



InfoSense, Inc
Innovating Acoustic Inspection Technology™



February 25-28, 2013

Indianapolis, Indiana, USA

Indiana Convention Center

Rethinking Collection System Maintenance with the Sewer Line Rapid Assessment Tool or SL-RAT™

February 25th, 2013

Alex Churchill

Agenda

- ▶ What is the Problem?
- ▶ Sewer Line Inspection Methods
- ▶ Acoustic Inspection Technology
- ▶ Case Studies
- ▶ Summary

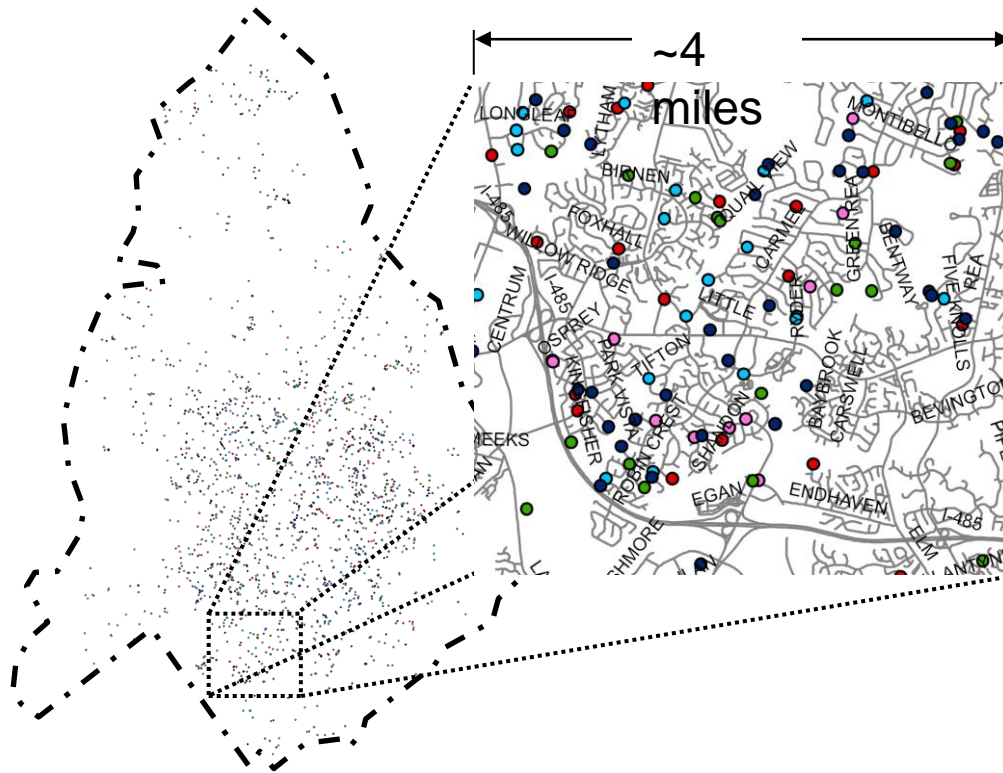
What is the Problem?

