the city of Lancaster
a city authentic

The City of Lancaster Green Infrastructure Plan and Demonstration Projects




American Planning Association PA Chapter
Annual Conference
Harrisburg PA
October 21, 2013

Session Agenda

City of Lancaster

Problem and Solutions

Green Infrastructure Plan

Demonstration Projects

www.saveitlancaster.org

About the City of Lancaster

- Incorporated in 1742
- Temporary National Capital during the Revolution
- Historic building stock (median home 100 years old)
- Surrounded by some of the most productive non-irrigated farmland in the U.S.
- ~60,000 residents in the 2010 census
- 7.34 square miles
- ~8,000 persons/square mile

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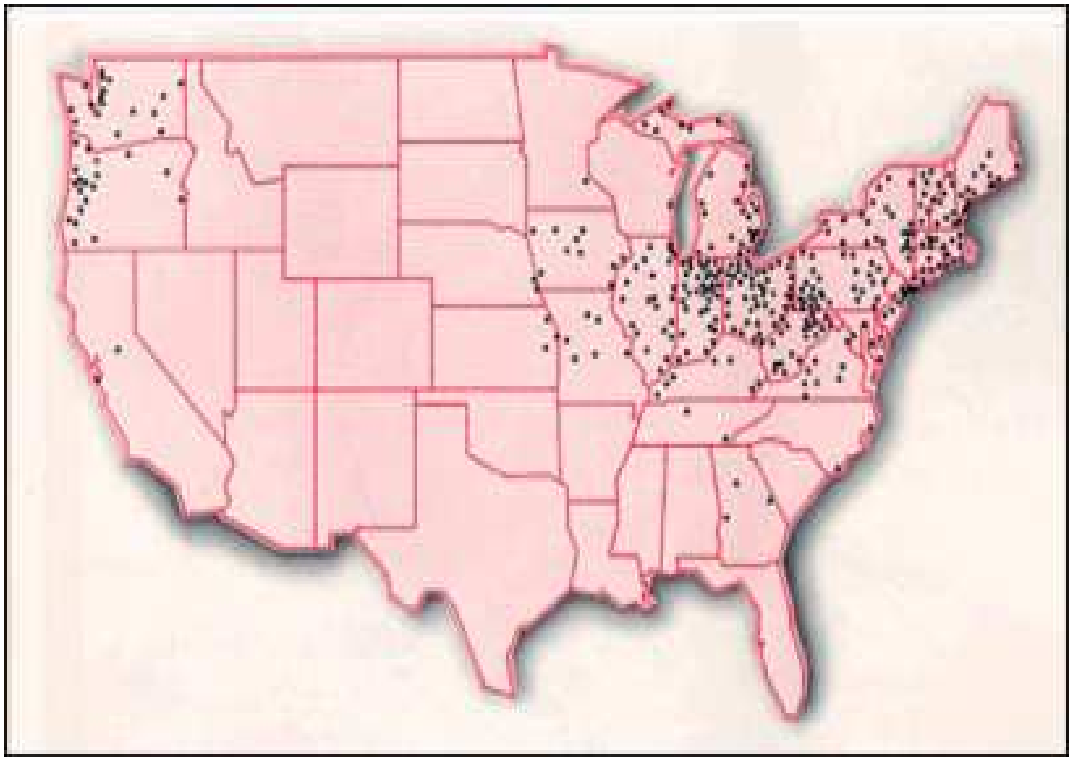
Existing Conditions

Lancaster City covers a land area of 7.34 square miles and includes 241 acres of publicly-owned park land and playgrounds, 135 miles of streets of which 27 miles are classified as alleys within the Conestoga River watershed with a small portion within the Little Conestoga Creek watershed and a minor portion draining to the Mill Creek watershed. The City is the urban center of one of the nation's most productive agricultural farming areas.

A Geographic Information System (GIS) was used to document and analyze the existing conditions for the planning area. Data was organized into a geospatial database to support the mapping of existing resources and other land and environmental features which are critical inputs for green infrastructure planning. The existing resource inventory includes maps of land use, impervious surfaces and open space opportunities which support specific locational strategies to implement green infrastructure technologies.

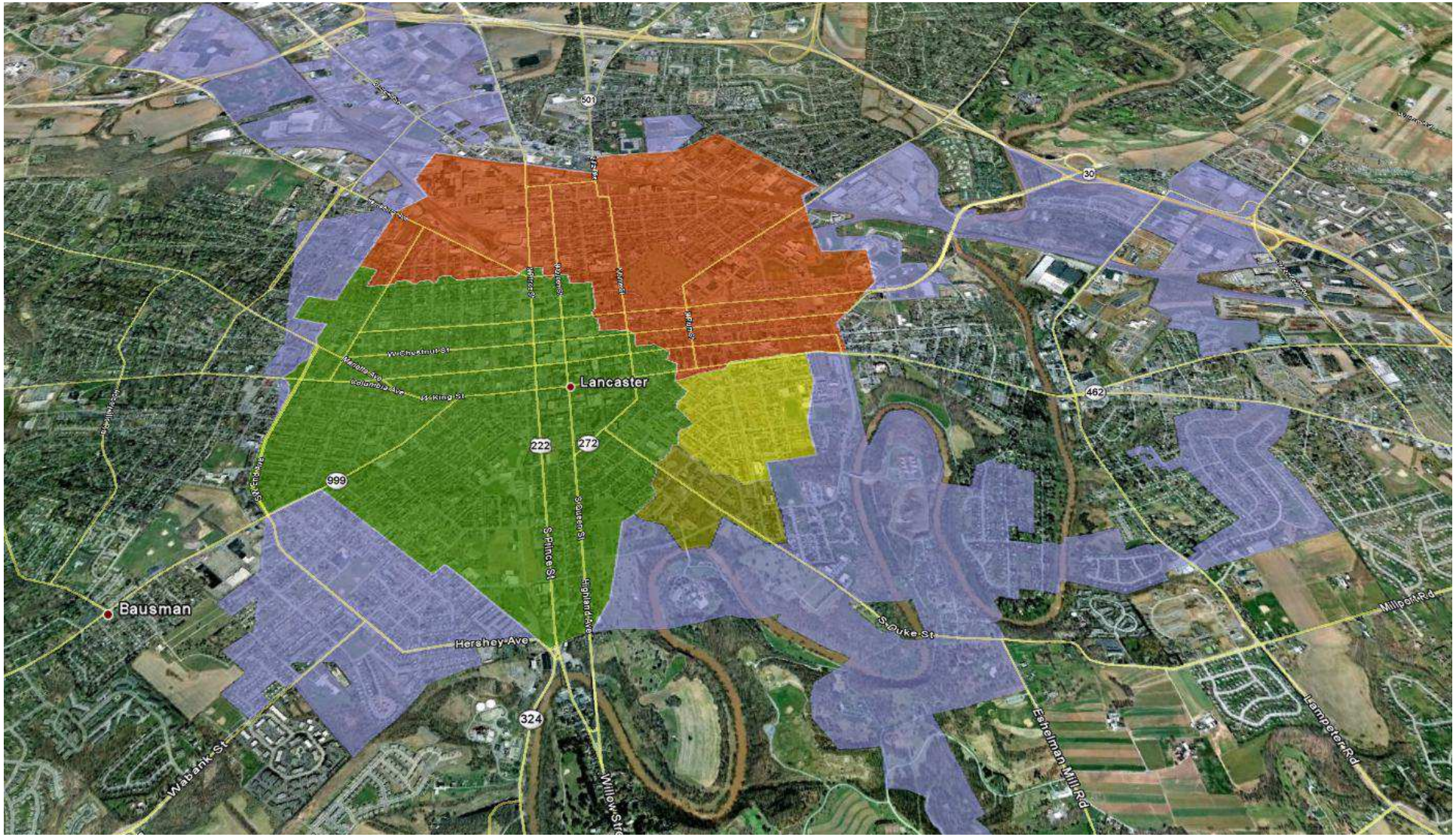
Problem

- Lancaster is one of about 770 cities nationwide with a combined sewer system (EPA).
- During intense rainstorms the system becomes overwhelmed causing combined sewer overflows (CSOs), which releases about 1 billion gallons of untreated wastewater into the Conestoga River.

