

RUTGERS

THE STATE UNIVERSITY
OF NEW JERSEY

Impervious Cover Assessments (ICAs) and Reduction Action Plans (RAPs)

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Raritan Basin



Central to New Jersey



Raritan River Basin

- 1,100 square miles in size
- Portions of seven counties and 98 municipalities
- Frequent localized flooding
- Impaired for total suspended solids (TSS) and phosphorus
- Impaired aquatic community

The goals of this project are to enhance the climate resilience of the municipalities within the Raritan River Basin study area by providing each municipality with a plan to reduce stormwater runoff.



Impervious Cover Assessment

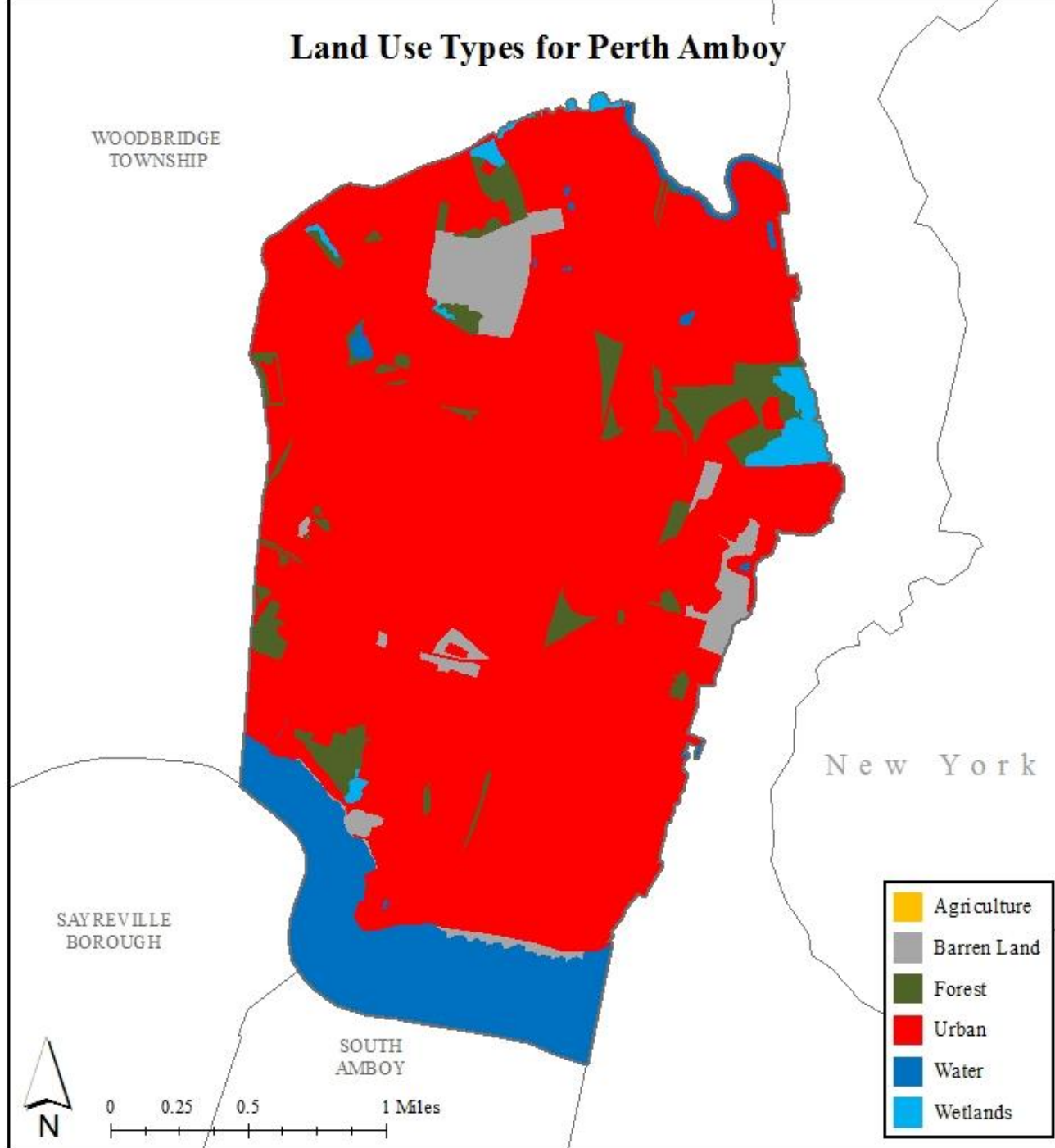


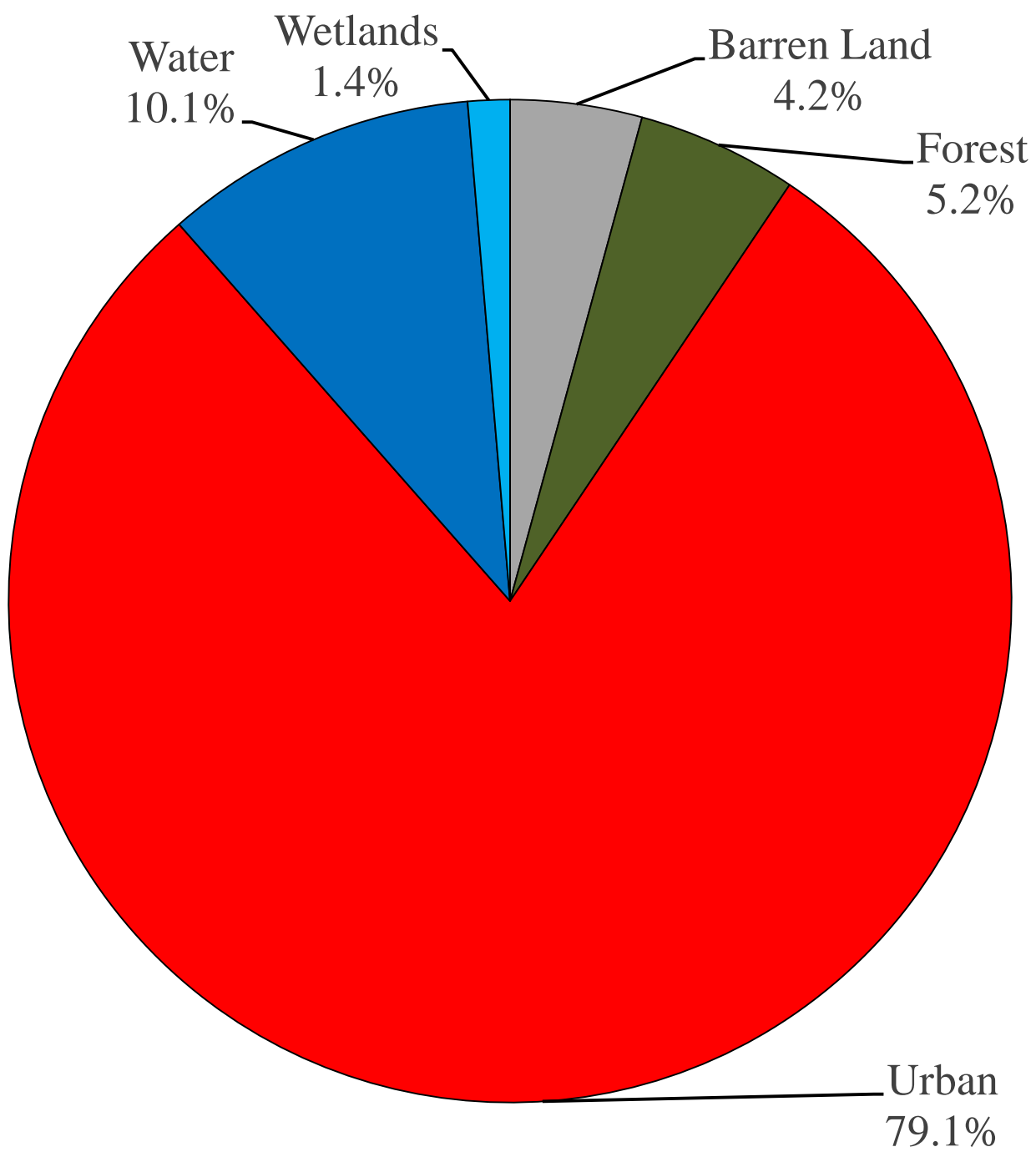
Impervious Cover Assessment

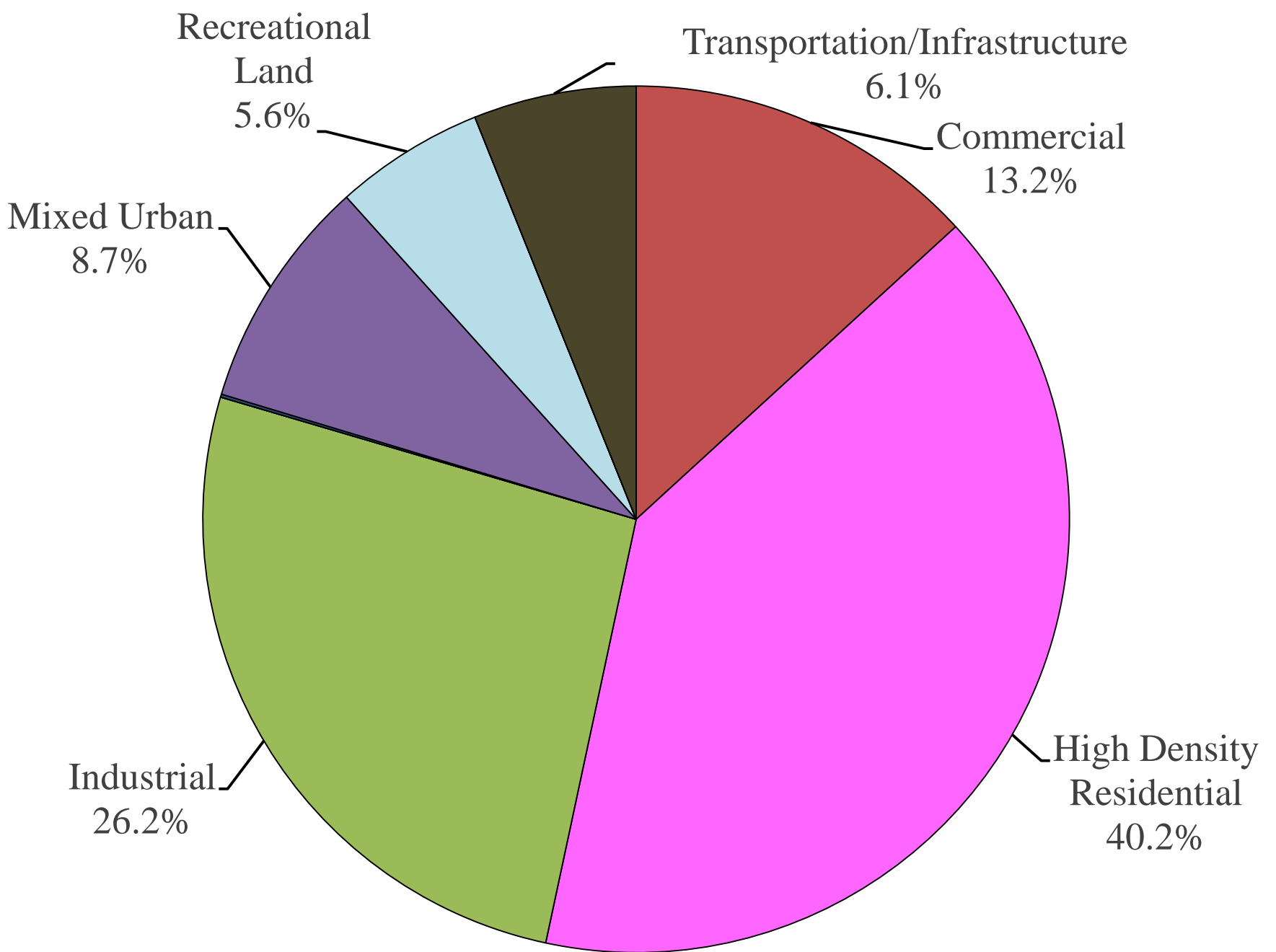
- Analysis completed by watershed and by municipality
- Use 2007 Land Use data to determine impervious cover
- Calculate runoff volumes for water quality, 2, 10 and 100 year design storm and annual rainfall
- Contain three concept designs



Land Use Types for Perth Amboy







Subwatersheds of Perth Amboy

WOODBIDGE
TOWNSHIP

SAYREVILLE
BOROUGH

SOUTH
AMBOY

New York



0 0.25 0.5 1 Miles



Watershed	Total Area (ac)	Impervious Cover (ac)	%
Arthur Kill Waterfront	1,099	568	51.9%
Raritan Bay	38.7	0.00	0.0%
Lower Raritan River	1,336	618	58.3%
Woodbridge Creek	839.0	381	46.3%
Total	3,312	1,567	52.6%

