Impervious Cover Reduction Action Plan
for
City of Vineland, Cumberland County, New Jersey

Prepared for the City of Vineland by the
Rutgers Cooperative Extension Water Resources Program

May 23, 2016

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Introduction

Located in Cumberland County New Jersey, the City of Vineland covers approximately 69 square miles. Figures 1 and 2 illustrate that the City of Vineland is dominated by urban land uses. A total of 36.6% of the municipality's land use is classified as urban. Of the urban land in the City of Vineland, rural residential is the dominant land use (Figure 3).

The New Jersey Department of Environmental Protection's (NJDEP) 2012 land use/land cover geographical information system (GIS) data layer categorizes the City of Vineland 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 City of Vineland. Based upon the 2012 NJDEP land use/land cover data, approximately 11.4% of the City of Vineland has impervious cover. This level of impervious cover suggests that the streams in the City of Vineland are likely impacted.[1]

Methodology

The City of Vineland contains portions of eleven subwatersheds (Figure 4). For this impervious cover reduction action plan, projects have been identified in three of these watersheds: the Maurice River, Menantico Creek, and Parvin/Tarkiln Branch. 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 a 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

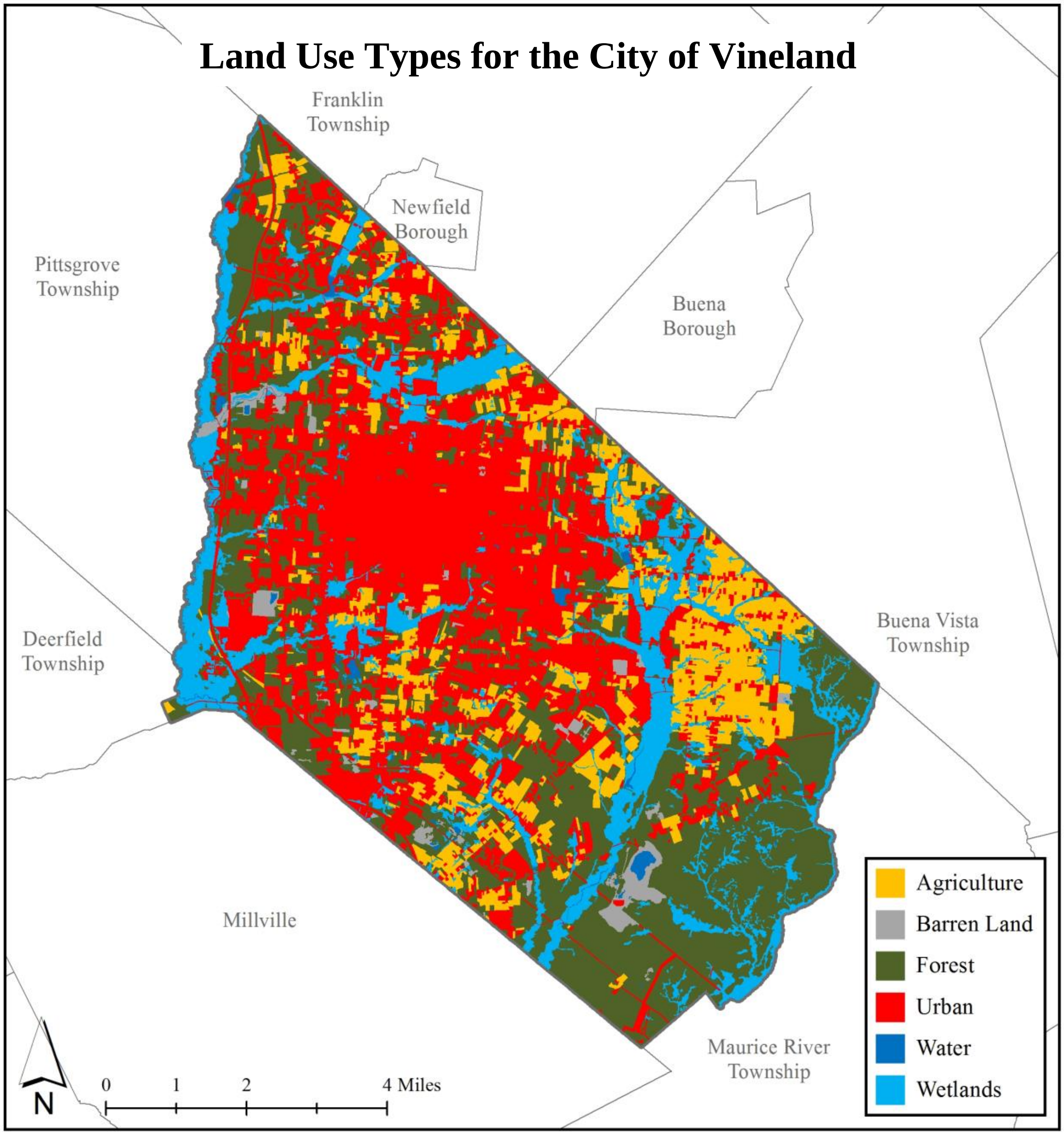


Figure 1: Map illustrating the land use in the City of Vineland.

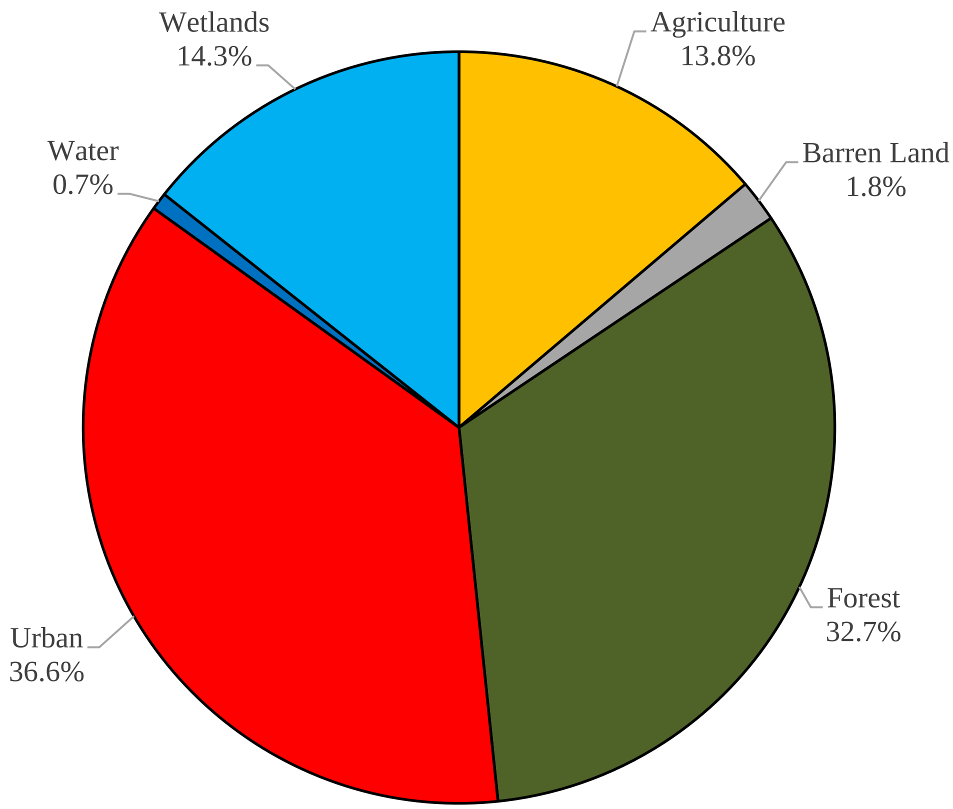


Figure 2: Pie chart illustrating the land use in the City of Vineland.

