RUTGERS
New Jersey Agricultural
Experiment Station

Draft

Impervious Cover Reduction Action Plan
for
Buena Borough, Atlantic County, New Jersey

Prepared for Buena Borough by the
Rutgers Cooperative Extension Water Resources Program

November 29, 2018

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Introduction

Located in Atlantic County, New Jersey, Buena Borough covers approximately 6.52 square miles. Figures 1 and 2 illustrate that Buena Borough is dominated by agriculture land uses. A total of 29.0% of the municipality's land use is classified as urban. Of the urban land in Buena Borough, 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 Buena 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 Buena Borough. Based upon the 2012 NJDEP land use/land cover data, approximately 8.3% of Buena Borough has impervious cover. This level of impervious cover suggests that the streams in Buena Borough are likely sensitive streams. [1]

Methodology

Buena Borough contains portions of six 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.

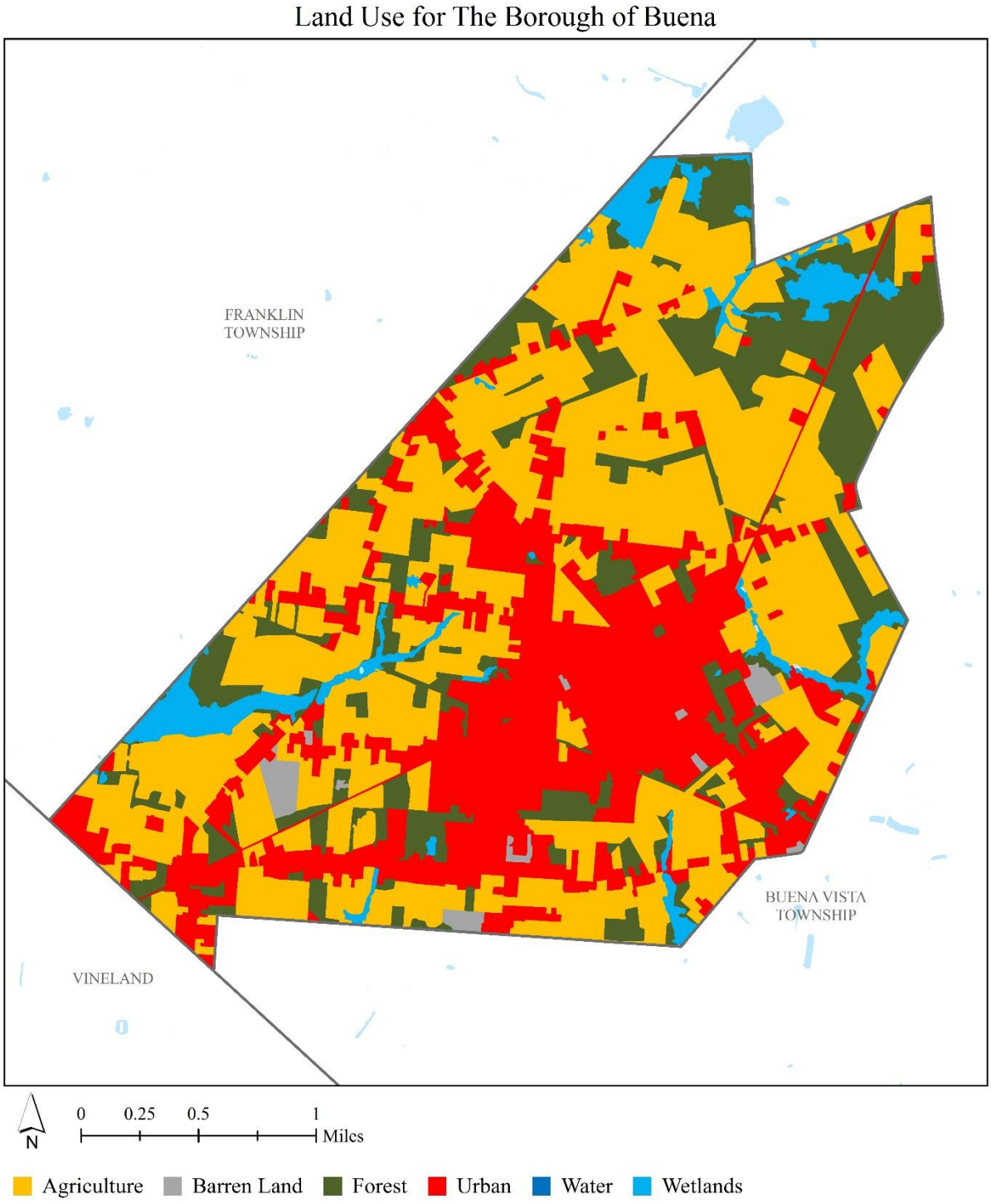


Figure 1: Map illustrating the land use in Buena Borough

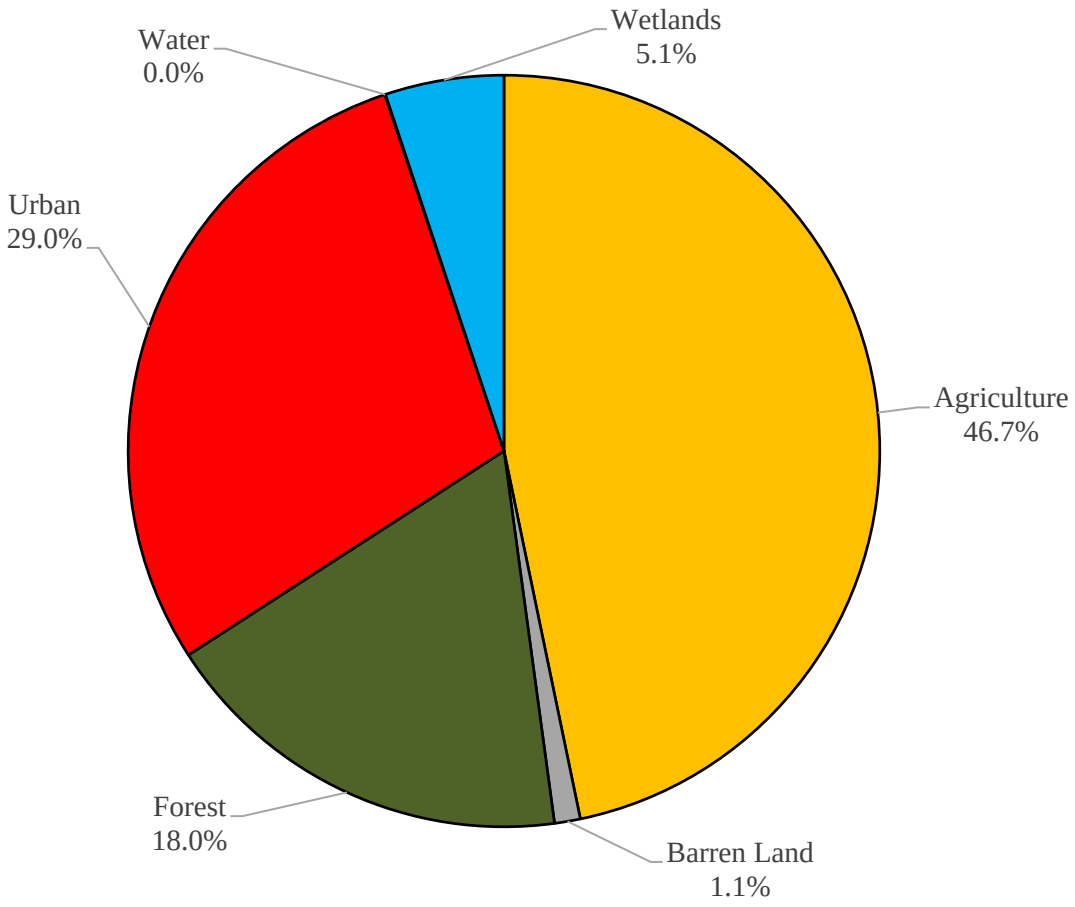


Figure 2: Pie chart illustrating the land use in Buena Borough

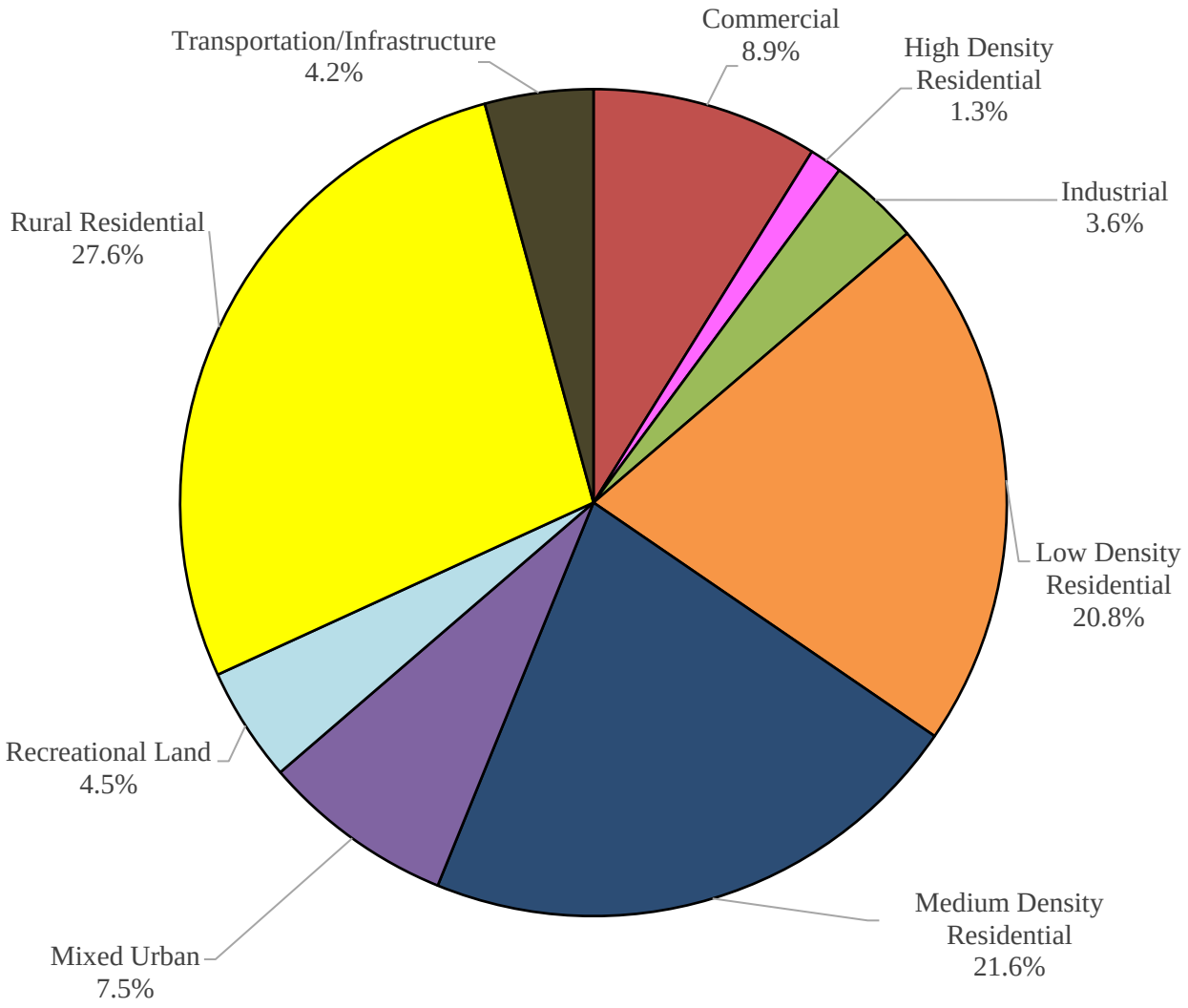


Figure 3: Pie chart illustrating the various types of urban land use in Buena Borough

