RUTGERS
New Jersey Agricultural Experiment Station

Draft

Impervious Cover Reduction Action Plan for Long Branch, Monmouth County, New Jersey

Prepared for Long Branch by the Rutgers Cooperative Extension Water Resources Program

February 10, 2016

Sea Grant
NJ Sea Grant Consortium

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Introduction

Located in Monmouth County in central New Jersey, Long Branch is approximately 6.3 square miles in size. Figures 1 and 2 illustrate that Long Branch City is dominated by urban land use. A total of 86.8% of the municipality's land use is classified as urban. Of the urban land use in Long Branch, medium density residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection (NJDEP) 2007 land use/land cover geographical information system (GIS) data layer categorizes Long Branch City 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 Long Branch. Based upon the NJDEP 2007 land use/land cover data, approximately 38.9% of Long Branch has impervious cover. This level of impervious cover suggests that the streams in Long Branch are likely non-supporting streams.[1]

Methodology

Long Branch contains portions of four 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

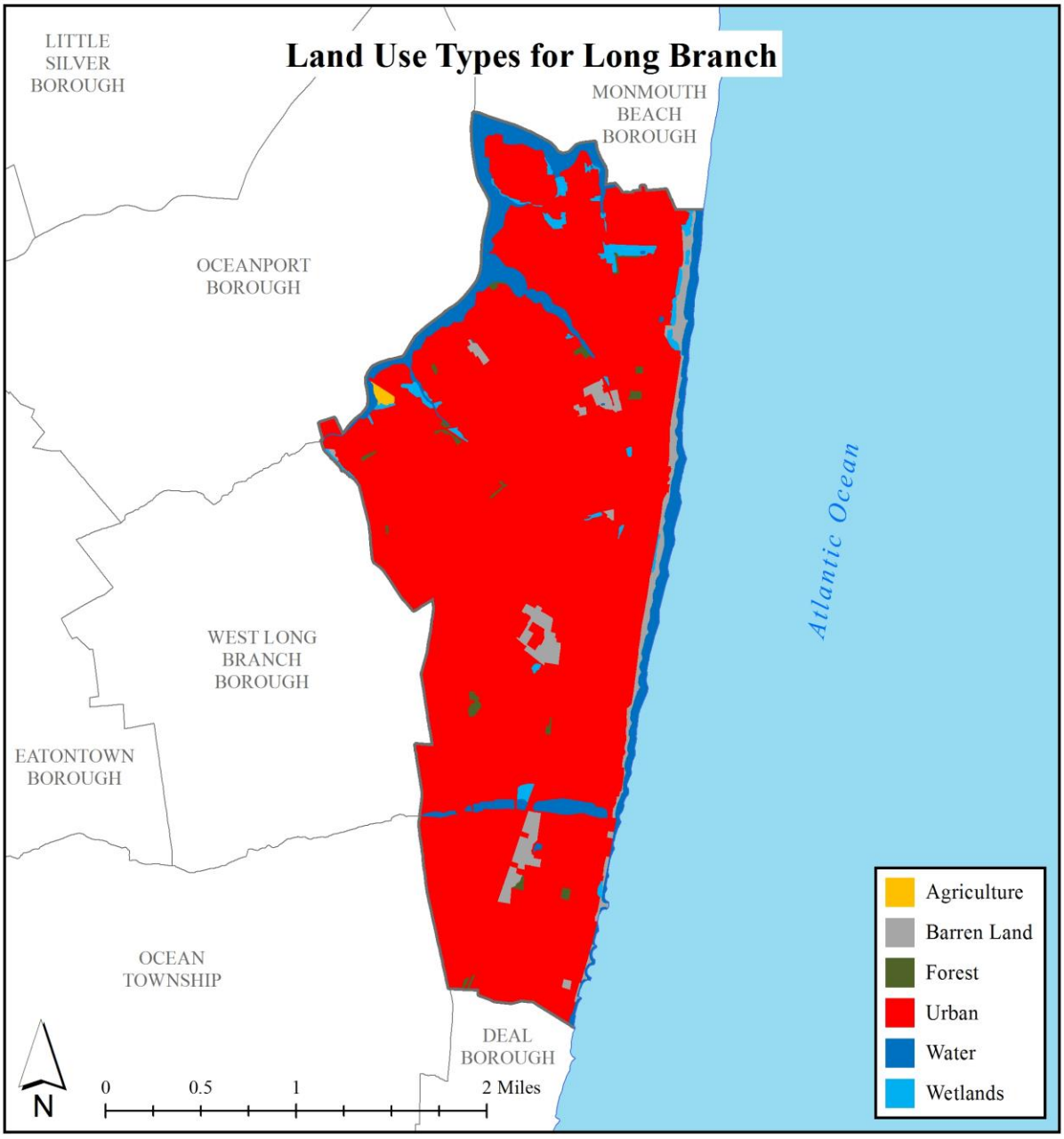


Figure 1: Map illustrating the land use in Long Branch

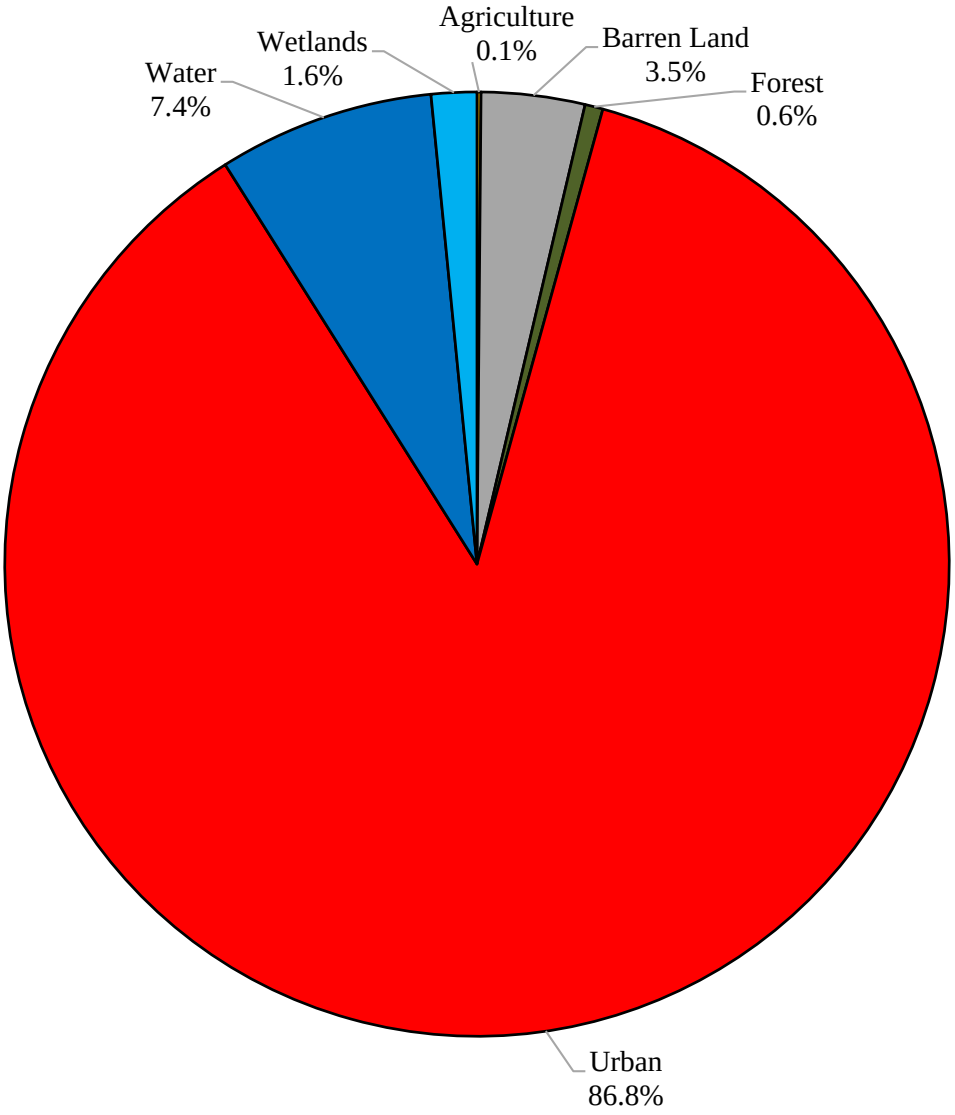


Figure 2: Pie chart illustrating the land use in Long Branch

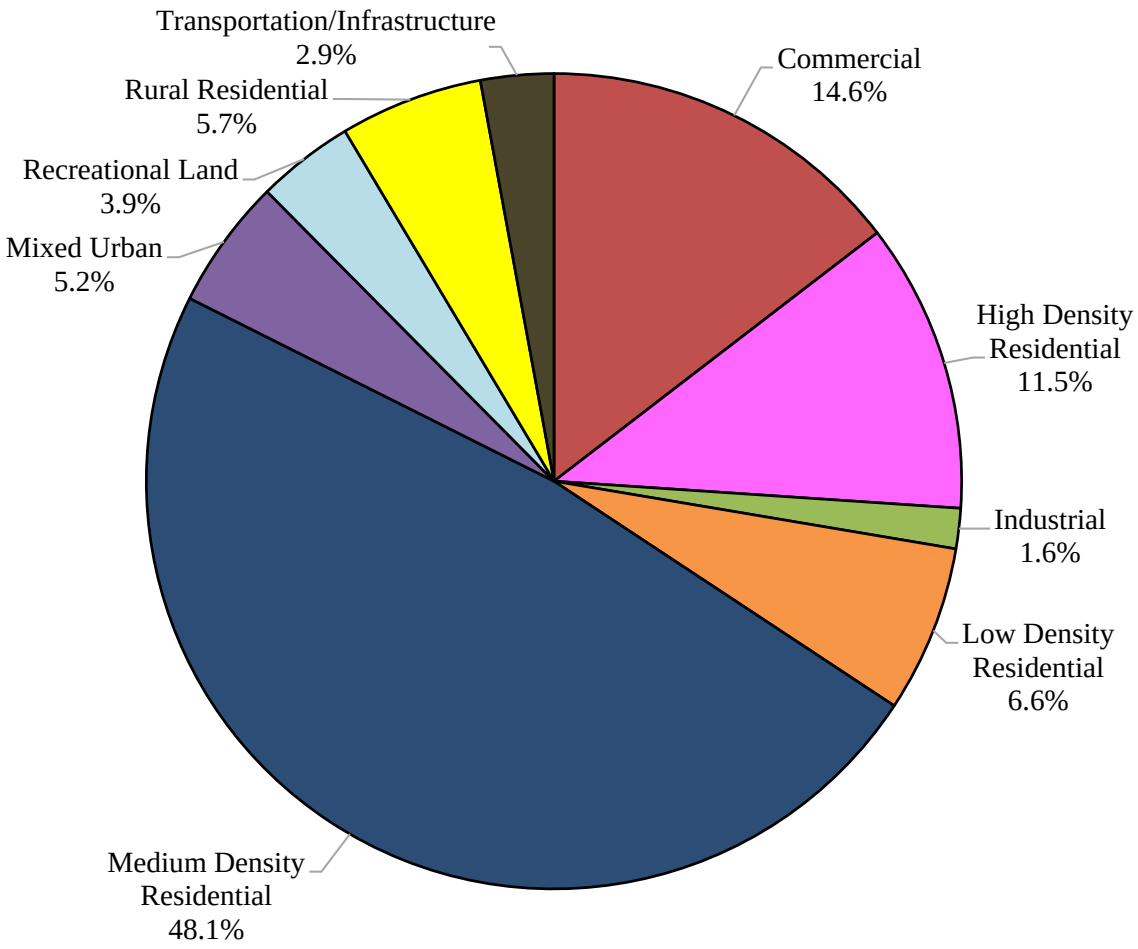


Figure 3: Pie chart illustrating the various types of urban land use in Long Branch

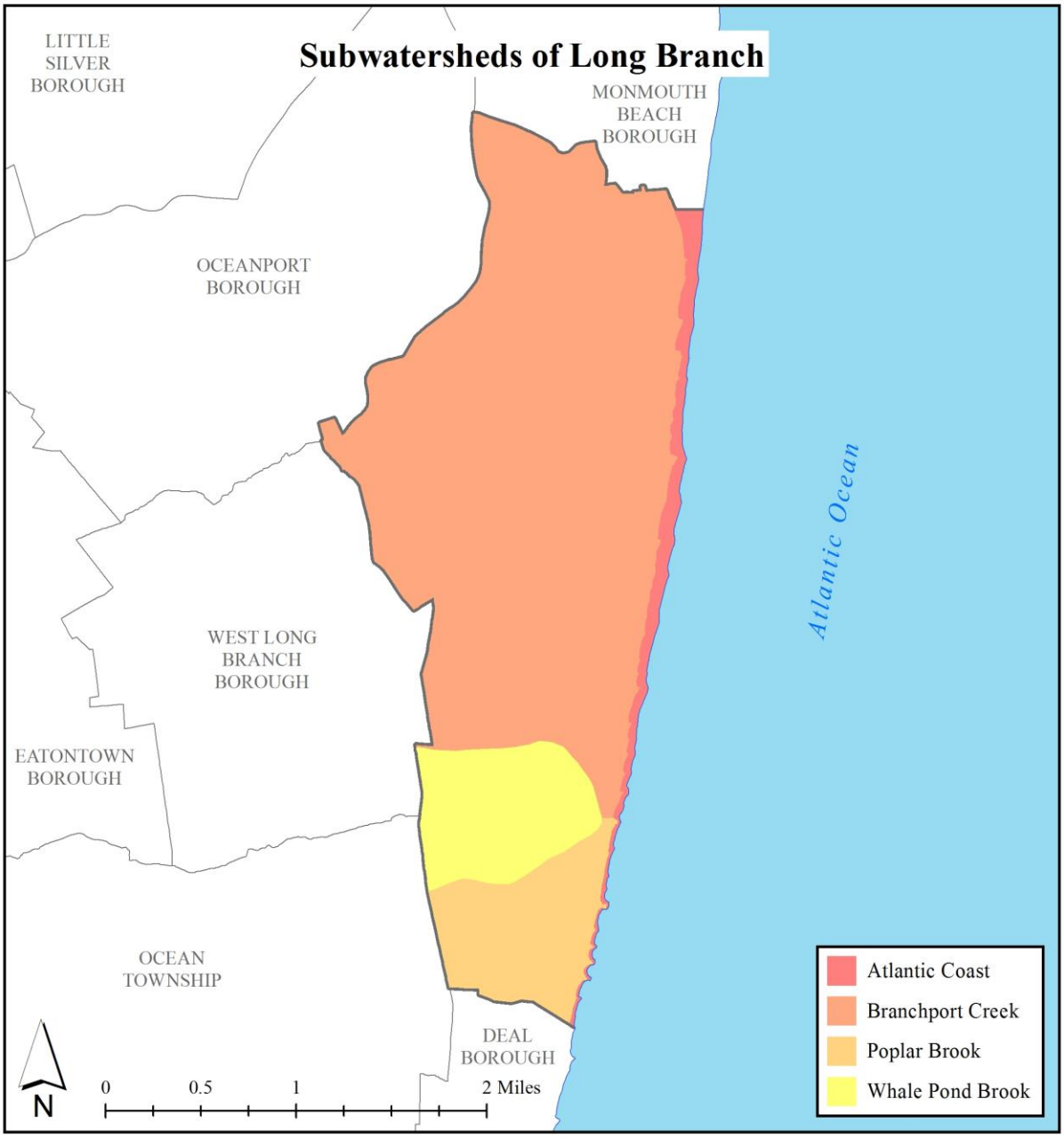


Figure 4: Map of the subwatersheds in Long Branch

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 Long Branch 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 Long Branch. 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. Green Infrastructure Sites

LONG BRANCH CITY: GREEN INFRASTRUCTURE SITES

SITES WITHIN THE BRANCHPORT CREEK SUBWATERSHED:

1. Jerry Morgan Park
2. Long Branch Covenant Church
3. Long Branch Fire Department
4. Long Branch Free Public Library / Municipal Building
5. Long Branch High School
6. Long Branch Middle School
7. Long Branch Public Works
8. Pleasure Bay Park
9. Saint James Episcopal Church
10. Saint Luke's United Methodist Church