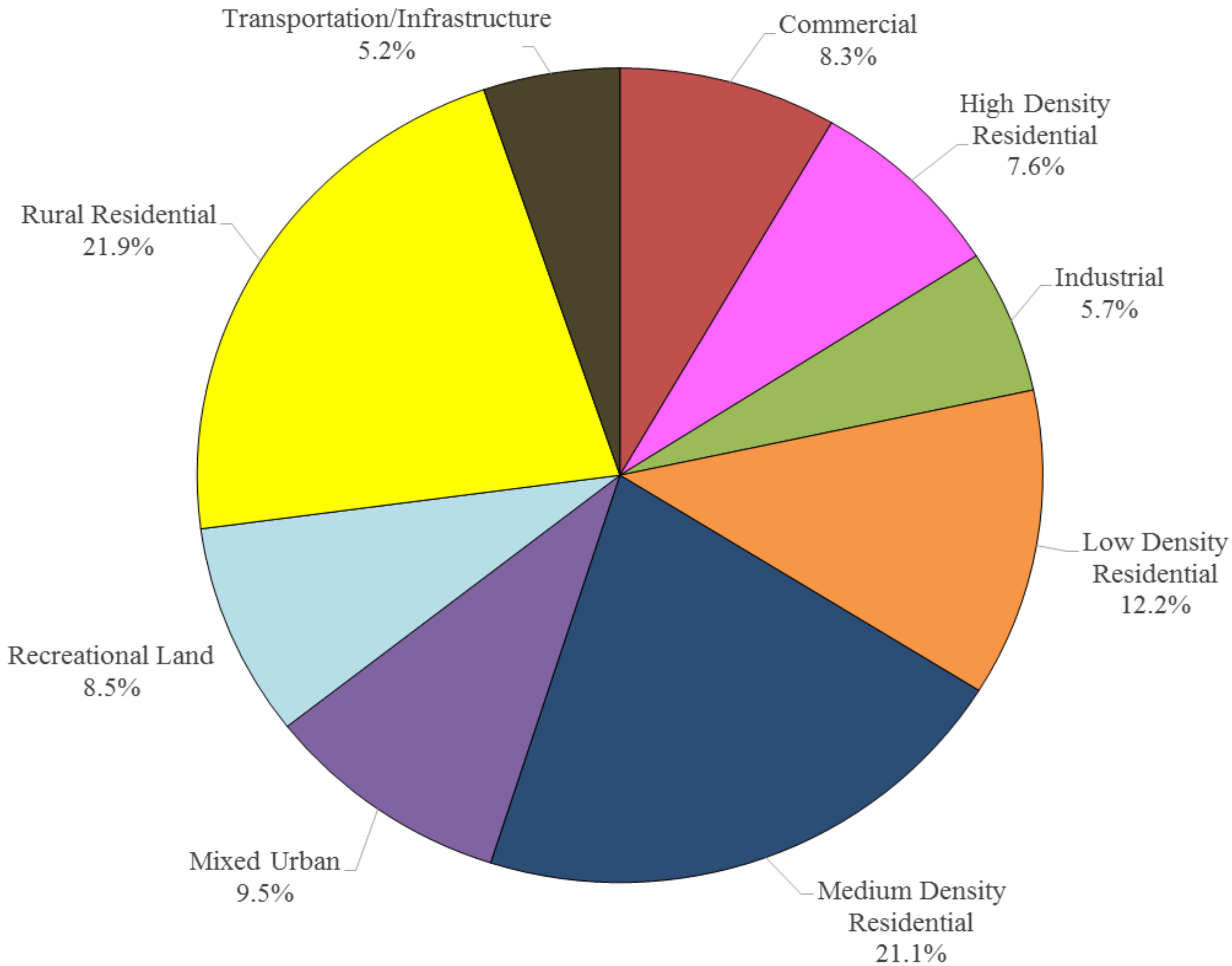


Figure 3: Pie chart illustrating the various types of urban land use in the City of Vineland.

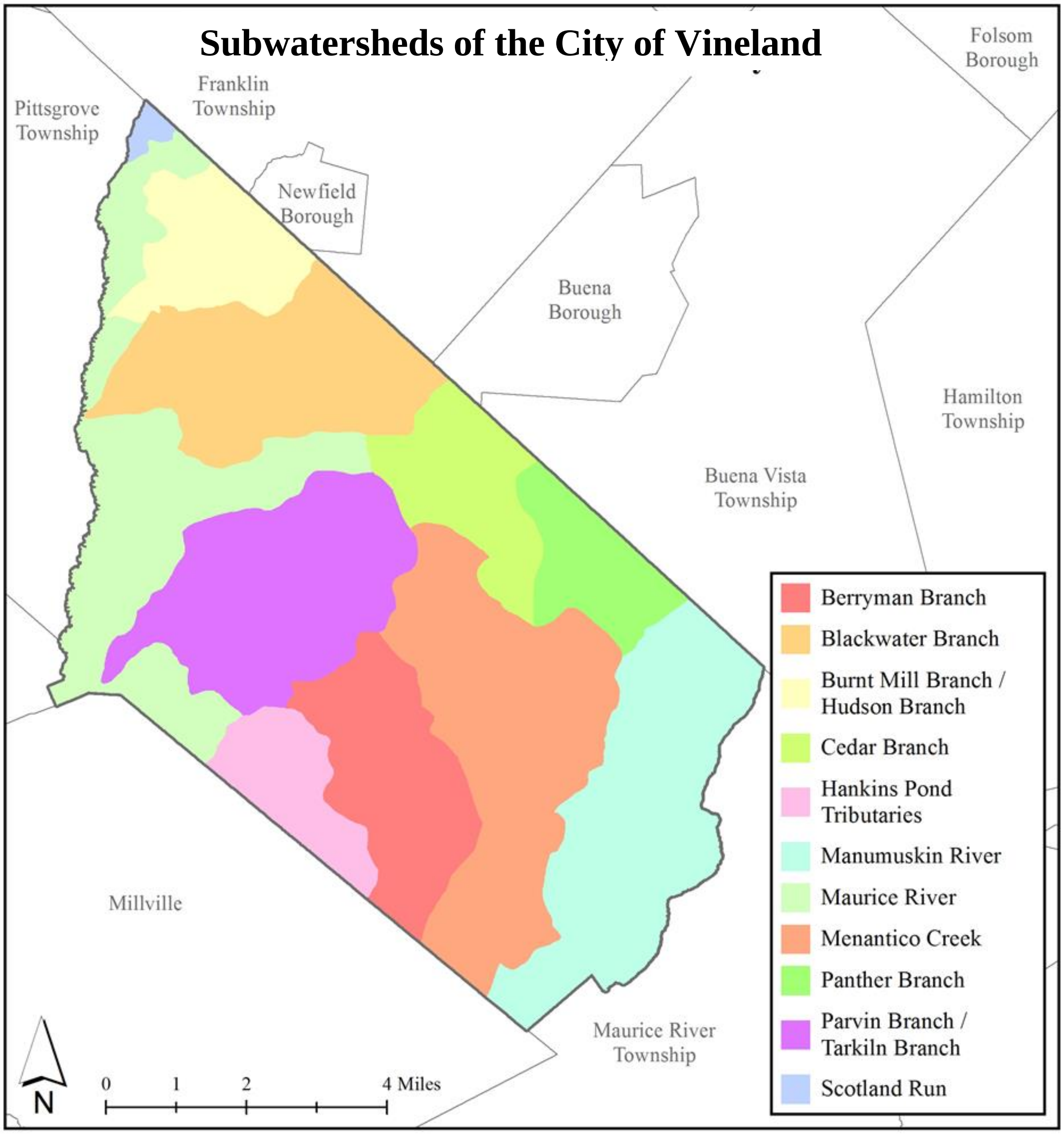


Figure 4: Map of the subwatersheds in the City of Vineland.

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 2012 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 City of Vineland 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
Barren Land/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, pervious 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 Vineland. Each practice is discussed below.

Disconnected downspouts

This is often referred to as simple disconnection. A downspout is simply disconnected, prevented from draining directly to the roadway or storm sewer system, and directed to discharge water to a pervious area (i.e., lawn).

