

Collaborating Toward a GREEN City Approach

Mo Minkara, Ph.D., P.E., CPSWQ
Water Quality Manager



resource: Rain

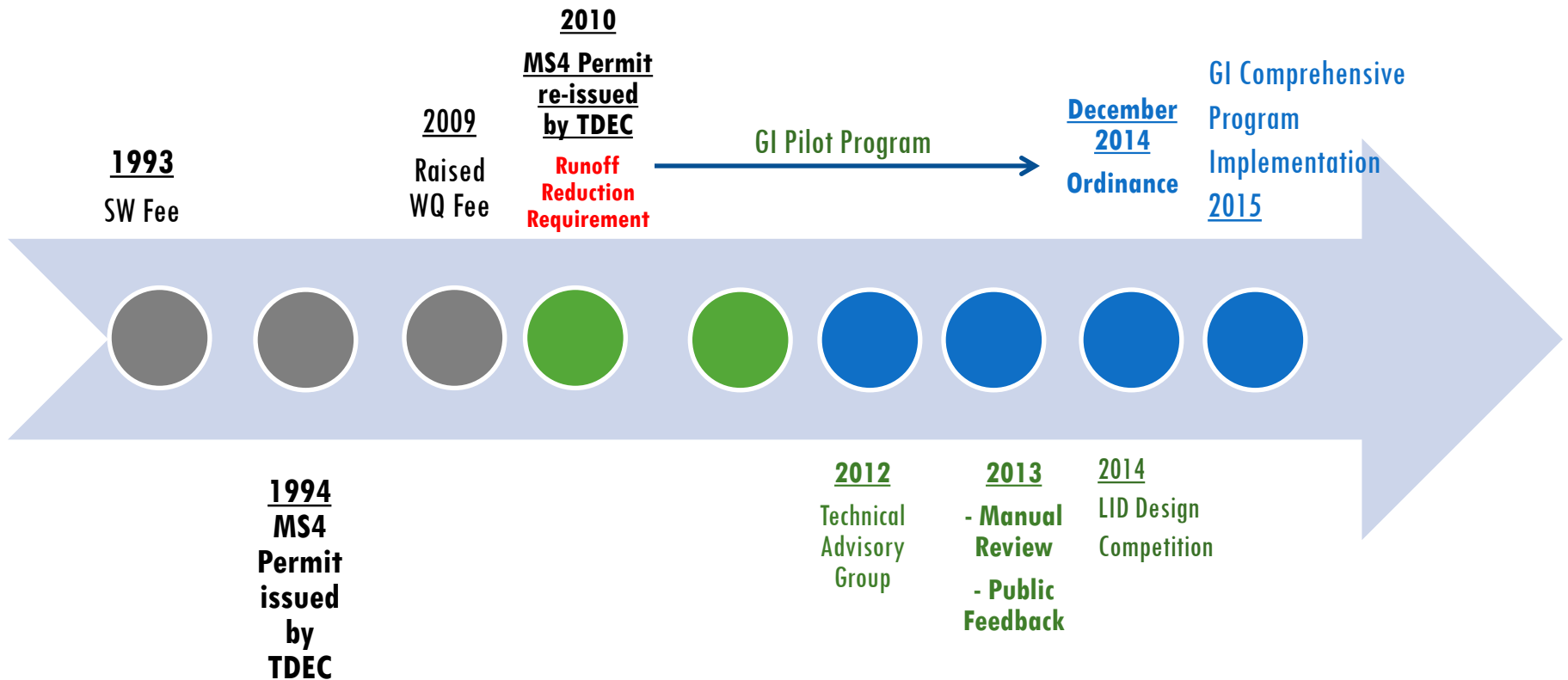


Oct. 15, 2015

SESWA 10th Annual Conference, Chattanooga, TN

Chattanooga Phase 1 MS4 Program

Timeline





What is Chattanooga's water issue?

This large scale initiative involved developing new policies, ordinances, and codes relating to rainwater management and water quality. It's a game changer — promoting the use of green infrastructure as a means for community revitalization and establishing Chattanooga as a leader in sustainable water quality management.