b. Proposed Green Infrastructure Concepts

JERRY MORGAN PARK

Subwatershed: **Branchport Creek**

Site Area: **584,920 sq. ft.**

Address: **26 Long Branch Avenue**
Long Branch, NJ 07740

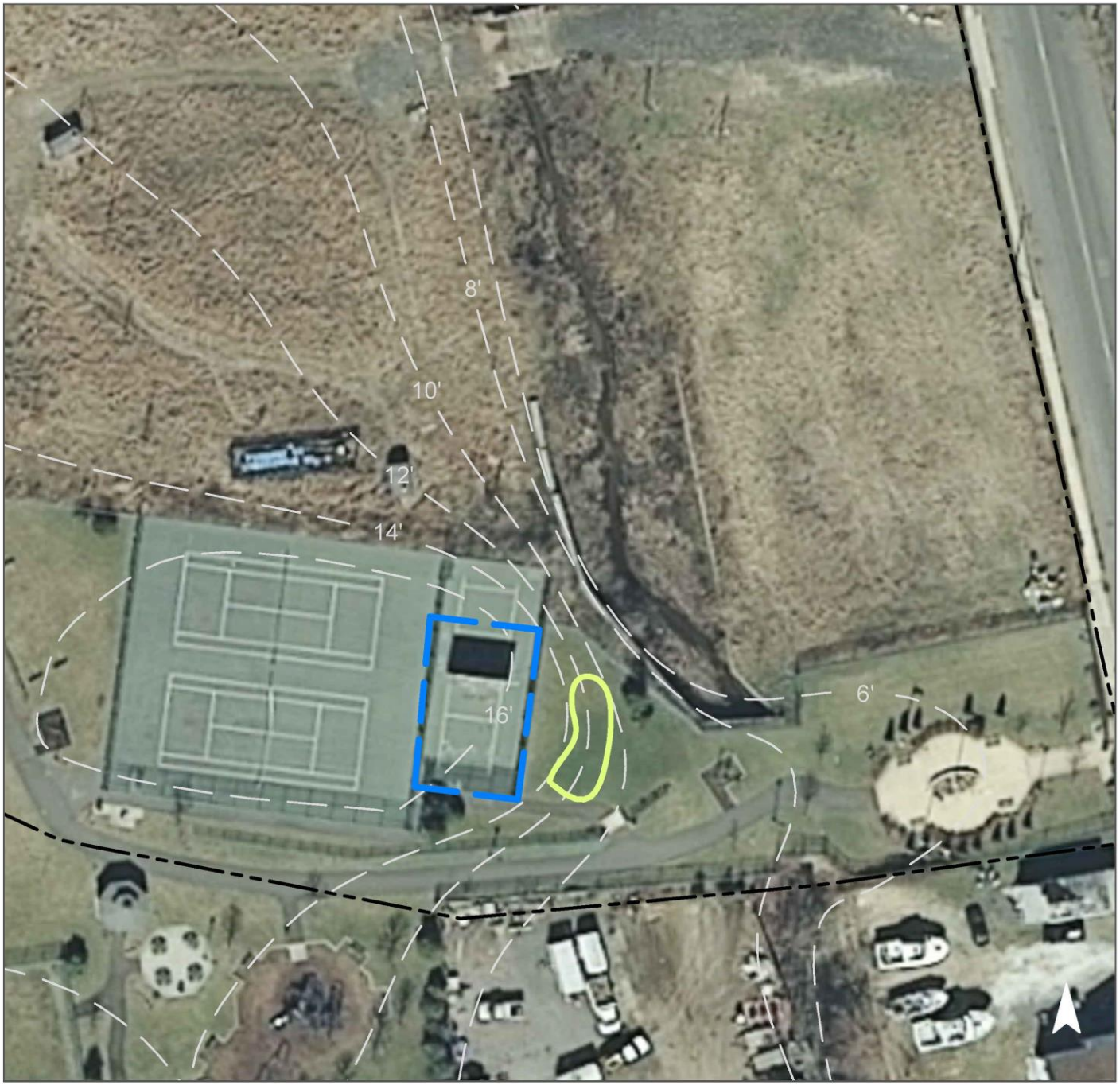
Block and Lot: **Block 493, Lot 2**

A rain garden can be installed to capture, treat, and infiltrate runoff from the tennis court. 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"
6	33,165	1.6	16.7	152.3	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
Bioretention systems	0.073	12	5,528	0.21	715	$3,575

GREEN INFRASTRUCTURE RECOMMENDATIONS



Jerry Morgan Park

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

0 30' 60'

LONG BRANCH COVENANT CHURCH

Subwatershed: **Branchport Creek**

Site Area: **211,385 sq. ft.**

Address: **355 Joline Avenue**
Long Branch, NJ 07740

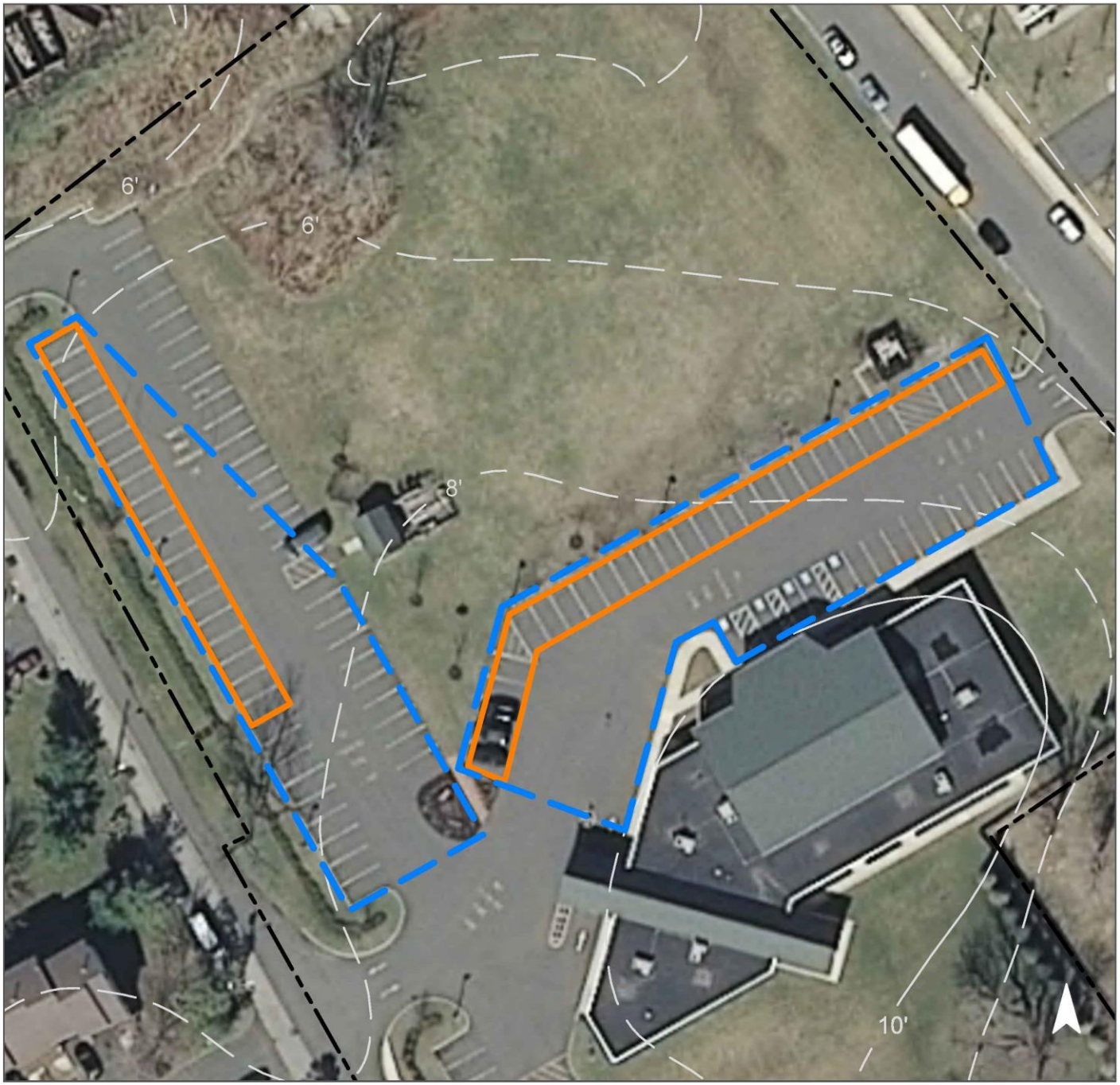
Block and Lot: **Block 328, Lot 5**

Parking spaces 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"
35	73,765	3.6	37.3	338.7	0.057	2.02

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 pavements	0.750	126	56,833	2.13	7,310	$182,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Long Branch Covenant Church

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

0 30' 60'

LONG BRANCH FIRE DEPARTMENT

Subwatershed: Branchport Creek

Site Area: 30,000 sq. ft.