- ▶ Overflows are a Symptom – Not the Problem



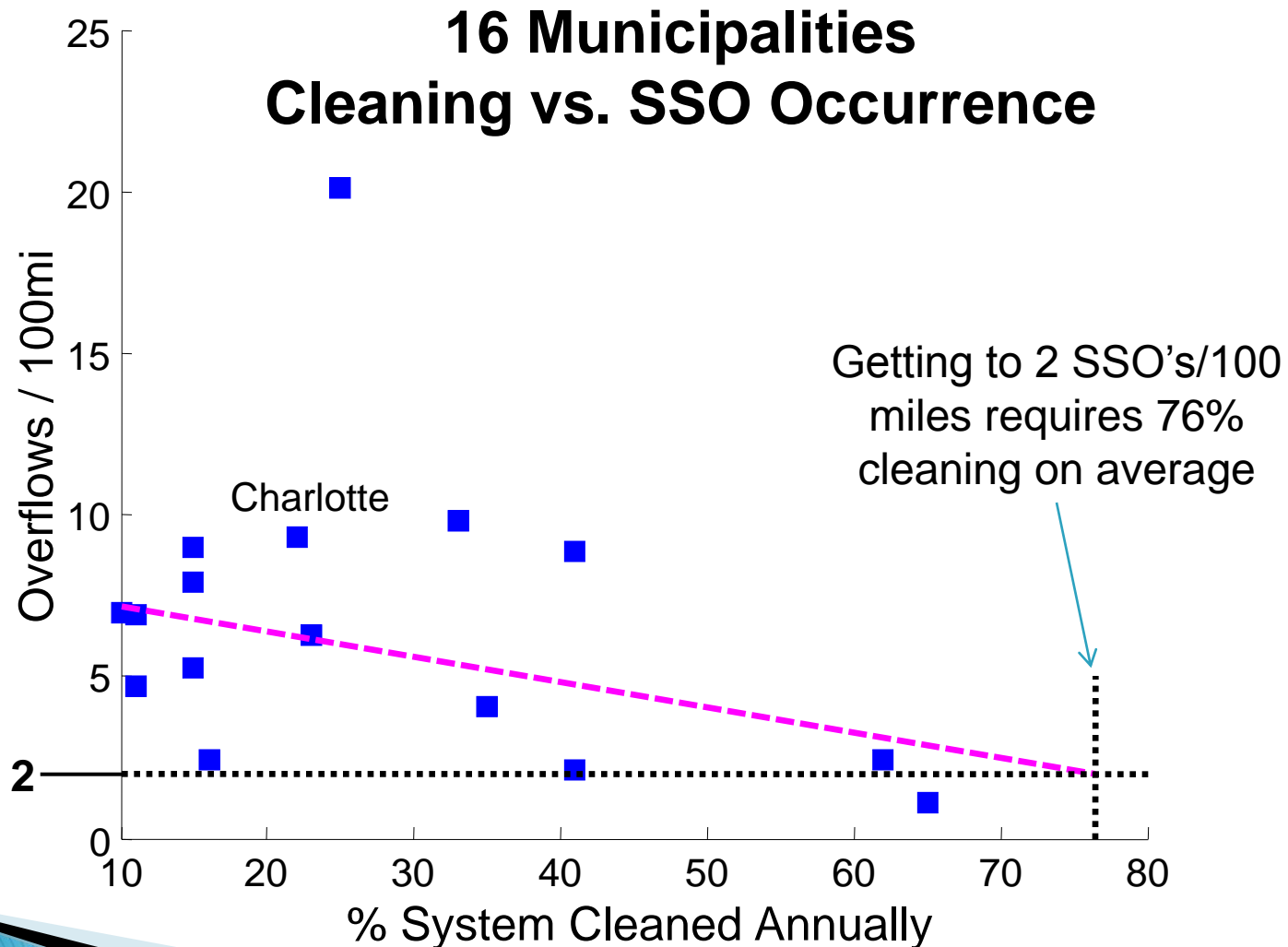
Problem – Condition Information

Example Charlotte, North Carolina



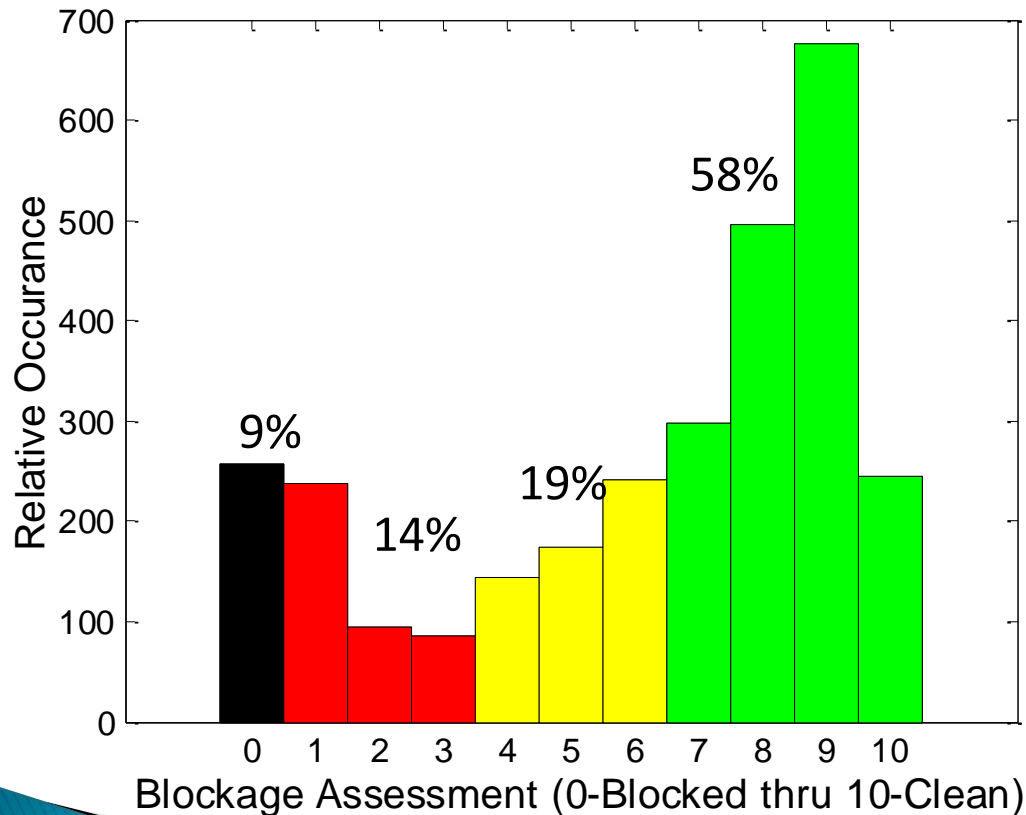
- ▶ Overflow locations – “Random”
- ▶ >90% in pipes less than 12”
- ▶ Historical GIS – Helpful – But Insufficient
- ▶ Where & When to Deploy Cleaning Resources
- ▶ Cost Effective & Timely Condition Information

Lack of Condition Information Drives Cleaning Effort



How Much Cleaning is Wasted?

Acoustic Inspection Results ~1 Million Feet of Pipe



- ▶ Target Historical Problematic Areas
 - >50% Pipes Essentially Clean
 - <10% Need Immediate Action
- ▶ Cleaning a Clean Pipe ⇒ Wastes Resources
- ▶ Not Cleaning a Dirty Pipe ⇒ SSO

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Sewer Line Inspection Methods