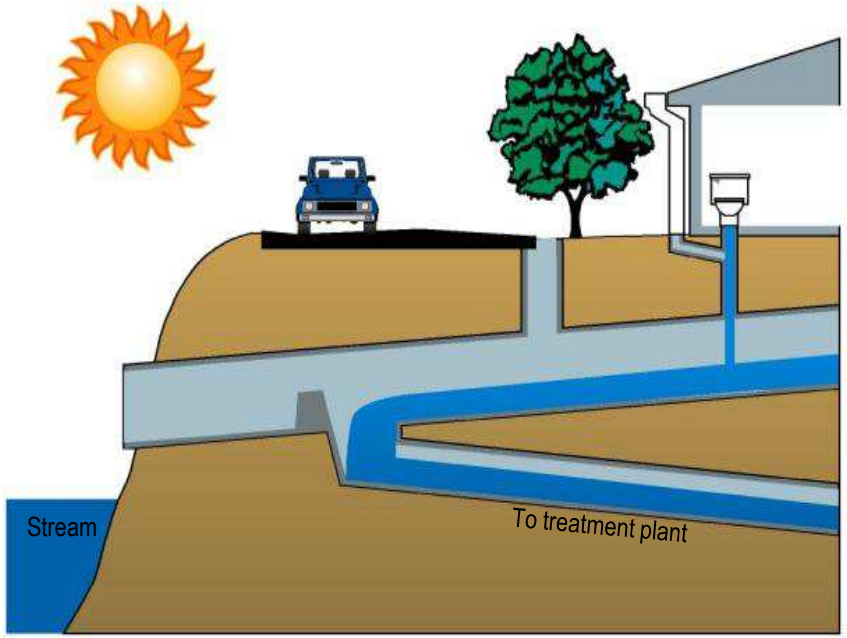


- Impervious Coverage. 44% of the land area of the entire City is covered by impervious surfaces.
- 56% of CSS is impervious.

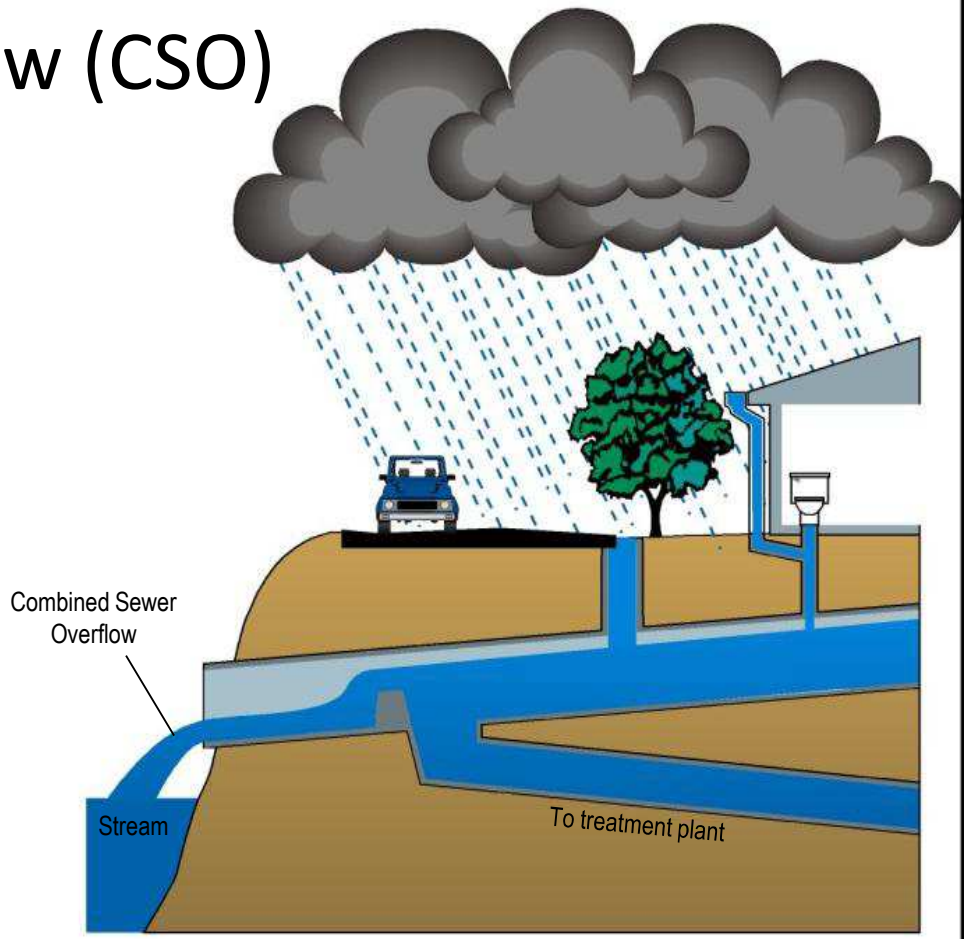
45% of the City is Served by Combined Sewers



Combined Sewer Overflow (CSO)