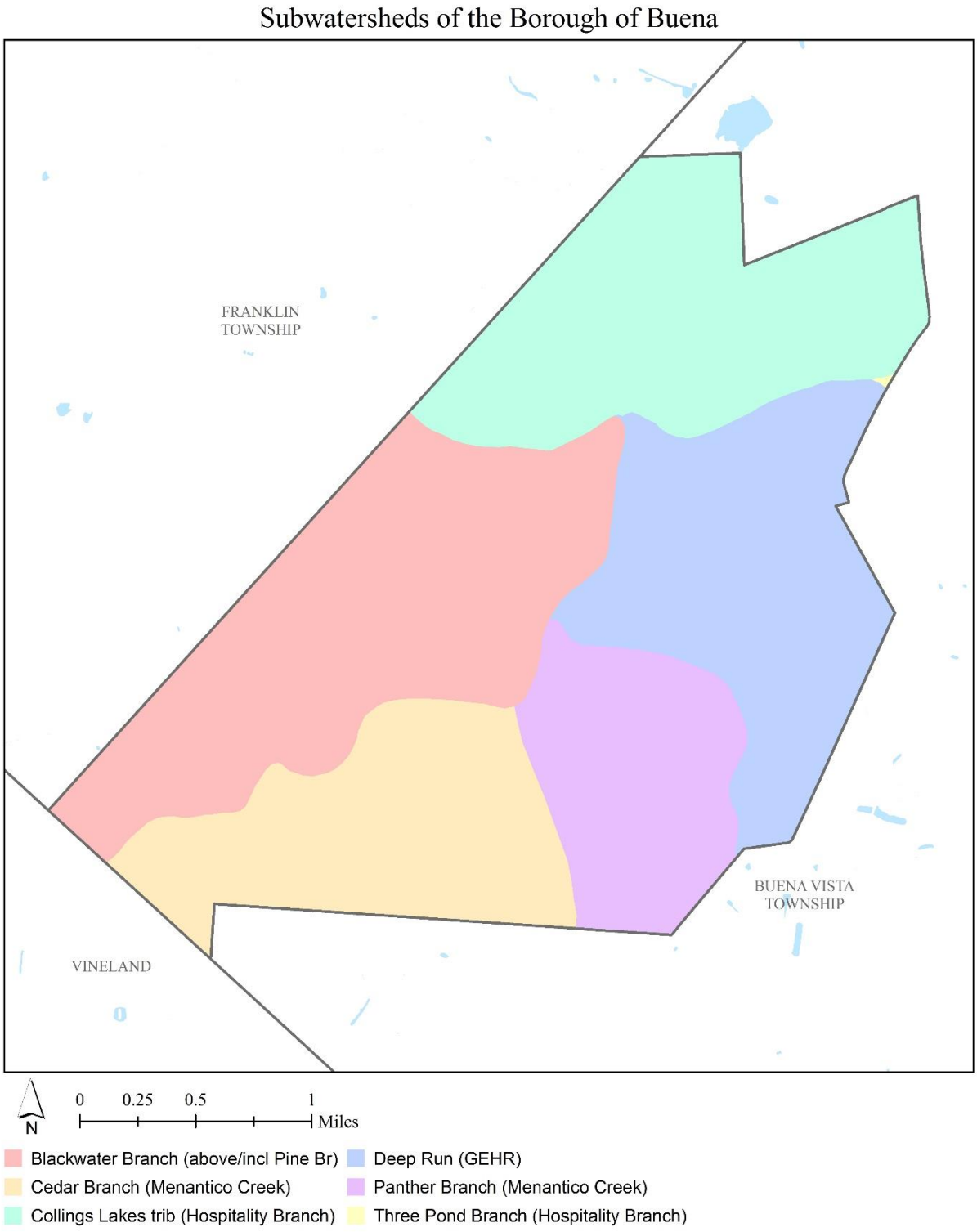


Figure 4: Map of the subwatersheds in Buena Borough

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 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 Buena 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 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 Buena Borough. 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

Appendix A contains information on potential project sites where green infrastructure practices could be installed as well as information on existing site conditions. The recommended green infrastructure practices and the drainage area that the green infrastructure practices can treat are identified for each potential project site. For each practice, the recharge potential, TSS removal potential, maximum volume reduction potential per storm, the peak reduction potential, and estimated costs 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*.