- ▶ Manhole Inspection



- ▶ *Acoustic*



- ▶ Zoom Camera

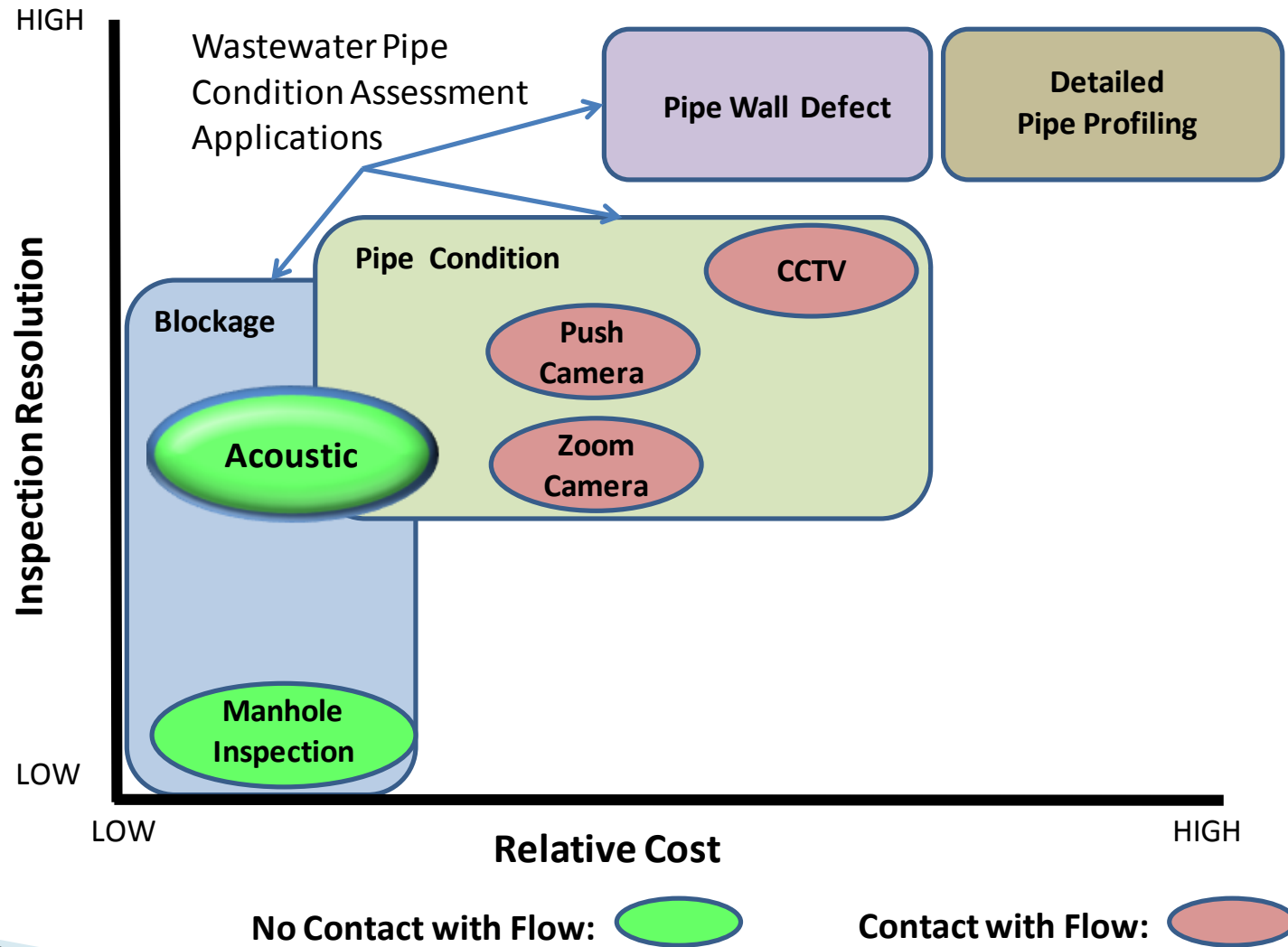


- ▶ Push Camera



- ▶ CCTV/Robotic Camera
- ▶ Pipe Wall Defect Scanners
- ▶ Pipe Profiling / Robotic Multi-Sensor

Relative Segmentation of Methods



- ▶ What is the Problem?
- ▶ Sewer Line Inspection Methods
- ▶ **Acoustic Inspection Technology**
- ▶ Case Studies
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Active Acoustic Pipe Inspection Background

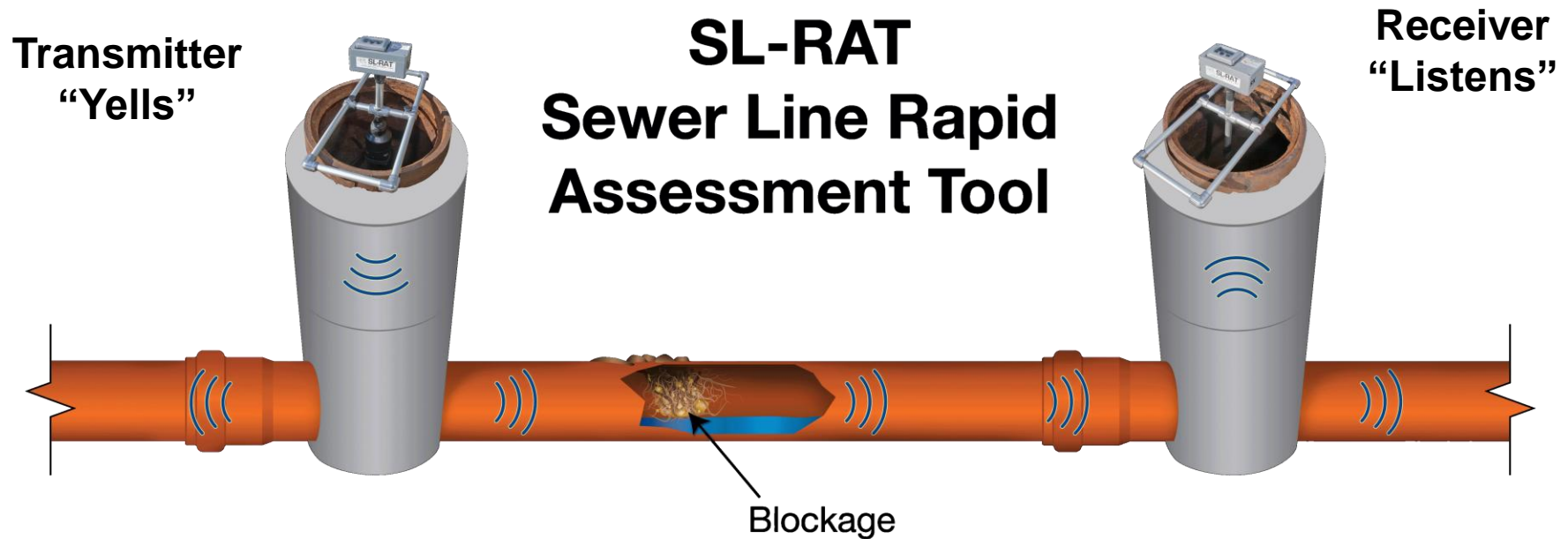
- ▶ Patented technology
- ▶ Gravity-fed sewer focus
- ▶ Developed in Charlotte with CMUD as key partner



- ▶ Over 1.5M feet inspected
- ▶ Rapid assessment helps better focus cleaning and CCTV resources

Acoustic Inspection Technology

► How Does it Work?



