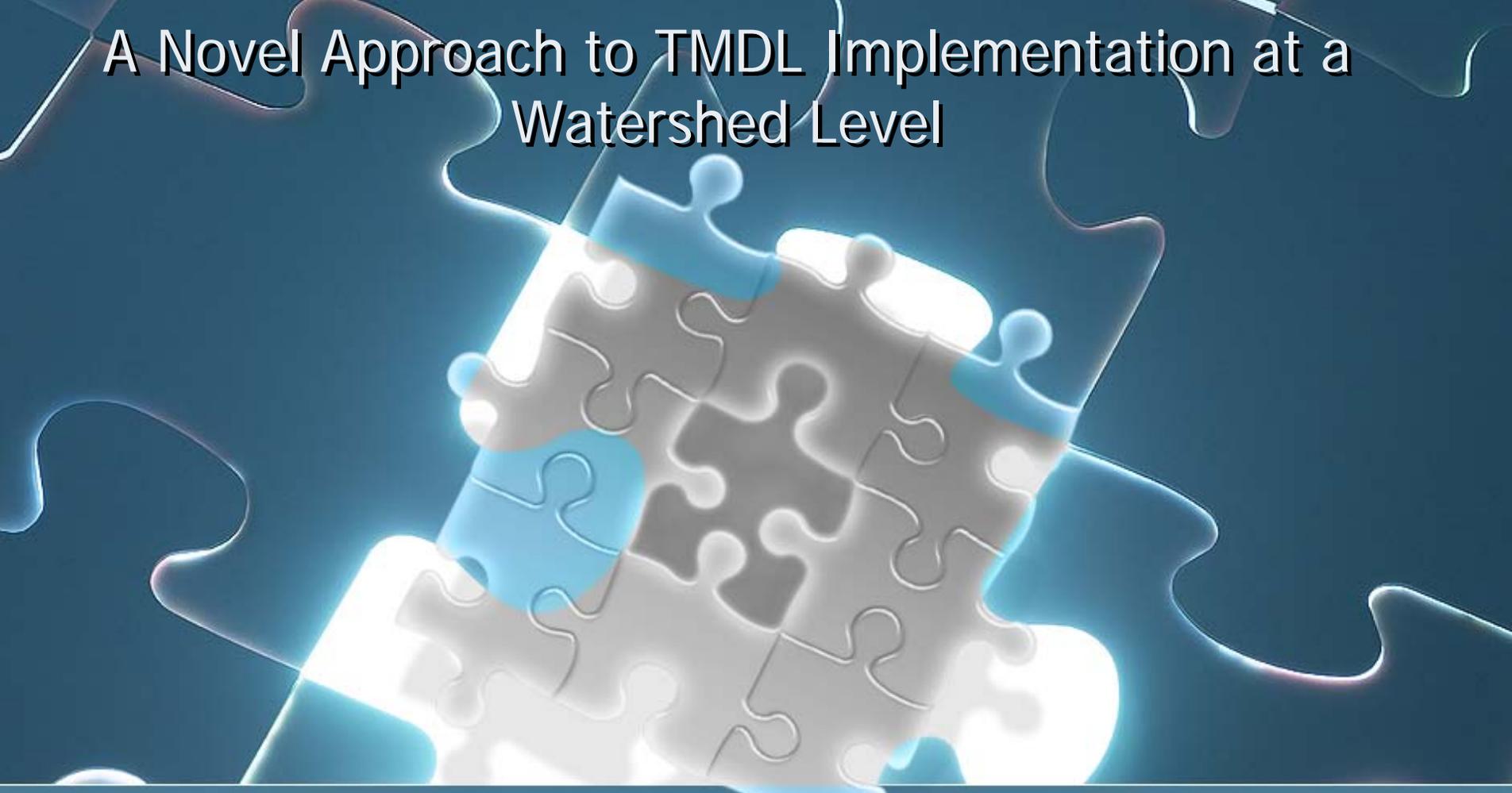


# A Novel Approach to TMDL Implementation at a Watershed Level



City of Chattanooga  
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# Putting the pieces together for pathogen reduction program in urban streams

## Goals:

1. To identify sources of pathogen pollution.
2. To foster stakeholder involvement (via developing partnerships with the community & other constituents).
3. To develop mitigation strategies to reduce pathogen loadings.



# Objectives

- Development and implementation of a program to replace/repair sanitary service laterals in the low to the very low income neighborhoods.
- Monitoring surface water quality for pathogens reduction in the targeted watersheds.
- Evaluation of sanitary infrastructure (private and public).
- Community outreach and public relations and education



# Background

2005 the Tennessee Department of Environment and Conservation issued a Consent Order to the City of Chattanooga.

- The City agreed to spend \$100,000 to assist eligible homeowners (low to very low income levels) with repair or replacement of private sanitary sewer laterals.
- The purpose of the program was to reduce pathogen loading resulting from leaking sanitary infrastructure.



