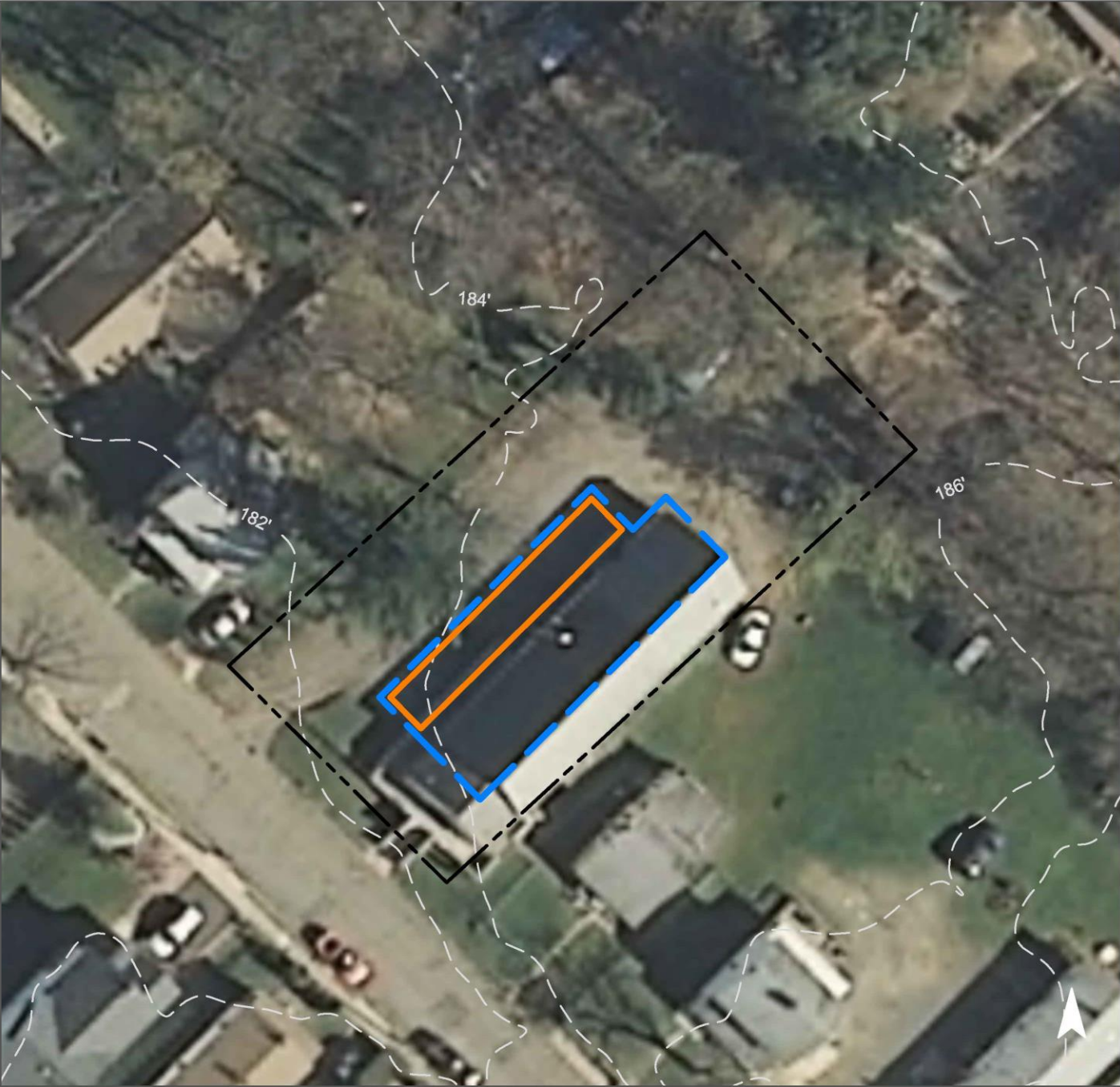


Parking spots adjacent to the northwest side of the church can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the roof. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
34	4,548	0.2	2.3	20.9	0.004	0.12

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 pavements	0.082	14	6,201	0.23	829	\$20,725

GREEN INFRASTRUCTURE RECOMMENDATIONS



Faith Tabernacle United Holiness Church

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



FREEHOLD RACEWAY PARKING LOT



Subwatershed: Weamaconk Creek

Site Area: 541,036 sq. ft.