Key Features of Acoustic Inspection

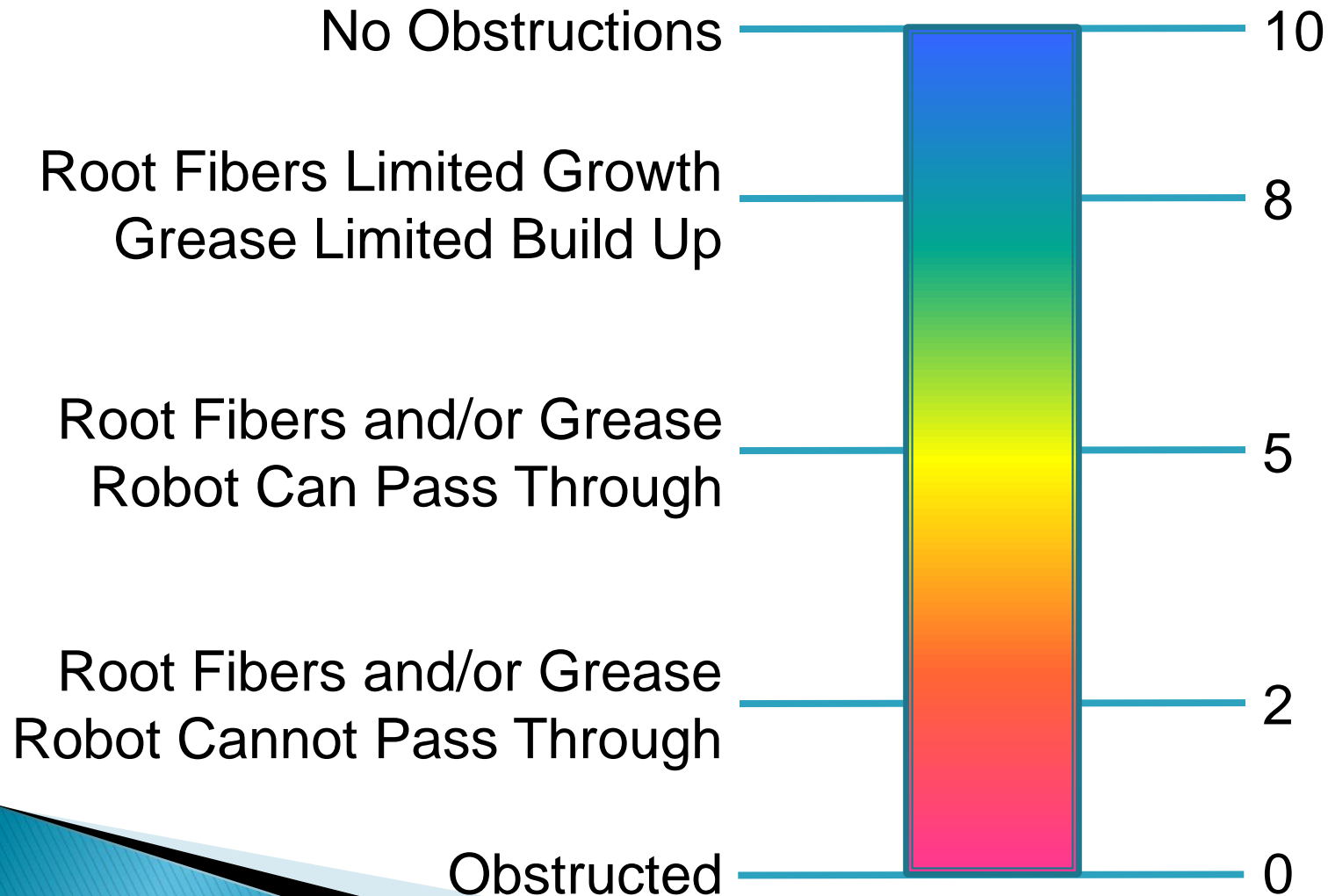


- ▶ No Flow Contact / No Confined Space Entry
- ▶ Simple to use – train operators in minutes
- ▶ Low Cost—Pennies/foot
- ▶ Rapid Onsite Results – Under 3 min./segment
- ▶ Portable < 30 lbs
- ▶ GIS Integration – GPS Enabled
- ▶ Archive Pipe Segment Blockage Assessments

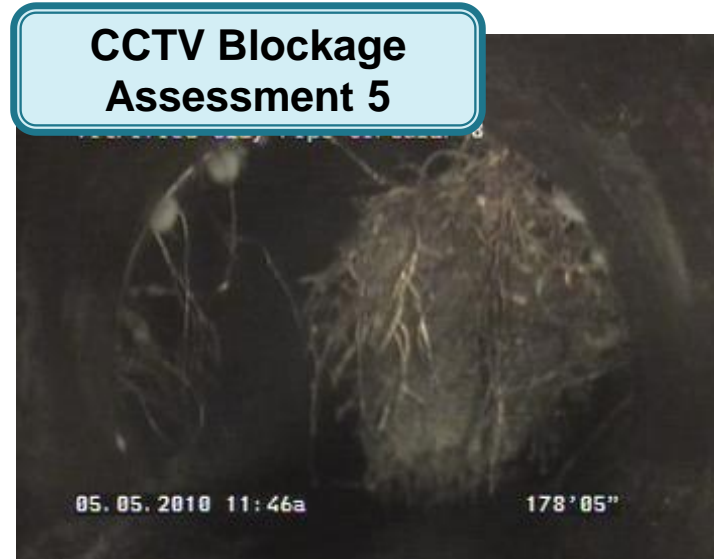
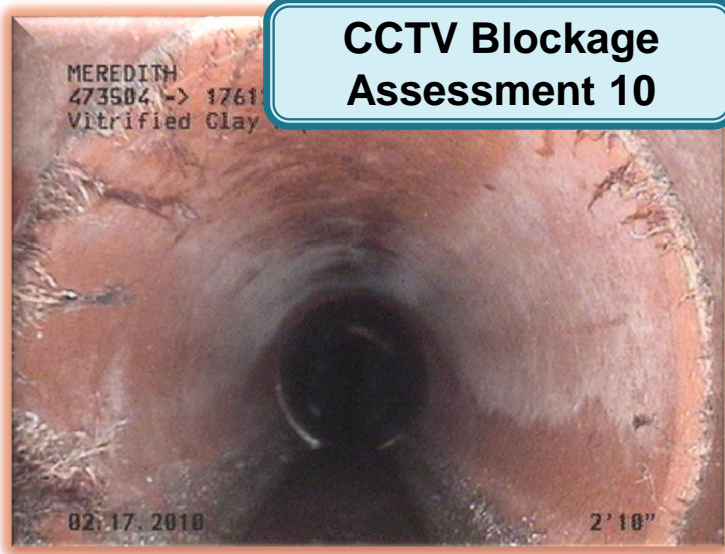
Blockage Assessment Comparison