Pervious pavements

There are several types of permeable pavement systems including porous asphalt, pervious concrete, permeable pavers, and grass pavers. These surfaces are hard and support vehicle traffic but also allow water to infiltrate through the surface. They have an underlying stone layer to store stormwater runoff and allow it to slowly seep into the ground.




[3] United States Environmental Protection Agency (USEPA), 2013. Watershed Assessment, Tracking, and Environmental Results, New Jersey Water Quality Assessment Report.
http://ofmpub.epa.gov/waters10/attains_state.control?p_state=NJ

Bioretention systems/rain gardens

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

Downspout planter boxes

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

Rainwater harvesting systems (cistern or rain barrel)

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




Bioswale

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

Stormwater planters

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

Tree filter boxes

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

Potential Project Sites

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*.

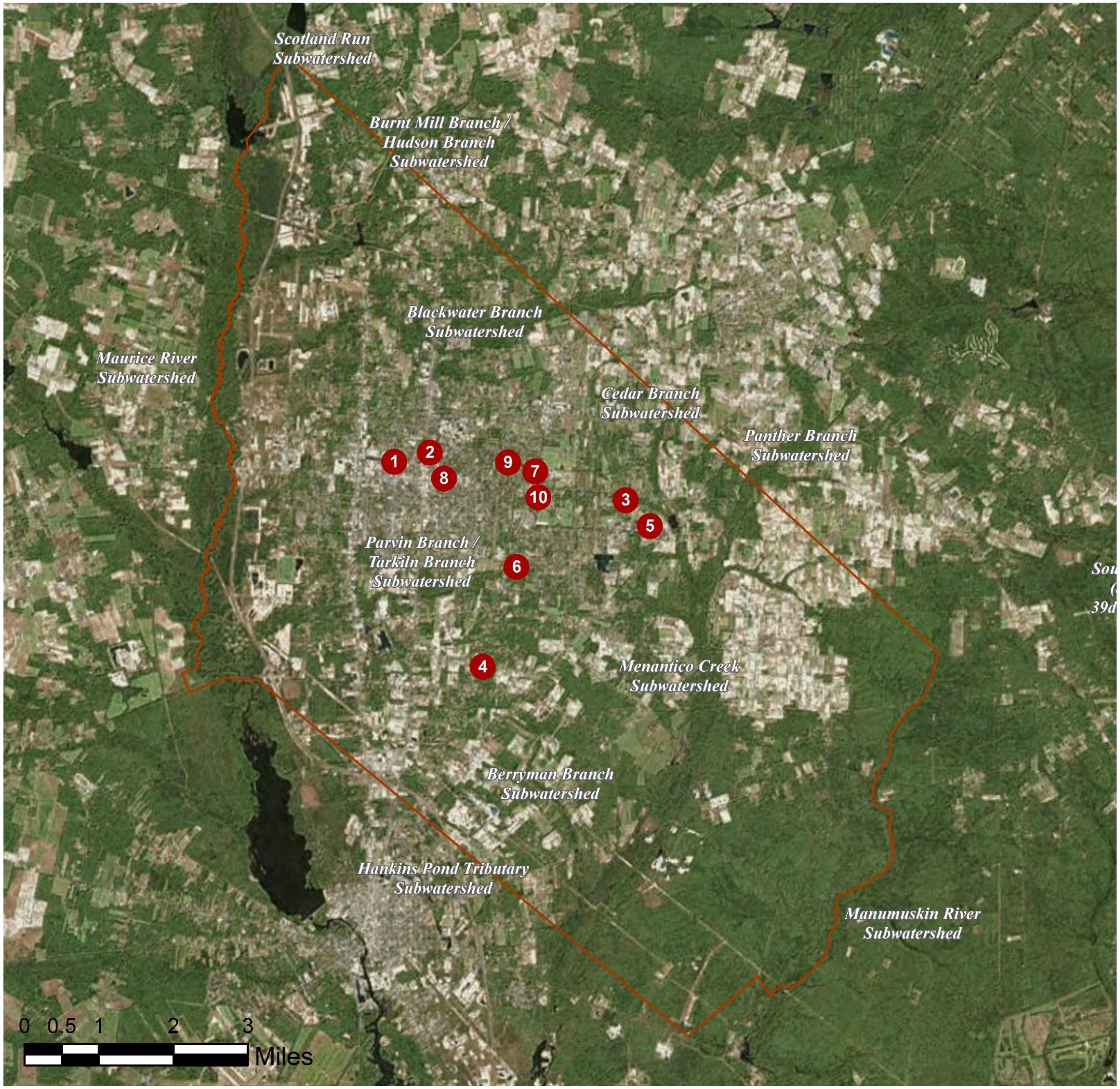
Conclusion

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

CITY OF VINELAND: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE MAURICE RIVER SUBWATERSHED:

1. Landis Intermediate School
2. Vineland Fire Department

SITES WITHIN THE MENANTICO CREEK SUBWATERSHED:

3. Chestnut Assembly of God
4. South Vineland Methodist Church
5. Vineland High School

SITES WITHIN THE PARVIN BRANCH/TARKILN BRANCH SUBWATERSHED:

6. Magnolia Shopping Court
7. Vine Haven Adventist School
8. Vineland Learning Complex
9. Vineland Public Library
10. Vineland YMCA

b. Proposed Green Infrastructure Concepts

LANDIS INTERMEDIATE SCHOOL

Subwatershed: Maurice River

Site Area: 888,234 sq. ft.