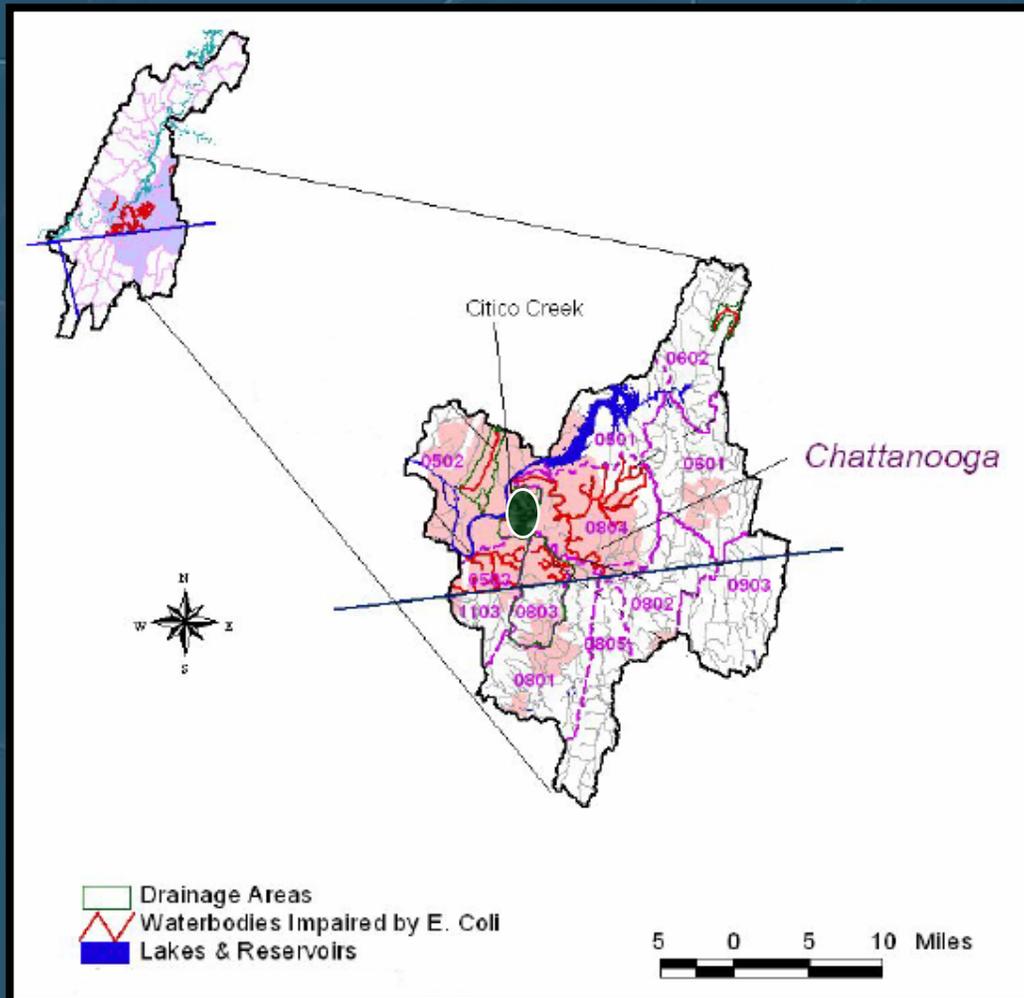
# Target Watershed Identification

- Selected one primary watershed for implementation of a pilot program entitled:

SEP – Supplemental  
Environmental Project

*The target watershed is the Citico Creek Watershed.*

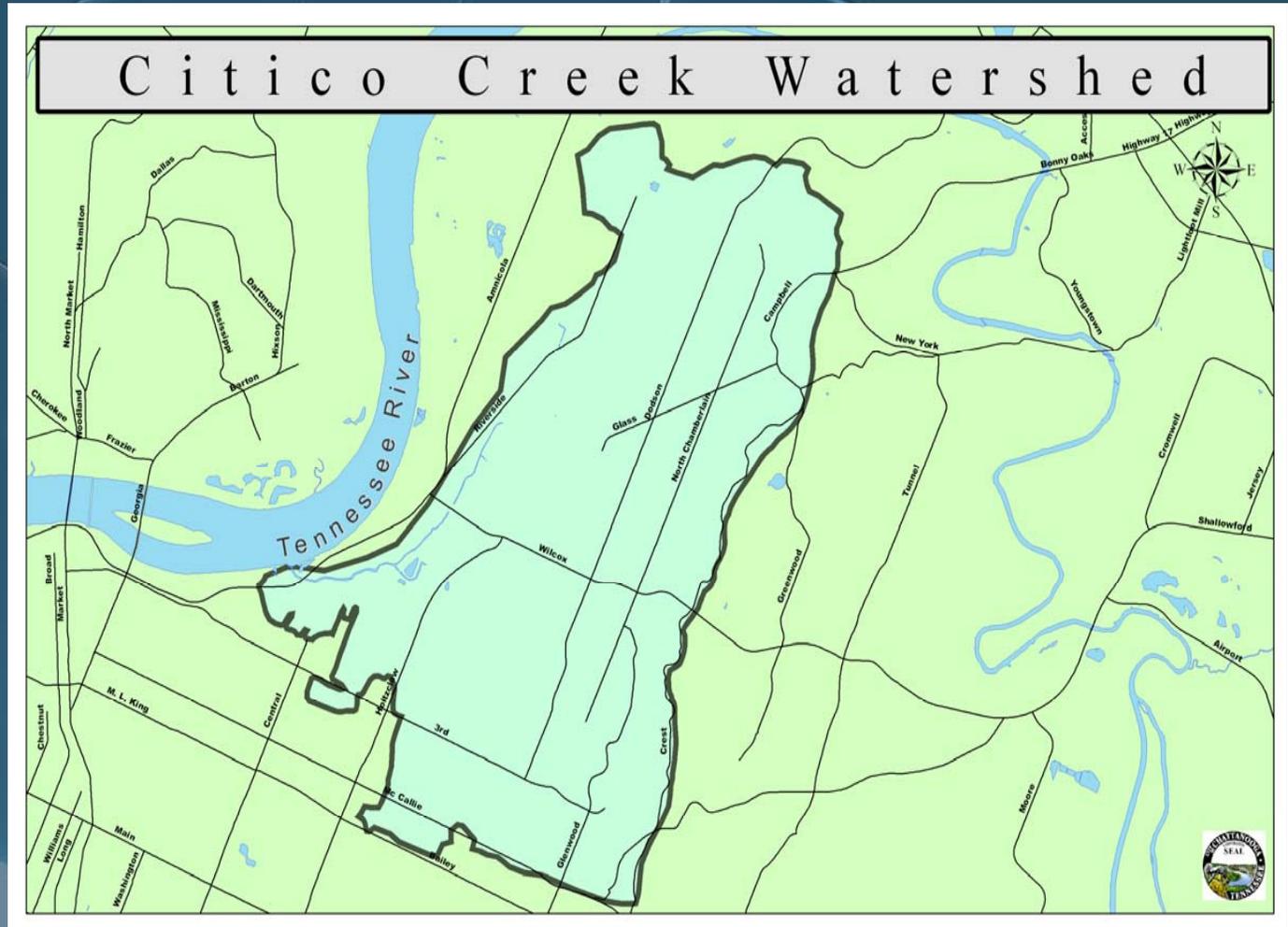
# Where is the Citico Creek Watershed ?