Address: 205 Union Avenue
Long Branch, NJ 07740

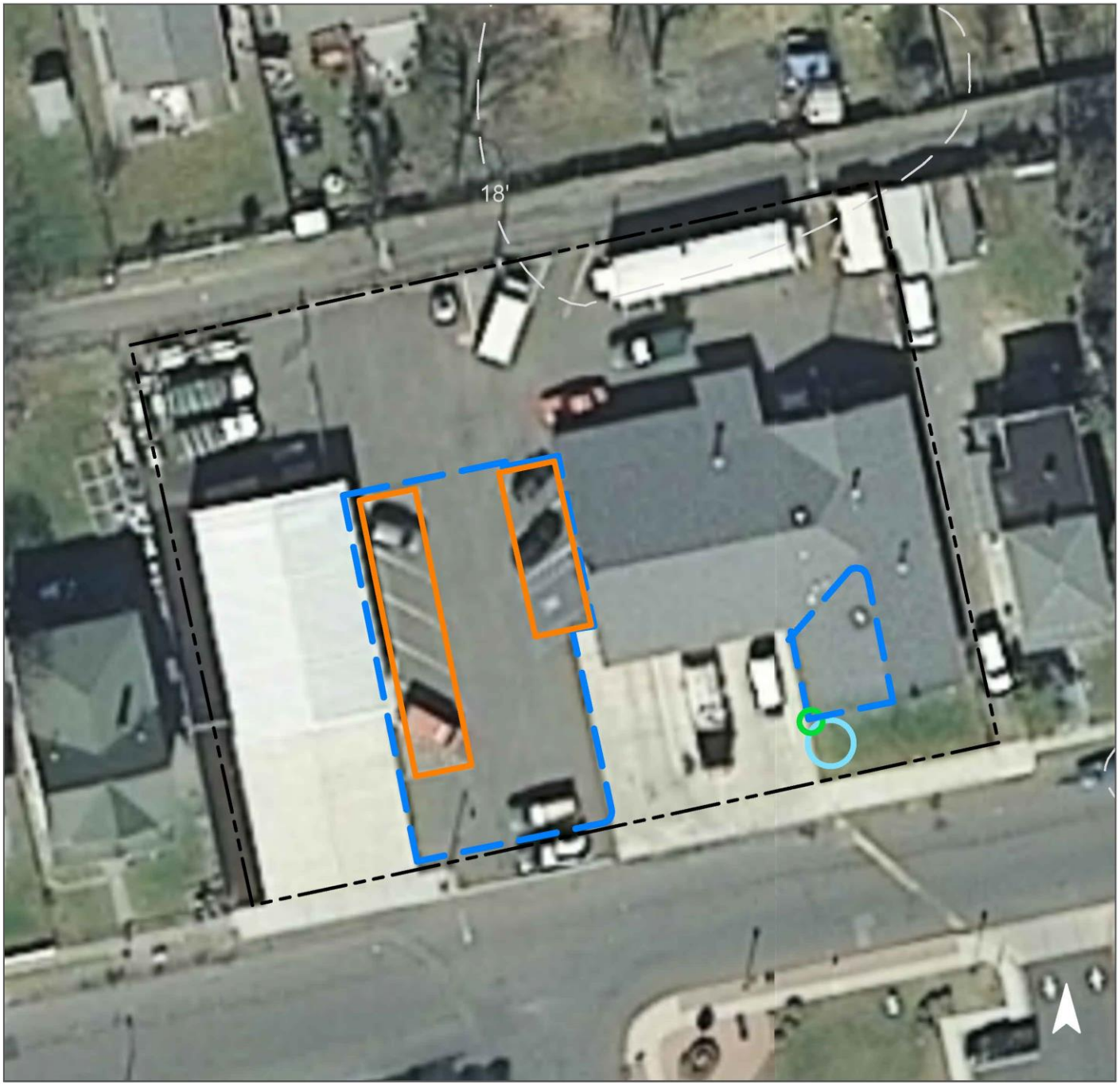
Block and Lot: Block 273, Lot 10, 12, 13

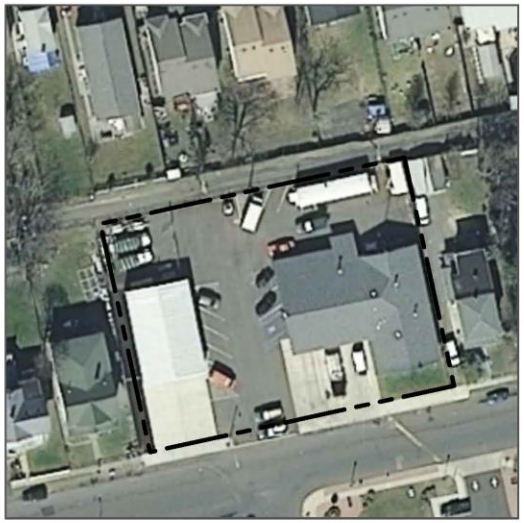
A cistern can be installed to harvest rainwater from the roof. The water can be used to wash emergency vehicles on site. Parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics 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"
85	25,500	1.2	12.9	117.1	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	0.139	23	10,524	0.39	1,750	$43,750
Rainwater harvesting systems	0.018	3	1,000	0.05	1,000 (gal)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Long Branch Fire Department

- disconnected downspouts
- pervious pavements
- rainwater harvesting
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 20' 40'

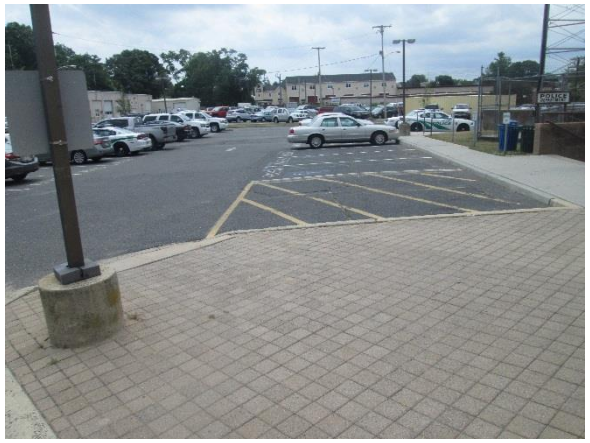
LONG BRANCH FREE PUBLIC LIBRARY / MUNICIPAL OFFICE

Subwatershed: **Branchport Creek**

Site Area: **272,170 sq. ft.**

Address: **328; 344 Broadway**
Long Branch, NJ 07740

Block and Lot: **Block 234, Lot 1.01**

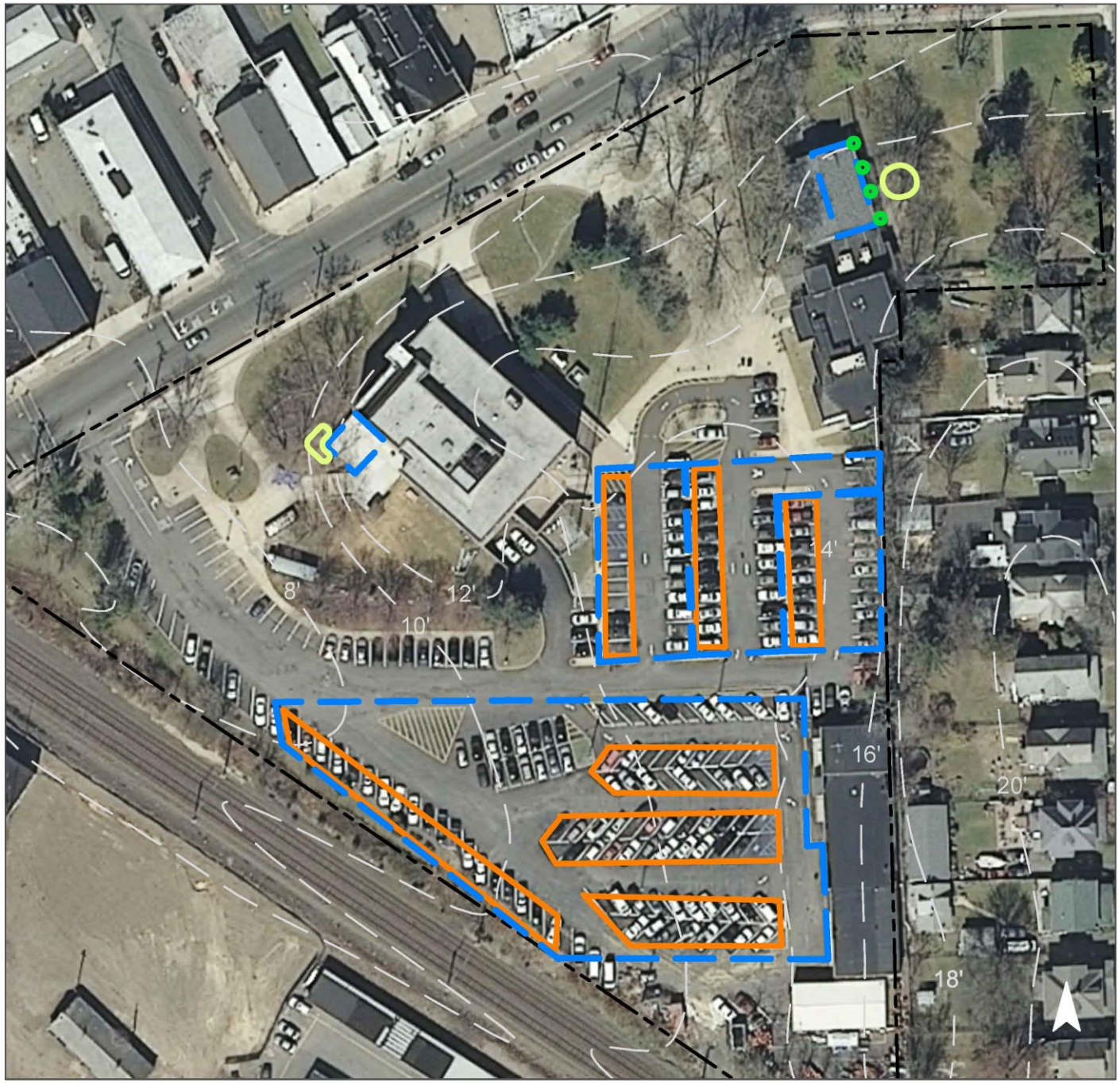


Parking spots can be replaced with porous asphalt to capture and infiltrate stormwater. A rain garden can be installed at the west entrance of the municipal building to intercept runoff from the roof from directly draining into the catch basin. Another rain garden can be installed east of the library to 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"
59	161,610	7.8	81.6	742.0	0.126	4.43

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
Bioretention systems	0.059	10	4,451	0.17	570	$2,850
Pervious pavements	1.822	305	137,999	5.18	21,540	$538,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Long Branch Free Public Library / Municipal Office