Address: 61 West Landis Avenue
Vineland, NJ 08360

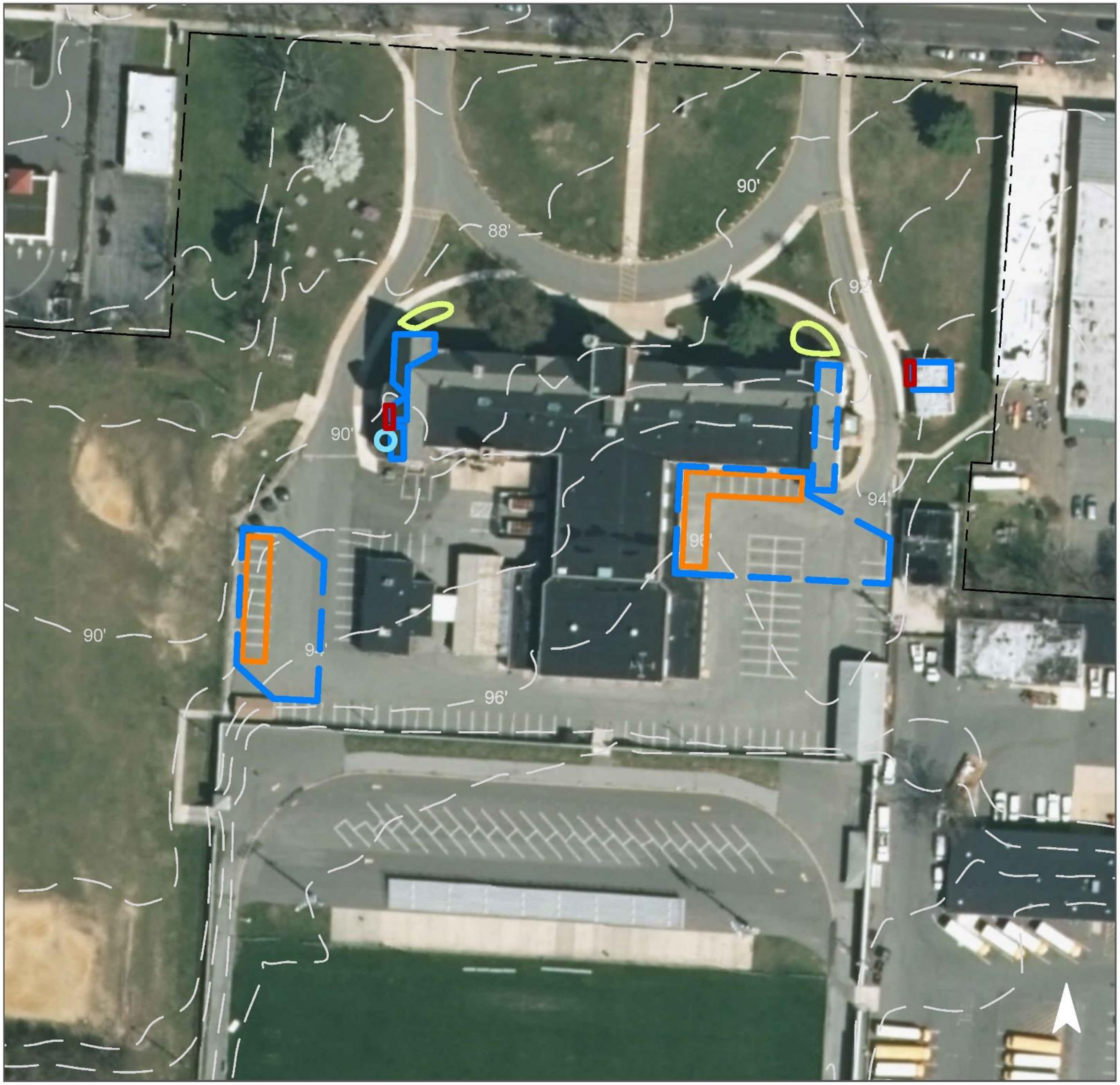
Block and Lot: Block 3602, Lot 8

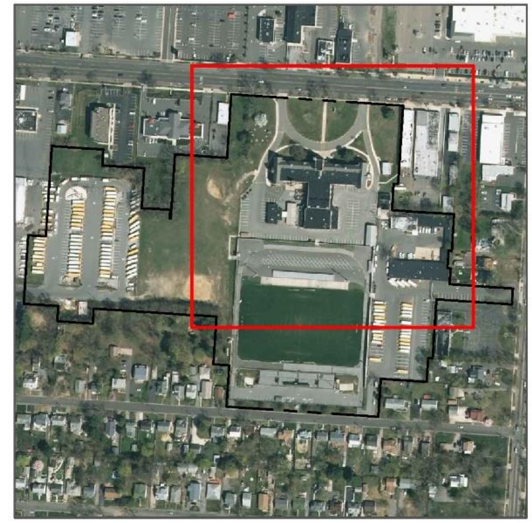
Rain gardens lining the sidewalks can direct and infiltrate stormwater away from the school. Parking spots can be replaced with pervious pavement to infiltrate stormwater and reduce erosion. Downspouts can be directed to downspout planter boxes and a rain barrel to capture roof runoff. A preliminary 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	527,044	25.4	266.2	2,419.9	0.411	14.46

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	0.047	8	3,441	0.09	1,961	$9,805
Pervious pavement	0.357	60	26,180	0.71	3,060	$76,500
Planter boxes	0.011	2	n/a	n/a	24	$2,000
Rainwater harvesting	0.004	1	100	0.01	100 (gal)	$200

GREEN INFRASTRUCTURE RECOMMENDATIONS





Landis Intermediate School

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

VINELAND FIRE DEPARTMENT

Subwatershed: Maurice River

Site Area: 45,000 sq. ft.

Address: 110 North 4th Street
Vineland, NJ 08360

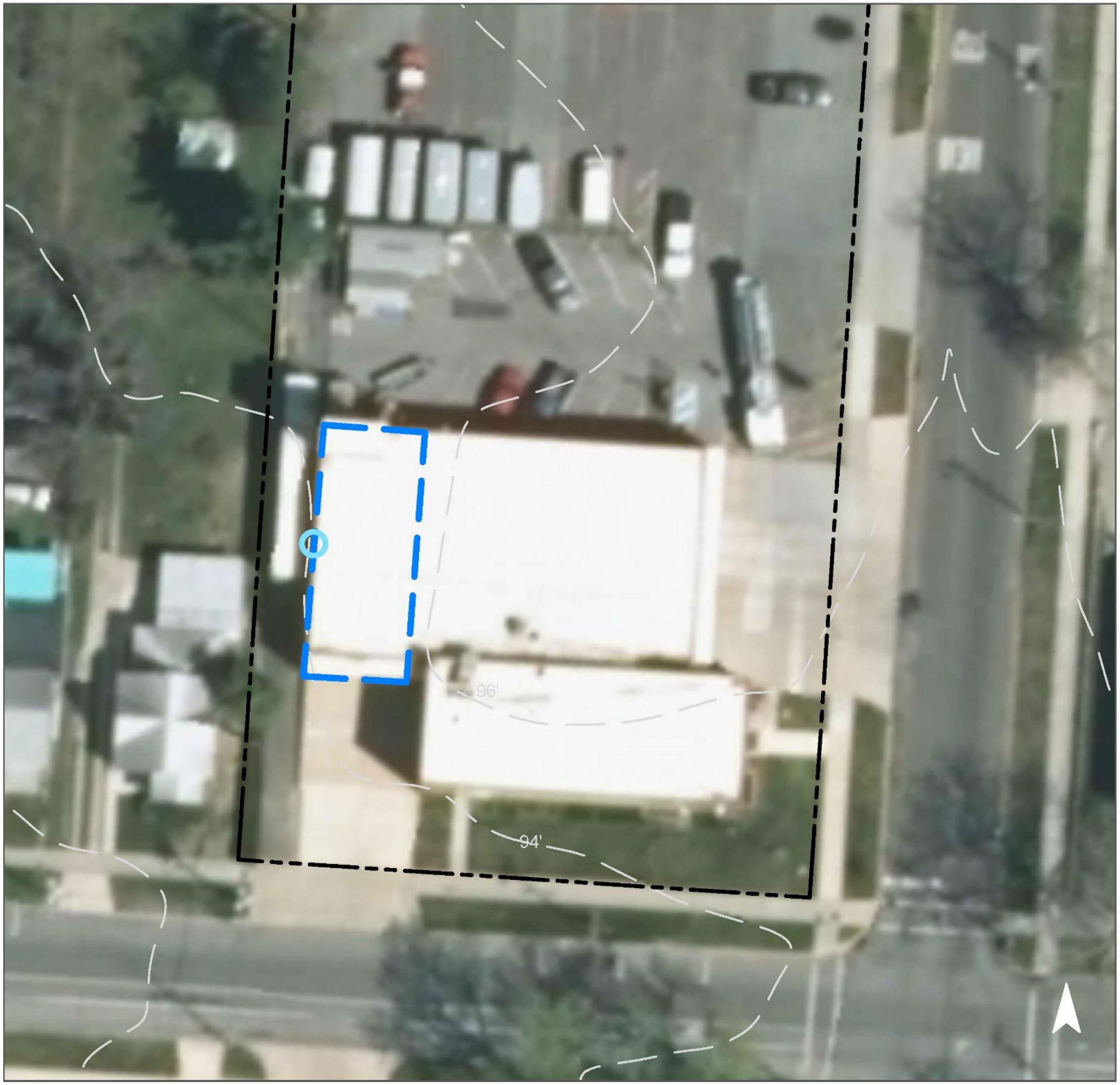
Block and Lot: Block 2914, Lots 8-12

Stormwater is currently directed to a small garden on the south side of the building and to the sidewalk. Downspouts can be directed to a cistern on the west side of the building to capture rainwater, which can be used for washing the firetrucks. 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"
94	42,380	2.0	21.4	194.6	0.033	1.16

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
Rainwater harvesting	0.046	8	1,000	0.09	1,000 (gal)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Vineland Fire Department

- rainwater harvesting
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 20' 40'

CHESTNUT ASSEMBLY OF GOD

Subwatershed: Menantico Creek

Site Area: 1,124,291 sq. ft.