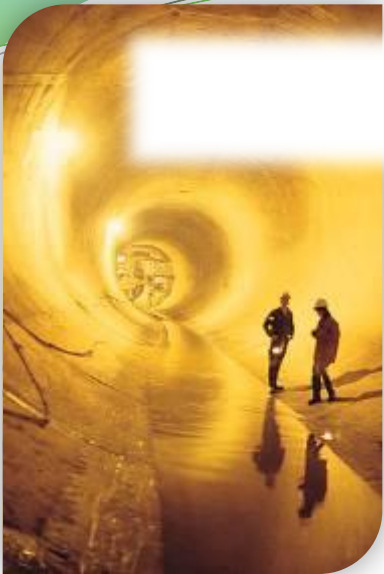
What is Chattanooga's water issue?

Why are we doing it?

- Improve Water Quality
- Manage Volume of Stormwater
- Reducing Stream Bank Erosion



Moving from Grey to Green?



Grey

Green



Complying with MS4 Permit

- Align codes and ordinances with development process
- Create design standards manual for new development & redevelopment
- Incentivize the use of Green Infrastructure & Low Impact Development



Green City Approach

- Created Incentives for GI (when raised the Water Quality Fee) in 2009
- Public-Private Partnership projects
- GI Design Competition
- LID Excellence Award
- 3-Tier Approach for Runoff Reduction
- Water Quality Credit Trading & New Incentives Program
- RainSmart Program
- StormWater Enhancement & Education Program (SWEEP)
- Green Grants Program



GI Pilot Program (before RRS)

- **(Previous) WQ Fee Credit System**

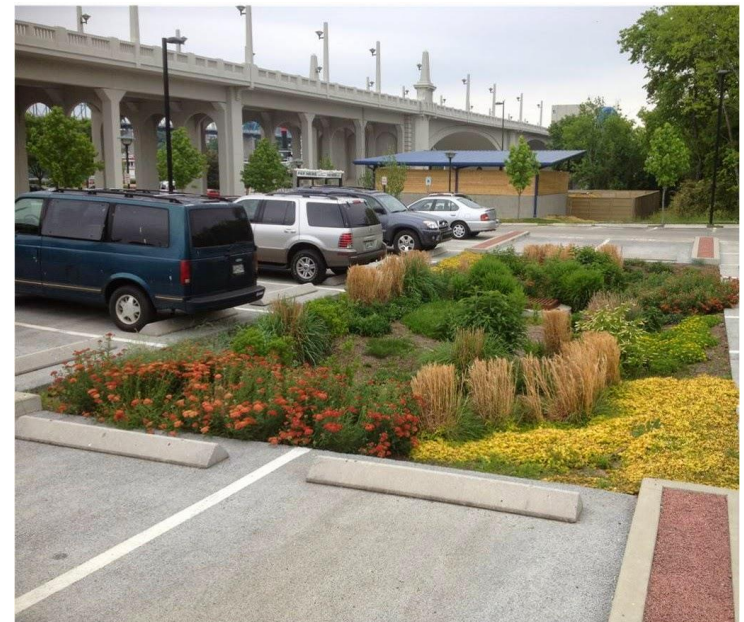
- New Construction LID Credits
- Retrofit LID Credits

- **Private-Public Partnership Projects**

- Johnson Street
- Airport SEP
- Normal Park Retrofit

- **City Projects**

- Renaissance Park
- Outdoor Chattanooga Facility
- Fire Stations #4 & 9
- Goodwin Rd
- Wellness Center
- 11th Street Parking
- City Council Bldg



2009 WQ Fee Rate increases

- Rates went up from \$32/ERU to \$115/ERU
- 75% Reduction in WQ Fee for sites with Green Infrastructures BMPs
- Encouraged GI Retrofits
- Encouraged GI at new Construction sites



Public-Private Partnership

Johnson Street & Flying Squirrel Bar



Drainage area = 1.65 acres
Disturbed area = 25,000 sq.ft.
Pervious Pavement with
subsurface detention



LID Development Design Challenge



Goals:

Test the City's new Rainwater Management Guide

- Demonstrate cost effectiveness of LID green infrastructure alternatives.
- Present real world design challenges
- Raise awareness about green infrastructure and the City's new development requirements.