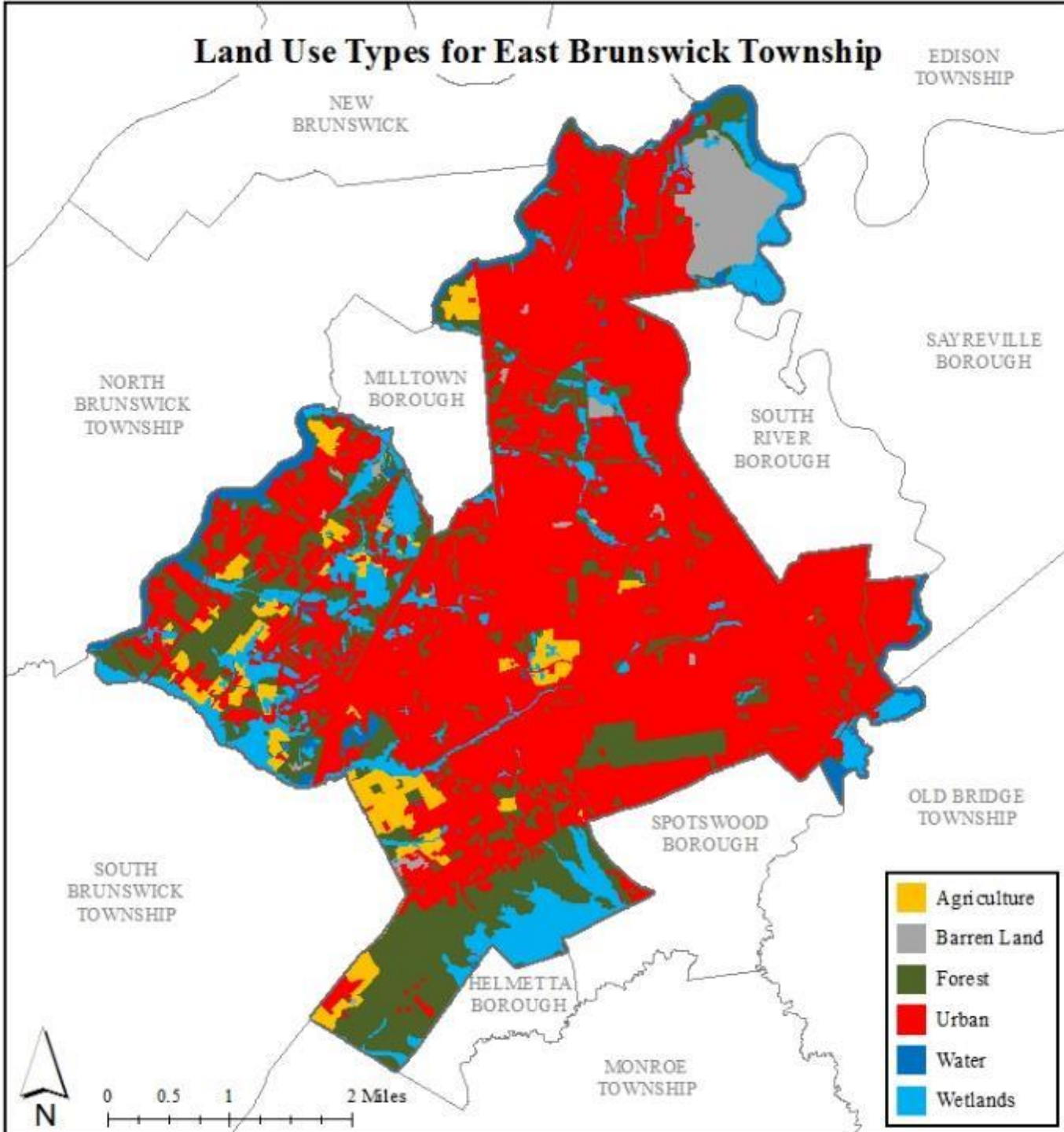
Subwatershed	NJ Water Quality Storm (MGal)	Annual Rainfall of 44" (MGal)	2-Year Design Storm (3.3") (MGal)	10-Year Design Storm (5.0") (MGal)	100-Year Design Storm (8.2") (MGal)
Arthur Kill Waterfront	19.3	678.6	50.9	78.7	132.6
Raritan Bay	0.0	0.0	0.0	0.0	0.0
Lower Raritan River	21.0	738.3	55.4	85.6	144.3
Woodbridge Creek	12.9	455.2	34.1	52.8	89.0
Total	53.2	1,872	140.4	217.0	366

IMPERVIOUS COVER ASSESSMENT (ICA)

- Analysis completed by watershed and by municipality
- Use 2007 Land Use data to determine impervious cover
- Calculate runoff volumes for water quality, 2, 10 and 100 year design storm and annual rainfall
- Contain three concept designs