Address: 2554 East Chestnut Avenue
Vineland, NJ 08361

Block and Lot: Block 4405, Lot 30

Stormwater is currently directed to the parking lot and retention basins on the east and west side of the property. Parking spots by the southeastern side of the building can be replaced with pervious pavement to capture and infiltrate stormwater. Downspouts can be disconnected and directed to a rain garden adjacent to the building, which can capture, treat, and infiltrate roof runoff. A preliminary soil assessment suggests that the soils have very 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"
21	238,673	11.5	120.5	1,095.8	0.186	6.55

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.183	31	13,404	0.36	1,755	$8,775
Pervious pavement	0.835	140	61,261	1.67	10,820	$270,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Chestnut Assembly of God

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

0 50' 100'

SOUTH VINELAND UNITED METHODIST CHURCH

Subwatershed: Menantico Creek

Site Area: 75,673 sq. ft.

Address: 2724 South Main Road
Vineland, NJ 08361

Block and Lot: Block 6701, Lot 42

Stormwater is currently directed to the parking lot which connects to one storm drain on the property. Parking spots by the west and south side of the building can be replaced with pervious pavement to capture and infiltrate stormwater. Downspout planter boxes can be installed in the front of the building to capture rooftop 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"
68	51,663	2.5	26.1	237.2	0.040	1.42

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	0.610	102	13,404	0.36	4,400	$110,000
Planter boxes	0.011	2	n/a	n/a	24	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

South Vineland United Methodist Church

pervious pavement

planter box

drainage area

property line

2015 Aerial: NJOIT, OGIS

0 30' 60'

VINELAND HIGH SCHOOL

Subwatershed: Menantico Creek

Site Area: 2,858,937 sq. ft.

Address: 2800 East Chestnut Avenue
Vineland, NJ 08361

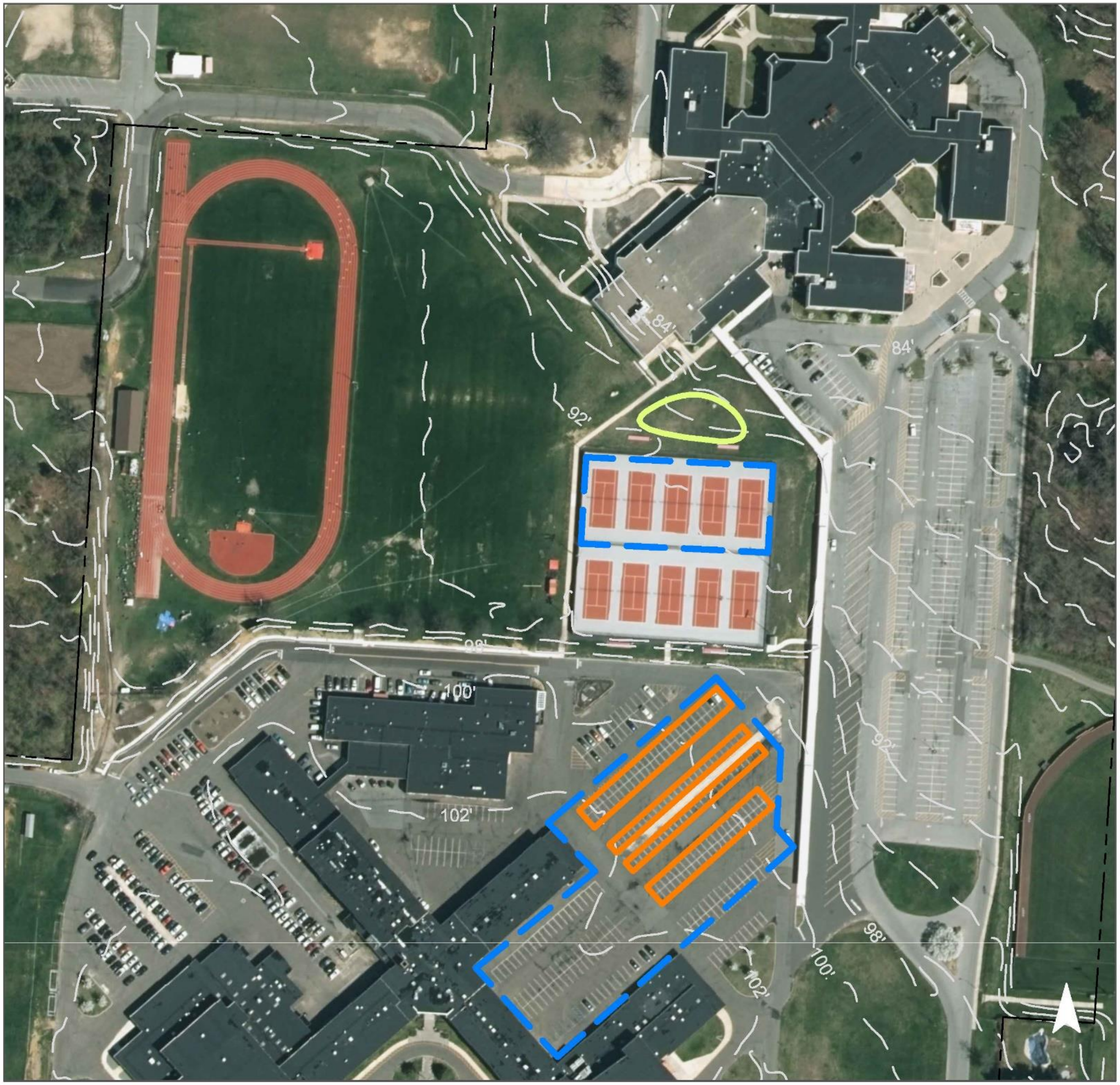
Block and Lot: Block 4501, Lot 42

Parking spots in the south building lot can be replaced with pervious pavement to capture and infiltrate stormwater. Installing a rain garden adjacent to the tennis courts can capture, treat, and infiltrate runoff as well as provide educational opportunities for students. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

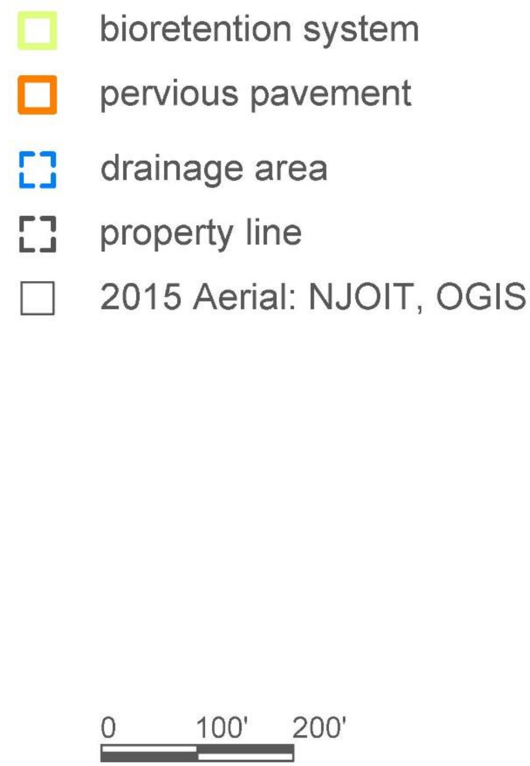
Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
41	1,161,650	56.0	586.7	5,333.6	0.905	31.86

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
Bioretention system	0.724	121	53,130	1.44	6,000	$30,000
Pervious pavement	2.428	407	178,114	4.84	20,000	$500,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Vineland High School



MAGNOLIA SHOPPING COURT

Subwatershed: Parvin / Tarkiln Branch

Site Area: 77,344 sq. ft.