LID Design Challenge

Four Sites:

- 1) A Mixed Use/Multifamily Development: **Bonny Oaks**
- 2) Urban Street: **Broad Street** from MLK to Aquarium Way
- 3) Urban Arterial: **Cherokee Blvd**
- 4) Urban Commercial Mall: **Northgate Mall**

Jun 27, 2014 Technical finals judging: Finalist announced

July 10, 2014 Final Awards Program

For each site:

First place: \$10,000

Second Place \$ 3,000

Third place \$ 1,000

American Idol Price: One Finalist will be selected as People's Choice Winner with a prize of \$2,000.



www.chattanooga.gov/designchallenge





Winner: W. M. Whitaker and Associates, GeoSyntec, Garth Brown Designs

March 16/2019



Streamline Broad Street

Chattanooga's LID Design Competition

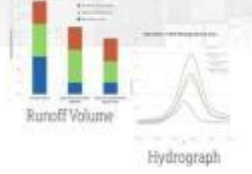
Streamline Broad Street is a complete street design that allows for sustainable management of water, with permeability at all levels of transportation. Pedestrian space, bicycles, and vehicles are considered a form of transportation, reducing pavement area, curbs, and allowing for transit. Expanded parking areas allow for more transit options & can't take the bus, encourage the use of alternative modes of transportation. Increased sidewalk space allows for more comfortable pedestrian and more secondary uses such as outdoor cafes, landscaping and green walls. Permeable paving and blue roofs provide an additional level of stormwater management. All of this is done with a budget of \$100 million, which is a realistic and achievable amount for a city of Chattanooga.

- 1. Pedestrian Plaza
- 2. Plantable Planter
- 3. Expanded Parking Along Commercial Frontage
- 4. Existing Commercial Street
- 5. Pedestrian Green Space
- 6. Bike Lane
- 7. Increased Right of Way
- 8. Green Park Lane
- 9. Pedestrian Greenway Extension
- 10. Plant-Over-Under
- 11. Greenway
- 12. Greenway
- 13. Pedestrian Greenway
- 14. Pedestrian Greenway
- 15. Pedestrian Greenway
- 16. Pedestrian Greenway
- 17. Pedestrian Greenway
- 18. Pedestrian Greenway
- 19. Pedestrian Greenway
- 20. Pedestrian Greenway



Resource Rain
Runoff Management Guide

Targeted Frequency	Runoff Volume
100 Year Return	1.0
100 Year Return	1.2
100 Year Return	1.5
100 Year Return	2.0
100 Year Return	2.5
100 Year Return	3.0
100 Year Return	3.5
100 Year Return	4.0
100 Year Return	4.5
100 Year Return	5.0
100 Year Return	5.5
100 Year Return	6.0
100 Year Return	6.5
100 Year Return	7.0
100 Year Return	7.5
100 Year Return	8.0
100 Year Return	8.5
100 Year Return	9.0
100 Year Return	9.5
100 Year Return	10.0



March 16/2019

Winner: Arcadis



TRANSFORMED CHEROKEE BOULEVARD

A re-imagined Cherokee Boulevard is a complete and green street, a vital artery in northwest Chattanooga with strong connections from adjacent neighborhoods with enhancing transit, walkability and bicycle infrastructure. A re-imagined Cherokee Boulevard will be the commercial heart of the neighborhood and the backbone for economic development, connectivity and environmental improvement - more than passage - a clean, green and inviting place.



188,000 CU FT STORM WATER CAPTURE VOLUME

(sufficient to capture a 25 year storm event)

- 400 NEW STREET TREES
- 27,016 SF STORMWATER PLANTERS
- 14,135 SF BIORETENTION MEDIAN
- 314,350 SF PERVIOUS PAVERS
- 4 IMPROVED TRANSIT STOPS
- 5,400 LF DEDICATED BIKE LANES



Northgate Mall





Goals:

Test the City's new Rainwater Management Guide

- Demonstrate cost effectiveness of LID green infrastructure alternatives.
- Present real world design challenges
- Raise awareness about green infrastructure and the City's new development requirements.

Winner: Dethick, Henley and Wilerson; March Adams, Casey Neal Landscape

Northgate Mall

Dethick, Henley and Wilerson;
March Adams, Casey Neal
Landscape

PARKING AND VEHICLE ACCESS

1. Parking divided into smaller more focused lots
2. 90 degree parking as more efficient use of impervious space
3. Longer medians on either side of drive aisle to create visual corridor to main mall entrances
4. Raised speed tables at pedestrian and bike crossings
5. Second collector drive to divide traffic into narrower roadways
6. Utilize existing asphalt paving throughout
7. Fewer vehicle lanes to encourage pedestrian circulation through shortened lane crossing distances