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

0 50' 100'

LONG BRANCH HIGH SCHOOL

Subwatershed: **Branchport Creek**

Site Area: **1,026,210 sq. ft.**

Address: **404 Indiana Avenue**
Long Branch, NJ 07740

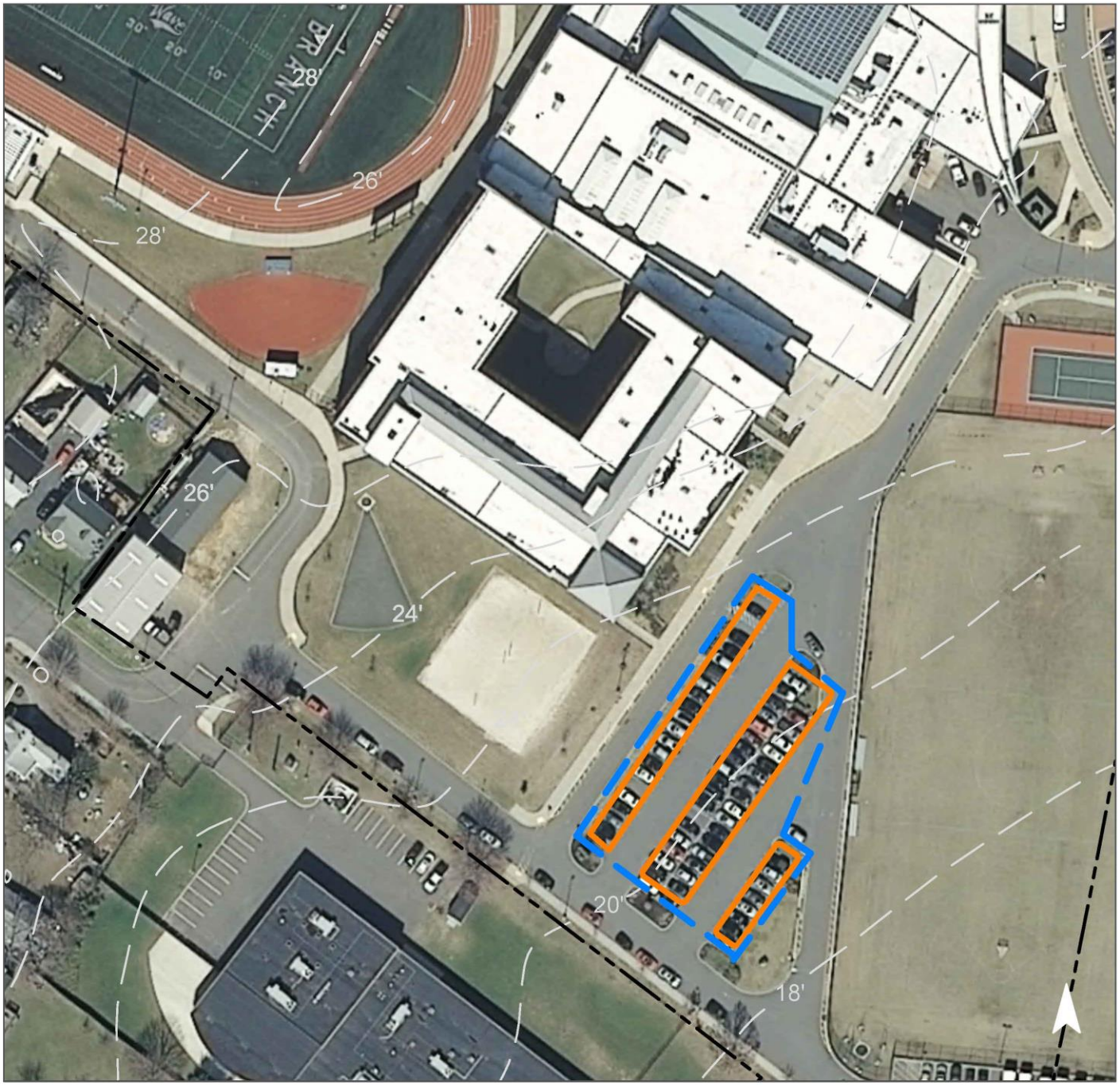
Block and Lot: **Block 114, Lot 7.01**

In the parking lot located south of the school parking spots can be replaced by porous asphalt 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"
65	665,505	32.1	336.1	3,055.6	0.519	18.25

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 pavements	0.502	84	38,051	1.43	10,275	$256,875

GREEN INFRASTRUCTURE RECOMMENDATIONS



Long Branch High School

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

0 50' 100'

LONG BRANCH MIDDLE SCHOOL

Subwatershed: **Branchport Creek**

Site Area: **602,900 sq. ft.**

Address: **350 Indiana Avenue**
Long Branch, NJ 07740

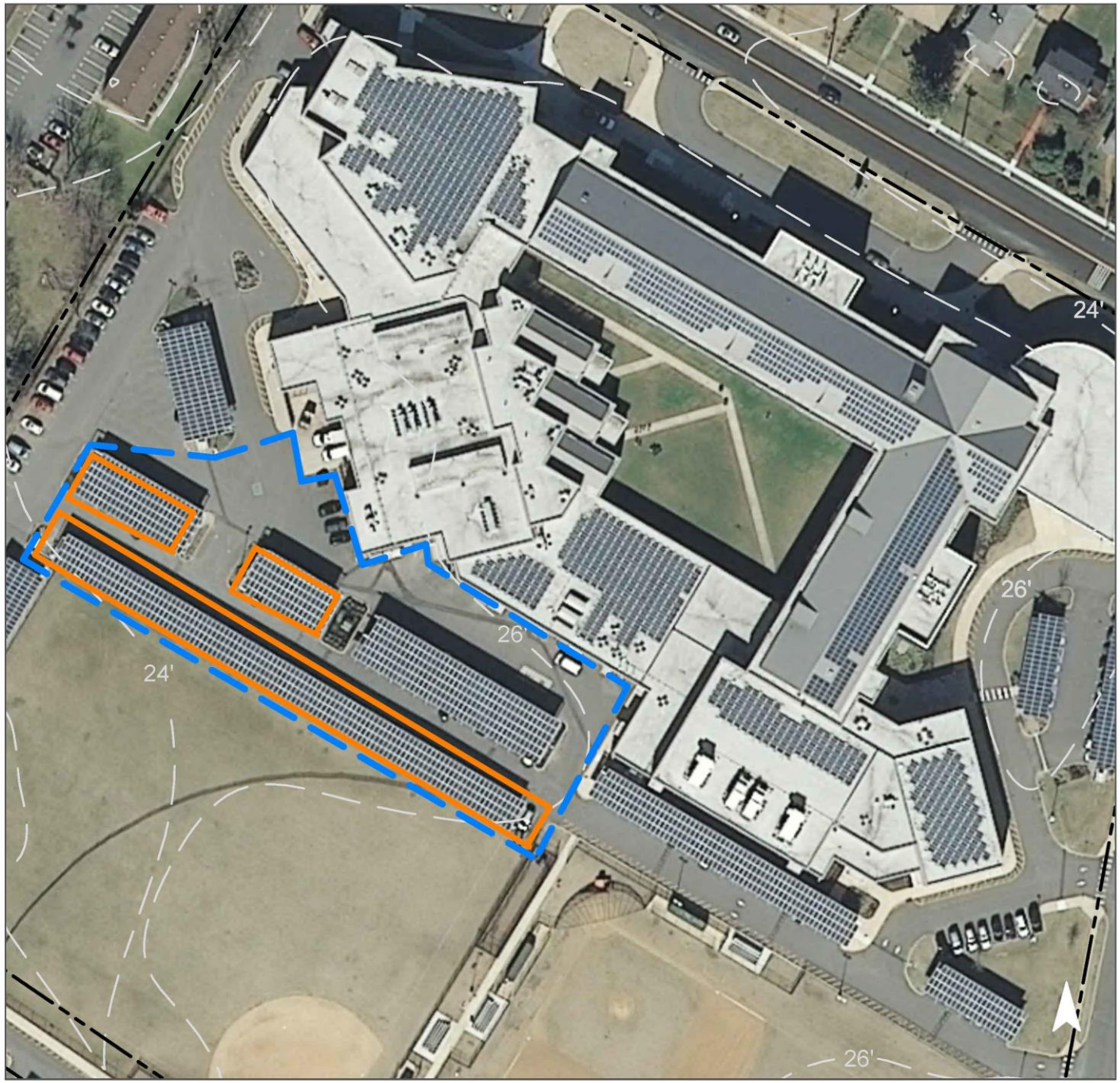
Block and Lot: **Block 156, Lot 2.01**

Parking spots south of the school can be replaced with porous asphalt 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"
59	354,000	17.1	178.8	1,625.3	0.276	9.71

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavements	1.281	214	97,023	3.64	15,800	$395,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Long Branch Middle School

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

0 50' 100'