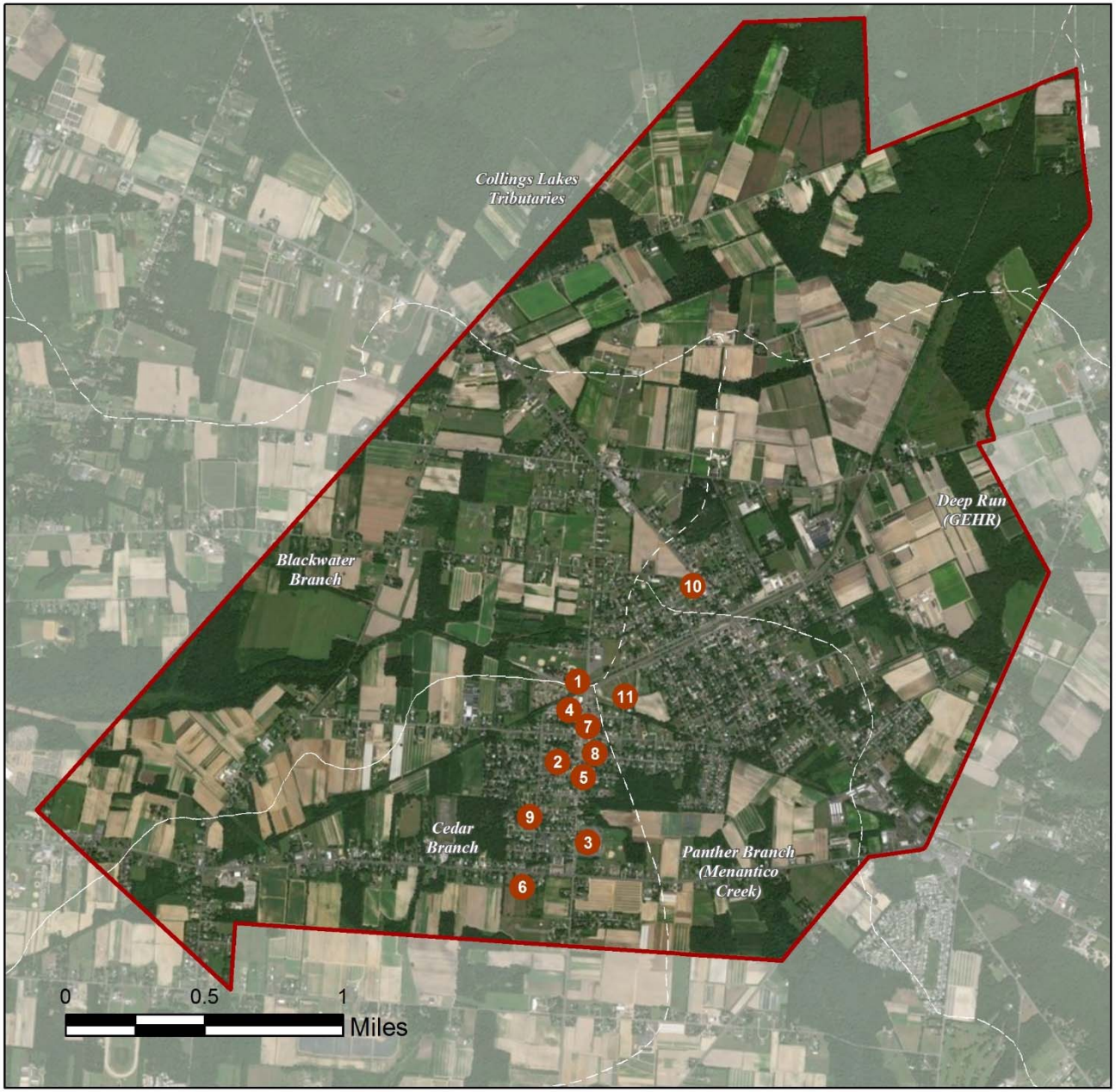
Conclusion

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

BUENA BOROUGH: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE BLACKWATER BRANCH SUBWATERSHED

1. Buena Municipal Center

SITES WITHIN THE CEDAR BRANCH SUBWATERSHED

2. Buena Gardens Senior Apartments
3. Cleary Elementary School
4. Grace Orthodox Fellowship Church
5. Minotola Dental Associates
6. Minotola Fire Company
7. Minotola Post Office
8. Minotola United Methodist Church
9. Our Lady of the Blessed Sacrament Church

SITES WITHIN THE DEEP RUN SUBWATERSHED

10. Landisville Volunteer Fire Company

SITES WITHIN THE PANTHER BRANCH SUBWATERSHED

11. Buena EMS and Crossfit Complex

b. Proposed Green Infrastructure Concepts

BUENA MUNICIPAL CENTER

Subwatershed: Blackwater Branch

Site Area: 867,356 sq. ft.

Address: 616 Central Avenue
Minotola, NJ 08341

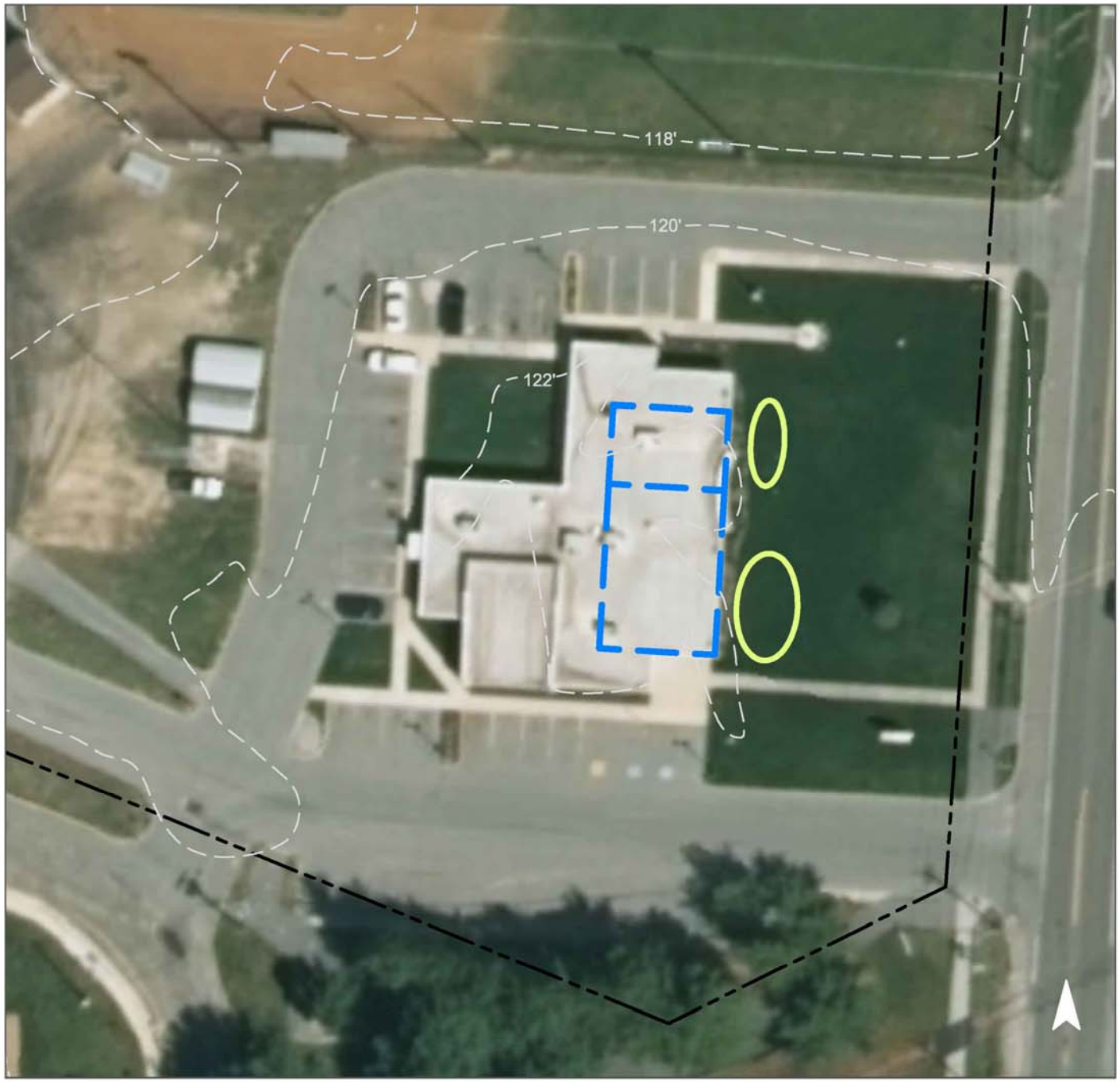
Block and Lot: Block 126, Lot 27

Connected downspouts on the east side of the building can be disconnected and led to bioretention systems on the southeast and northeast corners of the building to capture, treat, and infiltrate 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"
17	144,588	7.0	73.0	663.9	0.113	3.97