- The Citico Creek Watershed is located within the Lower TN River Watershed
  - **Drains approximately 2,514 Acres**
  - Contains 23 sub-watersheds (or sub-basins)
  - **Approximately 90% of the stream channel is rock & mortar**

# Why Citico Creek?

Mono-  
jurisdictional



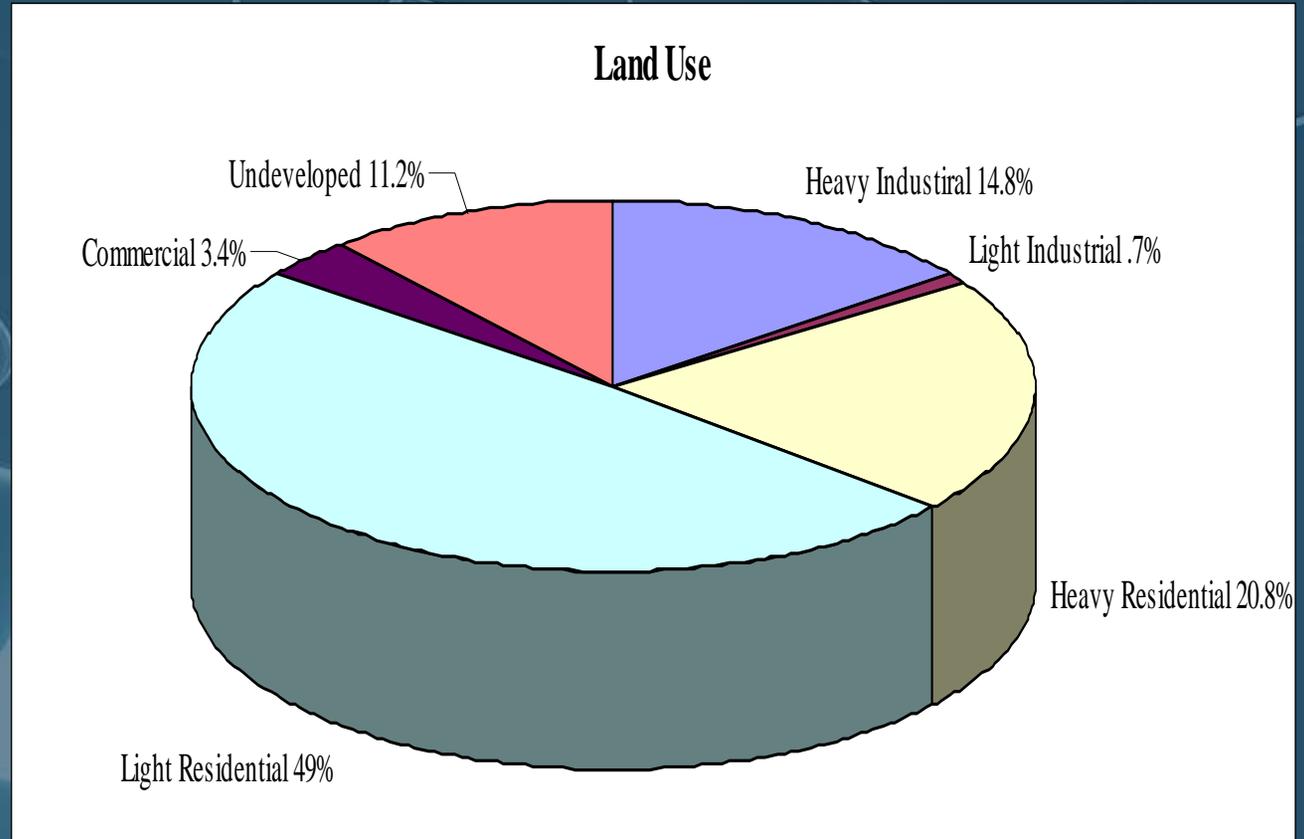


# Why Citico Creek?

Highly Developed  
Watershed

Impervious Cover

12 % - 45 %



Typical urban watershed



# Why Citico Creek?

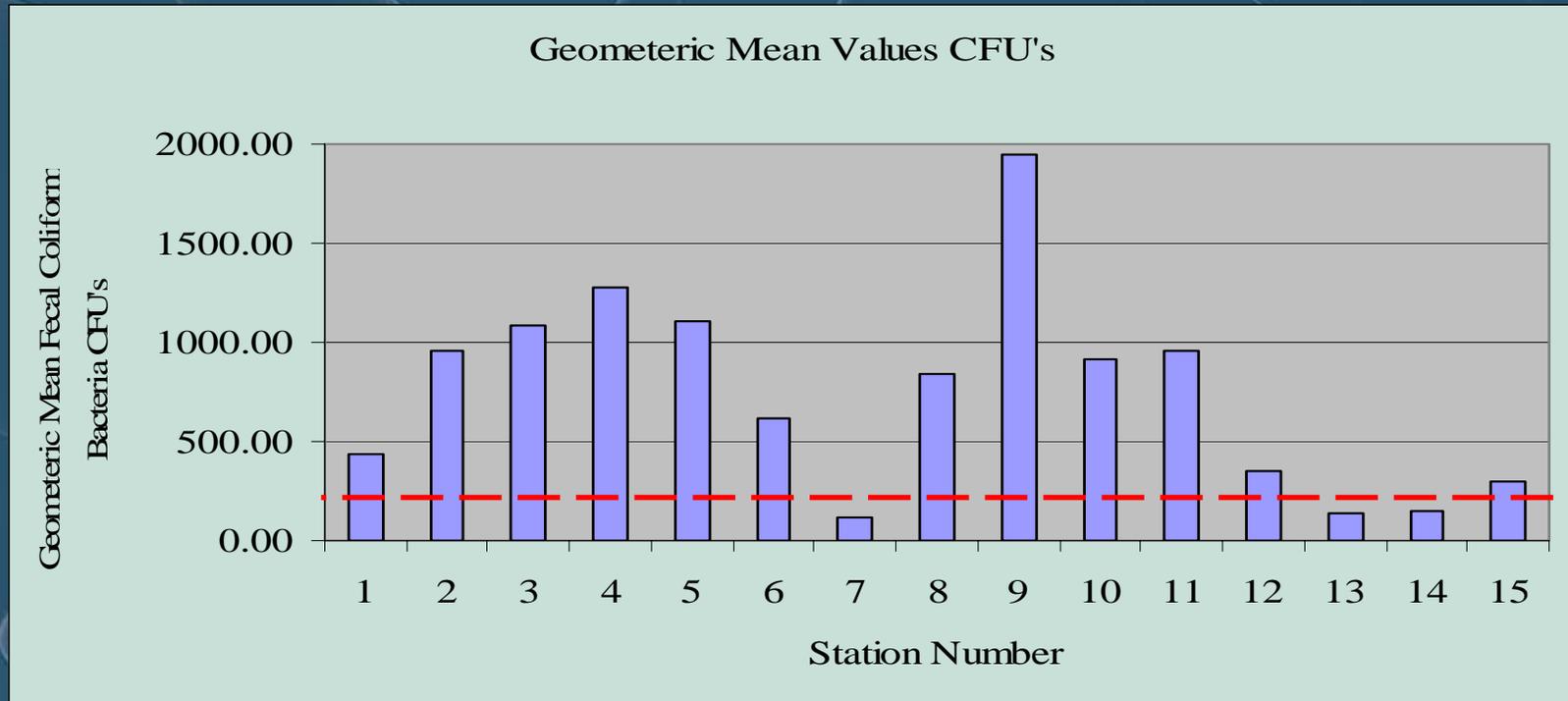
- Poor water quality as demonstrated by that fact that portions of the creek is currently "*Posted Against Human Contact*" due to elevated pathogen levels
- Age of the sanitary infrastructure