CCTV Comparison

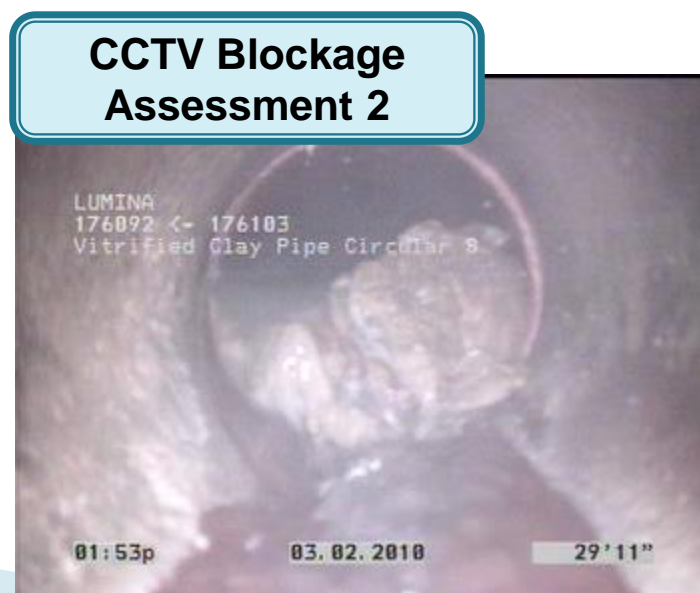
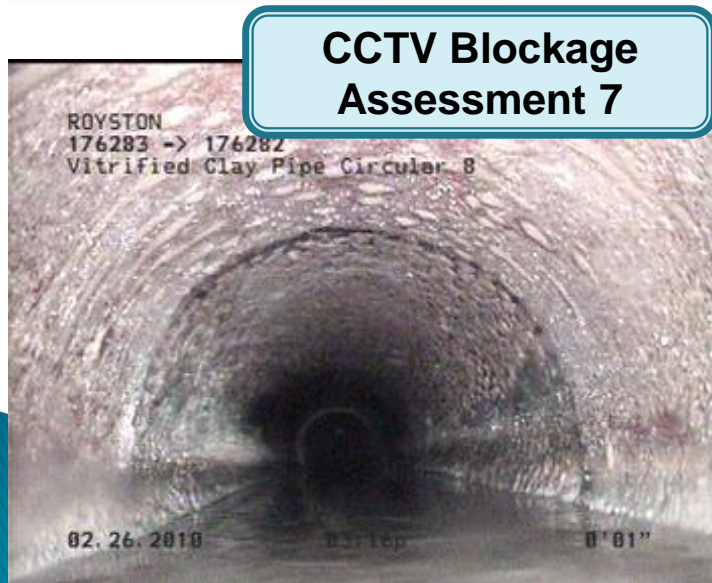
Acoustic Score



Visual Comparison

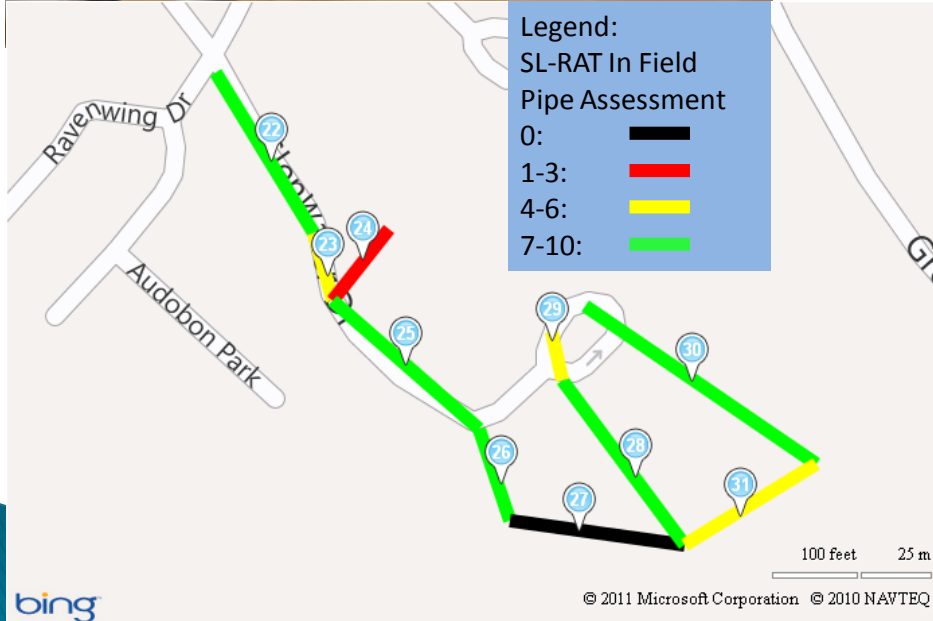


**CCTV Robot was Able to
Pass Through Root Fibers**



**CCTV Robot was
Not Able to Pass
Through Obstruction**

Historical Archive – SL-DOG



- ▶ Sewer Line Data Organizer – SL-DOG
- ▶ Convert Assessment Data to Actions
- ▶ Better Schedule Cleaning Activities
- ▶ Better Management of Inspection Activities
- ▶ Improve Collection Cleaning Effectiveness