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
Bioretention systems	0.079	13	5,849	0.22	765	$3,825

GREEN INFRASTRUCTURE RECOMMENDATIONS



Buena Municipal Center

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

0 25' 50'

BUENA GARDENS SENIOR APARTMENTS

Subwatershed: Cedar Branch

Site Area: 133,026 sq. ft.

Address: 114 West Arctic Road
Minotola, NJ 08341

Block and Lot: Block 179, Lot 1

Two bioretention systems can be installed in the turfgrass areas at the northwest corner of the building. Two strips of parking spaces in the parking lot can be retrofitted with pervious pavement to allow stormwater runoff to infiltrate the ground before it reaches the catch basins. Four planter boxes can be installed at each of the three downspouts on the east side of the building. Rainwater can be harvested from the roof of the building and stored in a cistern on the southeast side of the building. 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"
64	85,293	4.1	43.1	391.6	0.066	2.34

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	0.100	17	7,345	0.28	960	$4,800
Pervious pavement	1.021	171	38,739	1.46	8,620	$215,500
Planter boxes	n/a	9	n/a	n/a	12 (boxes)	$12,000
Rainwater harvesting	0.019	3	560	0.02	560 (gal)	$1,120

GREEN INFRASTRUCTURE RECOMMENDATIONS

Buena Gardens Senior Apartments

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

0 50' 100'

CLEARY ELEMENTARY SCHOOL

Subwatershed: Cedar Branch

Site Area: 979,416 sq. ft.

Address: 1501 Central Avenue
Minotola, NJ 08341

Block and Lot: Block 201, Lot 10

The downspouts on the south side of the building can be disconnected and led to a bioretention system to capture, treat, and infiltrate rooftop runoff. Sections of pervious pavement can be installed in the parking lot along the west side of the building to capture and infiltrate stormwater runoff from the 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"
16	153,197	7.4	77.4	703.4	0.119	4.20

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
Bioretention system	0.150	25	11,048	0.42	1,440	$7,200
Pervious pavement	0.391	65	28,768	1.08	5,620	$140,500

GREEN INFRASTRUCTURE RECOMMENDATIONS

Cleary Elementary School

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

0 50' 100'

GRACE ORTHODOX FELLOWSHIP CHURCH

Subwatershed: **Cedar Branch**

Site Area: **27,238 sq. ft.**

Address: **106 West Atlantic Avenue**
Minotola, NJ 08341

Block and Lot: **Block 144, Lot 2**

The connected downspout at the southwest corner of the church can be disconnected and led to a downspout planter box to allow roof runoff to be filtered and reused. The disconnected downspout in the middle of the south side of the church can be redirected to join with the connected downspout on the southeast corner of the church to lead to a bioretention system. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure. (*Aerial is not up to date with current building*)

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"
32	8,652	0.4	4.4	39.7	0.007	0.24

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	0.022	4	1,631	0.06	215	$1,075
Planter boxes	n/a	3	n/a	n/a	4 (boxes)	$4,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Grace Orthodox Fellowship Church

- bioretention system
- planter box
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 15' 30'

MINOTOLA DENTAL ASSOCIATES

Subwatershed: Cedar Branch

Site Area: 7,826 sq. ft.

Address: 1001 South Central Avenue
Minotola, NJ 08341

Block and Lot: Block 193, Lot 1

A strip of parking spaces on the west side of the building can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the roof. 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"
80	6,261	0.3	3.2	28.7	0.005	0.17

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	0.063	11	4,668	0.18	1,205	$30,125

GREEN INFRASTRUCTURE RECOMMENDATIONS

Minotola Dental Associates

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

0 15' 30'

MINOTOLA FIRE COMPANY

Subwatershed: Cedar Branch

Site Area: 165,690 sq. ft.