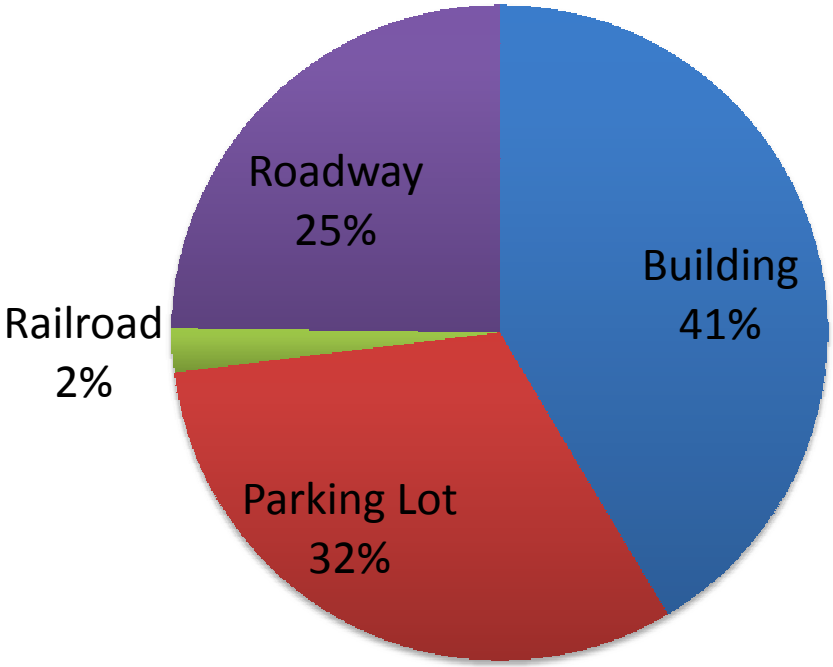


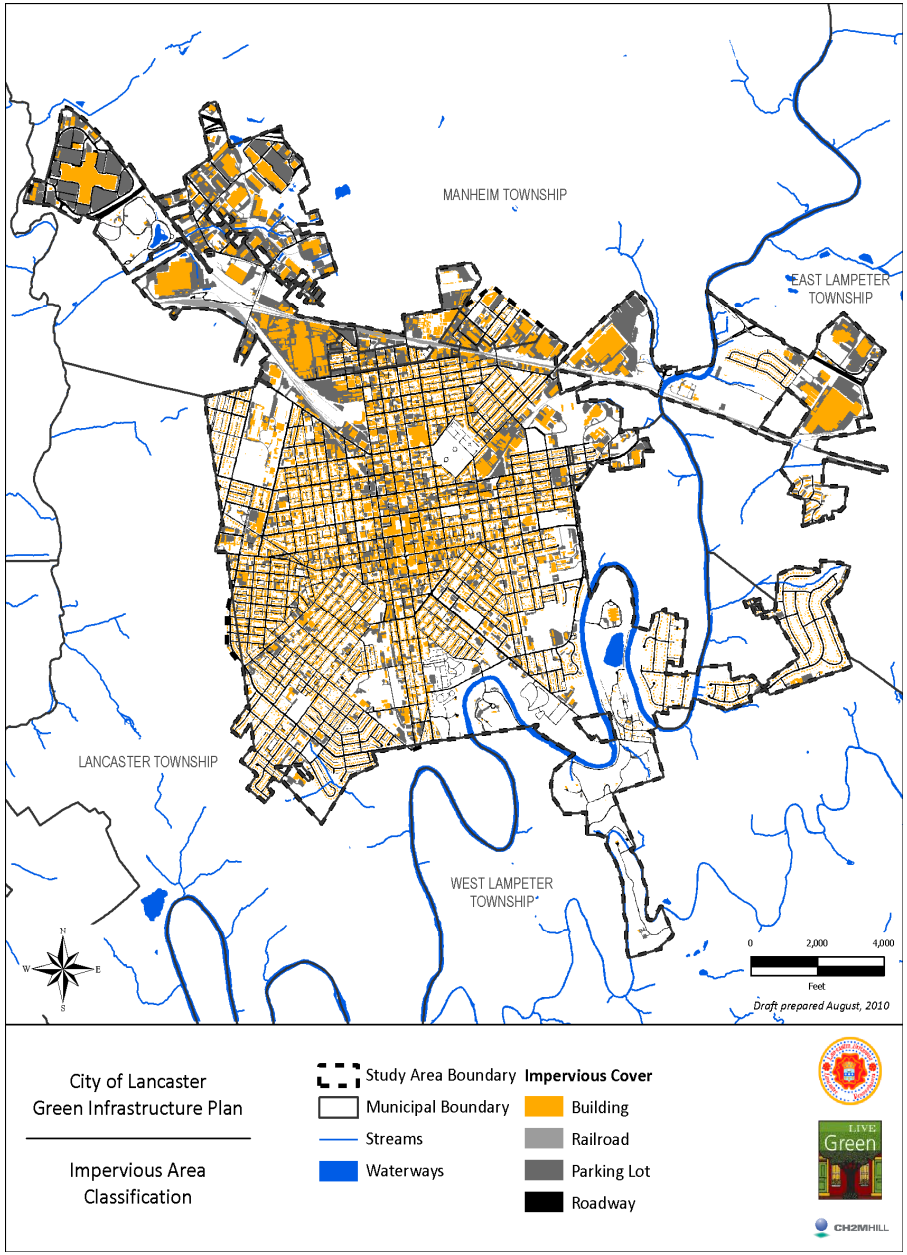
Under normal circumstances, wastewater and stormwater pipes are joined and flow to a treatment plant



In heavy rains, the combined sewer and stormwater pipes overflow, and discharge directly to the river

Impervious Area





Solutions

Employ “green infrastructure” methods of stormwater management -

- technologies that replicate and restore the natural hydrologic cycle and reduce the volume of stormwater entering the sewer system by:
  - infiltrate (porous pavements, sidewalks, and gutters; linear infiltration systems)
  - evaporate, transpire and reduce energy consumption (vegetated roofs, trees, planter boxes)
  - infiltrate and transpire (rain gardens and bioretention)
  - capture and reuse rainfall (rain barrels, cisterns, irrigation supply systems, and gray water systems)

AND

Increase the efficiency and capacity of the City’s existing “gray infrastructure “-

- Increase the capacity of wastewater conveyance and treatment infrastructure;
- Add storage or holding tanks to detain wastewater flows until treatment capacity returns;
- Treat the overflow discharges.
- More than $18 million already invested including first wastewater treatment system in PA to meet nutrient removal requirements. expensive to construct and maintain
- One storage tank to manage 1/10 annual CSO volume = $70 million

1 billion gallons of polluted stormwater discharge

= 1515 Olympic-sized swimming pools

Cost of Solutions Are Significant

Previous Solution

Proposed Solution

"**Lancaster is in violation** of the AO, and needs to address these deficiencies as soon as possible. Violation of the terms of the AO may result in **further EPA enforcement** action for violation of the order and for the underlying violations including, but not limited to, imposition of **administrative penalties**, 33 U.S.C § 1319(g), and/or initiation of judicial proceedings that allow for **civil penalties of up to $37,500 per day**, 33 U.S.C § 1319 (b) and (d), for each day of violation."

Doing Nothing is Not an Option

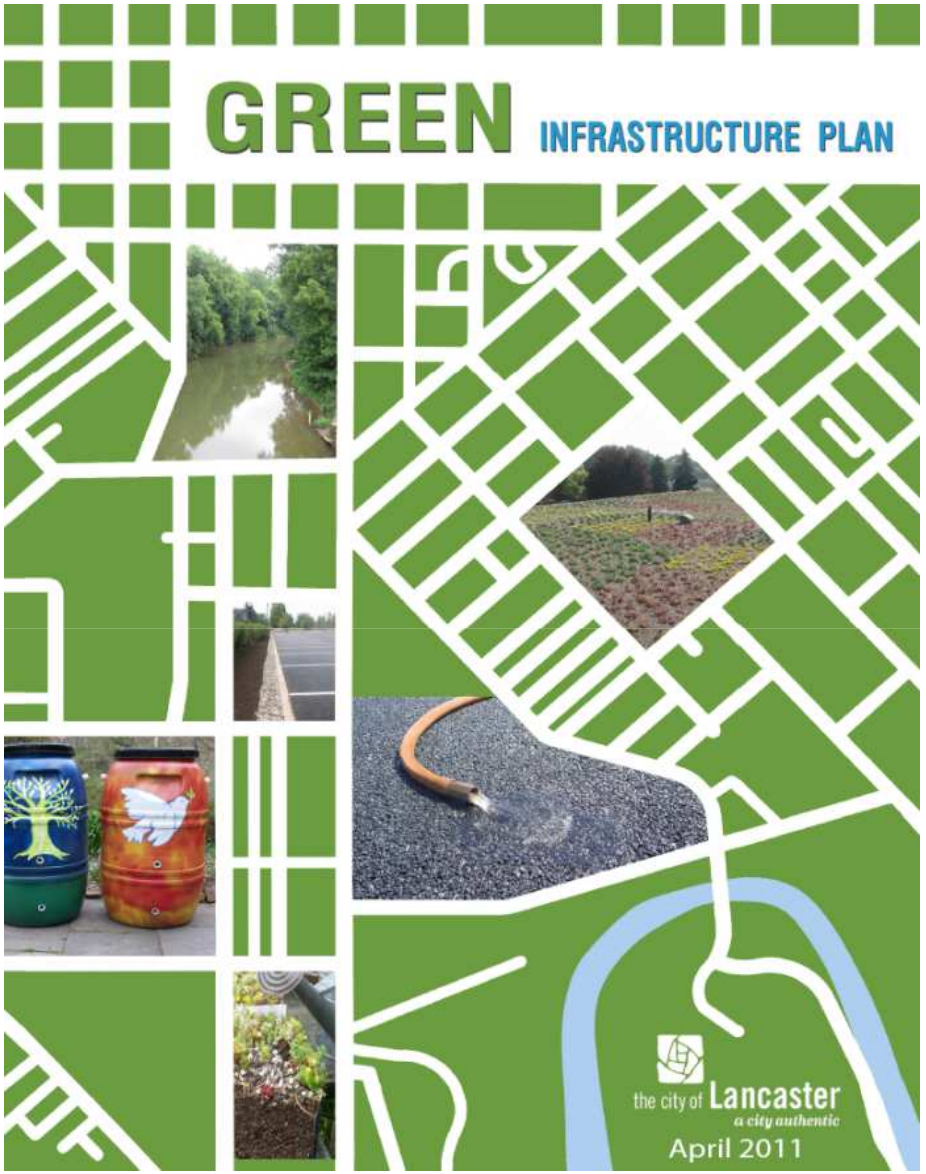
EPA stormwater regulations require us to protect our waterways by -

- Reducing the quantity of runoff
- Improving the quality of runoff

To meet these requirements, Lancaster has to:

- Operate and maintain our existing facilities
  - Drainage System
  - Water Quality Treatment Systems
- Build new stormwater cont facilities
  - Green Infrastructure Plan
  - Rehabilitation/Repair Proje

MISSION: To provide more livable, sustainable neighborhoods for City residents and reduce combined sewer overflows and nutrient loads.