Address: 130 Park Avenue
Freehold, NJ 07728

Block and Lot: Block 24, Lot 10.01



The parking spaces can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
67	363,400	17.5	183.5	1,668.5	0.283	9.97

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 pavements	8.707	1,458	659,676	24.76	106,886	\$2,672,150

GREEN INFRASTRUCTURE RECOMMENDATIONS



Freehold Raceway Parking Lot

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



GRACE LUTHERAN CHURCH



Subwatershed: Weamaconk Creek
Site Area: 64,079 sq. ft.
Address: 200 Park Avenue
Freehold, NJ 07728
Block and Lot: Block 117, Lot 21

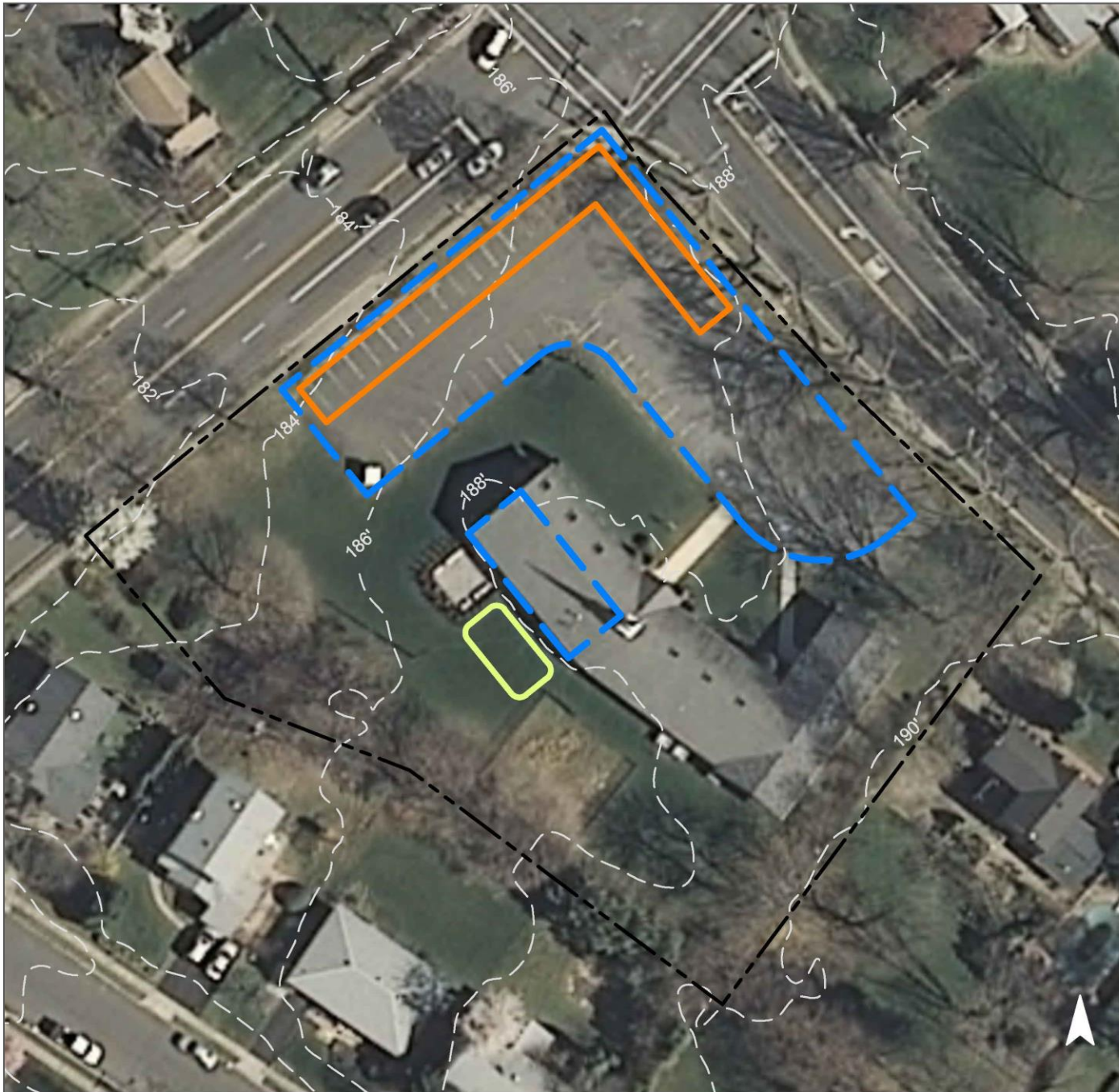


A rain garden can be installed on the northeast side of the building to capture, treat, and infiltrate runoff from the roof. Some parking spaces can be replaced with porous asphalt to capture and infiltrate part of the stormwater runoff the parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
39	25,221	1.2	12.7	115.8	0.020	0.69

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	0.042	7	3,216	0.12	628	\$3,140
Pervious pavements	0.408	68	30,885	1.16	3,467	\$86,675

GREEN INFRASTRUCTURE RECOMMENDATIONS



Grace Lutheran Church

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



HALL OF RECORDS



Subwatershed: Weamaconk Creek

Site Area: 65,895 sq. ft.