VEGETATION / INFILTRATION

1. Forested micro-habitat areas for restorative SOV credits
2. Additional landscaping serves as an enhanced visual screen and pretreatment for runoff toward right-of-way and restorative volume credits
3. Permeous paving to intercept runoff and provide pedestrian route through parking lot
4. Retrofit existing parking medians as bio-retention medians
5. Save existing established trees at entry and enhance with undergrowth species to create micro-habitat along new retention pond
6. Meadow micro-habitat areas for restorative SOV volume credits
7. Green parking for seasonal overflow parking or community events
8. Planter boxes and living wall at main mall entrances
9. Stream restoration using living walls adjusting stream slopes to save existing trees - See Section 1
10. Maintain existing established tree vegetation throughout

PEDESTRIAN / BIKE ACCESS

1. 8' shared use bike path connecting various areas around the mall campus
2. Bike racks
3. Bus stops
4. Protected pedestrian path between perimeter retail and mall
5. Crosswalks for access to overflow parking
6. Maintain and improve pedestrian access to neighboring property
7. Connection of shared use bike path to proposed extension of Chickahomay Creek Greenway

STORM WATER FACTS

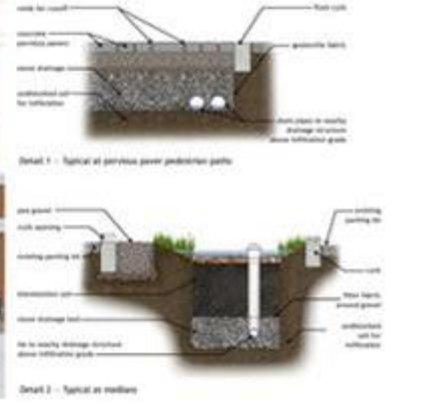
With an average annual rainfall of 46.2", the current annual runoff from the site is 38.44". With the proposed changes, the **AVERAGE ANNUAL RUNOFF** will be **CUT BY 81%** reducing the amount to 9".

Category	Existing	Proposed
Infiltration	5%	19%
Evaporation	82%	48%
Runoff	13%	21%

- **81.9 MILLION** GALLONS of storm water per year **INFILTRATED** instead of runoff to gray infrastructure.
- **Yearly STORM WATER FEE CREDITS** of **\$97,300.00**.
- Design **EXCEEDS THE 1" STAY ON VOLUME** required of 185,800 CF to 251,000 CF. The **65,200 CF EXTRA VOLUME** can be sold as coupons worth \$33/CF totaling **\$1,804,000**.



An Education Plaza
Connection between mall
and Theater



LID Excellence Award

Low Impact Design (LID)/ Green Infrastructure (GI) excellence awards program recognizes outstanding achievements of development exceeding regulatory GI requirements.



LID Excellence Award

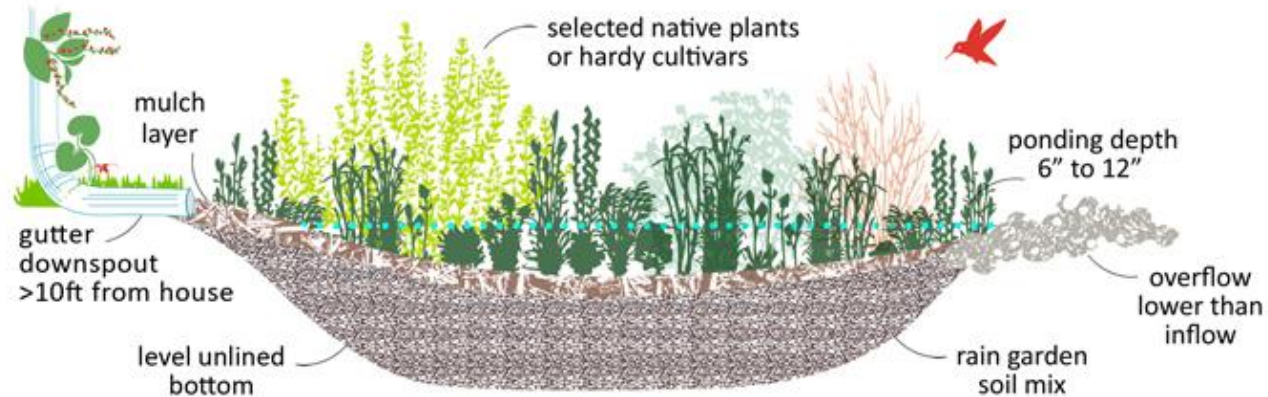
Winners:

- 1) The Crash Pad Hostel
- 2) Fairmount Avenue Public Housing
- 3) Jarnigan Medical Center



RainSmart

- Rebate Program for single-family Rain Garden installation
- Up to \$1,500 per household
- Assist in design
- Oversee construction
- Qualified landscape installers



Chattanooga MS4 Requirements

Stay-On-Volume (SOV)

MS4 Permit issued 12/1/2010

Implement Runoff Reduction Standards 12/1/2014

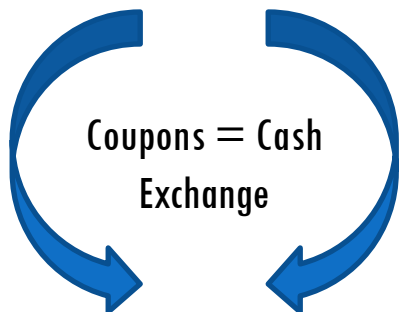
Runoff Reduction (infiltration or green infrastructure)

- The City requires all **new and redevelopment projects**, in combination or alone, to design and maintain, runoff reduction measures to manage (**infiltrate, evapotranspire, harvest and/or use**), at a minimum, **one inch** for every rainfall event preceded by 72 hours of no measurable precipitation.
- This first **one inch** of rainfall must be **100% managed** with no discharge to surface waters.
- Chattanooga is FIRST in TN! Lucky us!
- Most MS4 communities in Tennessee will be subject to the new 1” requirement
April 2016
- Chattanooga Calculation methodologies is different than that of State.

Chattanooga Hardship Management

For Unmet SOV:

- Must do 80% TSS Removal **and** must do either...
 - Off-Site Mitigation,
 - Pay Mitigation Fee (\$45/CF), or
 - Buy Coupons → WQ Volume Trading
 - Earned when exceeding the requirements at another site
 - Generated by same developer or other developer
 - Sold, transferred or applied



CREDIT COUPON

CITY OF CHATTANOOGA
1250 Market St., Chattanooga, TN 37401

COUPON # [NO.]
DATE: [CLICK TO SELECT DATE]

ISSUED TO: [Contact Name]
[Company Name]
[Street Address]
[City, ST, ZIP Code]
[Phone]

CATEGORY: New Development ____ (1.5:1 ratio)
Redevelopment ____
Retrofit ____
Off-Site Mitigation ____

SITE INFORMATION: Site Name (if applicable): _____
Address: _____
Watershed: _____
Baseline SOV: _____ CF
Installed SOV: _____ CF
Date of approval As-Built: [Click to Select Date]