Goals

1. Strengthen the City's economy and improve health and quality of life for its residents by linking clean water solutions to community improvements.
2. Create a green infrastructure program to respond comprehensively to the multiple water quality drivers to maximize the value of the City's investments meeting the numerous overlapping environmental regulations and programs.
3. Use green infrastructure to reduce nutrients and erosive flows from urban storm water runoff and combined sewer overflows to support the attainment of Pennsylvania's Watershed Implementation Plan for the Chesapeake Bay.
4. Achieve lower cost and higher benefit from the City's infrastructure investments.
5. Establish Lancaster City as a national and statewide model in green infrastructure implementation.

Over the next 25 years

Area / Impervious Source	Green Infrastructure Project / Program Type	Assumed Percent of Impervious Area Managed	Impervious Area Managed (acres)	Total SW Runoff (MG/yr)	Assumed WQv or BMP Capture Volume (in.)	Average Annual Runoff Reduction	Runoff Reduction (MG/yr)
Roads / Alleys	Green Streets	30%	158.7	513	1.0	86%	132.4
Parks	Park Improvements / Greening	85%	17.0	19	1.0	86%	14.2
Sidewalks	Disconnection, Porous Pavement	35%	43.3	120	1.0	86%	36.1
Parking Lots	Porous Pavement, Bioretention	20%	129.5	628	2.0	97%	121.3
Flat Roofs	Vegetated Roofs	15%	32.7	212	1.0	86%	27.3
Sloping Roofs	Disconnection/Rain Gardens	25%	163.5	635	1.0	86%	136.5
Street Trees	Enhanced Tree Planting	N/A	45.1	44	0.3	49%	21.5
Public Schools	Green Schools	75%	38.4	50	1.0	86%	32.0
Various (Ordinance)	First-Flush Ordinance	50%	637.0	1236	1.0	86%	531.6
Total			**1,265**	**3,752**			**1,053**
			55%				

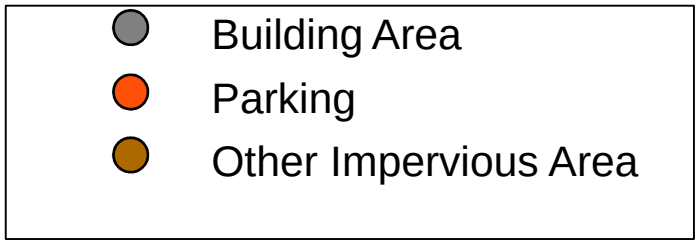
Green Infrastructure Benefits

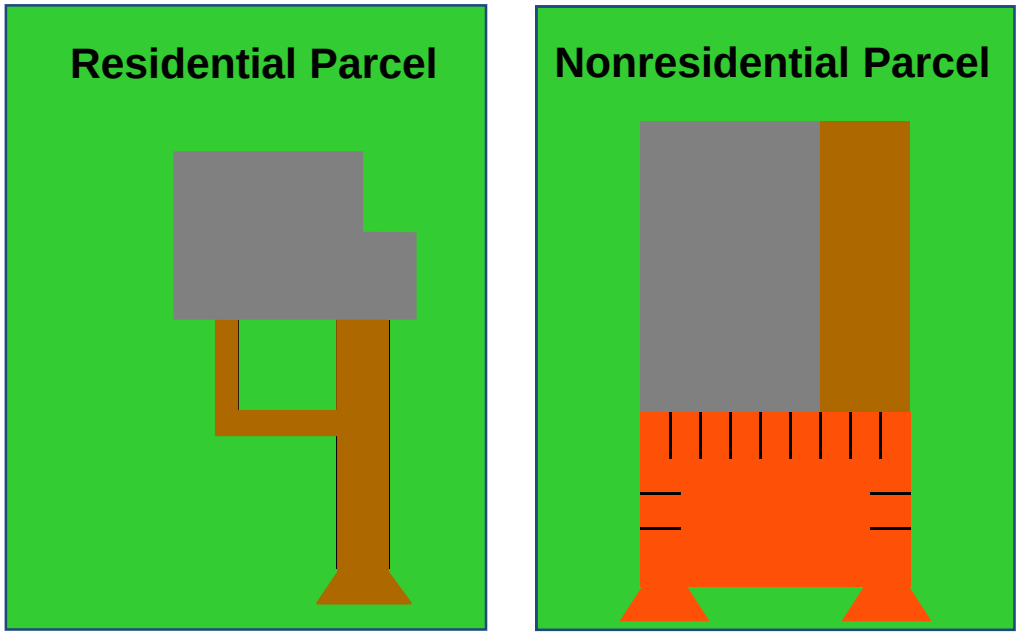
The Triple Bottom Line

- *Environmental* – recharges ground water, provides natural storm water management, reduced energy usage, improved water quality.
- *Social* – beautifies and increases recreational opportunities, improves health through cleaner
- air and water, improves psychological well-being.
- *Economic* – reduces future costs of stormwater management and increases property values.

Funding the stormwater management program

- Potential funding sources:
  - Increase property taxes
  - Raise sewer bills
  - Implement a fee based on stormwater runoff