Address: 1 Court House Square
Freehold, NJ 07728

Block and Lot: Block 40, Lot 1.01

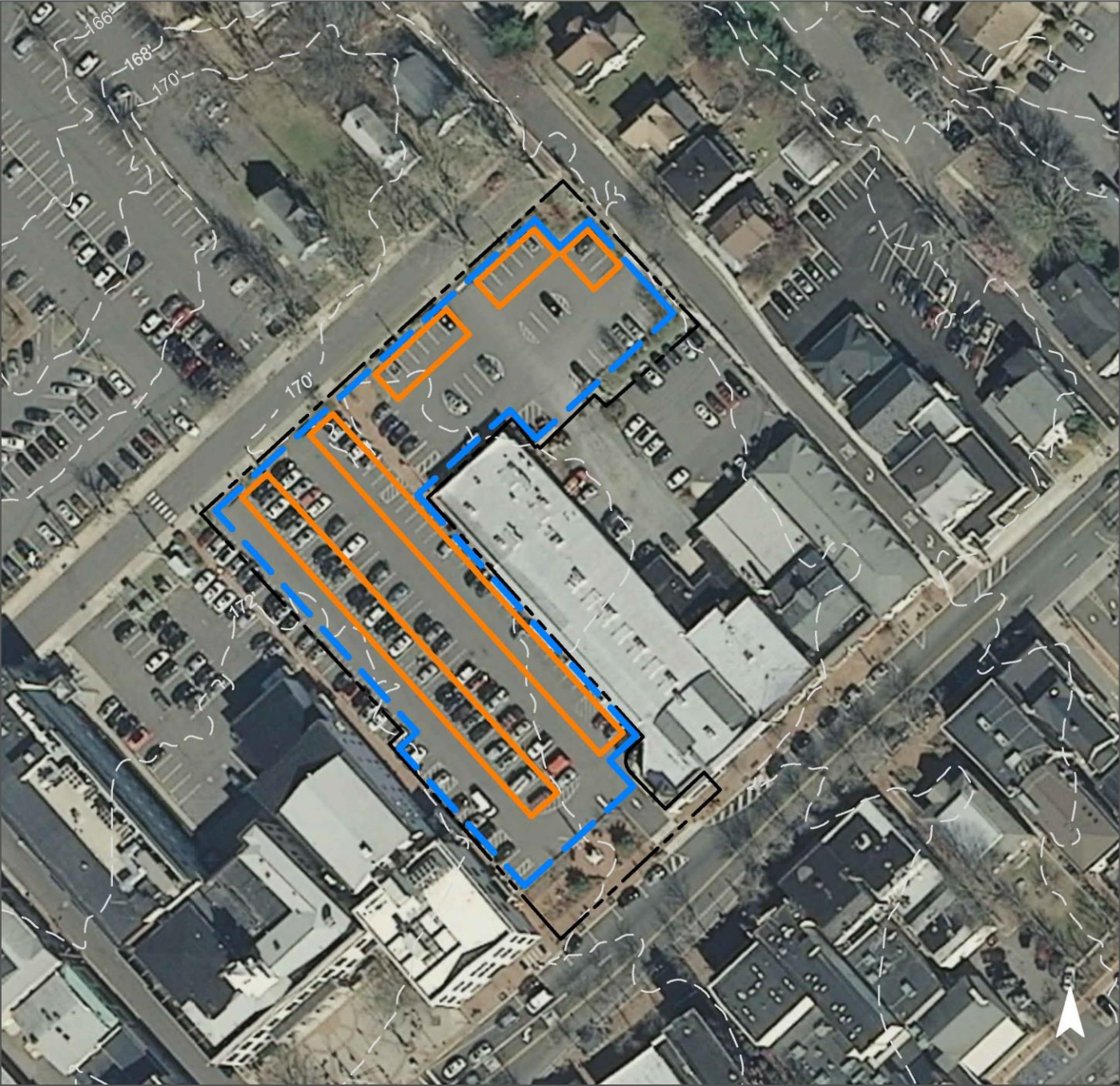


Parking spaces can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
95	62,600	3.0	31.6	287.4	0.049	1.72

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
Pervious pavements	1.378	231	104,376	3.92	15,188	\$379,700