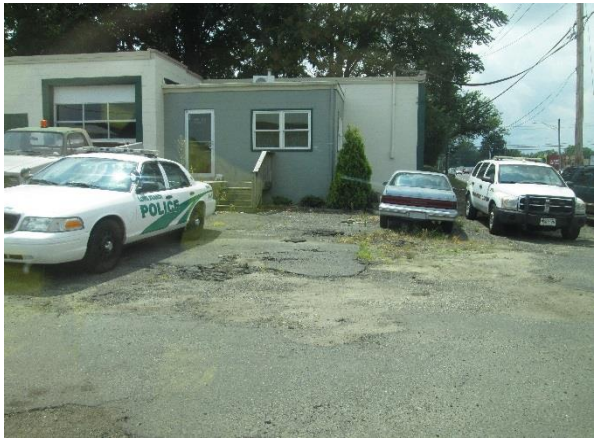
LONG BRANCH PUBLIC WORKS

Subwatershed: **Branchport Creek**

Site Area: **106,670 sq. ft.**

Address: **636 Joline Avenue**
Long Branch, NJ 07740

Block and Lot: **Block 252, Lot 1.01, 1.02**

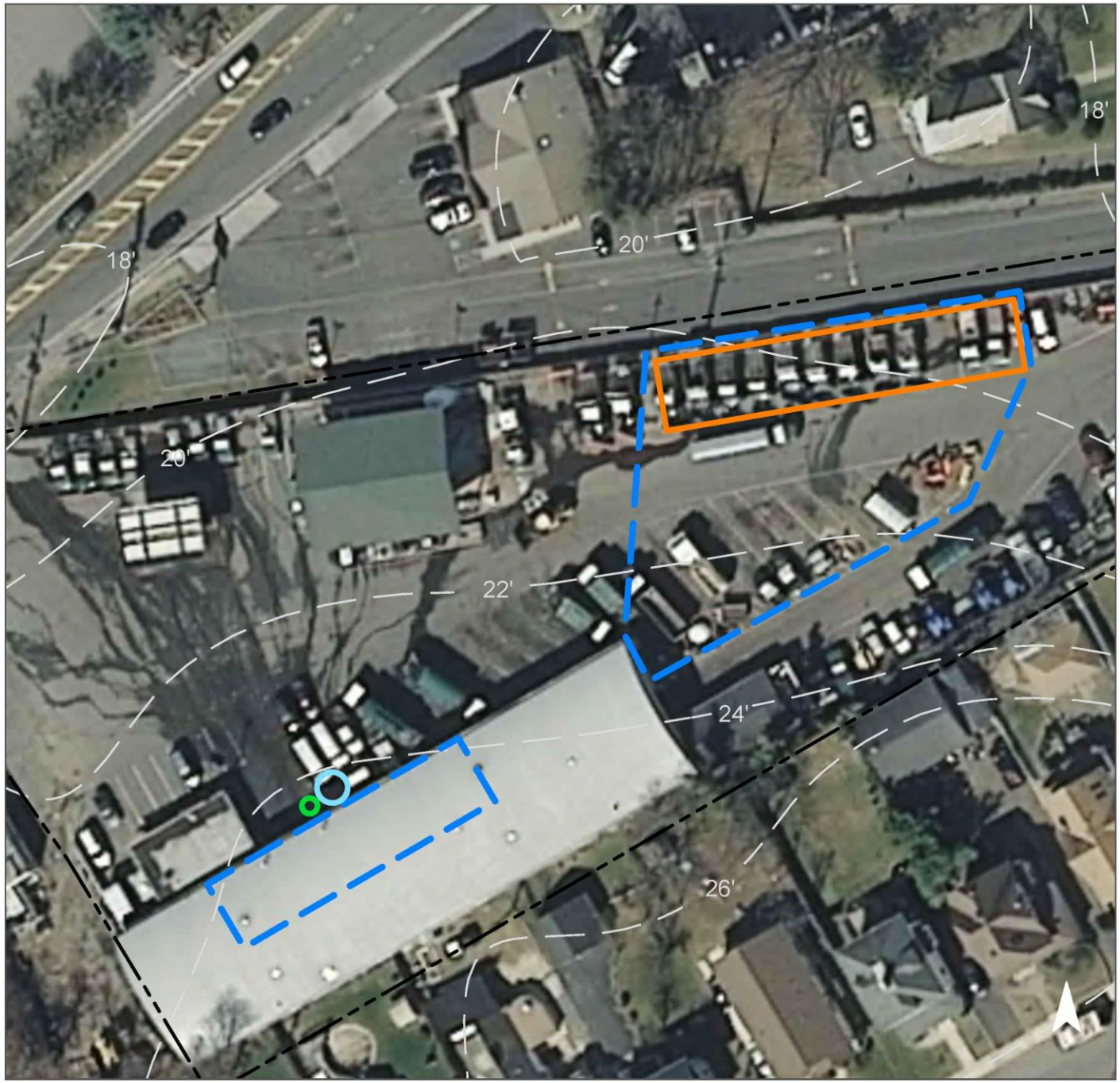


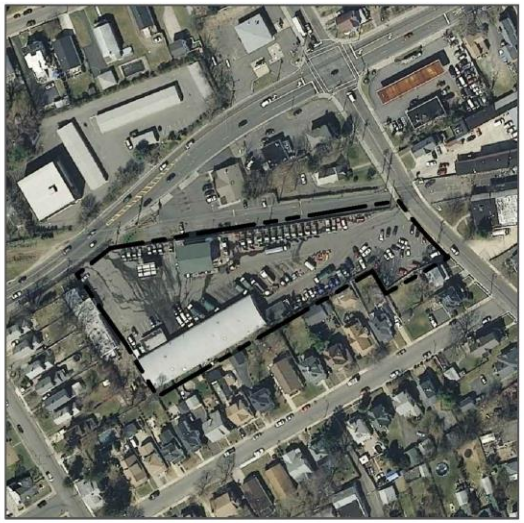
Runoff drains towards the road in front of the building. Parking spots along the north side of the lot can be replaced with porous asphalt to capture and infiltrate stormwater. A cistern can be installed to harvest rainwater from the roof. The water can be used to wash vehicles on site. A preliminary 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"
98	104,215	5.0	52.6	478.5	0.081	2.86

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	0.394	66	29,875	1.12	4,125	$103,125
Rainwater harvesting systems	0.086	14	3,000	0.24	3,000 (gal)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Long Branch Public Works

- disconnected downspouts
- pervious pavements
- rainwater harvesting
- drainage areas
- property line
- 2012 Aerial: NJOIT, OGIS

0 30' 60'