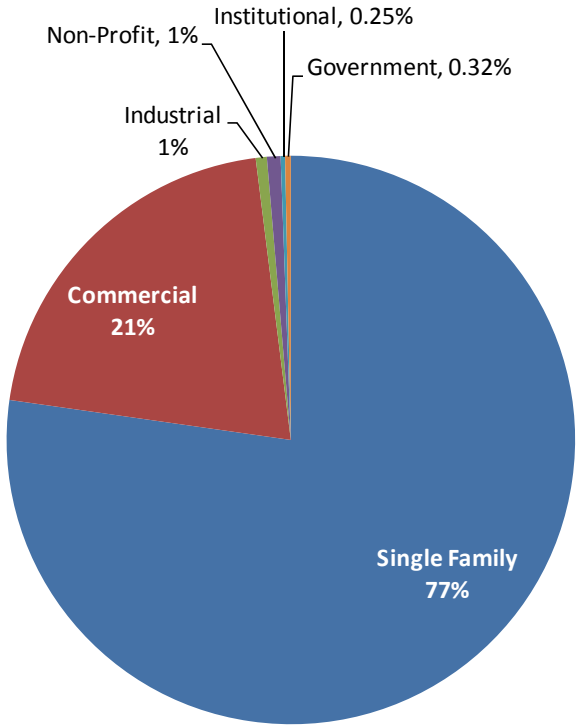




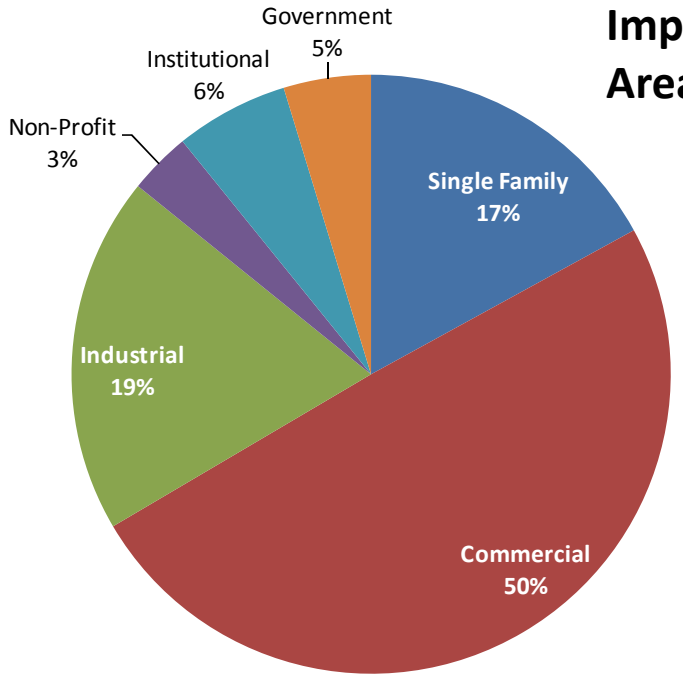
Stormwater runoff is measured by impervious area = roofs and pavement where rain runs off, rather than soaking into the ground

A fee based on impervious area is the most equitable measure of stormwater runoff

Number of Properties



Impervious Area

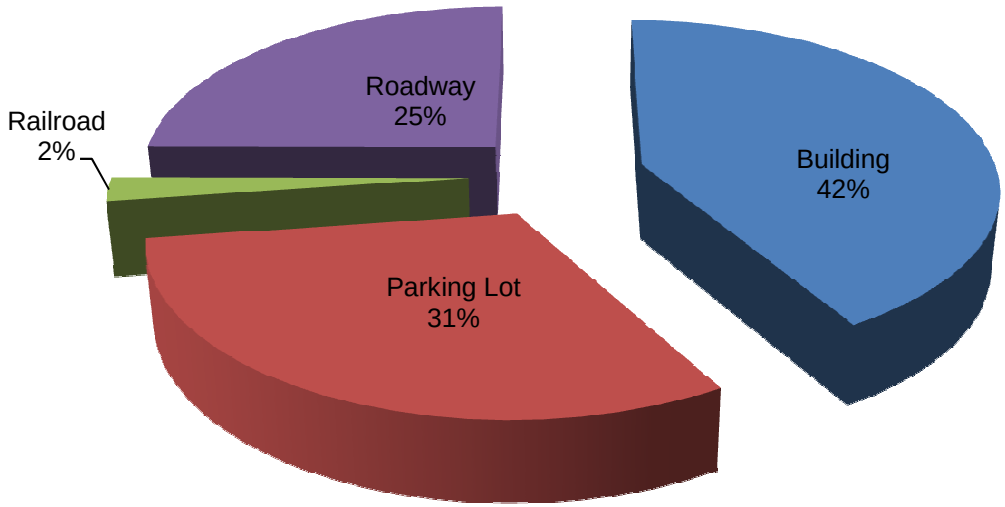


Single Family | Commercial | Industrial | Non-Profit | Institutional | Government

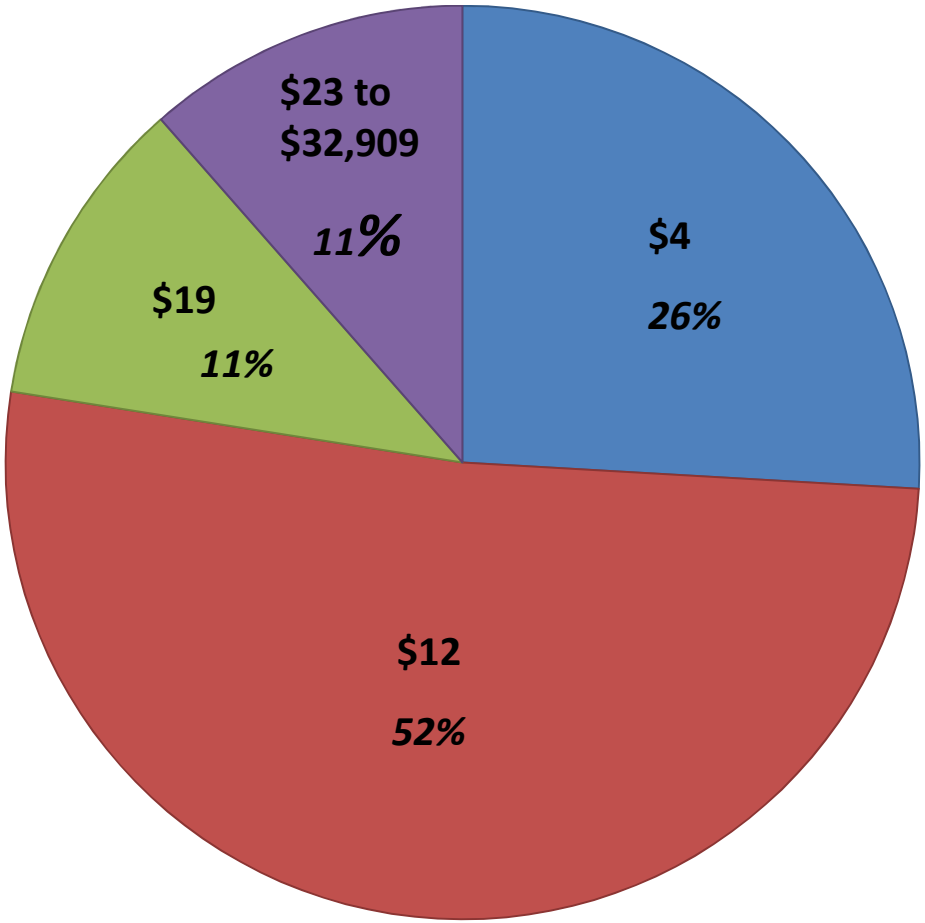
Impervious Area Analysis

- Stormwater impacts are directly linked to the amount and type of impervious land cover.

Impervious Cover	Area (Acres)
Building	865
Parking Lot	649
Railroad	46
Roadway/Driveway	518
Total Impervious Area	2,079



Implementing a rate structure with four “tiers” based on impervious area.



- Tier 1 (0-999 sq. ft.)
- Tier 2 (1,000-1,999 sq. ft.)
- Tier 3 (2,000-2,999 sq. ft.)
- Tier 4 (≥3,000 sq. ft.)

Percentages refer to percent of all properties

Rates are estimated first year fees per quarter, for Medium Level of Service

For example – average fee per quarter:
Residential: $10
Commercial: $139

Green Infrastructure Demonstration Projects

- 20 initial projects
- eight GI program “types”
  1. green streets/green alleyways
  2. green sidewalks
  3. green parking lots
  4. green roofs
  5. private disconnection / rain gardens & rain barrels
  6. enhanced street tree plantings
  7. green parks, and
  8. green schools and city-owned sites.