GREEN INFRASTRUCTURE RECOMMENDATIONS



Hall of Records

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



KINGDOM HALL OF JEHOVAH'S WITNESSES



Subwatershed: Weamaconk Creek

Site Area: 106,856 sq. ft.

Address: 141 Court Street
Freehold, NJ 07728

Block and Lot: Block 4.01, Lot 1

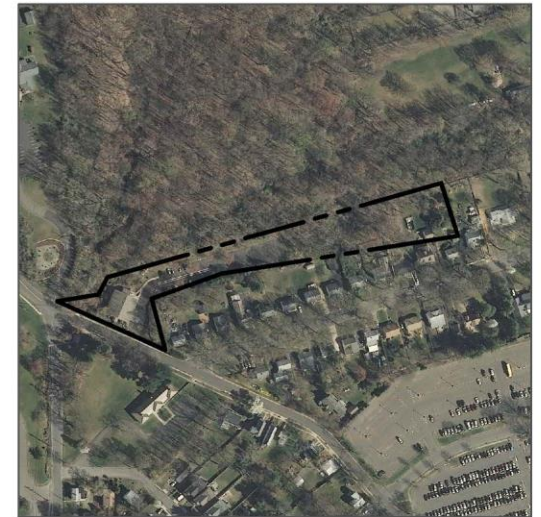
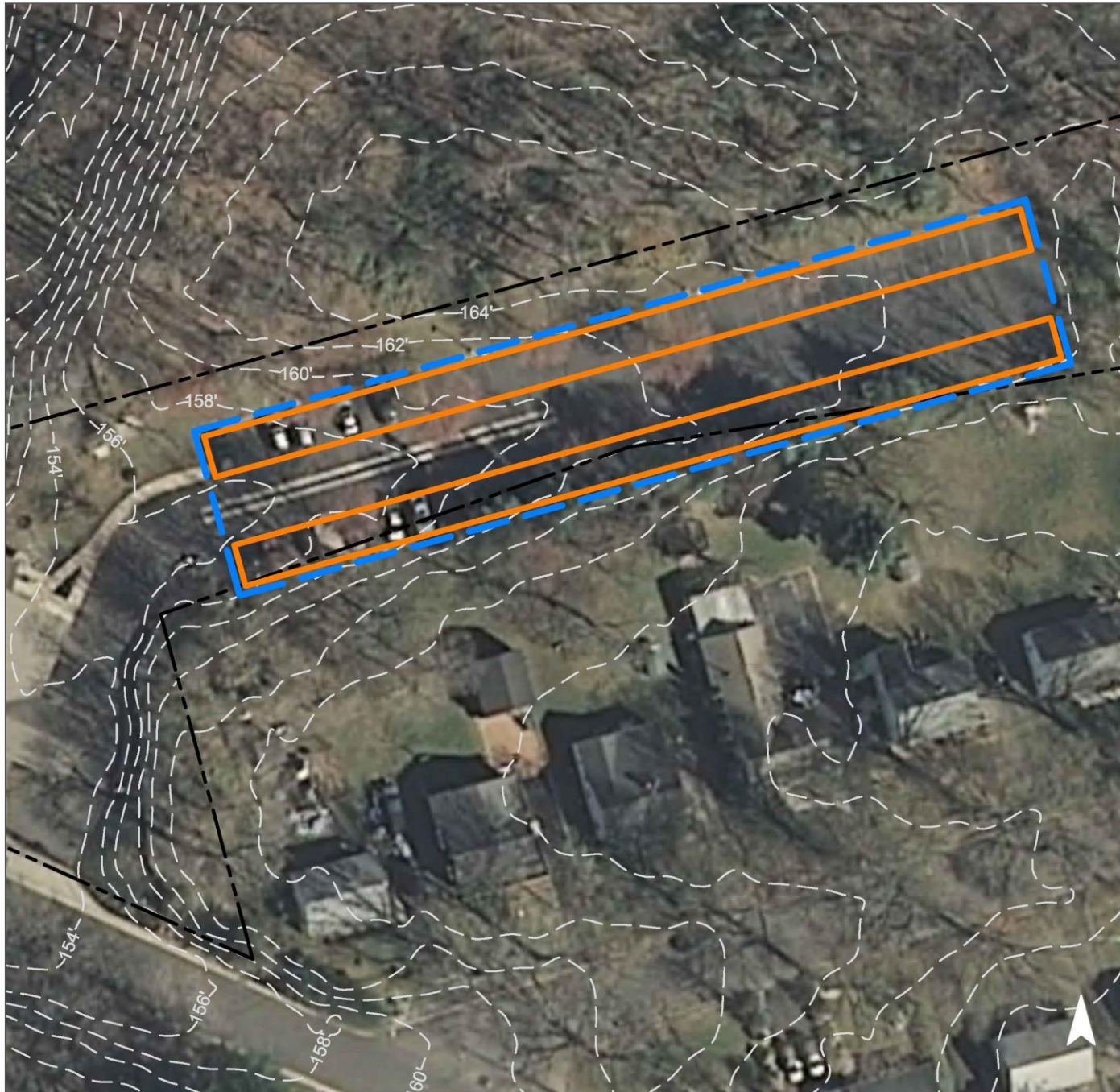