# Why Citico Creek?

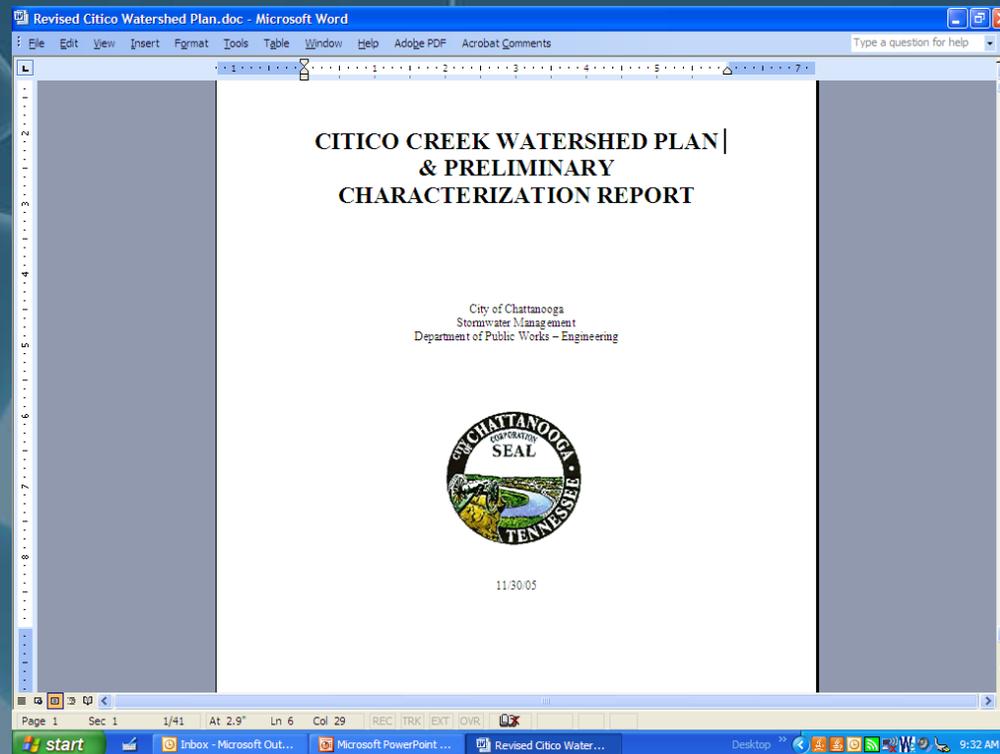
- Historical Water Quality Data
- Portions of Citico Creek have consistently shown pathogen levels in excess of state water quality standards.
- Listed in the 303(d) list for pathogens impairment





# Why Citico Creek?

- Completion of a preliminary watershed characterization.





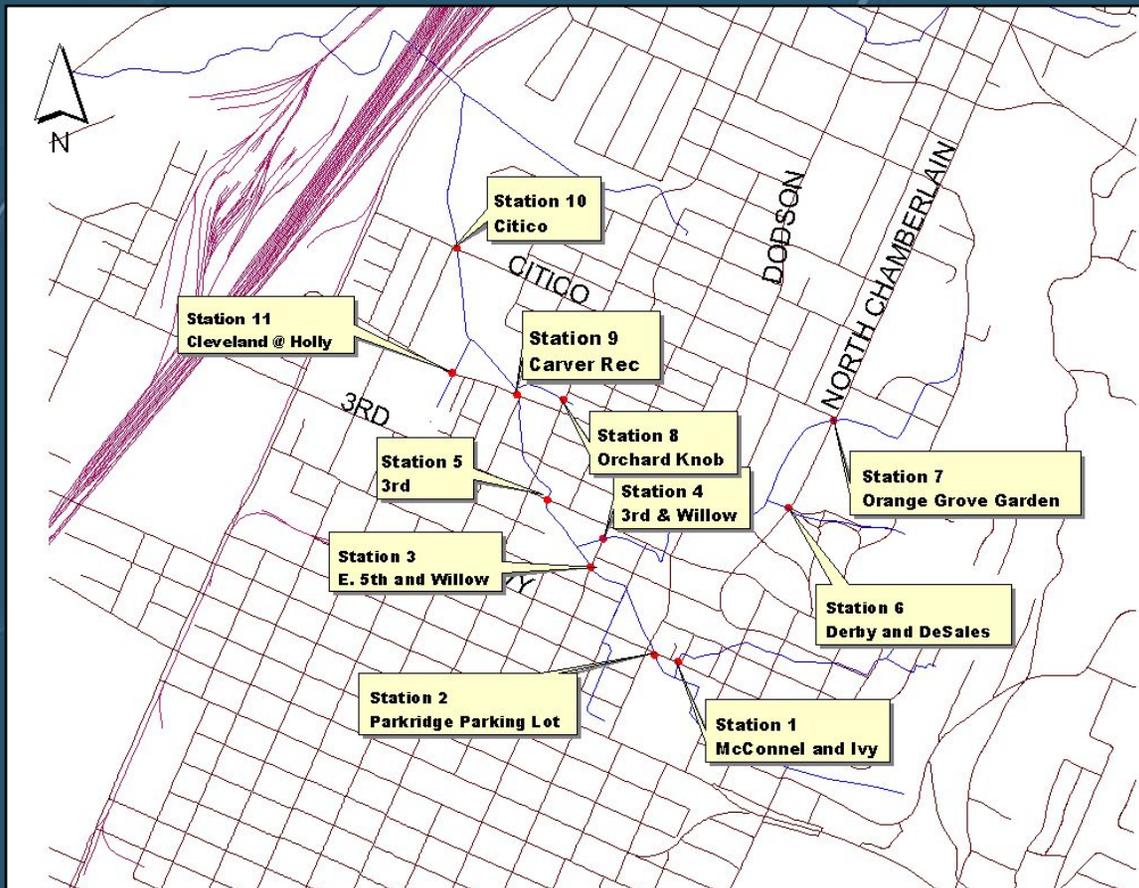
# TMDL Program Implementation

There are three core elements associated with effective TMDL programs:

- 1) Source Identification
- 2) Prioritization
- 3) Evaluation & Corrective Measures