Cost and Benefit

- "green infrastructure benefit calculator"
- to evaluate the potential stormwater benefits and costs associated with the implementation of green infrastructure

Area/Impervious Source	Green Infrastructure Project/Program Type	Assumed average loading ratio	Area/Number of GI (acre or number)	Unit	Assumed Unit Implementation Cost ($/Unit)	Assumed Marginal Unit Implementation Cost ($/Unit)
Streets/Alleys	Green Streets	5.0	2.64	SF	$20.00	$15.00
Parks	Park Improvement/Greening	3.0	1.33	SF	$15.00	$7.50
Sidewalks	Porous Pavement, Bioretention	2.0	1.55	SF	$15.00	$7.50
Parking Lots	Disconnection, Porous Pavement	3.0	2.16	SF	$13.00	$6.50
Flat Roofs	Vegetated Roofs	1.1	2.08	SF	$18.00	$5.00
Sloping Roofs	Disconnection/Rain Gardens	5.0	3.27	SF	$16.00	$12.00
Street Trees	Enhanced Tree Planting	N/A	1250	Each	$2,000.00	$500.00
Public Schools	Green Schools	3.0	1.70	SF	$12.00	$6.00
Various (Ordinance)	First Flush Ordinance	3.0	53.83	SF	$0.55	$0.55

Green Infrastructure
Project Implementation

Plum and Walnut Streets Intersection

Alley 42 (Brewery Alley)

Brandon Park

Green Roofs

PLUM AND WALNUT: "A GREEN INTERSECTION"

This keystone project is part of the City's ongoing commitment to reduce urban stormwater runoff and associated pollutants from combined sewer overflows and separate storm sewers. The drainage area contributing to this intersection currently has **86,000 square feet of impervious area.** Adding porous pavement and bioretention areas (rain gardens) will help capture approximately **86% of annual stormwater run-off**, which equates to over **1,400,000 gallons per year.**

Pollutant	Quantity Captured/Removed Per Year
Stormwater Runoff Capture	1.4 million gallons/year
Total Suspended Solids (TSS)	2400 lbs/year
Total Phosphorus (TP)	50 lbs/year
Total Nitrogen (TN)	120 lbs/year

Plum and Walnut Street Intersection Improvements Featuring Green Infrastructure

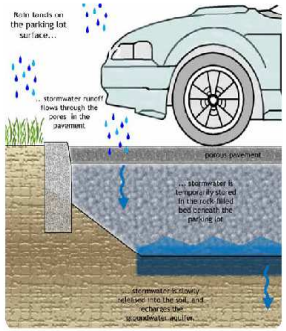
The green stormwater infrastructure installed at Plum and Walnut includes the following:

- *Vegetated curb extensions with subsurface infiltration facilities at 3 corners*
- *New porous paver patio and parking spaces with subsurface infiltration facilities*
- *New porous paver angled back-in parking spaces*
- *Inlet filter inserts for pretreatment*

Construction

Porous Pavers - Patio and Parking Lanes

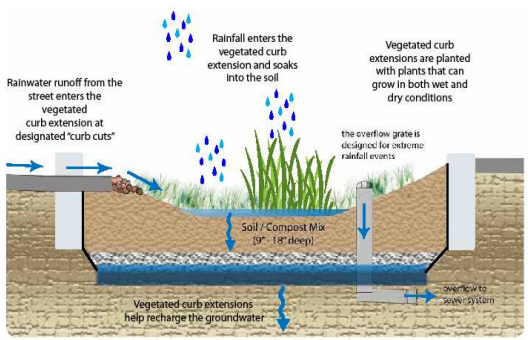
Porous pavement consists of a pervious surface course underlain by an aggregate trench placed on uncompacted subgrade to facilitate stormwater storage and/or infiltration. Porous pavement can be asphalt, concrete, or paver blocks and generally looks similar to regular pavement.



Porous Pavement with Subsurface Infiltration

Curb Extensions and Rain Gardens

Rain gardens and vegetated curb extensions are designed to capture stormwater runoff from adjacent impervious areas through a process called "bioretention". Water is collected before infiltrating into the groundwater below. Plants help to prevent soil erosion while also increasing evapotranspiration of stormwater.



Bioretention/Rain Garden

CH2MHILL

March 2013

Stormwater Chart

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Lancaster
BREWING COMPANY
Lancaster
BREW
COMPA
WEST
462
23


Lancaster
BREWING COMPANY
302 N PLUM ST
WEST
462
23
Community Fundraiser
HELD HERE
Thursday, May 9th
4pm - 8pm