Some parking spots can be replaced with porous asphalt to capture and infiltrate stormwater runoff before it drains to the catch basin installed into the middle of the parking lot. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.





Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
38	40,985	2.0	20.7	188.2	0.032	1.12

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 pavements	0.576	96	43,623	1.64	10,738	\$268,450

GREEN INFRASTRUCTURE RECOMMENDATIONS



**Kingdom Hall of
Jehovah's Witnesses**

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



MONMOUTH COUNTY VOCATIONAL SCHOOL



Subwatershed: Weamaconk Creek
Site Area: 71,088 sq. ft.
Address: 21 Robertsville Road
Freehold, NJ 07728
Block and Lot: Block 3, Lot 19.01,19.02

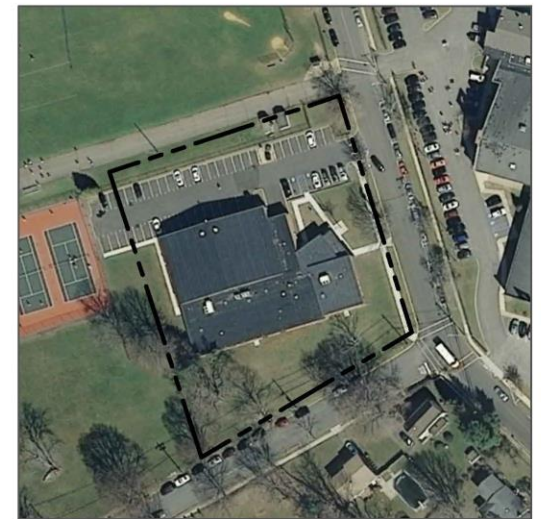
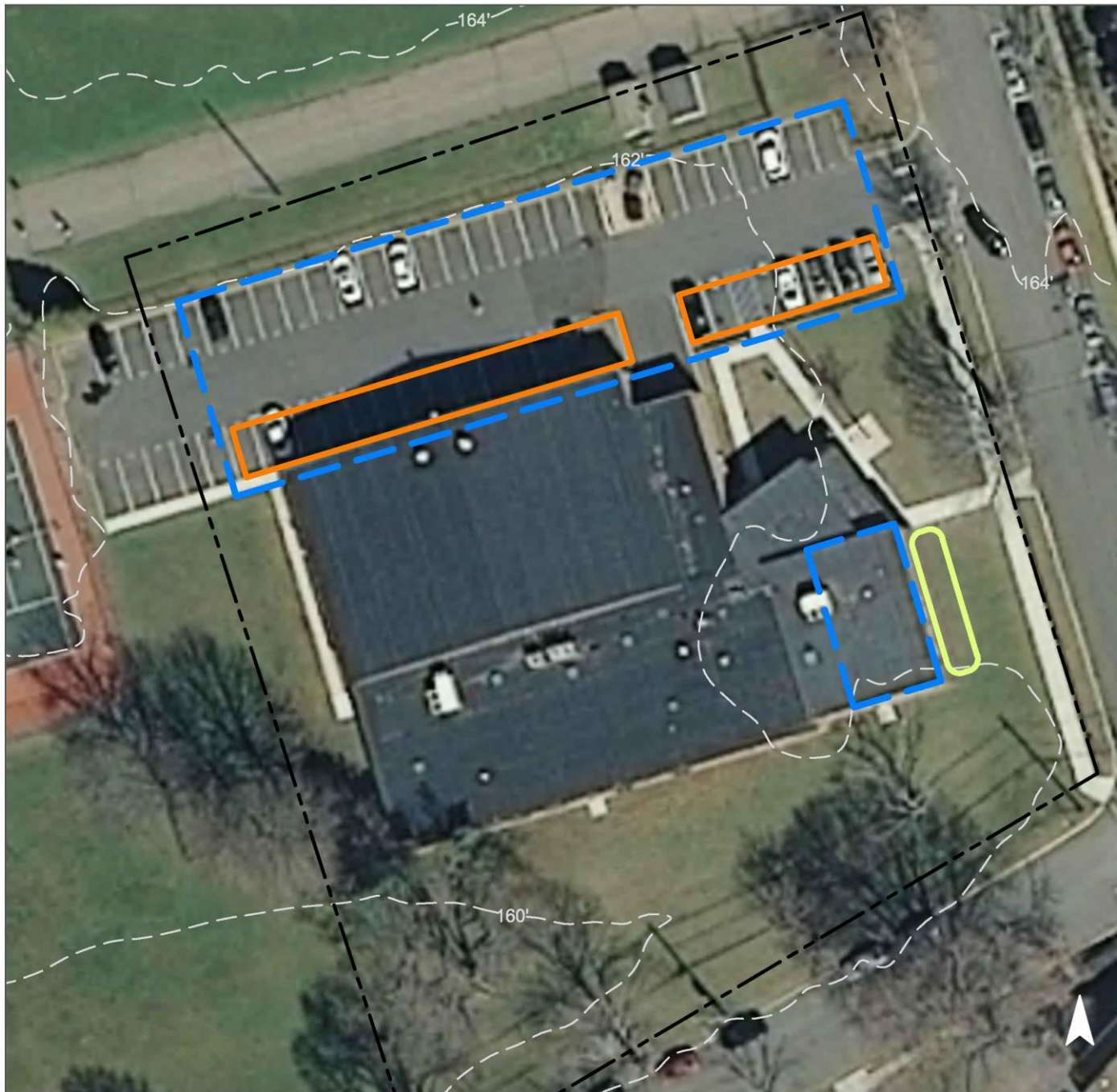


Parking spots can be replaced with porous asphalt to capture and infiltrate stormwater runoff from the parking lot. A rain garden can be installed on the southeast side of the building to infiltrate and treat roof runoff. A preliminary soil assessment suggests that more soil testing would be required 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"
47	33,742	4.1	43.0	391.0	0.026	0.93

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	0.041	7	3,082	0.12	461	\$2,305
Pervious pavements	0.386	65	29,224	1.10	3,193	\$79,825