Land Use Types for East Brunswick Township



How do we identify potential sites

- EPA SWMM model of the drainage basin for the municipality
 - Evaluate the existing stormwater control measures (SCMs)
 - Prepare GIS map of the SCMs
 - Install SCMs
- Identify potential sites for SCMs
- Prioritize sites for SCMs
- Complete cost-benefit analysis
- Secure property owner permission

REALLY?
Sounds expensive and time consuming



No! WE LOOK HERE FIRST:

- ✓ Schools
 - ✓ Churches
 - ✓ Libraries
 - ✓ Municipal Building
 - ✓ Public Works
 - ✓ Firehouses
 - ✓ Post Offices
 - ✓ Elks or Moose Lodge
 - ✓ Parks/ Recreational Fields
- 20 to 40 sites are entered into a powerpoint:
 - Site visits are conducted



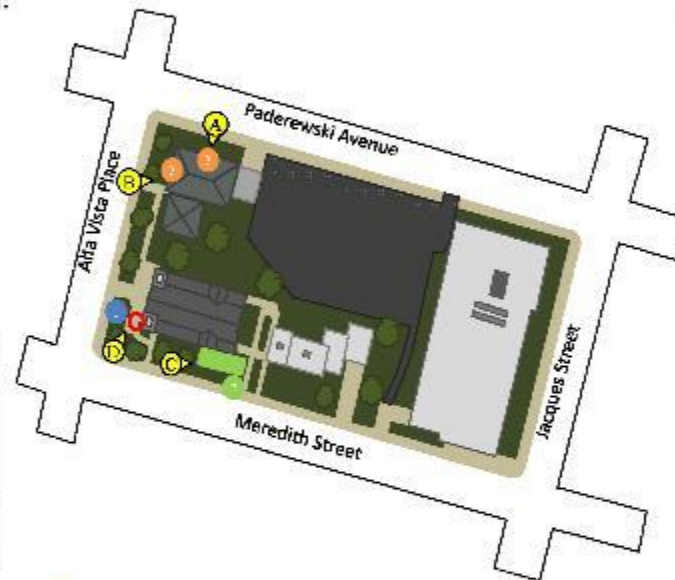
Perth Amboy City
Impervious Cover Assessment

Ukrainian Catholic Church of the Assumption, 684 Alta Vista Place
Assumption Catholic School, Meredith & Jacques Streets

PROJECT LOCATION:



SITE PLAN:



A



B



C



D



- 1 RAIN BARRELS:** Rain barrels will help capture the stormwater that drains from the building's rooftop. Connecting the church's downspouts to rain barrels will allow the stormwater to be collected and used for gardening.
- 2 BIORETENTION SYSTEM:** On this property a rain garden can be used to reduce sediment and nutrient loading to the local waterway and increase groundwater recharge.
- 3 DISCONNECTED DOWNSPOUTS:** Downspouts can be disconnected to allow rainwater to flow into the grassed areas which will help remove pollutants and allow for the stormwater to infiltrate into the ground.

1 RAIN BARREL



2 BIORETENTION SYSTEM



3 DISCONNECTED DOWNSPOUTS



Perth Amboy City
Impervious Cover Assessment

James J. Flynn Elementary School, 850 Chamberlain Avenue

PROJECT LOCATION:



SITE PLAN:



1 BIORETENTION SYSTEMS: Trench drains will carry stormwater into bioretention systems or rain gardens. These rain gardens will capture, treat, and infiltrate roadway runoff and runoff from the grass area in front of the school. The existing catch basins will handle any overflow from the gardens. The rain gardens will reduce sediment and nutrient loading to the local waterway while providing beautiful landscaping to the school grounds. The gardens will also provide habitat for birds, butterflies, and pollinators. They also can be incorporated into the elementary school science curriculum.

1 BIORETENTION SYSTEM



2 TRENCH DRAIN



Perth Amboy City
 Impervious Cover Assessment
Robert N. Wilentz Elementary, 51 1st Street



PROJECT LOCATION:



SITE PLAN:



1 **BIORETENTION SYSTEMS:** Rain gardens will be used to reduce sediment and nutrient loading to the local waterway and increase groundwater recharge. There are five areas proposed for the installation of bioretention systems to treat site runoff.

2 **EDUCATIONAL PROGRAM:** The RCE Water Resources Program, *Stormwater Management in Your Schoolyard*, can be delivered at Robert N. Wilentz Elementary School to educate the students about stormwater management and engage them in designing and building the bioretention systems.