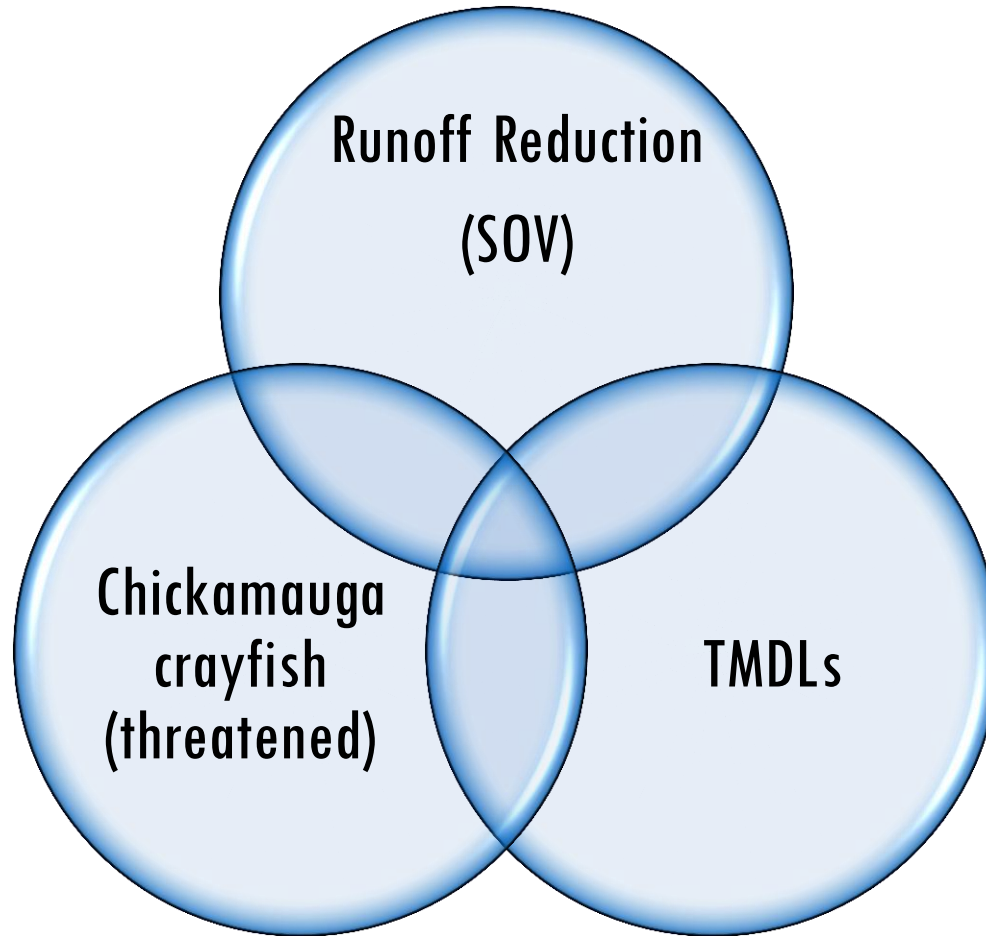
AMOUNT OF SOV CREDIT COUPON: _____ CF

Coupon particulars:
• Coupons are earned on new development sites at a ratio of 1.5:1 (installed/earned).
• Coupons earned on new development are limited to use within the watershed where they were earned.
• Use of coupons is not applicable within the CSS or on retrofit sites.
• Coupons earned on redevelopments, retrofits, and off-site mitigation sites* are eligible to be used within any City watershed.
*Off-site mitigation sites must be redevelopments or retrofits.

Approved Applicant Signature: _____ Date: _____
City Representative Signature: _____ Date: _____

Chattanooga thanks you for supporting water quality!