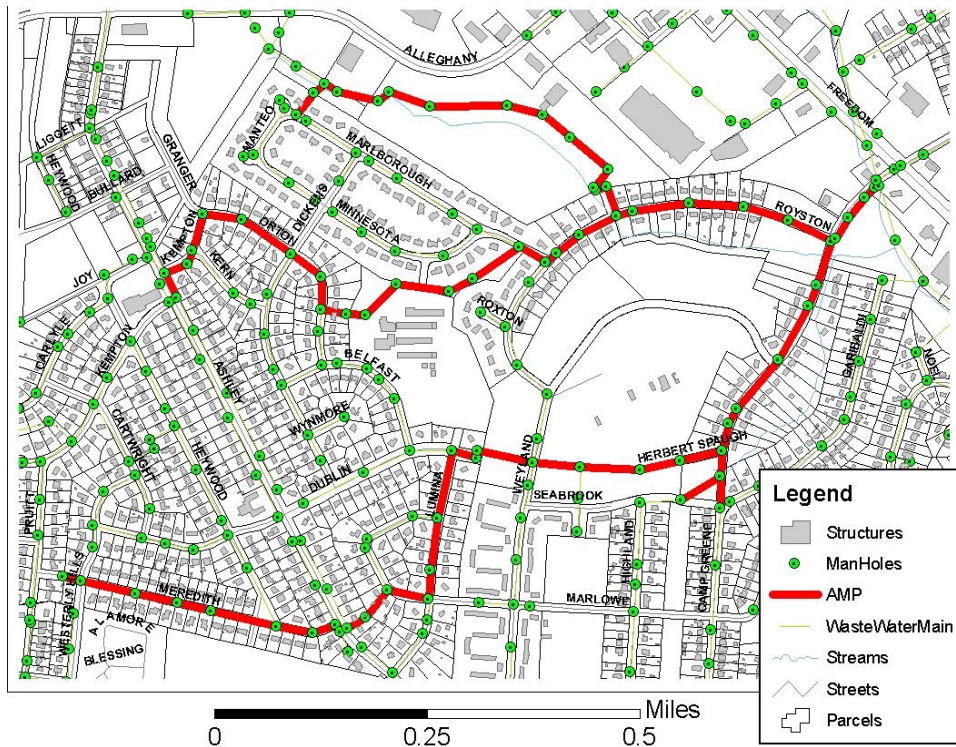
Acoustic Inspection Technology

► Demonstration Video



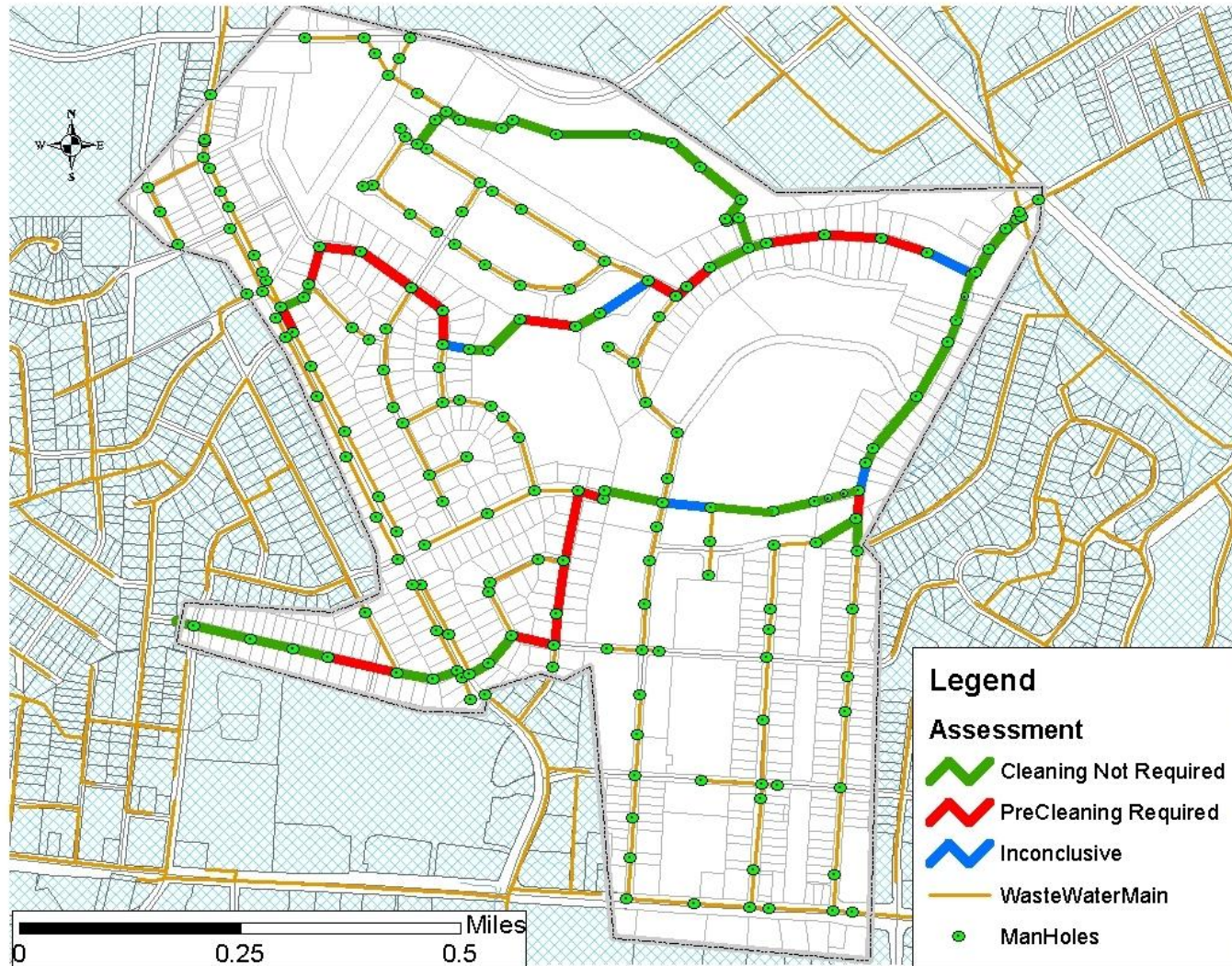
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Case Study I: 2010 CMU Pilot Project