1 **BIORETENTION SYSTEMS:**



2 **EDUCATIONAL PROGRAM**



Perth Amboy City
 Impervious Cover Assessment
Samuel E. Shull Middle School, 380 Hall Avenue



PROJECT LOCATION:



(A)



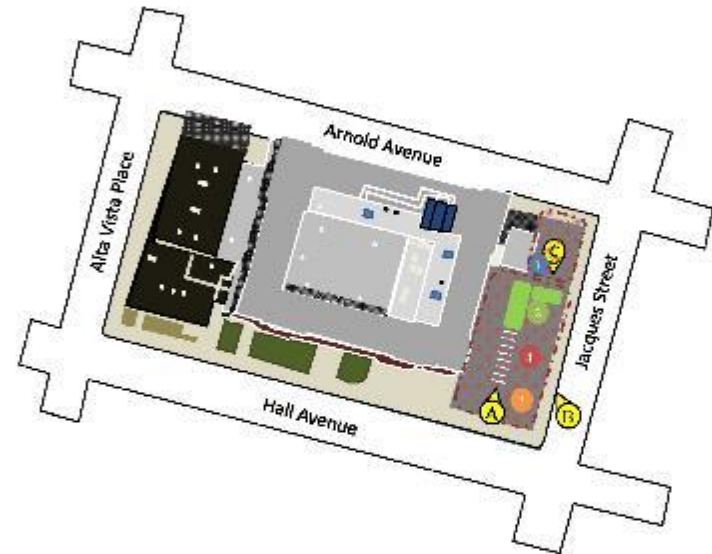
(B)



(C)



SITE PLAN:



- 1 **RAINWATER HARVESTING:** A cistern or a series of rain barrels will help capture the stormwater that drains from the building's loading dock roofline. Converting the loading dock down-grofts to a rainwater harvesting device will allow the stormwater to be collected and used for landscaping.
- 2 **BIORETENTION SYSTEM:** On this property a bioretention system or rain garden can be used to reduce sediment and nutrient loading to the local waterway and increase groundwater recharge.
- 3 **POROUS ASPHALT:** Porous asphalt promotes groundwater recharge and filters stormwater.
- 4 **DEPAVING:** The parking lot adjacent to the school building will be depaved (i.e., asphalt will be removed). Depaving reduces impervious surfaces, allowing for infiltration, filtration, and treatment of nonpoint source pollution and adds green space.

1 RAINWATER HARVESTING



2 BIORETENTION SYSTEM



3 POROUS ASPHALT



4 DEPAVING



		Total Area	Impervious Cover				Total Area	Impervious Cover	
Municipality	County	(ac)	(ac)	(%)	Municipality	County	(ac)	(ac)	(%)
Delaware Twp	Hunterdon	23,692	489	2.1%	Woodbridge Twp	Middlesex	15,368	5,725	38.7%
East Amwell Twp	Hunterdon	18,272	461	2.5%	Englishtown Boro	Monmouth	378	104	28.3%
Flemington Boro	Hunterdon	690	329	47.7%	Freehold Boro	Monmouth	1,236	514	41.6%
Franklin Twp	Hunterdon	14,831	428	2.9%	Freehold Twp	Monmouth	24,881	2,990	12.1%
Rancocas Twp	Hunterdon	24,224	2,427	10.0%	Manalapan Twp	Monmouth	12,752	2,522	19.8%
Readington Twp	Hunterdon	12,112	312	2.6%	Manalapan Boro	Monmouth	1,236	514	41.6%
Dunellen Twp	Hunterdon	12,112	312	2.6%	Manalapan Twp	Monmouth	12,752	2,522	19.8%
East Imlay City	Hunterdon	12,112	312	2.6%	Manalapan Twp	Monmouth	12,752	2,522	19.8%
East Imlay Twp	Hunterdon	12,112	312	2.6%	Manalapan Twp	Monmouth	12,752	2,522	19.8%
Healdton Twp	Hunterdon	12,112	312	2.6%	Manalapan Twp	Monmouth	12,752	2,522	19.8%
Highland Twp	Hunterdon	12,112	312	2.6%	Manalapan Twp	Monmouth	12,752	2,522	19.8%
Jarvis Twp	Hunterdon	12,112	312	2.6%	Manalapan Twp	Monmouth	12,752	2,522	19.8%
Meigs Twp	Hunterdon	12,112	312	2.6%	Manalapan Twp	Monmouth	12,752	2,522	19.8%
Micah Twp	Hunterdon	12,112	312	2.6%	Manalapan Twp	Monmouth	12,752	2,522	19.8%
Milltown Boro	Middlesex	1,021	407	40.9%	North Plainfield Boro	Somerset	1,805	593	33.2%
Monroe Twp	Middlesex	26,989	3,112	11.7%	Raritan Boro	Somerset	1,298	482	38.0%
New Brunswick City	Middlesex	3,686	1,648	49.4%	Somerville Boro	Somerset	1,501	593	40.1%
North Brunswick Twp	Middlesex	7,860	2,483	32.3%	South Bound Brook Boro	Somerset	473	138	33.4%
Old Bridge Twp	Middlesex	24,754	3,307	13.7%	Warren Twp	Somerset	12,563	1,550	12.4%
Perth Amboy City	Middlesex	3,312	1,566	52.6%	Watchung Boro	Somerset	3,867	641	16.7%
Piscataway Twp	Middlesex	12,131	3,609	30.2%	Berkeley Heights Twp	Union	4,004	1,008	25.3%
Sayreville Boro	Middlesex	11,252	2,364	23.5%	Fanwood Boro	Union	857	308	35.9%
South Amboy City	Middlesex	1,264	341	34.7%	Mountainside Boro	Union	2,585	555	21.7%
South Brunswick Twp	Middlesex	26,243	4,157	16.1%	Plainfield City	Union	3,819	1,521	40.0%
South Plainfield Boro	Middlesex	5,331	2,090	39.4%	Scotch Plains Twp	Union	5,796	1,220	21.2%
South River Boro	Middlesex	1,873	598	33.6%	Springfield Twp	Union	3,308	1,016	31.0%
Spotswood Boro	Middlesex	1,546	454	31.2%	Summit City	Union	3,868	1,182	30.9%