Address: 255 Wheat Road
Minotola, NJ 08341

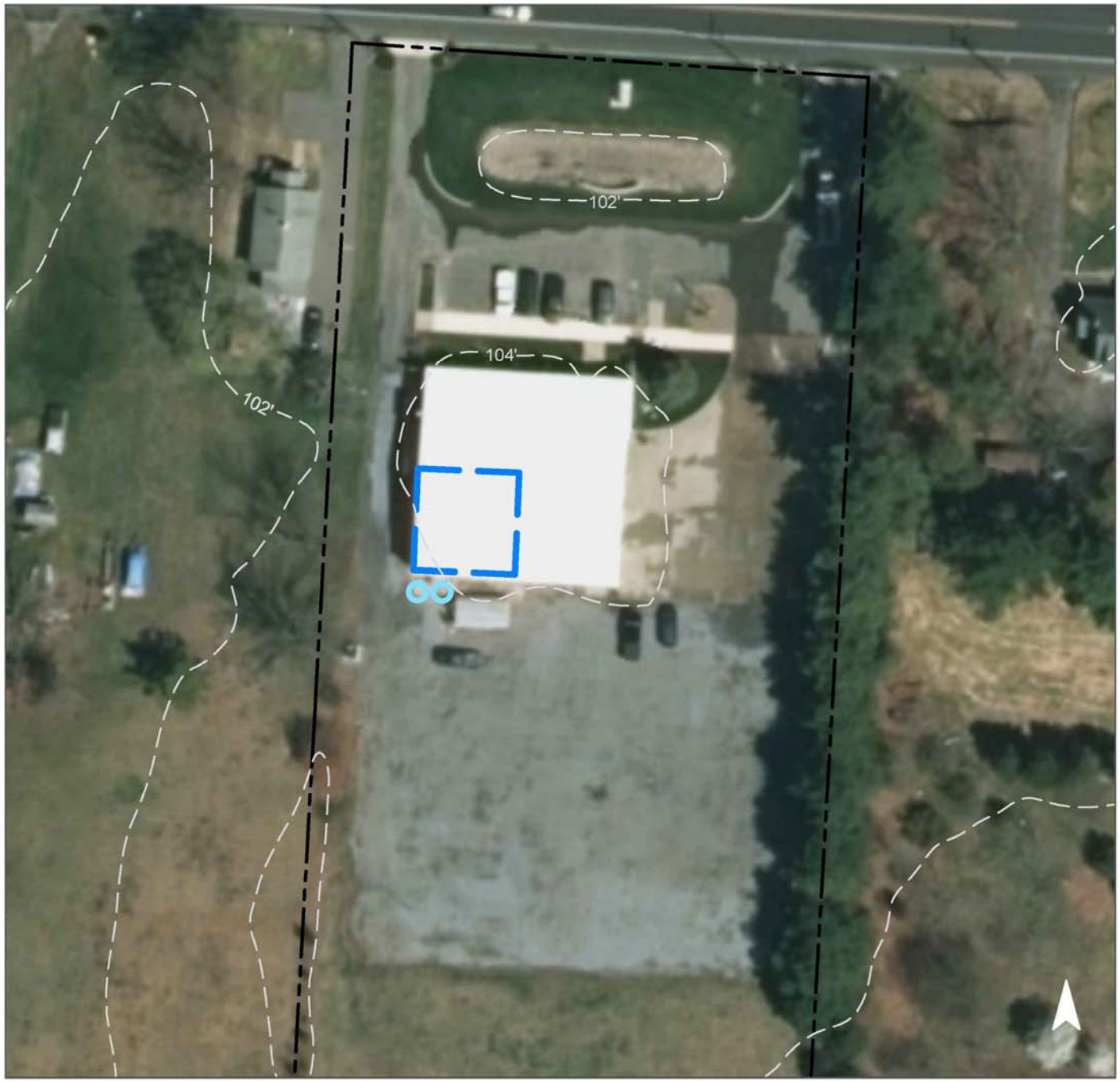
Block and Lot: Block 207, Lot 59

The downspout on the southwest corner of the building can lead to cisterns to capture stormwater runoff from the roof. Collected stormwater from the cistern can be used to wash off emergency vehicles or for other non-potable purposes. 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"
17	27,689	1.3	14.0	127.1	0.022	0.76

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Rainwater harvesting	0.042	7	1,245	0.12	1,245 (gal)	$2,490

GREEN INFRASTRUCTURE RECOMMENDATIONS



Minotola Fire Company

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

0 30' 60'

MINOTOLA POST OFFICE

Subwatershed: Cedar Branch

Site Area: 12,847 sq. ft.

Address: 807 Central Avenue
Minotola, NJ 08341

Block and Lot: Block 190, Lot 11

A bioretention system can be installed at the southeast corner of the building to capture, treat, and infiltrate 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"
65	8,350	0.4	4.2	38.3	0.007	0.23

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.003	1	217	0.01	30	$150

GREEN INFRASTRUCTURE RECOMMENDATIONS

Minotola Post Office

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

0 10' 20'

MINOTOLA UNITED METHODIST CHURCH

Subwatershed: Cedar Branch

Site Area: 30,611 sq. ft.

Address: 905 Central Avenue
Minotola, NJ 08341

Block and Lot: Block 191, Lot 11

A bioretention system can be installed on the west side of the church to capture, treat, and infiltrate 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"
30	9,183	0.4	4.6	42.2	0.007	0.25

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
Bioretention system	0.021	3	1,421	0.05	200	$1,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Minotola United Methodist Church

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

0 20' 40'

OUR LADY OF THE BLESSED SACRAMENT CHURCH

Subwatershed: Cedar Branch

Site Area: 50,527 sq. ft.