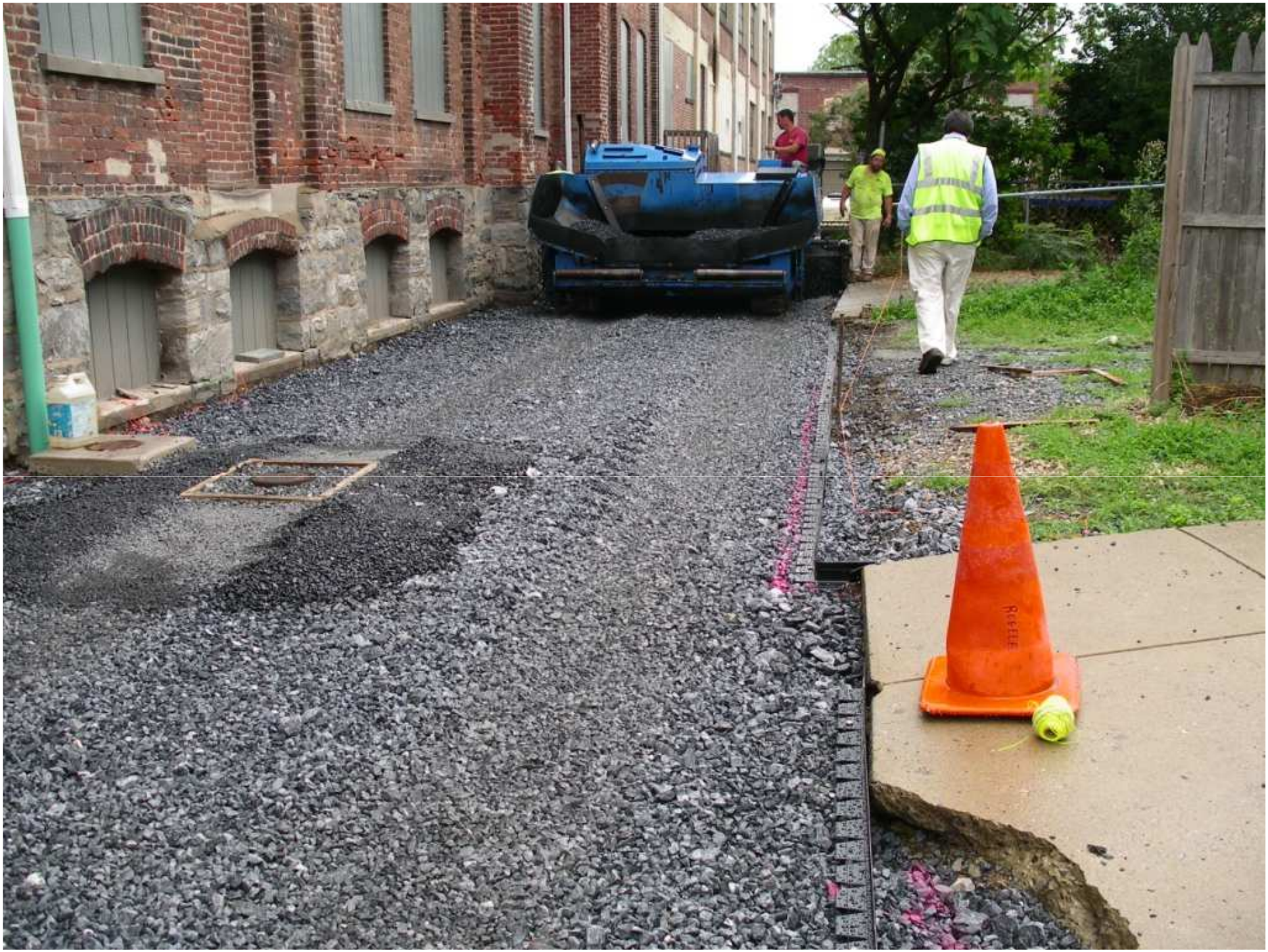

BREWING COMPANY

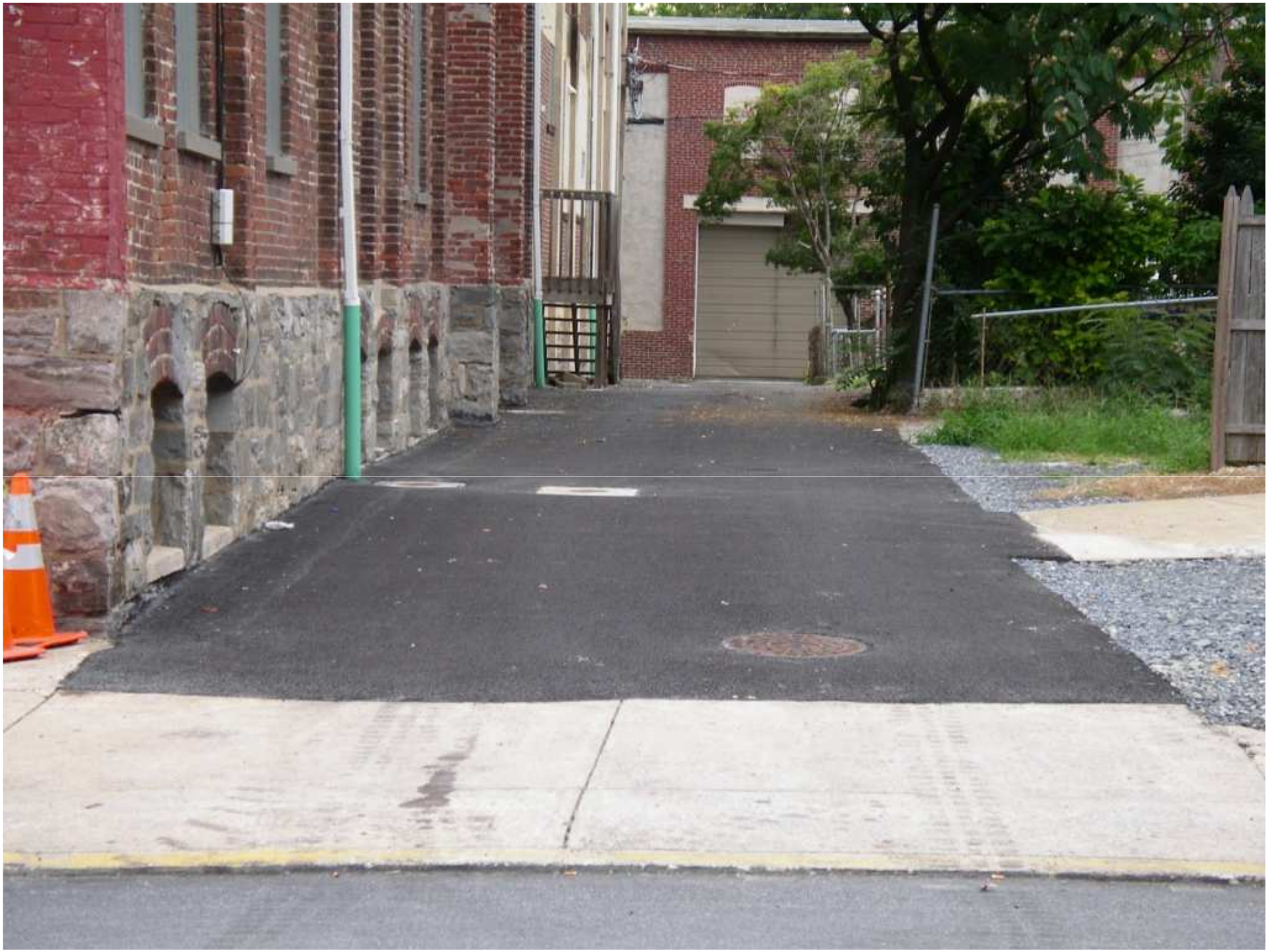

Lancaster
BREWING COMPANY


Water Essentials
SHOWROOM


ALLEY NW 42


KOMATSU





GREEN INFRASTRUCTURE AT BRANDON PARK

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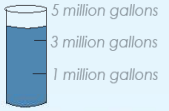
SAVE IT! YOUR WATER, YOUR FUTURE, YOUR CITY — savelancaster.org

This project is part of the City's ongoing commitment to reduce urban stormwater runoff and associated pollutants from combined sewer overflows and separate storm sewers. The drainage area contributing to Brandon Park currently has **180,000 square feet of impervious area.** Adding porous pavement and bioretention areas (rain gardens) will help capture approximately **86% of annual stormwater run-off,** which equates to over **3,900,000 gallons** in a typical year.

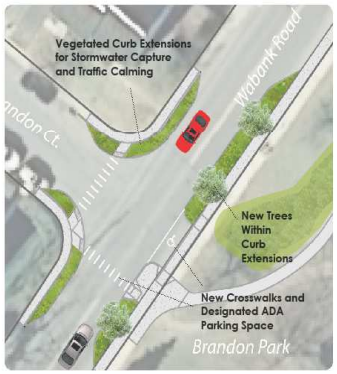
Estimated Volume of Stormwater Capture Per Year

3.9 million gallons

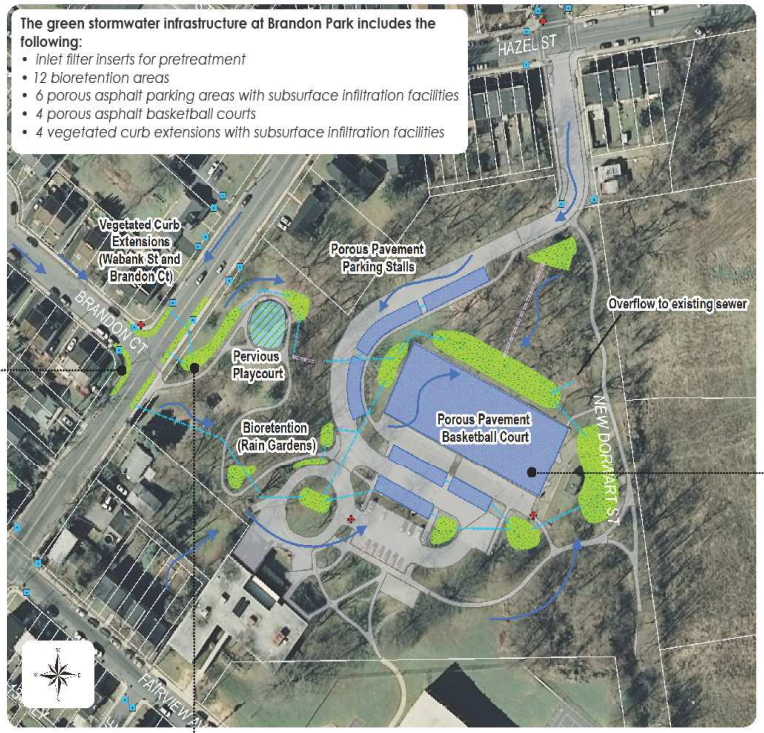


This project will remove the following (approximately) in a typical year: 6,885 pounds of Total Suspended Solids; 138 pounds of Total Phosphorus; and 338 pounds of Total Nitrogen.