\* The sewer lateral program achieves each of the core requirements

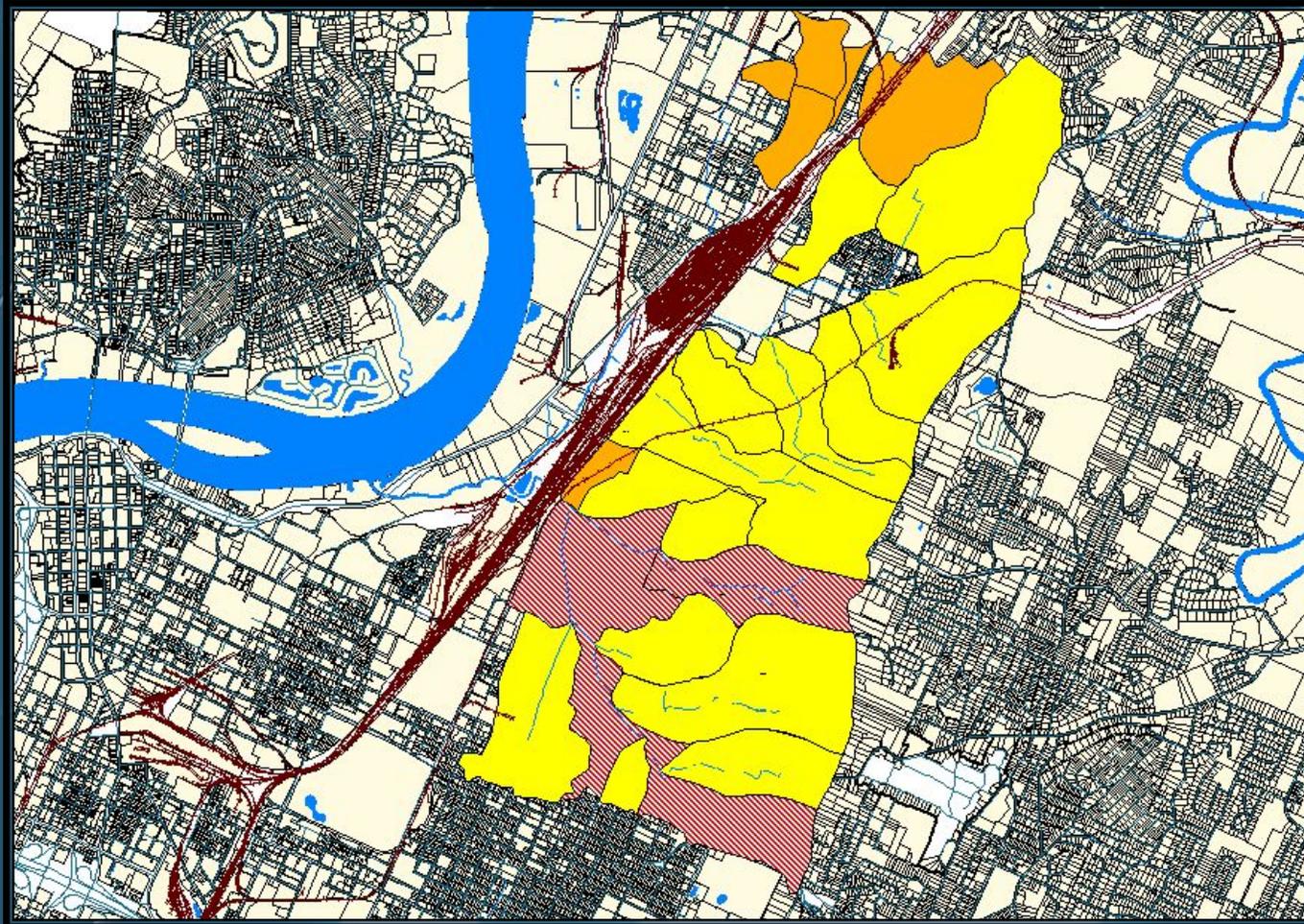
# Source Identification



Optical brightener analysis indicated that pathogen sources came from anthropogenic activity.



# Prioritization



Preliminary watershed characterization

IDP (Illicit Discharge Potential) Score

Results showed that the target basins were the ones currently posted.

# Prioritization

Basin ID	Imprevious Cover Ranking	Past Discharge Complaint	Water Quality	Average Age of Development	SSOs	Raw IDP Score	IDP Score	IDP Range
D0401	3			3		6	1.2	1 to 2
D0105	3	3	2.5	3		11.5	2.3	2 to 3
D0301	2	1		3	1	7	1.4	1 to 2
D07	3			2		5	1.0	1 to 2
D0605	2			3		5	1.0	1 to 2
D0604	2			2		4	0.8	0 to 1
D0603	2			2		4	0.8	0 to 1
D0602	3			2		5	1.0	1 to 2
D0505	2	1		3	1	7	1.4	1 to 2
D0504	2	2		3		7	1.4	1 to 2
D0503	3			3		6	1.2	1 to 2
D050201	2		3	3		8	1.6	1 to 2
D0501	2			3	1	6	1.2	1 to 2
D0104	3			3		6	1.2	1 to 2
D0103	3		2	3	1	9	1.8	1 to 2
D0102.05	2		1	3	1	7	1.4	1 to 2
D0102.04	3		1	3		7	1.4	1 to 2
D0102.03	2		1	3	1	7	1.4	1 to 2
D0102.02	3		1	3	1	8	1.6	1 to 2
D0601	3			2		5	1.0	1 to 2
D0101	2	1		2		5	1.0	1 to 2
D0102.01	3	2	1	3	1	10	2.0	2 to 3
D002	2	3	3	3		11	2.2	2 to 3

# Program Task Management

## Program Development

- Scope of Work Defined
- Develop Policy and Procedures
- Establish Eligibility Requirements
- Develop Bid Packages

## Initial Phase

- Identify "Target" Neighborhoods
- Implement PR Campaign
- Conduct Smoke Test
- Develop Database to Document Anomaly Locations
- Initiate Correspondence with Homeowners

## Administrative Phase

- Homeowner Application Eligibility Review
- Awarding of Bids for Video Inspection and Repair or Replacement of Service Lateral
- Video Inspection and Review of Service Laterals
- Assignment of Service Lateral Repair/Replacement to Plumber

## Implementation Phase

- Homeowner Notification
- Easement Obtainment
- Repair or Replacement of Service Laterals
- Inspection
- Update Database

## Project Evaluation

- Monitoring Water Quality (Grab Samples for *E. Coli*)
- Analyze Results
- Evaluate Project Effectiveness
- Initiate Strategic Plan for Program Renewal

# Program Implementation: Public Outreach

Public Relations campaign focusing on the target neighborhoods



Sanitary Sewer Lateral Assessment Program (SLAP)

Water Quality Program  
Engineering Division



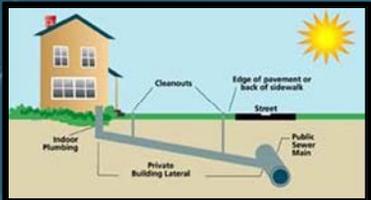
Interceptor Sewer System Maintenance  
Waste Resources Division

City of Chattanooga / Department of Public Works

Contact: Mo Minkara, Ph.D., P.E., Water Quality Manager  
1250 Market Street, Suite 2100  
Chattanooga, TN 37405  
(423) 643-5863  
minkara\_m@mail.chattanooga.gov

**What is a sanitary sewer lateral?**

A sewer lateral is the pipe that carries the wastewater from the house to the sanitary sewer main line in the street. The sewer lateral may consist of cast iron, clay or PVC material or combination of those and extends from the interior of/under the house to (usually) the center line of the street.