Address: 1370 South Main Road
Vineland, NJ 08360

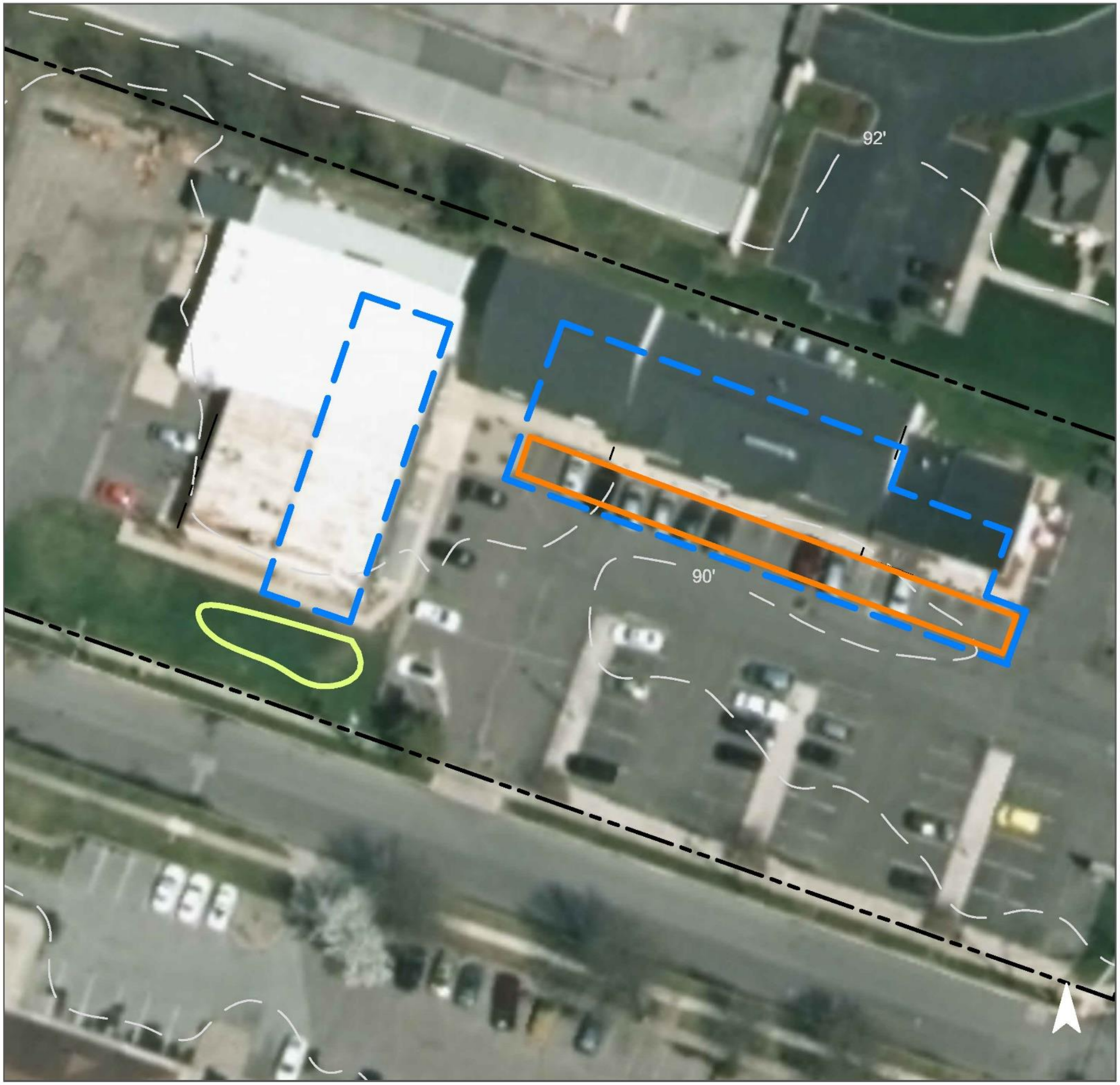
Block and Lot: Block 5804, Lot 18

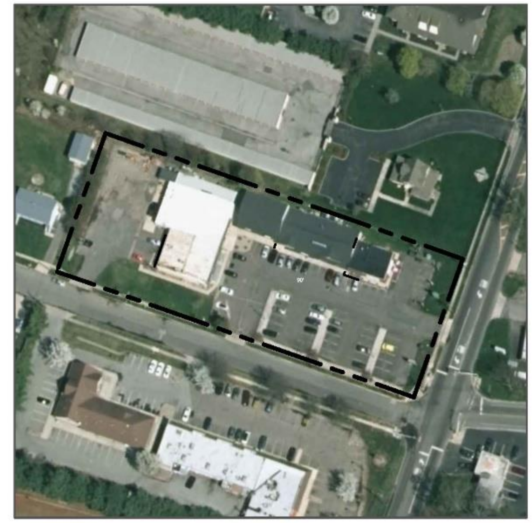
Stormwater is currently directed to the parking lot which connects to multiple storm drains. Parking spots on the northern side of the parking lot can be replaced with pervious pavement to capture and infiltrate stormwater. A rain garden adjacent to the building can capture, treat, and infiltrate roof runoff as well as reduce ponding on the property. 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"
89	69,079	3.3	34.9	317.2	0.054	1.89

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	0.081	14	5,924	0.16	750	$3,750
Pervious pavement	0.220	37	16,164	0.44	2,170	$54,250

GREEN INFRASTRUCTURE RECOMMENDATIONS





Magnolia Shopping Court

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

0 25' 50'

VINE HAVEN ADVENTIST SCHOOL

Subwatershed: Parvin / Tarkiln Branch

Site Area: 286,845 sq. ft.