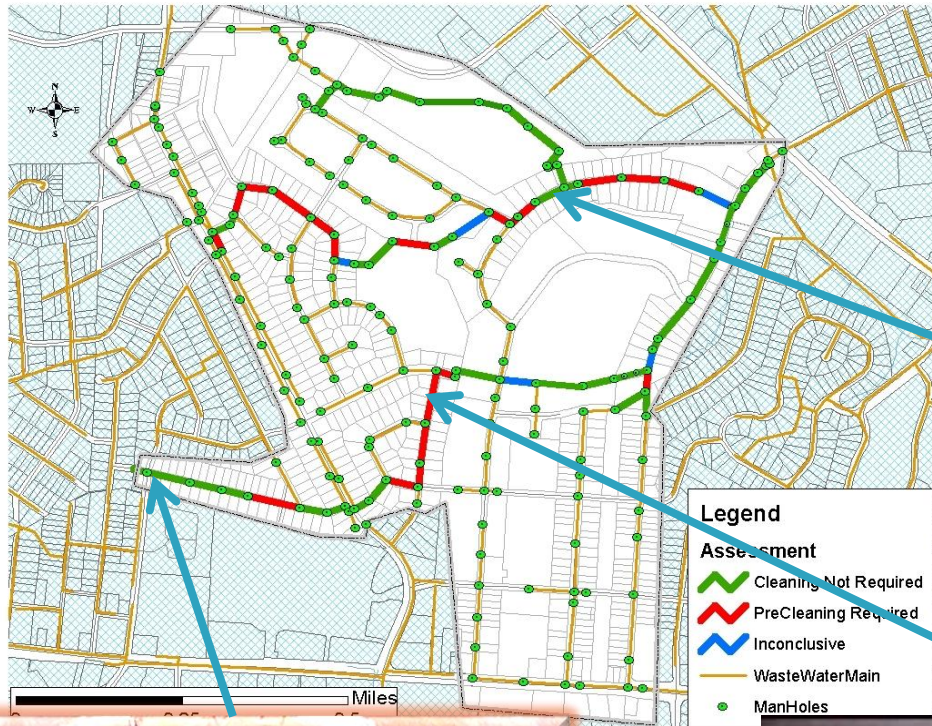


- ▶ **Goal:** Evaluate SL-RAT Cost & Reliability
- ▶ **Approach:** Compare SL-RAT Performance with CCTV
- ▶ **Effectiveness:**
 - SL-RAT Blockage Assessment Highly Consistent with CCTV
 - SL-RAT Loaded Operation Cost- less than \$0.10/ft
- ▶ NC-AWWA 2010 Spring Fling & Annual Meeting