- 54 Municipalities totaling 831 square miles
- Total population is 1,346,436 (15.3% of NJ)
- % of Impervious Cover ranges from 2.1 to 52.6
- Average Impervious Coverage is 26.6%

Impervious Cover Reduction Action Plan



PERTH AMBOY: GREEN INFRASTRUCTURE SITES



SITES WITHIN THE ARTHUR KILL WATERFRONT SUBWATERSHED:

1. Anthony V. Ceres School
2. Assumption Catholic School
3. Education Center
4. Ignacio Cruz Early Childhood Center
5. Perth Amboy High School
6. Perth Amboy Vocational School

SITES WITHIN THE LOWER RARITAN RIVER SUBWATERSHED:

7. 587 Fayette Street Plaza
8. Convery Plaza Shopping Center
9. Dr. Herbert N. Richardson 21st Century School
10. Public School No. 7
11. Raritan Bay Medical Center
12. Robert N. Wilentz Elementary
13. Walgreens
14. Washington Park
15. YMCA and Perth Amboy Police Department

SITES WITHIN THE WOODBRIDGE CREEK SUBWATERSHED:

16. 966 Convery Boulevard
17. 1012 Amboy Avenue
18. Edmund Hmieleski Jr. Early Childhood Center
19. James J. Flynn Elementary



ASSUMPTION CATHOLIC SCHOOL

Subwatershed: Arthur Kill
Site Area: 79,150 sq. ft.
Address: 376 Meredith Street
 Perth Amboy, NJ 08861
Block and Lot: Block 327, Lot 1



Parking spaces can be replaced with pervious pavement to infiltrate stormwater runoff in the north section of the site. A rain garden can be built in the southwest section of the site 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"
80	63,320	3.1	32.0	290.7	0.049	1.74

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	0.055	9	4,039	0.15	1,019	\$5,095
Pervious pavements	0.454	76	33,301	1.25	2,916	\$72,900