PLEASURE BAY PARK

Subwatershed: **Branchport Creek**

Site Area: **210,090 sq. ft.**

Address: **Atlantic Avenue**
Long Branch, NJ 07740

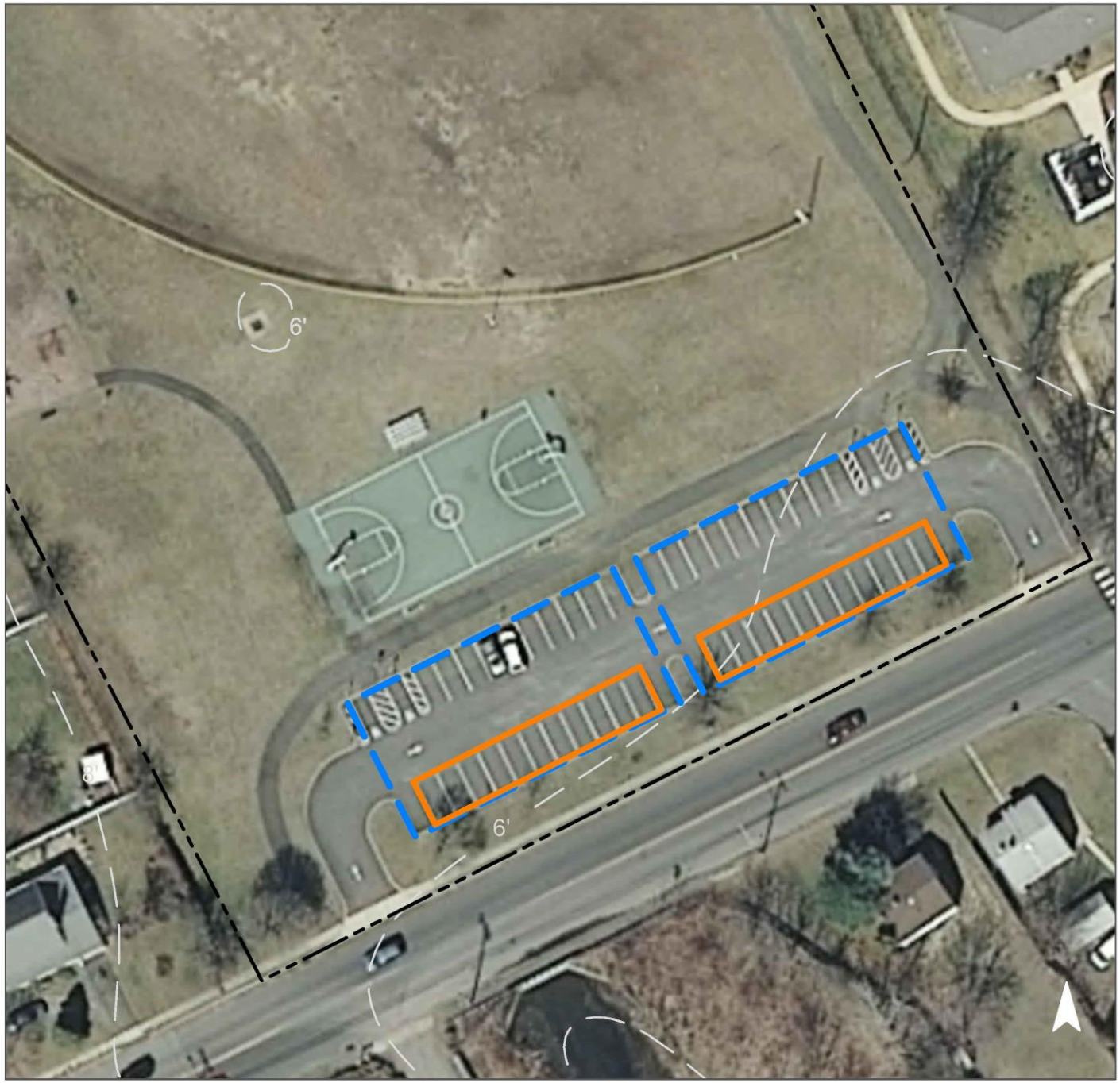
Block and Lot: **Block 396, Lot 2**

Stormwater runoff drains towards the turf grass south of the parking lot. Parking spaces 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"
10	20,875	1.0	10.5	95.8	0.016	0.57

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	0.360	60	27,257	1.02	3,790	$94,750

GREEN INFRASTRUCTURE RECOMMENDATIONS



Pleasure Bay Park

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

0 30' 60'

SAINT JAMES EPISCOPAL CHURCH

Subwatershed: Branchport Creek

Site Area: 34,210 sq. ft.

Address: 300 Broadway
Long Branch, NJ 07740

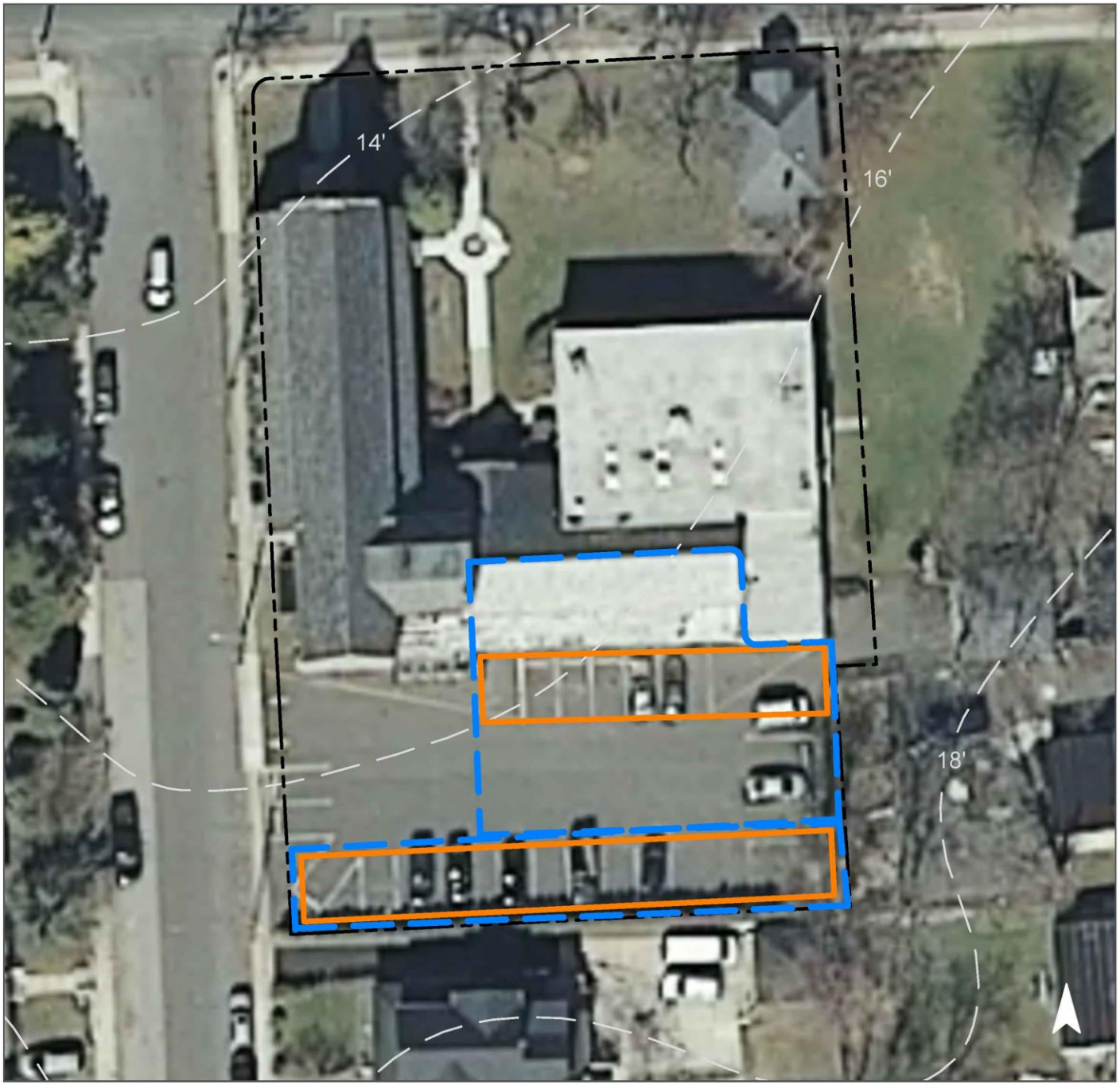
Block and Lot: Block 233, Lot 10, 11, 12

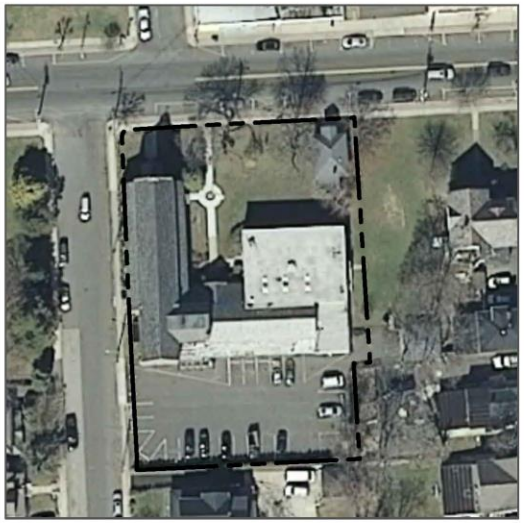
Parking spaces can be replaced with pervious pavement to capture and infiltrate stormwater from the rooftop and parking lot. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
93	31,930	1.5	16.1	146.6	0.025	0.88

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Pervious pavements	0.243	41	18,438	0.69	3,920	$98,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Saint James Episcopal Church

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

0 20' 40'