GREEN INFRASTRUCTURE RECOMMENDATIONS



Monmouth County Vocational School

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



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			I.C. %	I.C. Area (ac)	I.C. Area (SF)	Runoff Volumes from I.C.	
					TP (lb/yr)	TN (lb/yr)	TSS (lb/yr)				Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
MANASQUAN RIVER SUBWATERSHED	32.79	1,428,204			33.7	352.7	3,206.0		16.03	698,266	0.544	19.15
First Baptist Church of Freehold												
Total Site Info	1.75	76,179	35	42	3.0	31.8	289.0	83	1.44	62,942	0.049	1.73
First Presbyterian Church of Freehold												
Total Site Info	1.42	61,824	95	1	1.6	16.7	152.2	54	0.76	33,148	0.026	0.91
First United Methodist Church												
Total Site Info	0.85	37,053	28	19	1.2	12.9	116.9	69	0.58	25,454	0.020	0.70
Freehold Borough Municipal Building												
Total Site Info	0.96	41,670	35	27, 28	1.9	19.9	181.3	95	0.91	39,487	0.031	1.08
Hudson Manor												
Total Site Info	2.80	122,016	63	8.01	4.2	44.4	403.4	72	2.02	87,857	0.068	2.41
Park Avenue Elementary School and Intermediate School												
Total Site Info	19.76	860,821	116	1	13.5	141.4	1,285.8	33	6.43	280,041	0.218	7.68
Saint Rose of Lima Parish												
Total Site Info	5.97	259,867	82	12	10.0	104.8	953.0	80	4.76	207,555	0.162	5.69
Sunshine Schoolhouse												
Total Site Info	1.03	44,953	35	34, 35	1.2	12.5	113.5	55	0.57	24,724	0.019	0.68
WEAMACONK CREEK SUBWATERSHED	24.45	1,064,849			30.8	322.7	2,934.0		14.67	639,030	0.498	17.53
Borough Plaza												
Total Site Info	1.96	85,166	34	31	3.9	40.9	371.4	95	1.86	80,887	0.063	2.22
Church of God Freehold												
Total Site Info	0.51	22,334	7	4	0.4	3.7	33.4	33	0.17	7,268	0.006	0.20
Court Street School Education Community Center												
Total Site Info	2.19	95,188	5	1, 2, 3	1.0	10.3	93.6	21	0.47	20,379	0.016	0.56

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)				Water Quality Storm (1.25" over 2-hours) (Mgal)	Annual (Mgal)
Faith Tabernacle United Holiness Church Total Site Info	0.30	13,207	6	23.01	0.2	2.3	20.9	34	0.10	4,548	0.004	0.12
Freehold Raceway Parking Lot Total Site Info	12.42	541,036	24	10.01	17.5	183.5	1,668.5	67	8.34	363,400	0.283	9.97
Grace Lutheran Church Total Site Info	1.47	64,079	117	21	1.2	12.7	115.8	39	0.58	25,221	0.020	0.69
Hall of Records Total Site Info	1.51	65,895	40	1.01	3.0	31.6	287.4	95	1.44	62,600	0.049	1.72
Kingdom Hall of Jehova's Witnesses Total Site Info	2.45	106,856	4.01	1	2.0	20.7	188.2	38	0.94	40,985	0.032	1.12
Monmouth County Vocational School Total Site Info	1.63	71,088	3	19.02	1.6	17.0	154.9	47	0.77	33,742	0.026	0.93

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)									
MANASQUAN RIVER SUBWATERSHED	241,181	5.54	6.284	1,052	476,080	17.85	62,432			\$1,551,672	34.5%
1 First Baptist Church of Freehold											
Bioretention systems/rain gardens	1,092	0.03	0.028	5	2,154	0.08	457	5	SF	\$2,285	1.7%
Pervious pavements	31,418	0.72	0.819	137	62,017	2.33	6,004	25	SF	\$150,100	49.9%
Total Site Info	32,510	0.75	0.847	142	64,171	2.41	6,461			\$152,385	51.7%
2 First Presbyterian Church of Freehold											
Pervious pavements	5,276	0.12	0.137	23	10,412	0.39	1,255	25	SF	\$31,375	15.9%
Total Site Info	5,276	0.12	0.137	23	10,412	0.39	1,255			\$31,375	15.9%
3 First United Methodist Church											
Pervious pavements	8,703	0.20	0.227	38	17,182	0.64	1,902	25	SF	\$47,550	34.2%
Total Site Info	8,703	0.20	0.227	38	17,182	0.64	1,902			\$47,550	34.2%
4 Freehold Borough Municipal Building											
Pervious pavements	9,102	0.21	0.237	40	17,967	0.67	2,381	25	SF	\$59,525	23.1%
Total Site Info	9,102	0.21	0.237	40	17,967	0.67	2,381			\$59,525	23.1%
5 Hudson Manor											
Pervious pavements	40,014	0.92	1.043	175	78,989	2.96	12,139	25	SF	\$303,475	45.5%
Total Site Info	40,014	0.92	1.043	175	78,989	2.96	12,139			\$303,475	45.5%
6 Park Avenue Elementary School and Intermediate School											
Pervious pavements	24,981	0.57	0.651	109	49,308	1.85	6,687	25	SF	\$167,187	8.9%
Total Site Info	24,981	0.57	0.651	109	49,308	1.85	6,687			\$167,187	8.9%
7 Saint Rose of Lima Parish											
Pervious pavements	102,885	2.36	2.681	449	203,089	7.62	26,345	25	SF	\$658,625	49.6%
Total Site Info	102,885	2.36	2.681	449	203,089	7.62	26,345			\$658,625	49.6%
8 Sunshine Schoolhouse											
Pervious pavements	17,710	0.41	0.461	77	34,962	1.31	5,262	25	SF	\$131,550	71.6%
Total Site Info	17,710	0.41	0.461	77	34,962	1.31	5,262			\$131,550	71.6%