Smoke Testing  
Flyers

Watershed Flyers

Door Hangers

Community Meetings

Neighborhood Signs

**City of Chattanooga  
Water Quality Program**

## Welcome to the Chattanooga Creek Watershed

**What is a Watershed?**  
A watershed is an area of land that water flows across on its way to a particular body of water such as a pond, stream, river or ocean.

**Watersheds:**

- Collected and move rain water from a higher elevation to a lower one.
- Transport pollutants such as oil, grease, trash and dirt by way of rain to the receiving water body.

**We all live in a watershed.** The City of Chattanooga consists of 8 unique watersheds: Cicoo Creek, N. Chickamauga Creek, S. Chickamauga Creek, Mountain Creek, Lookout Creek, Chattanooga Creek, Wolfcreek Creek, CSO and the Tennessee River.

**Where am I?**  
The Chattanooga Creek Watershed is the home of the Federal Road, which connected the North to the South during the 1800s. At one time the Chattanooga Creek Watershed, consisting of Alton Park, Piney Woods, ST. Elmo, and S. Chattanooga, was considered part of the "Dynamo of Dixie".

**Water Quality Staff:**  
Mitch Linderwood  
Jason Bass  
Wayne Boyd  
Ray Harrington  
Jonathan Hagen  
Jessica Strawder  
Quinn Lewis  
Adam Reynolds  
1250 Market Street  
Suite 2100  
Chattanooga, TN 37405  
Phone: 423-643-5863  
Fax: 423-757-2482  
waterqa@cityofchattanooga.gov

**Chattanooga Creek Watershed Facts:**  
Chattanooga Creek extends over 7 1/2 miles from N. Georgia to South Chattanooga.  
The watershed drains approximately 8,500 acres of south Chattanooga.  
With a 1 inch rain, nearly 232,928,500 gallons of water discharges into the Tennessee River equating 11,646,475 baths.

**Water - that's a lot of water!**





# Program Implementation: IDD (Smoke Testing)



# Program Implementation: Record Keeping

Anomalies were “marked” in the field and documented in a geodatabase.



SEP Tracker - [by Customer]

SEP - Tracker (Workorders by Site) Thursday, October 11, 2007

Owner First Name: Gloria  
Owner Last Name: Jarrett  
Property Address: 600 N Holly St.  
Customer ID: 1  
Postal Code: 37404  
Property - City: Chattanooga  
State/Province: TN

Owners Address: 6117 S. Riverbend Drive  
Phone Number: 421-3800  
Owners - City: Nashville  
State/Province: TN  
Postal Code: 37221-3937  
Date- Smoke Test: 12/13/2005

Case File No.: D00001  
Basin ID: D0102:01  
Tax Map NO.: 146C P 035  
Case File Status: Closed  
Contractor-Video: Not Assigned  
Phone Number:   
Date of Workorder/Video:   
Date of Video Inspection:   
Date Video Reviewed:   
Contractor-Repair: Not Assigned  
Phone Number:   
Date of Workorder/Repair:   
Type of Work:   
Date Work Started:   
Date Work Completed: 2-7-2006  
Date of Reinspection: 2/7/2006  
Enforcement: NOV

Tasks  
Create New Site  
View Reports  
Create SEP Application  
Create Easement Agreement  
Create Service Bid  
Create Private Letter  
Create Commercial Letter  
Create Renter Letter  
Find Photo's

Setup  
Add or Delete Materials  
Add or Delete Employees  
Add or Delete Contractors  
City Information  
Contractor Charges  
Add or Delete Pymnt Methods  
SEP Application  
Easement Agreement  
Video Bid  
Service Bid  
Notification Letter  
Written Warnings  
NOV  
Find Record

Workorders Communication Inspections

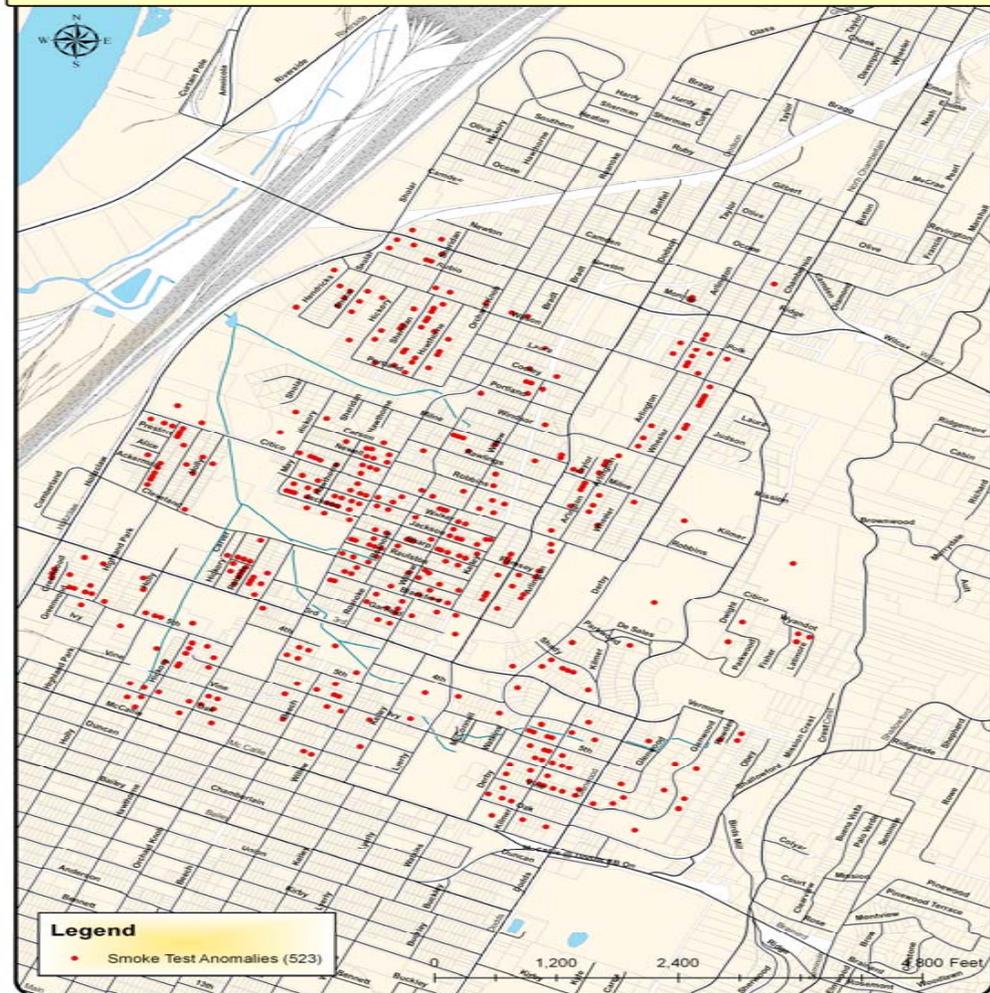
CustomerID	Phone_Comm	DateOfPhone
1	Mrs. Gloria Jarrett phone into this office to ask wh	2/13/2006