Address: 1155 East Landis Avenue
Vineland, NJ 08360

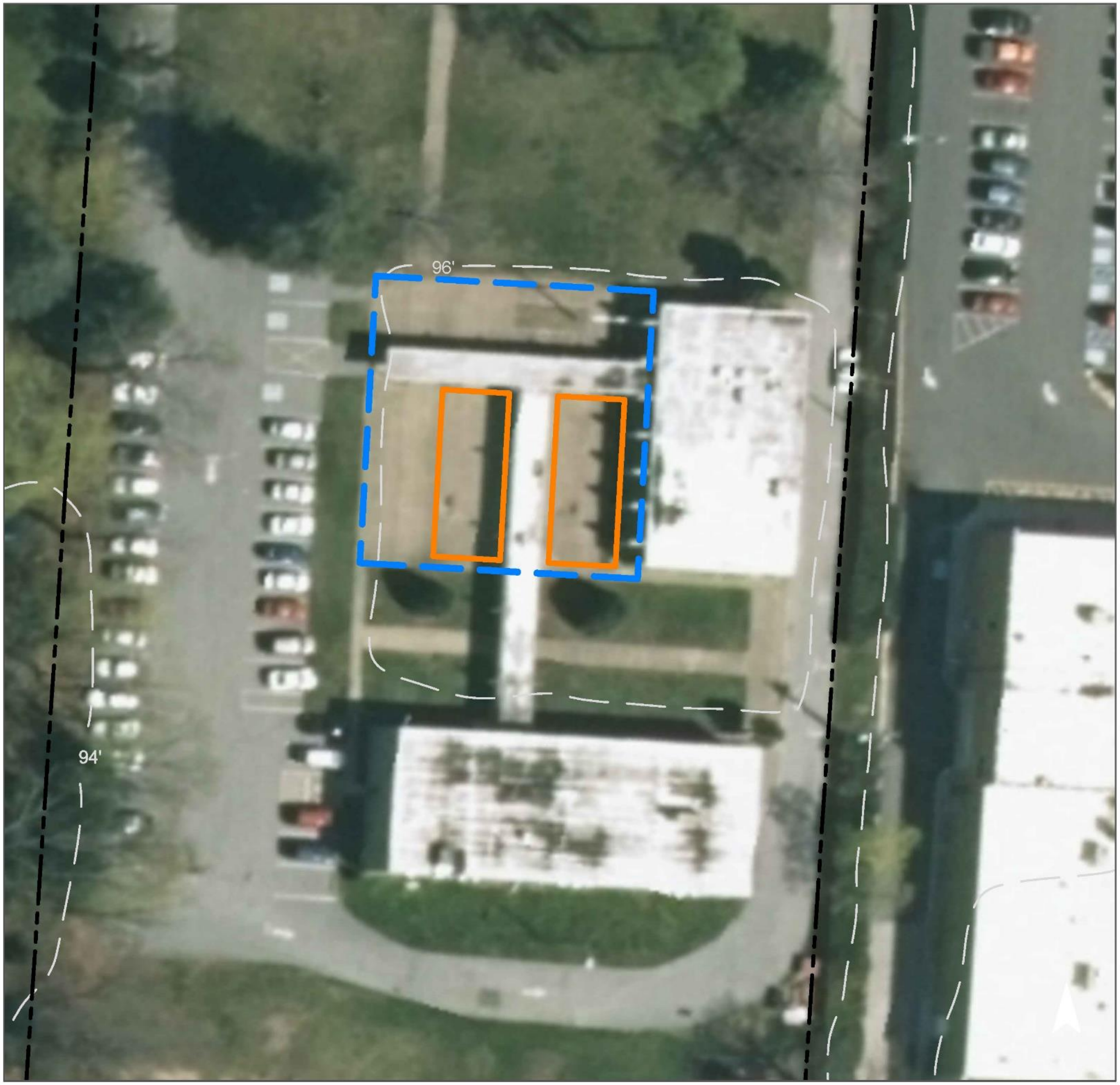
Block and Lot: Block 4211, Lot 3

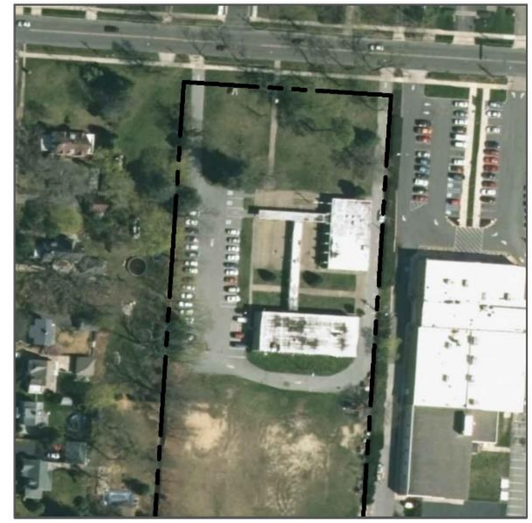
Sections of the courtyard can be replaced with pervious pavement to intercept and infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

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"
19	53,194	2.6	26.9	244.2	0.041	1.46

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	0.223	37	13,494	0.37	2,400	$60,000

GREEN INFRASTRUCTURE RECOMMENDATIONS





Vine Haven Adventist School

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

0 25' 50'

VINELAND LEARNING COMPLEX

Subwatershed: Parvin / Tarkiln Branch

Site Area: 412,321 sq. ft.

Address: 301 Southeast Boulevard
Vineland, NJ 08360

Block and Lot: Block 4009, Lots 6

Parking spaces can be replaced with porous asphalt to infiltrate stormwater. Installing rain gardens can capture, treat, and infiltrate roof runoff. Rainwater can be harvested into a cistern at the rear of the building for watering plants. Downspout planter boxes can be installed along the building to reuse rooftop 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"
75	308,281	14.9	155.7	1,415.4	0.240	8.46

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	0.229	38	16,815	0.46	2,200	$11,000
Pervious pavement	0.388	65	28,454	0.77	3,900	$97,500
Planter boxes	0.034	6	n/a	n/a	72	$6,000
Rainwater harvesting	0.036	6	1,000	0.07	1,000 (gal)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Vineland Learning Complex

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

VINELAND PUBLIC LIBRARY

Subwatershed: Parvin / Tarkiln Branch

Site Area: 90,238 sq. ft.

Address: 1058 East Landis Avenue
Vineland, NJ 08360

Block and Lot: Block 3116, Lot 27

Stormwater is currently directed through connected downspouts to eight storm drains on the property. Parking spots by the north and west side of the building can be replaced with pervious pavement to capture and infiltrate stormwater. Downspouts can be disconnected and directed to rain gardens adjacent to the building, which can capture, treat, and infiltrate roof runoff as well as provide an educational opportunity. A preliminary soil assessment suggests that the soils have very 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	58,744	2.8	29.7	269.7	0.046	1.61

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.126	21	18,535	0.50	1,390	$6,950
Pervious pavement	0.536	90	39,307	1.07	3,400	$85,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Vineland Public Library

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

0 30' 60'

VINELAND YMCA

Subwatershed: Parvin / Tarkiln Branch

Site Area: 231,254 sq. ft.

Address: 1159 East Landis Avenue
Vineland, NJ 08360

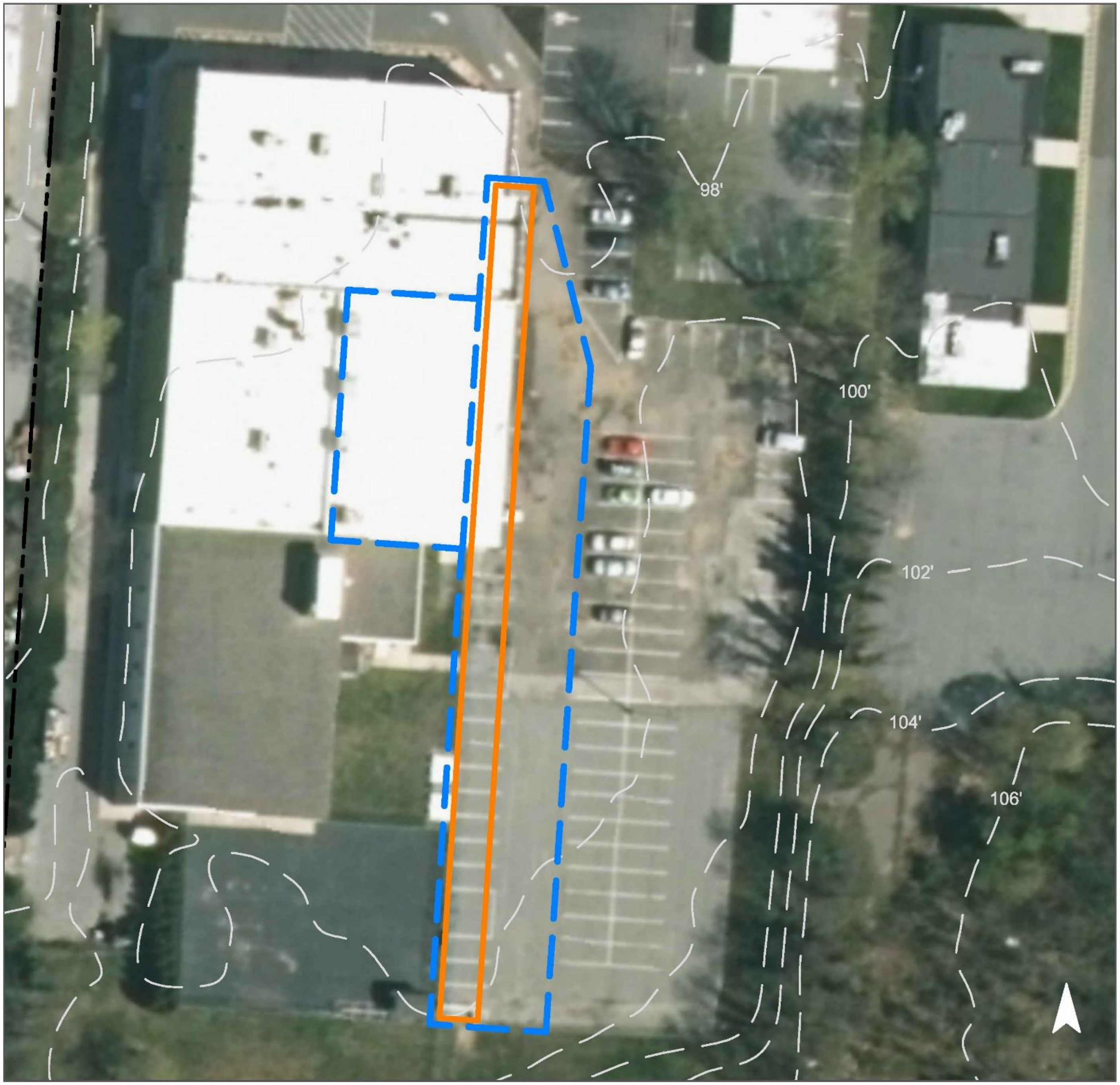
Block and Lot: Block 4211, Lot 4

Stormwater is currently directed to a parking lot which connects to multiple storm drains. Parking spots on the west side of the parking lot 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"
51	118,923	5.7	60.1	546.0	0.093	3.26