GREEN INFRASTRUCTURE RECOMMENDATIONS



Assumption Catholic School

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



Perth Amboy

ALL SITES

ARTHUR KILL WATERFRONT

LOWER RARITAN RIVER

WOODBIDGE CREEK



1 Anthony V. Ceres School



2 Assumption Catholic School



3 Education Center



4 Ignacio Cruz Early Childhood Center



5 Perth Amboy High School



6 Perth Amboy Vocational School



7 687 Fayette St Plaza



8 Convery Plaza Shopping Center



9 Dr. Herbert N. Richardson 21st Century School



10 Pueblo School No. 7



11 Raritan Bay Medical Center



12 Robert N. Wilentz Elementary



13 Walgreens



14 Washington Park



15 YMCA and Perth Amboy Police Department



Perth Amboy

ALL SITES

ARTHUR KILL WATERFRONT

LOWER RARITAN RIVER

WOODBRIIDGE CREEK



1 Anthony V. Ceres School



2 Assumption Catholic School



3 Education Center



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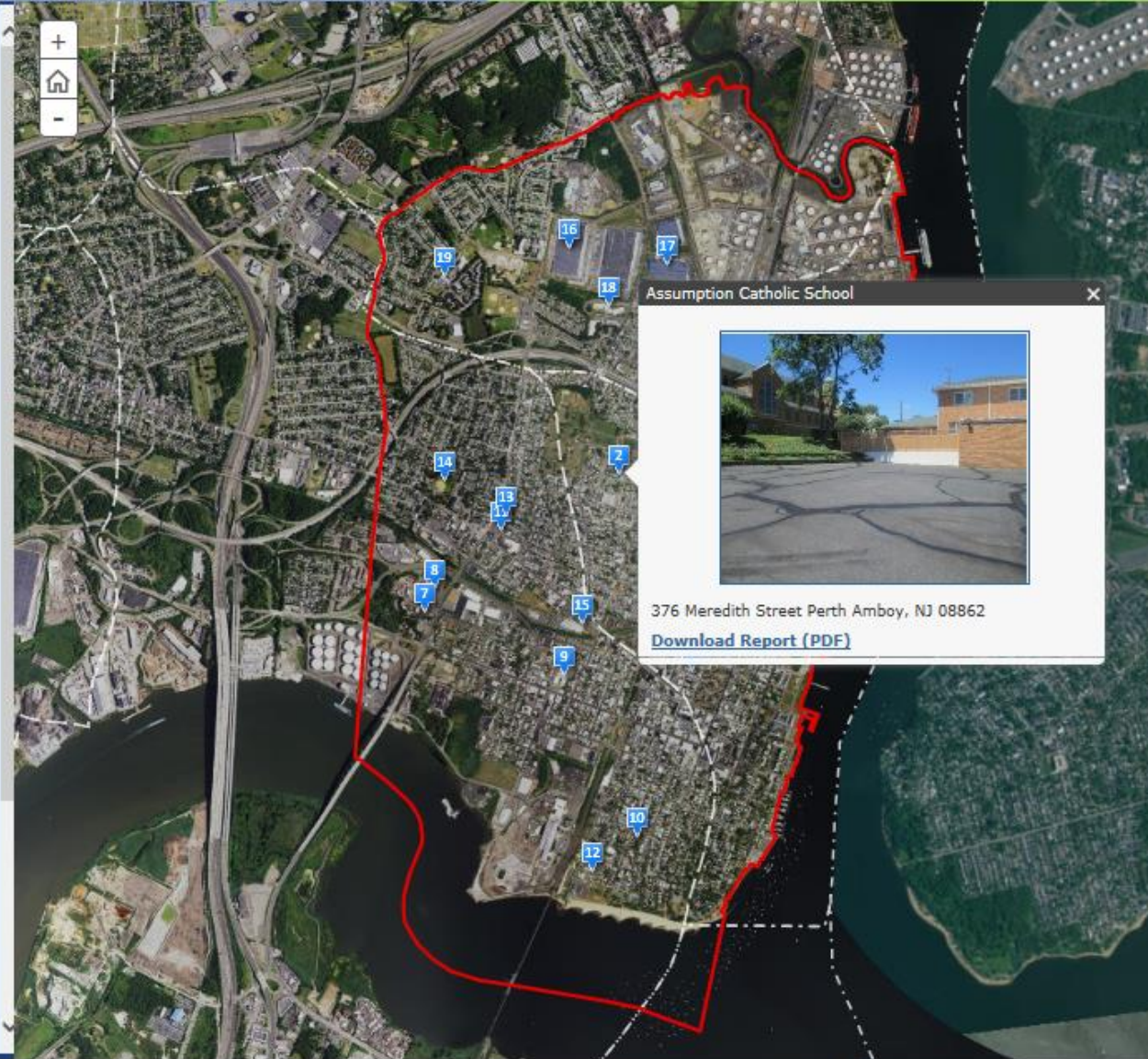
13 Walgreens



14 Washington Park



15 YMCA and Perth Amboy Police Department



Assumption Catholic School



376 Meredith Street Perth Amboy, NJ 08862

[Download Report \(PDF\)](#)

Final Thoughts

- Plans promote action
- Plans are a conduit for funding
- Impervious Cover Reduction Action Plan provide sites for developers to offset impacts
- Wide range in cost of projects (Eagle Scout Projects to Stimulus Money Projects)
- Foundation for stormwater utilities, watershed restoration plans, and integrated water quality plans
- Plans are quick and easy to develop



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Questions?

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