Record: 1 of 1270

Form View

# Program Implementation: Corrective Actions

## SEP Smoke Test Area (Anomalies)



- Property owners were sent notification letters requesting repairs be made to their private sanitary sewer lateral.
- Applications were provided to eligible homeowners and reviewed by a reviewing committee.
- Work orders were created for City sanitary sewer lines repair.

# Program Implementation: Compliance & Enforcement

Property owners were notified by:

- Written Warnings
- NOVs
- Compliance Orders
- Court Citations

requesting repairs be made to their private sanitary sewer lateral.

The image displays three overlapping Microsoft Word documents. The top document, titled 'Chattanooga Creek.doc', shows a template for a 'Notification of Potential Discharge from Sanitary Sewer Line'. The middle document, 'Warning Template.doc', is a 'Certified Mail' document with a subject line 'Written Warning CITY CODE, CHAPTER 31, ARTICLE VIII, DIVISION 6 Sec. 31-345 (c). Unlawful acts, misdemeanor' and a body of text starting with 'Dear <Owner\_First\_Name> <Owner\_Last\_Name>:'. The bottom document, 'Compliance Template.doc', is also a 'Certified Mail' document with a subject line 'Compliance Order CITY CODE, CHAPTER 31, ARTICLE VIII, DIVISION 6 Sec. 31-342 (c) (6). Prohibition of pollutant discharge' and a body of text starting with 'Dear <Owner\_First\_Name> <Owner\_Last\_Name>:'. The documents are shown in a windowed view, with the Windows taskbar visible at the bottom.



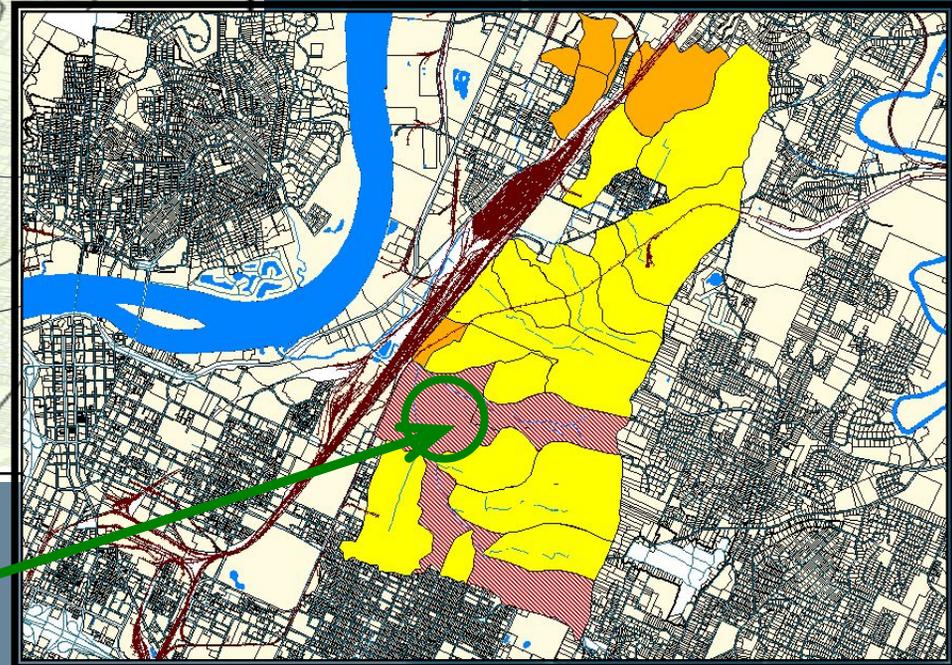
# Program Implementation: Performance Measures/Results

## Total Number of Anomalies Discovered During the SEP

<i>Anomaly Type</i>	<i>Count</i>	<i>Repairs</i>	<i>% Compliance</i>
Clean-out	205	163	80
Ground	268	174	65
Foundation	23	17	74
Sidewalk	18	11	61
Gutters	4	1	25
Utilities	5	3	60
<b>Total</b>	<b>523</b>	<b>369</b>	<b>71</b>
City Issues	82	82	100