Curb Extensions at Brandon Court and Wabank Road



Park Improvements Featuring Green Infrastructure



Porous Asphalt Basketball Courts and Parking Areas

Bioretention Areas Within Brandon Park

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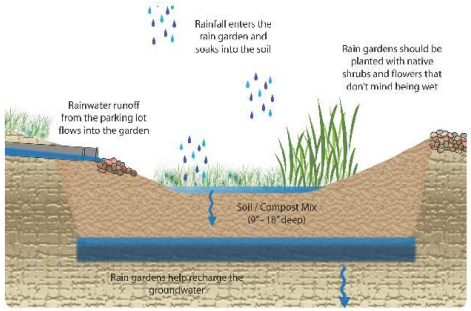

Bioretention/Rain Garden

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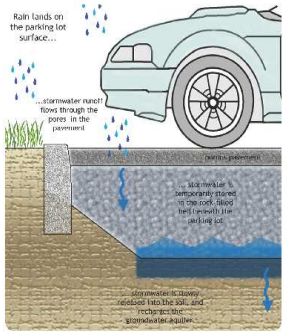


Porous Pavement with Subsurface Infiltration

CH2MHILL. Dec. 2012


ONE
WAY

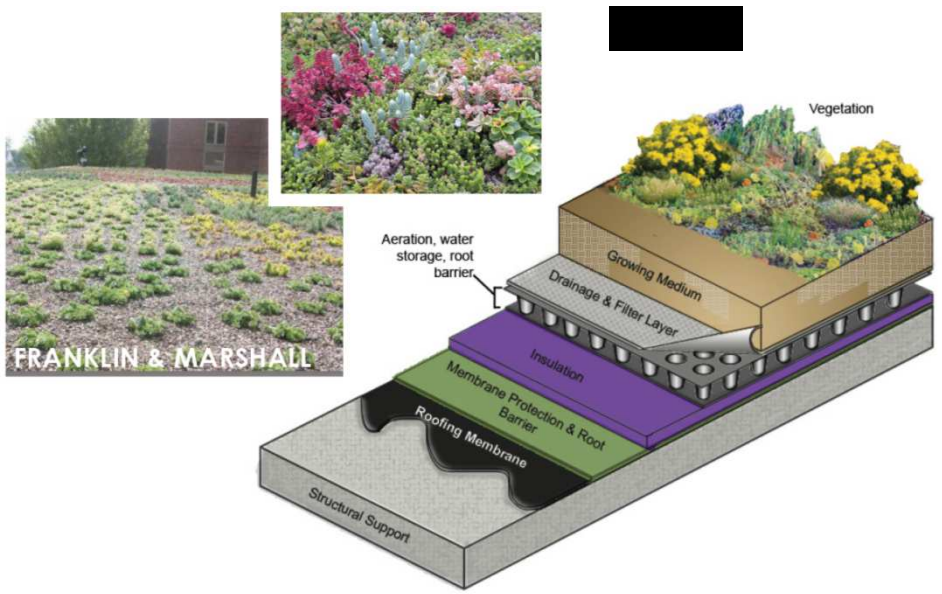
Green Roofs

- Nearly 1.5 SF per resident
- Most per capita in North American

Project Name	GI Area (SF)
Wharton Elementary	13,150
Lafayette Elementary	11,500
Ross Elementary	2,500
National Novelty Brush Co.	16,900
F&M Brooks Bump out	1,250
Wohlson Center for Sustain. Envr.	1,825
Groff Family Funeral Home	8,910
Tellus 360	9,600
F&M Weis Hall	820
F&M Schnader Hall	9,400
City Hall	3,000
Oxidation/Maintenance Building at City WWTP	10,500
Total	**89,355**

Metropolitan Area	State/ Province	Installed (SF)	# of Projects
Chicago	IL	534,507	84
Washington	DC	501,042	67
New York	NY	358,986	35
Philadelphia	PA	353,337	38
Vancouver	BC	320,000	1
Baltimore	MD	150,032	21
Montreal	Quebec	75,700	17
Grand Rapids	MI	74,784	16
Princeton	NJ	56,250	4
Lancaster *	PA	51,385	7

Based on 2008 ***Green Roof for Healthy Cities*** *Figures*

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St. Garage

Challenges and Opportunities

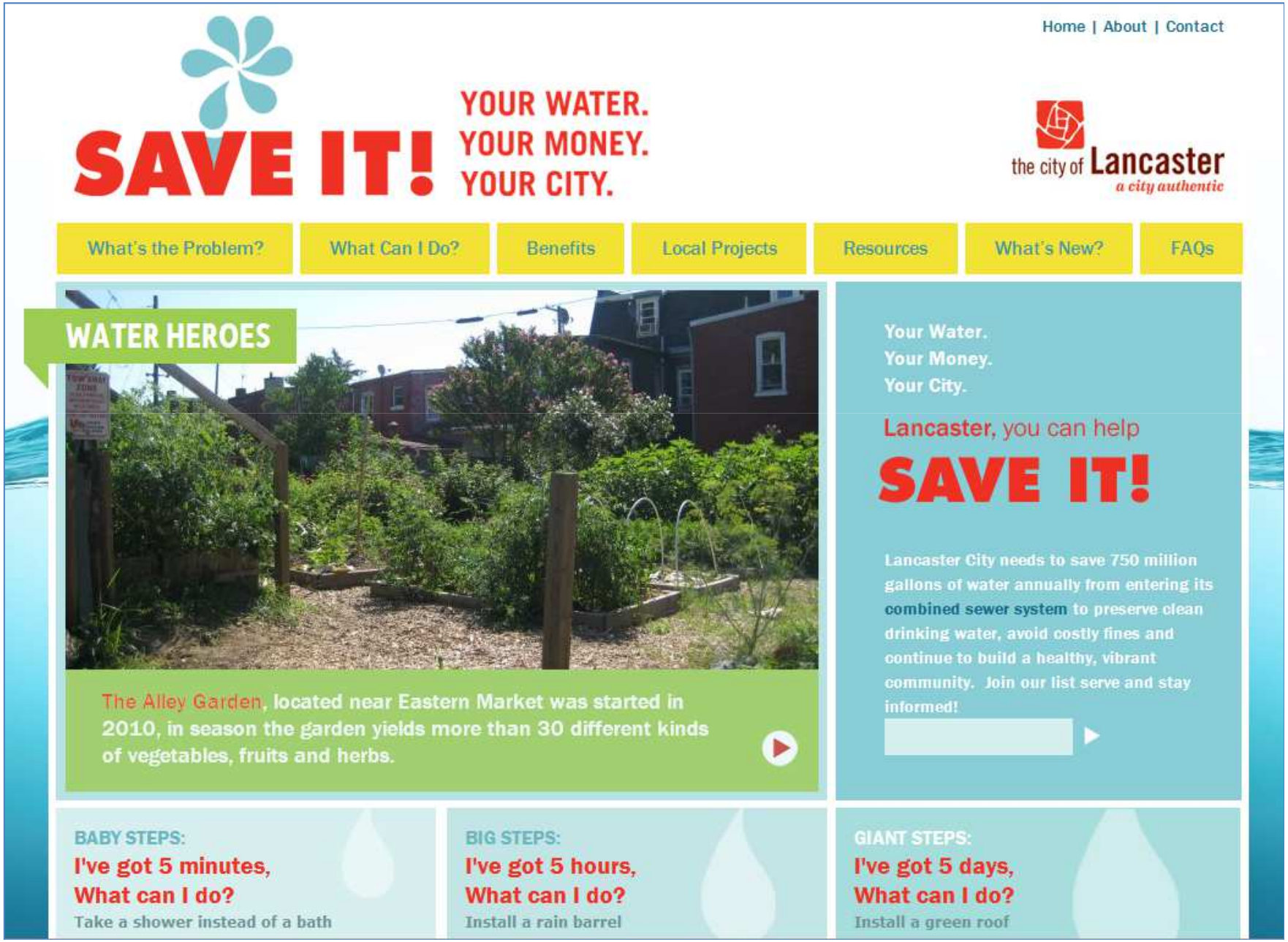
Challenges

- Utility conflicts
- Karst
- Urban and/or contaminated soils
- Landowner Agreements
- Funding

Opportunities

- Broad public support
- Supportive leadership
- Grant funding for demonstration projects

www.saveitlancaster.org



MORE Information And Questions?

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