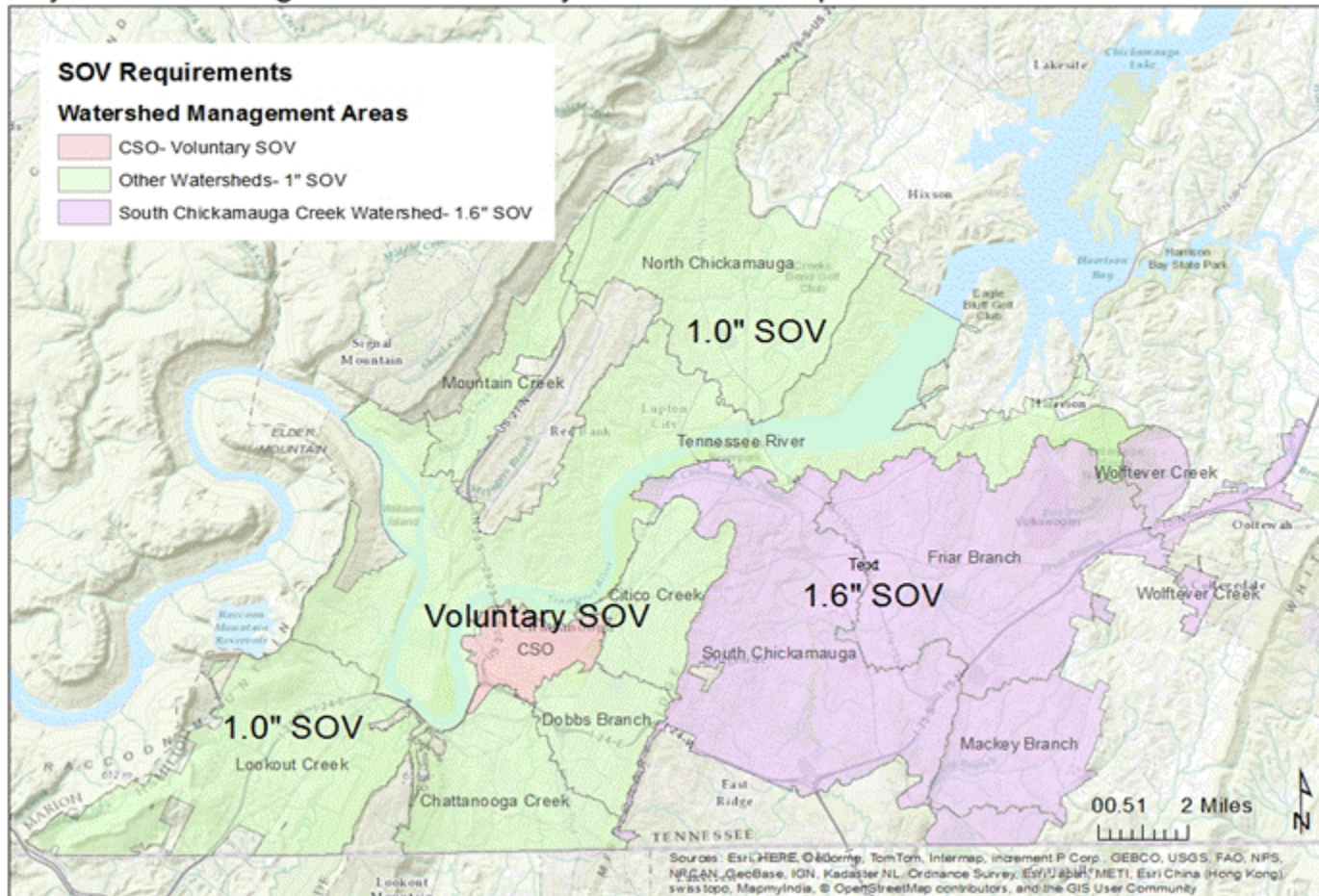
Green City Approach: Goal



How is this approach different from the past?

Exceptional waters require 1.6" of Stay-On-Volume (SOV)