# Program Implementation: Performance Measures/Results

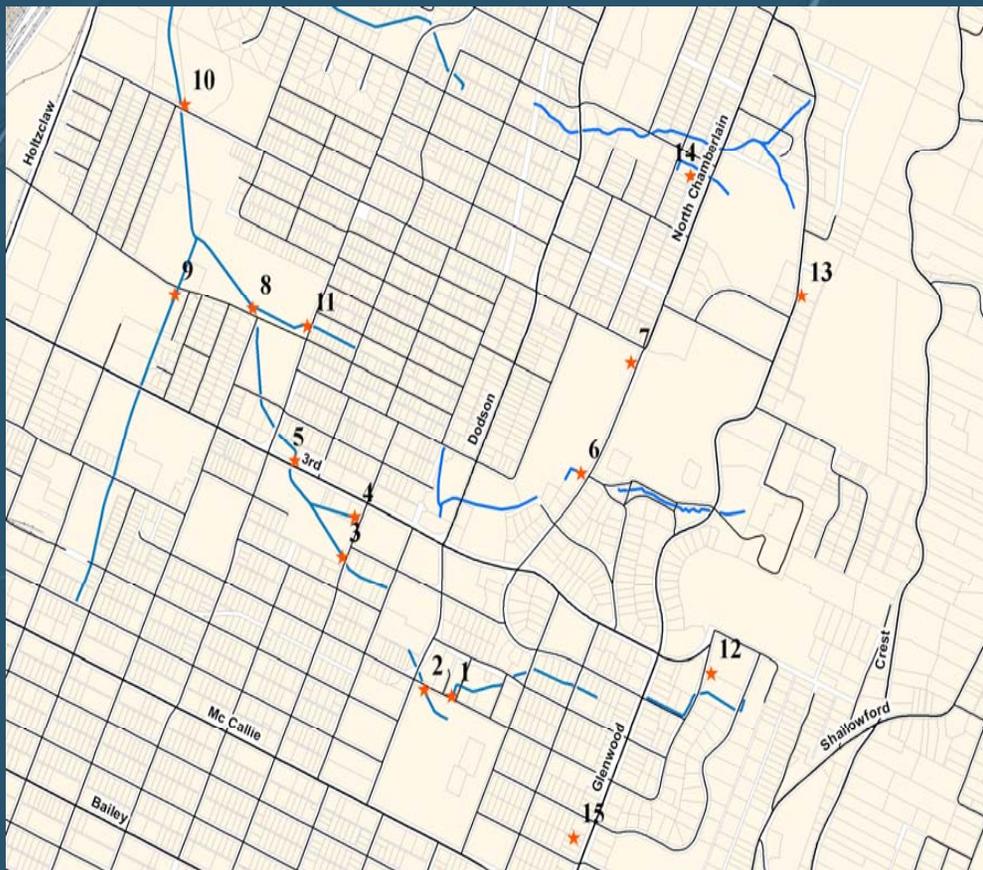
Citico Smoke Test Density Analysis



Spatial analysis of anomaly density verified the IDP score.

# Program Implementation: Performance Measures/Results

Preliminary results indicated a reduction in pathogen loading.



E. Coli (Col/100mL)

Station No.	May 2006	Feb. 2007
1	27,400	3,790
2	800	<100
3	1,400	<100
4	100	<100
5	1,190	<100
6	995	100
7	205	<100
8	1,840	520
9	3,660	8,550
10	4,280	100
11	3,880	<100
12	3,670	Dry
13	485	1,340
14	1,460	<100
15	550	100



# How far have we come?

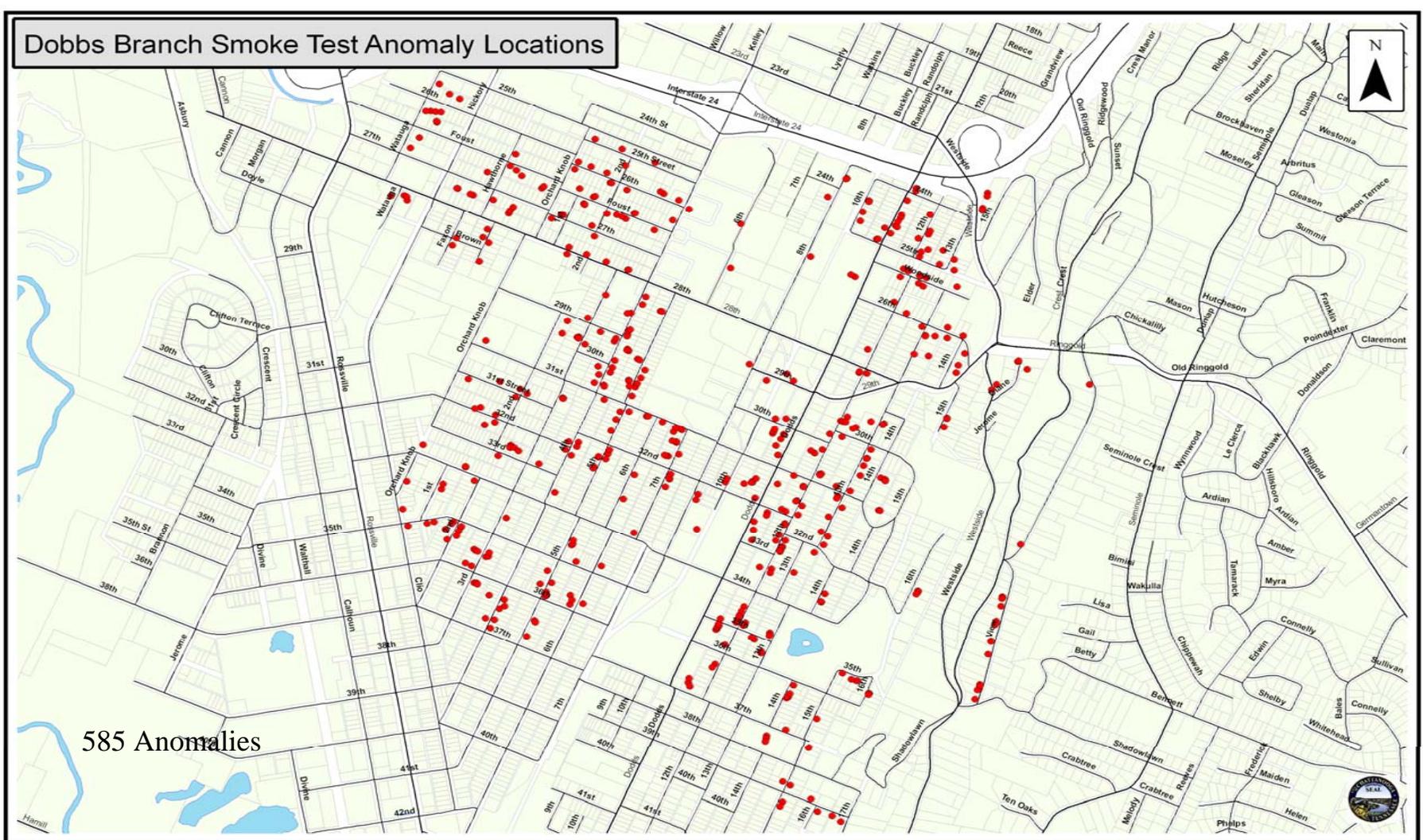
- Completed smoke testing of approximately 1.45 square miles of City infrastructure testing 1,800 buildings.
- **Developed a geodatabase to track work activities.**
- Developed an effective application reviewing process for qualification.
- **Secured continuous funding.**
- Continuing to monitor water quality within the watershed.



# Program Extension

- SEP evolved into the Sewer Lateral Assessment Program (SLAP)
- Extended into other watersheds within the City
- New target areas are identified through strategic planning:
  - Age of Sanitary Infrastructure
  - Historical Water Quality Data
  - Mean Income Level of Community

# Recent anomalies discovered in Dobbs Branch Watershed





# Program Benefits

- Reduce sanitary discharge into the stormwater system → Meeting TMDLs
- Reduce I/I into the sanitary system → Reduce treatment cost
- Improved the living conditions → Increase property value
- Facilitate community involvement → community empowerment



Thank You