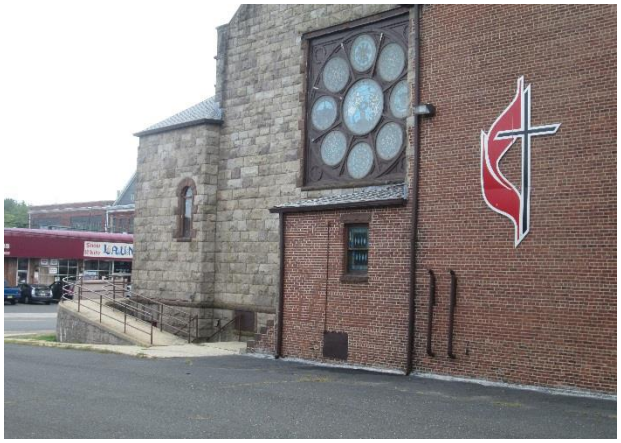
SAINT LUKE'S UNITED METHODIST CHURCH

Subwatershed: **Branchport Creek**

Site Area: **53,480 sq. ft.**

Address: **535 Broadway**
Long Branch, NJ 07740

Block and Lot: **Block 257, Lot 20**

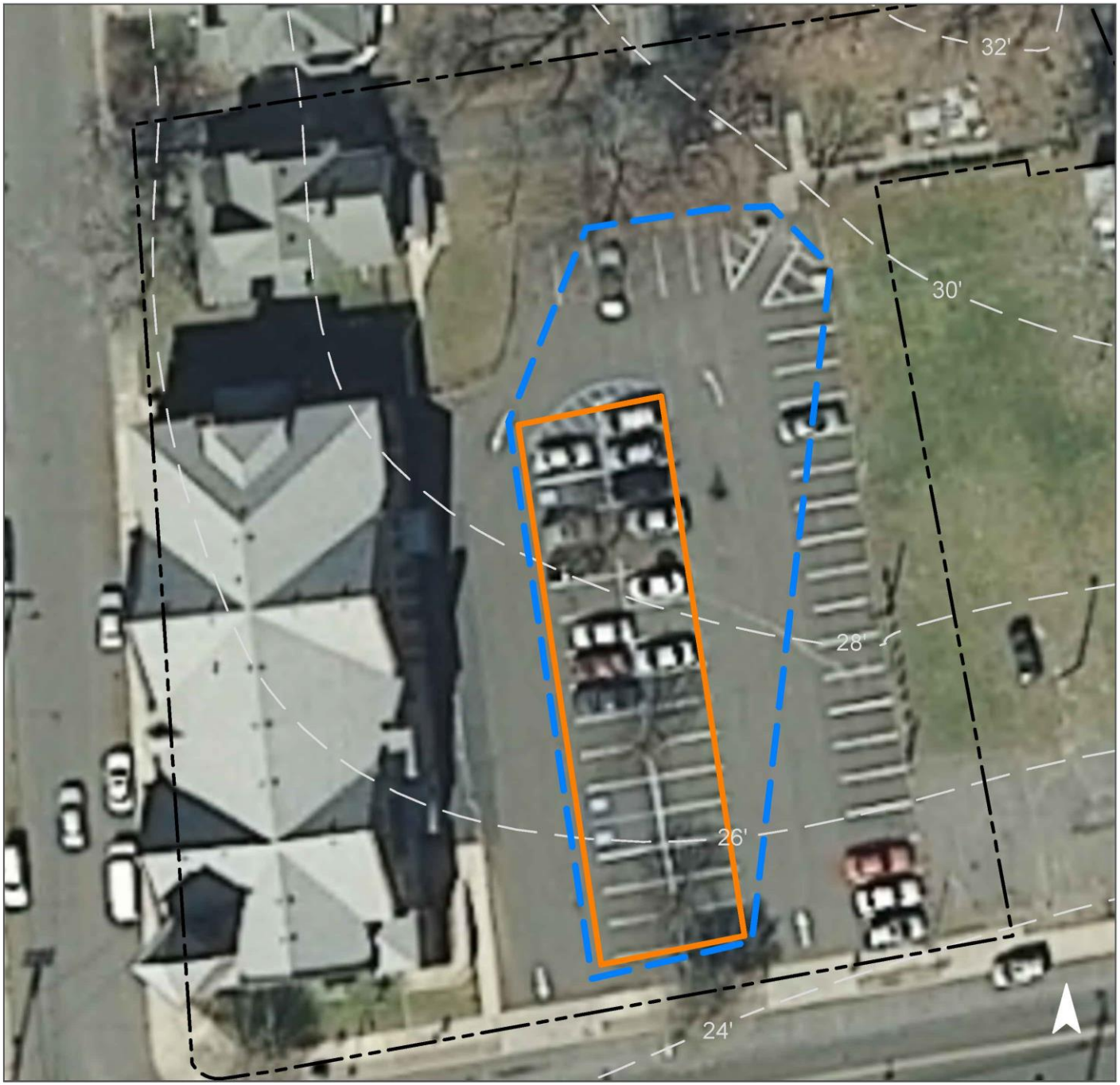


Parking spots can be replaced with porous asphalt to capture and infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

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"
78	41,910	2.0	21.2	192.4	0.033	1.15

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	0.322	54	24,385	0.92	5,455	$136,375

GREEN INFRASTRUCTURE RECOMMENDATIONS



Saint Luke's United Methodist Church

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

0 20' 40'

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 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)
BRANCHPORT CREEK SUBWATERSHED	**71.90**	**3,132,035**			**72.9**	**763.9**	**6,944.3**		**34.72**	**1,512,474**	**1.178**	**41.48**
Jerry Morgan Park												
Total Site Info	13.43	584,920	493	2	1.6	16.7	152.3	6	0.76	33,165	0.026	0.91
Long Branch Covenant Church												
Total Site Info	4.85	211,385	328	5	3.6	37.3	338.7	35	1.69	73,765	0.057	2.02
Long Branch Fire Department												
Total Site Info	0.69	30,000	273	10,12,13	1.2	12.9	117.1	85	0.59	25,500	0.020	0.70
Long Branch Free Public Library / Municipal Office												
Total Site Info	6.25	272,170	234	1.01	7.8	81.6	742.0	59	3.71	161,610	0.126	4.43
Long Branch High School												
Total Site Info	23.56	1,026,210	114	7.01	32.1	336.1	3,055.6	65	15.28	665,505	0.519	18.25
Long Branch Middle School												
Total Site Info	13.84	602,900	156	2.01	17.1	178.8	1,625.3	59	8.13	354,000	0.276	9.71
Long Branch Public Works												
Total Site Info	2.45	106,670	252	1.01,1.02	5.0	52.6	478.5	98	2.39	104,215	0.081	2.86
Pleasure Bay Park												
Total Site Info	4.82	210,090	396	2	1.0	10.5	95.8	10	0.48	20,875	0.016	0.57
Saint James Episcopal Church												
Total Site Info	0.79	34,210	233	10,11,12	1.5	16.1	146.6	93	0.73	31,930	0.025	0.88
Saint Luke's United Methodist Church												
Total Site Info	1.23	53,480	257	20	2.0	21.2	192.4	78	0.96	41,910	0.033	1.15

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)									
	BRANCHPORT CREEK SUBWATERSHED	**232,135**	**5.33**	**6.048**	**1,013**	**454,364**	**17.19**	**79,250**			**$1,861,550**	**15.3%**
1	**Jerry Morgan Park**											
	Bioretention systems/rain gardens	2,800	0.06	0.073	12	5,528	0.21	715	5	SF	$3,575	8.4%
	Total Site Info	**2,800**	**0.06**	**0.073**	**12**	**5,528**	**0.21**	**715**			**$3,575**	**8.4%**
2	**Long Branch Covenant Church**											
	Pervious pavements	28,790	0.66	0.750	126	56,833	2.13	7,310	25	SF	$182,750	39.0%
	Total Site Info	**28,790**	**0.66**	**0.750**	**126**	**56,833**	**2.13**	**7,310**			**$182,750**	**39.0%**
3	**Long Branch Fire Department**											
	Pervious pavements	5,330	0.12	0.139	23	10,524	0.39	1,750	25	SF	$43,750	20.9%
	Rainwater harvesting systems	700	0.02	0.018	3	1,000	0.05	1,000	2	gal	$2,000	2.7%
	Total Site Info	**6,030**	**0.14**	**0.157**	**26**	**11,524**	**0.44**	**2,750**			**$45,750**	**23.6%**
4	**Long Branch Free Public Library / Municipal Office**											
	Bioretention systems/rain gardens	2,250	0.05	0.059	10	4,451	0.17	570	5	SF	$2,850	1.4%
	Pervious pavements	69,910	1.60	1.822	305	137,999	5.18	21,540	25	SF	$538,500	43.3%
	Total Site Info	**72,160**	**1.66**	**1.880**	**315**	**142,450**	**5.35**	**22,110**			**$541,350**	**44.7%**
5	**Long Branch High School**											
	Pervious pavements	19,275	0.44	0.502	84	38,051	1.43	10,275	25	SF	$256,875	2.9%
	Total Site Info	**19,275**	**0.44**	**0.502**	**84**	**38,051**	**1.43**	**10,275**			**$256,875**	**2.9%**
6	**Long Branch Middle School**											
	Pervious pavements	49,150	1.13	1.281	214	97,023	3.64	15,800	25	SF	$395,000	13.9%
	Total Site Info	**49,150**	**1.13**	**1.281**	**214**	**97,023**	**3.64**	**15,800**			**$395,000**	**13.9%**
7	**Long Branch Public Works**											
	Pervious pavements	15,135	0.35	0.394	66	29,875	1.12	4,125	25	SF	$103,125	14.5%
	Rainwater harvesting systems	3,290	0.08	0.086	14	3,000	0.24	3,000	2	gal	$4,000	3.2%
	Total Site Info	**18,425**	**0.42**	**0.480**	**80**	**32,875**	**1.36**	**7,125**			**$107,125**	**17.7%**
8	**Pleasure Bay Park**											
	Pervious pavements	13,810	0.32	0.360	60	27,257	1.02	3,790	25	SF	$94,750	66.2%
	Total Site Info	**13,810**	**0.32**	**0.360**	**60**	**27,257**	**1.02**	**3,790**			**$94,750**	**66.2%**

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)									
9	**Saint James Episcopal Church**											
	Pervious pavements	9,340	0.21	0.243	41	18,438	0.69	3,920	25	SF	$98,000	29.3%
	Total Site Info	**9,340**	**0.21**	**0.243**	**41**	**18,438**	**0.69**	**3,920**			**$98,000**	**29.3%**
10	**Saint Luke's United Methodist Church**											
	Pervious pavements	12,355	0.28	0.322	54	24,385	0.92	5,455	25	SF	$136,375	29.5%
	Total Site Info	**12,355**	**0.28**	**0.322**	**54**	**24,385**	**0.92**	**5,455**			**$136,375**	**29.5%**