Address: 504 Southwest Avenue
Minotola, NJ 08341

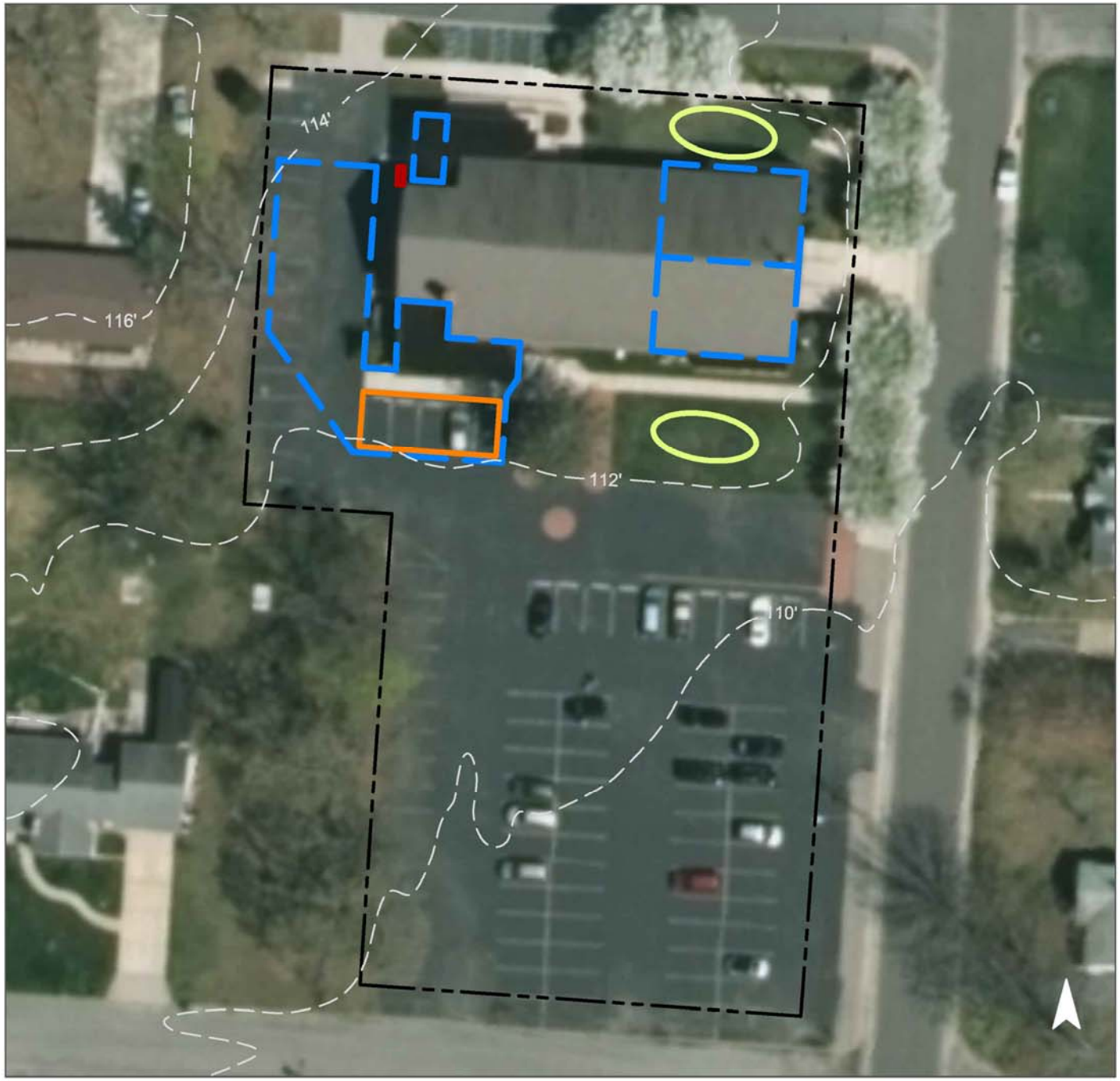
Block and Lot: Block 184, Lot 3

Bioretention systems can be installed at the north and south sides of the church to capture, treat, and infiltrate rooftop runoff. The five parking spaces on the southwest side of the church can be replaced with pervious pavement to capture and infiltrate stormwater runoff from the parking lot and roof. The downspout at the northwest corner of the building can lead to a downspout planter box to allow rooftop runoff to be filtered and reused. 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"
80	40,267	1.9	20.3	184.9	0.031	1.10

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.075	12	5,483	0.21	720	$3,600
Pervious pavement	0.118	20	8,692	0.33	810	$20,250
Planter box	n/a	1	n/a	n/a	1 (box)	$1,000

GREEN INFRASTRUCTURE RECOMMENDATIONS



Our Lady of the Blessed Sacrament Church

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

0 25' 50'

LANDISVILLE VOLUNTEER FIRE COMPANY

Subwatershed: Deep Run

Site Area: 69,277 sq. ft.

Address: 102 West Arbor Avenue
Landisville, NJ 08326

Block and Lot: Block 136, Lot 4

A bioretention system can be installed along the parking lot on the west side of the property to capture, treat, and infiltrate stormwater runoff from the parking lot. The downspout on the south side of the building along the driveway can lead to a cistern. Collected stormwater from the cistern can be used to wash off emergency vehicles or for other non-potable purposes. 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"
31	21,699	1.0	11.0	99.6	0.017	0.60

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention system	0.206	34	15,154	0.57	1,975	$9,875
Rainwater harvesting	0.033	6	1,000	0.09	1,000 (gal)	$2,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Landisville Fire Company

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

0 30' 60'

BUENA EMS AND CROSSFIT COMPLEX

Subwatershed: Panther Creek

Site Area: 204,927 sq. ft.

Address: 525 Southwest Boulevard
Buena, NJ 08341

Block and Lot: Block 145, Lot 8

A strip of parking spaces on the west side of the building can be replaced with pervious pavement to capture and infiltrate stormwater. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
37	75,830	3.7	38.3	348.2	0.059	2.08

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 pavement	0.438	73	32,224	1.21	3,000	$75,000

GREEN INFRASTRUCTURE RECOMMENDATIONS

Buena EMS and Crossfit Complex

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

0 50' 100'

c. Summary of Existing Conditions

Summary of Existing Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Existing Annual Loads (Commercial)			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)
	BLACKWATER BRANCH SUBWATERSHED	**19.91**	**867,356**			**17**	**3.32**	**144,588**	**7.0**	**73.0**	**663.9**	**0.113**	**3.97**
1	**Buena Municipal Center**												
	Total Site Info	19.91	867,356	126	27	17	3.32	144,588	7.0	73.0	663.9	0.113	3.97
	CEDAR BRANCH SUBWATERSHED	**32.30**	**1,407,181**			**383**	**7.78**	**338,893**	**16.3**	**171.2**	**1,556.0**	**0.264**	**9.29**
2	**Buena Gardens Senior Apartments**												
	Total Site Info	3.05	133,026	179	1	64	1.96	85,293	4.1	43.1	391.6	0.066	2.34
3	**Cleary Elementary School**												
	Total Site Info	22.48	979,416	201	10	16	3.52	153,197	7.4	77.4	703.4	0.119	4.20
4	**Grace Orthodox Fellowship Church**												
	Total Site Info	0.63	27,238	144	2	32	0.20	8,652	0.4	4.4	39.7	0.007	0.24
5	**Minotola Dental Associates**												
	Total Site Info	0.18	7,826	193	1	80	0.14	6,261	0.3	3.2	28.7	0.005	0.17
6	**Minotola Fire Company**												
	Total Site Info	3.80	165,690	207	59	17	0.64	27,689	1.3	14.0	127.1	0.022	0.76
7	**Minotola Post Office**												
	Total Site Info	0.29	12,847	190	11	65	0.19	8,350	0.4	4.2	38.3	0.007	0.23
8	**Minotola United Methodist Church**												
	Total Site Info	0.70	30,611	191	11	30	0.21	9,183	0.4	4.6	42.2	0.007	0.25
9	**Our Lady of the Blessed Sacrament Church**												
	Total Site Info	1.16	50,527	184	3	80	0.92	40,267	1.9	20.3	184.9	0.031	1.10