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)									
WEAMACONK CREEK SUBWATERSHED	495,615	11.38	12.913	2,162	978,323	36.74	156,040			\$3,875,960	77.6%
9 Borough Plaza											
Pervious pavements	37,120	0.85	0.967	162	73,274	2.75	11,796	25	SF	\$294,900	45.9%
Total Site Info	37,120	0.85	0.967	162	73,274	2.75	11,796			\$294,900	45.9%
10 Church of God Freehold											
Pervious pavements	4,526	0.10	0.118	20	8,931	0.34	927	25	SF	\$23,175	62.3%
Total Site Info	4,526	0.10	0.118	20	8,931	0.34	927			\$23,175	62.3%
11 Court Street School Education Community Center											
Bioretention systems/rain gardens	609	0.01	0.016	3	1,204	0.05	163	5	SF	\$815	3.0%
Pervious pavements	7,413	0.17	0.193	32	14,631	0.55	1,764	25	SF	\$44,100	36.4%
Total Site Info	8,022	0.18	0.209	35	15,835	0.60	1,927			\$44,915	39.4%
12 Faith Tabernacle United Holiness Church											
Pervious pavements	3,141	0.07	0.082	14	6,201	0.23	829	25	SF	\$20,725	69.1%
Total Site Info	3,141	0.07	0.082	14	6,201	0.23	829			\$20,725	69.1%
13 Freehold Raceway Parking Lot											
Pervious pavements	334,190	7.67	8.707	1458	659,676	24.76	106,886	25	SF	\$2,672,150	92.0%
Total Site Info	334,190	7.67	8.707	1,458	659,676	24.76	106,886			\$2,672,150	92.0%
14 Grace Lutheran Church											
Bioretention systems/rain gardens	1,628	0.04	0.042	7	3,216	0.12	628	5	SF	\$3,140	6.5%
Pervious pavements	15,648	0.36	0.408	68	30,885	1.16	3,467	25	SF	\$86,675	62.0%
Total Site Info	17,276	0.40	0.450	75	34,101	1.28	4,095			\$89,815	68.5%
15 Hall of Records											
Pervious pavements	52,876	1.21	1.378	231	104,376	3.92	15,188	25	SF	\$379,700	84.5%
Total Site Info	52,876	1.21	1.378	231	104,376	3.92	15,188			\$379,700	84.5%
16 Kingdom Hall of Jehova's Witnesses											
Pervious pavements	22,098	0.51	0.576	96	43,623	1.64	10,738	25	SF	\$268,450	53.9%
Total Site Info	22,098	0.51	0.576	96	43,623	1.64	10,738			\$268,450	53.9%

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)									
17 Monmouth County Vocational School											
Bioretention systems/rain gardens	1,563	0.04	0.041	7	3,082	0.12	461	5	SF	\$2,305	4.6%
Pervious pavements	14,803	0.34	0.386	65	29,224	1.10	3,193	25	SF	\$79,825	43.9%
Total Site Info	16,366	0.38	0.426	71	32,306	1.22	3,654			\$82,130	48.5%