City of Chattanooga Stormwater Stay on Volume Requirements

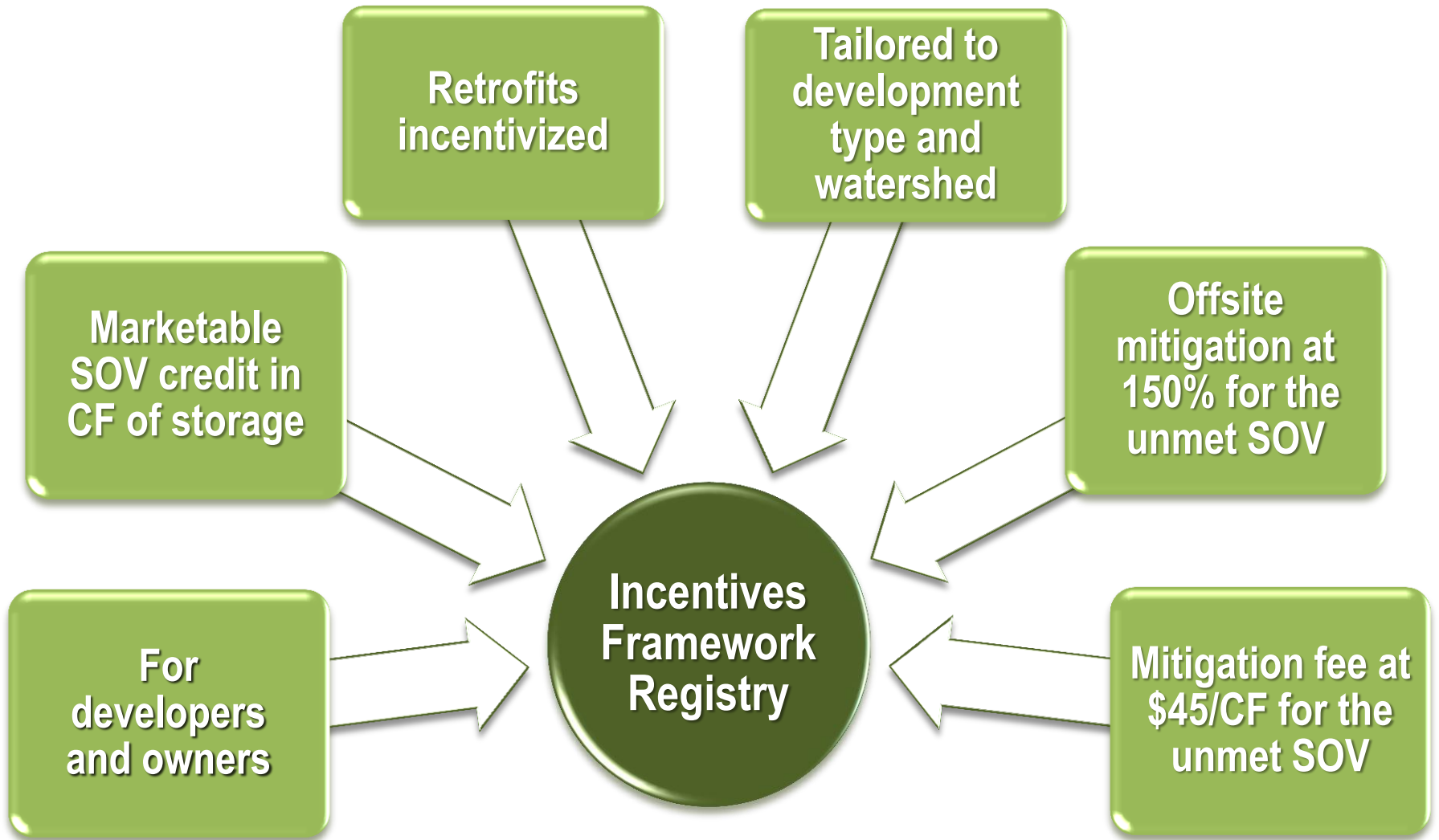


Program Drivers

- Development of a WQ Market (not a permit requirement)
 - Offset for mitigation (developer focus)
 - Better positioned GI (environmental focus)
 - TMDLs
 - T&E Species
 - Supply vs Demand






Credits/Incentive Implementation



Chattanooga GI Virtual Story Map

City of Chattanooga Green Infrastructure

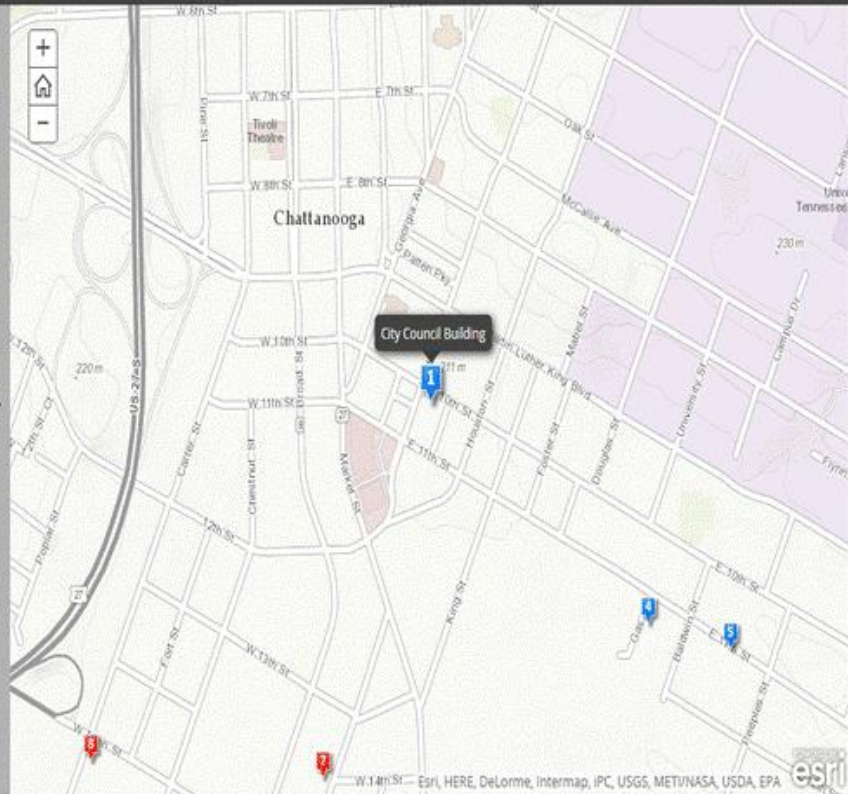
This is a map of green infrastructure features in and around Chattanooga. Stay tuned! Many of these projects are young and have many changes ahead.

A Green Infrastructure Story Map   



City Council Building

A green roof covers Chattanooga's City Council Building, exemplifying City leadership's commitment to green infrastructure and sustainability. Funding was provided by the U.S. Department of Energy Block Grant.



City Council Building



Johnson Street Pavers



The Crash Pad Green Roof



City of Chattanooga Well Advantage Health Center



Police Station Parking Pervious Pavement



Main Terrain Art Park



Southern Surgical



Green Roof by Finley Stadium atop the



Creative Discovery Museum Green Roof



Republic Parking Lot Pavers



Carmike Majestic Cinema