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	0.507	85	37,198	1.01	4,900	$122,500

GREEN INFRASTRUCTURE RECOMMENDATIONS



Vineland YMCA

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

0 30' 60'

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)	TN (lb/yr)	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)	Annual (Mgal)
MAURICE RIVER SUBWATERSHED	**21.42**	**933,234**			**27.5**	**287.6**	**2,614.4**		**13.07**	**569,424**	**0.444**	**15.62**
Landis Intermediate School												
Total Site Info	20.39	888,234	3602	8	25.4	266.2	2,419.9	59	12.10	527,044	0.411	14.46
Vineland Fire Department												
Total Site Info	1.03	45,000	2914	8, 9, 10, 11,12	2.0	21.4	194.6	94	0.97	42,380	0.033	1.16
MENANTICO CREEK SUBWATERSHED	**93.18**	**4,058,901**			**70.0**	**733.3**	**6,666.6**		**33.33**	**1,451,986**	**1.131**	**39.82**
Chestnut Assembly of God												
Total Site Info	25.81	1,124,291	4405	30	11.5	120.5	1,095.8	21	5.48	238,673	0.186	6.55
South Vineland United Methodist Church												
Total Site Info	1.74	75,673	6707	42	2.5	26.1	237.2	68	1.19	51,663	0.040	1.42
Vineland High School												
Total Site Info	65.63	2,858,937	4501	42	56.0	586.7	5,333.6	41	26.67	1,161,650	0.905	31.86
PARVIN BRANCH / TARKILN BRANCH SUBWATERSHED	**25.21**	**1,098,002**			**29.3**	**307.2**	**2,792.6**		**13.96**	**608,221**	**0.474**	**16.68**
Magnolia Shopping Court												
Total Site Info	1.78	77,344	5804	18	3.3	34.9	317.2	89	1.59	69,079	0.054	1.89
Vine Haven Adventist School												
Total Site Info	6.59	286,845	4211	3	2.6	26.9	244.2	19	1.22	53,194	0.041	1.46
Vineland Learning Complex												
Total Site Info	9.47	412,321	4009	6	14.9	155.7	1,415.4	75	7.08	308,281	0.240	8.46
Vineland Public Library												
Total Site Info	2.07	90,238	3116	27	2.8	29.7	269.7	65	1.35	58,744	0.046	1.61
Vineland YMCA												
Total Site Info	5.31	231,254	4211	4	5.7	60.1	546.0	51	2.73	118,923	0.093	3.26

d. Summary of Proposed Green Infrastructure Practices

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	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 %
	MAURICE RIVER SUBWATERSHED	**17,862**	**0.41**	**0.465**	**78**	**30,721**	**0.90**	**6,145**			**$90,505**	**3.1%**
1	**Landis Intermediate School**											
	Bioretention systems	1,800	0.04	0.047	8	3,441	0.09	1,961	5	SF	$9,805	0.3%
	Pervious pavement	13,700	0.31	0.357	60	26,180	0.71	3,060	25	SF	$76,500	2.6%
	Planter boxes	430	0.01	0.011	2	n/a	n/a	24	1,000	box	$2,000	0.1%
	Rainwater harvesting	172	0.00	0.004	1	100	0.01	100	2	gal	$200	0.0%
	Total Site Info	**16,102**	**0.37**	**0.420**	**70**	**29,721**	**0.81**	**5,145**			**$88,505**	**3.1%**
2	**Vineland Fire Department**											
	Rainwater harvesting	1,760	0.04	0.046	8	1,000	0.09	1,000	2	gal	$2,000	4.2%
	Total Site Info	**1,760**	**0.04**	**0.046**	**8**	**1,000**	**0.09**	**1,000**			**$2,000**	**4.2%**
	MENANTICO CREEK SUBWATERSHED	**183,900**	**4.22**	**4.792**	**802**	**319,313**	**8.67**	**42,999**			**$921,275**	**12.7%**
3	**Chestnut Assembly of God**											
	Bioretention system	7,015	0.16	0.183	31	13,404	0.36	1,755	5	SF	$8,775	2.9%
	Pervious pavement	32,055	0.74	0.835	140	61,261	1.67	10,820	25	SF	$270,500	13.4%
	Total Site Info	**39,070**	**0.90**	**1.018**	**170**	**74,665**	**2.03**	**12,575**			**$279,275**	**16.4%**
4	**South Vineland United Methodist Church**											
	Pervious pavement	23,400	0.54	0.610	102	13,404	0.36	4,400	25	SF	$110,000	45.3%
	Planter boxes	430	0.01	0.011	2	n/a	n/a	24	1,000	box	$2,000	0.8%
	Total Site Info	**23,830**	**0.55**	**0.621**	**104**	**13,404**	**0.36**	**4,424**			**$112,000**	**46.1%**
5	**Vineland High School**											
	Bioretention system	27,800	0.64	0.724	121	53,130	1.44	6,000	5	SF	$30,000	2.4%
	Pervious pavement	93,200	2.14	2.428	407	178,114	4.84	20,000	25	SF	$500,000	8.0%
	Total Site Info	**121,000**	**2.78**	**3.153**	**528**	**231,244**	**6.28**	**26,000**			**$530,000**	**10.4%**
	PARVIN BRANCH / TARKILN BRANCH SUBWATERSHED	**91,335**	**2.10**	**2.380**	**398**	**158,356**	**4.35**	**22,182**			**$448,950**	**15.0%**
6	**Magnolia Shopping Court**											
	Bioretention system	3,100	0.07	0.081	14	5,924	0.16	750	5	SF	$3,750	4.5%
	Pervious pavement	8,460	0.19	0.220	37	16,164	0.44	2,170	25	SF	$54,250	12.2%
	Total Site Info	**11,560**	**0.27**	**0.301**	**50**	**22,088**	**0.60**	**2,920**			**$58,000**	**16.7%**

Summary of Proposed Green Infrastructure Practices

	Subwatershed/Site Name/Total Site Info/GI Practice	Potential Management Area Area (SF)	Potential Management Area Area (ac)	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 %
7	**Vine Haven Adventist School**											
	Pervious pavement	8,560	0.20	0.223	37	13,494	0.37	2,400	25	SF	$60,000	16.1%
	Total Site Info	**8,560**	**0.20**	**0.223**	**37**	**13,494**	**0.37**	**2,400**			**$60,000**	**16.1%**
8	**Vineland Learning Complex**											
	Bioretention systems	8,800	0.20	0.229	38	16,815	0.46	2,200	5	SF	$11,000	2.9%
	Pervious pavement	14,890	0.34	0.388	65	28,454	0.77	3,900	25	SF	$97,500	4.8%
	Planter boxes	1,290	0.03	0.034	6	n/a	n/a	72	1,000	box	$6,000	0.4%
	Rainwater harvesting	1,380	0.03	0.036	6	1,000	0.07	1,000	2	gal	$2,000	0.4%
	Total Site Info	**26,360**	**0.61**	**0.687**	**115**	**46,269**	**1.30**	**7,172**			**$116,500**	**8.6%**
9	**Vineland Public Library**											
	Bioretention systems	4,820	0.11	0.126	21	18,535	0.50	1,390	5	SF	$6,950	8.2%
	Pervious pavement	20,570	0.47	0.536	90	39,307	1.07	3,400	25	SF	$85,000	35.0%
	Total Site Info	**25,390**	**0.58**	**0.662**	**111**	**39,307**	**1.07**	**4,790**			**$91,950**	**43.2%**
10	**Vineland YMCA**											
	Pervious pavement	19,465	0.45	0.507	85	37,198	1.01	4,900	25	SF	$122,500	16.4%
	Total Site Info	**19,465**	**0.45**	**0.507**	**85**	**37,198**	**1.01**	**4,900**			**$122,500**	**16.4%**