Summary of Existing Conditions

	Subwatershed/Site Name/Total Site Info/GI Practice	Area (ac)	Area (SF)	Block	Lot	I.C. %	I.C. Area (ac)	I.C. Area (SF)	Existing Annual Loads (Commercial)			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)
	DEEP RUN SUBWATERSHED	**1.59**	**69,277**			**31**	**0.50**	**21,699**	**1.0**	**11.0**	**99.6**	**0.017**	**0.60**
10	**Landisville Volunteer Fire Company**												
	Total Site Info	1.59	69,277	136	4	31	0.50	21,699	1.0	11.0	99.6	0.017	0.60
	PANTHER BRANCH SUBWATERSHED	**4.70**	**204,927**			**37**	**1.74**	**75,830**	**3.7**	**38.3**	**348.2**	**0.059**	**2.08**
11	**Buena EMS and Crossfit Complex**												
	Total Site Info	4.70	204,927	145	8.01	37	1.74	75,830	3.7	38.3	348.2	0.059	2.08

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	Unit Cost ($/unit)	Unit	Total Cost ($)	I.C. Treated %
	BLACKWATER BRANCH SUBWATERSHED	**3,050**	**0.07**	**0.079**	**13**	**5,849**	**0.22**				**$3,825**	**2.1%**
1	**Buena Municipal Center**											
	Bioretention systems	3,050	0.07	0.079	13	5,849	0.22	765	$5	SF	$3,825	2.1%
	Total Site Info	**3,050**	**0.07**	**0.079**	**13**	**5,849**	**0.22**				**$3,825**	**2.1%**
	CEDAR BRANCH SUBWATERSHED	**81,185**	**1.86**	**2.024**	**352**	**109,816**	**4.22**				**$444,810**	**24.0%**
2	**Buena Gardens Senior Apartments**											
	Bioretention systems	3,830	0.09	0.100	17	7,345	0.28	960	$5	SF	$4,800	4.5%
	Pervious pavement	39,200	0.90	1.021	171	38,739	1.46	8,620	$25	SF	$215,500	46.0%
	Planter boxes	2,580	0.06	n/a	9	n/a	n/a	12	$1,000	box	$12,000	3.0%
	Rainwater harvesting	720	0.02	0.019	3	560	0.02	560	$2	gal	$1,120	0.8%
	Total Site Info	**46,330**	**1.06**	**1.140**	**200**	**46,644**	**1.76**				**$233,420**	**54.3%**
3	**Cleary Elementary School**											
	Bioretention system	5,760	0.13	0.150	25	11,048	0.42	1,440	$5	SF	$7,200	3.8%
	Pervious pavement	15,000	0.34	0.391	65	28,768	1.08	5,620	$25	SF	$140,500	9.8%
	Total Site Info	**20,760**	**0.48**	**0.541**	**91**	**39,816**	**1.50**				**$147,700**	**13.6%**
4	**Grace Orthodox Fellowship Church**											
	Bioretention system	850	0.02	0.022	4	1,631	0.06	215	$5	SF	$1,075	9.8%
	Planter boxes	690	0.02	n/a	3	n/a	n/a	4	$1,000	box	$4,000	8.0%
	Total Site Info	**1,540**	**0.04**	**0.022**	**6**	**1,631**	**0.06**				**$5,075**	**17.8%**
5	**Minotola Dental Associates**											
	Pervious pavement	2,435	0.06	0.063	11	4,668	0.18	1,205	$25	SF	$30,125	38.9%
	Total Site Info	**2,435**	**0.06**	**0.063**	**11**	**4,668**	**0.18**				**$30,125**	**38.9%**
6	**Minotola Fire Company**											
	Rainwater harvesting	1,600	0.04	0.042	7	1,245	0.12	1,245	$2	gal	$2,490	5.8%
	Total Site Info	**1,600**	**0.04**	**0.042**	**7**	**1,245**	**0.12**				**$2,490**	**5.8%**
7	**Minotola Post Office**											
	Bioretention system	115	0.00	0.003	1	217	0.01	30	$5	SF	$150	1.4%
	Total Site Info	**115**	**0.00**	**0.003**	**1**	**217**	**0.01**				**$150**	**1.4%**

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	Unit Cost ($/unit)	Unit	Total Cost ($)	I.C. Treated %
8	**Minotola United Methodist Church**											
	Bioretention system	800	0.02	0.021	3	1,421	0.05	200	$5	SF	$1,000	8.7%
	Total Site Info	**800**	**0.02**	**0.021**	**3**	**1,421**	**0.05**				**$1,000**	**8.7%**
9	**Our Lady of the Blessed Sacrament Church**											
	Bioretention systems	2,860	0.07	0.075	12	5,483	0.21	720	$5	SF	$3,600	7.1%
	Pervious pavement	4,530	0.10	0.118	20	8,692	0.33	810	$25	SF	$20,250	11.2%
	Planter box	215	0.00	n/a	1	n/a	n/a	1	$1,000	box	$1,000	0.5%
	Total Site Info	**7,605**	**0.17**	**0.193**	**33**	**14,175**	**0.54**				**$24,850**	**18.9%**
	DEEP RUN SUBWATERSHED	**9,180**	**0.21**	**0.239**	**40**	**16,154**	**0.66**				**$11,875**	**42.3%**
10	**Landisville Volunteer Fire Company**											
	Bioretention system	7,900	0.18	0.206	34	15,154	0.57	1,975	$5	SF	$9,875	36.4%
	Rainwater harvesting	1,280	0.03	0.033	6	1,000	0.09	1,000	$2	gal	$2,000	5.9%
	Total Site Info	**9,180**	**0.21**	**0.239**	**40**	**16,154**	**0.66**				**$11,875**	**42.3%**
	PANTHER BRANCH SUBWATERSHED	**16,800**	**0.39**	**0.438**	**73**	**32,224**	**1.21**				**$75,000**	**22.2%**
11	**Buena EMS and Crossfit Complex**											
	Pervious pavement	16,800	0.39	0.438	73	32,224	1.21	3,000	$25	SF	$75,000	22.2%
	Total Site Info	**16,800**	**0.39**	**0.438**	**73**	**32,224**	**1.21**				**$75,000**	**22.2%**