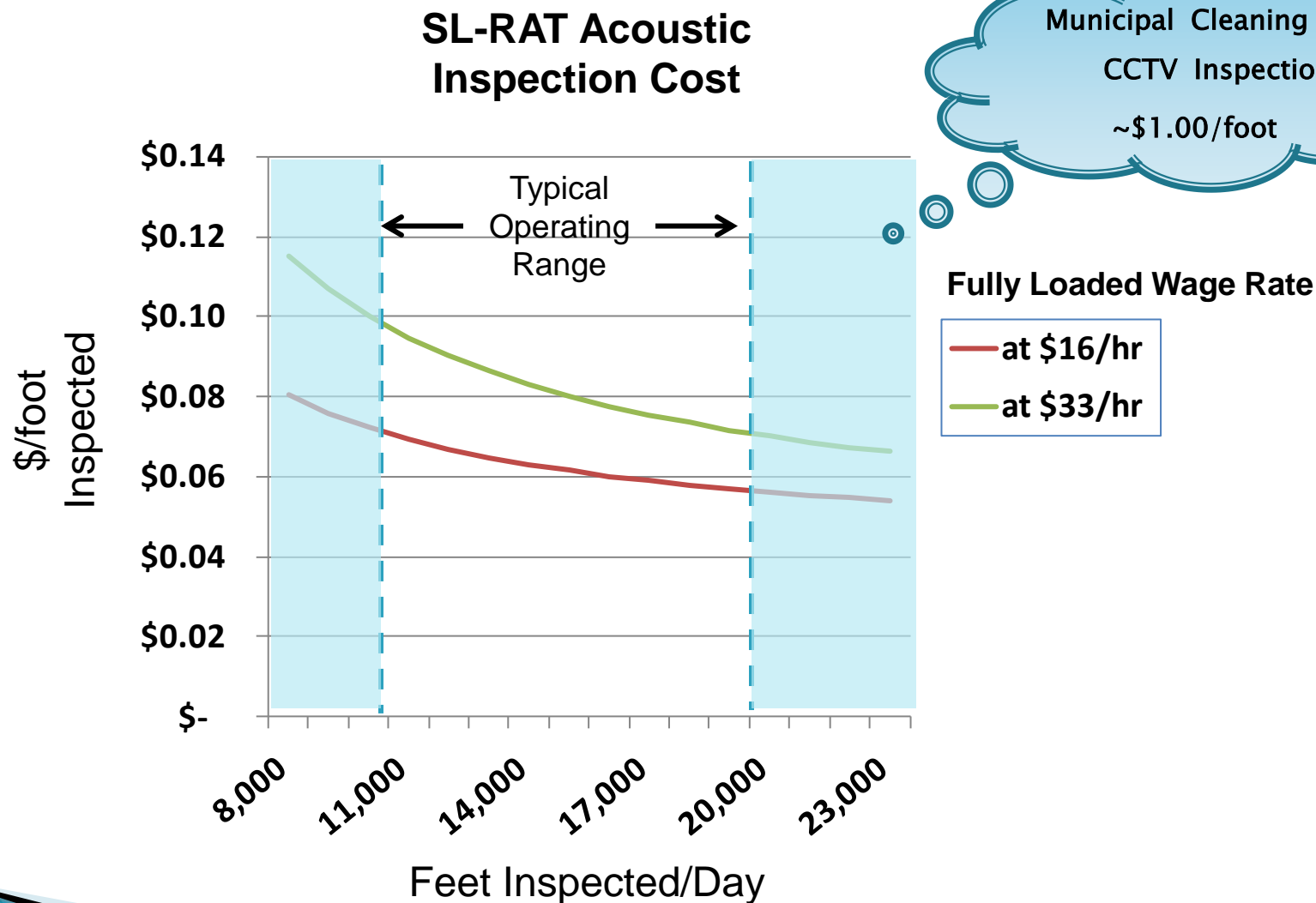
Case Study I – Acoustic Inspection



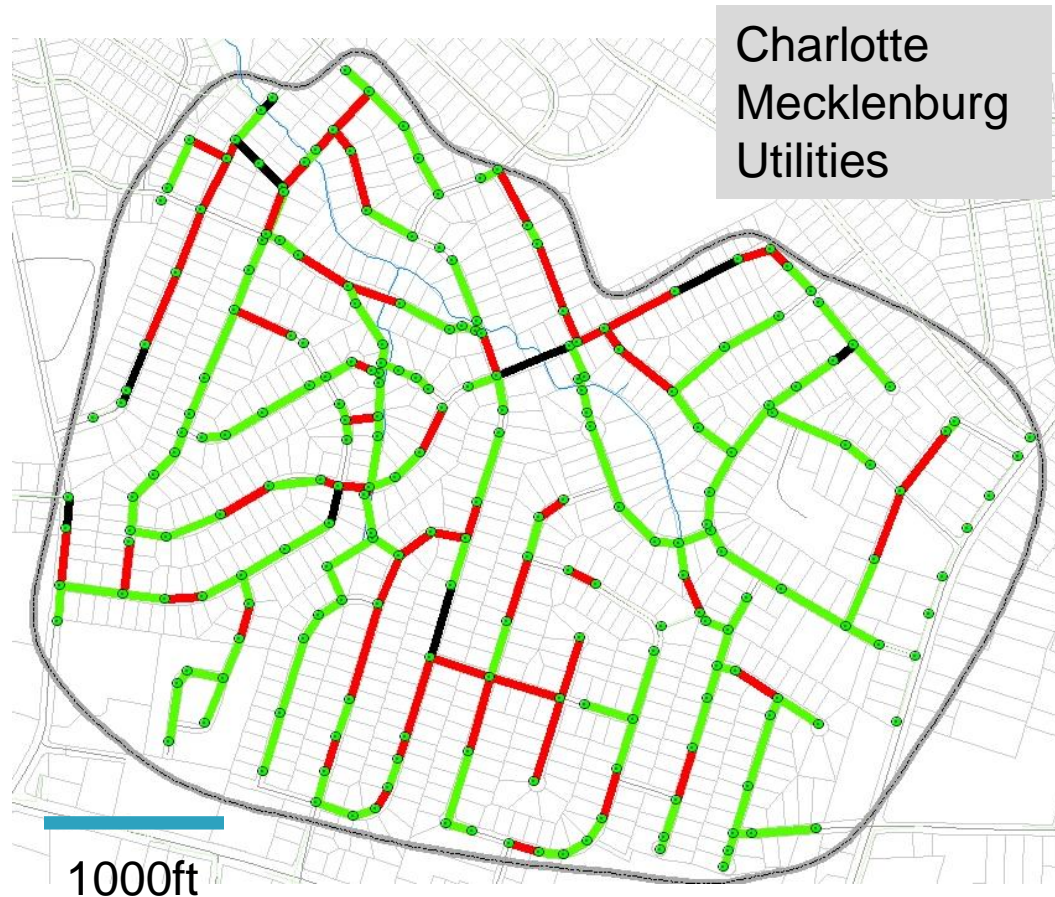
Case Study I: CCTV Comparison



Case Study I: Cost Evaluation



Case Study II: Basin Cleaning Project



▶ **Goal:** Improve Cleaning Efficiency

▶ **Approach:** Acoustic Inspection Directed Cleaning

▶ **Effectiveness:**

- 52,000 ft Basin
- 30,000 ft Assessed by SL-RAT as “Clean”
- 22,000 ft Below Threshold & Cleaned

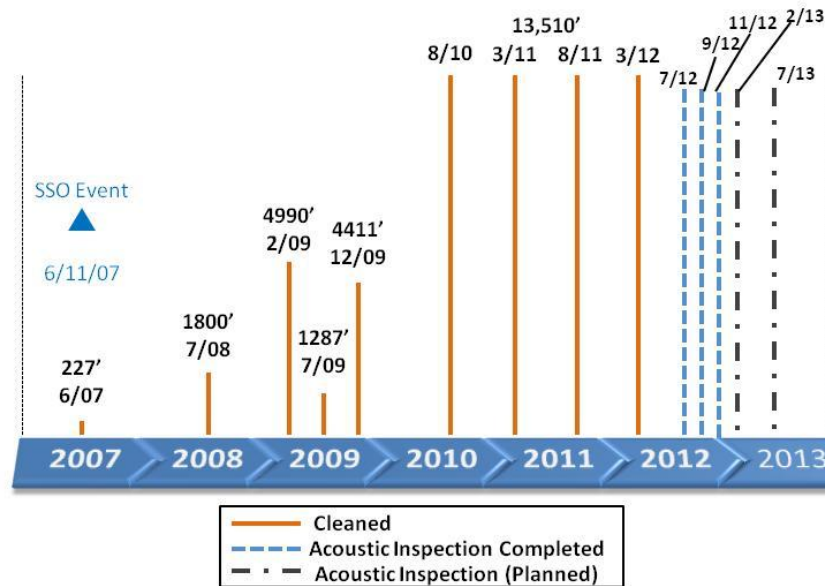
▶ **58% Cleaning Reduction**

Case Study III: Rehabilitation Project



- ▶ **Goal:** Early stage engineering assessment at USA Military Base
- ▶ **Approach:** Acoustic Inspection
- ▶ **Effectiveness:**
 - 8000' Inspected in 5 hours
 - Identified problematic pipe segments: Structural, Grease & Roots
 - CCTV Confirmation

Case Study IV: Periodic Scheduling



- ▶ **Goal:** Refine Periodic PM Program in high visibility location
- ▶ **Approach:** Repeat Acoustic Inspection – Adapt PM Program
- ▶ **Effectiveness:**
 - **Immediate Cost Savings** - Delayed scheduled maintenance
 - Straight Forward to Adopt within current PM program
 - Utility crew highly productive within an hour

LEGEND – Phase 3
 Sewer Line —
 Manhole ●
 Acoustic Blockage Assessment

7/8/8
 7/19/12 9/5/12 11/21/12



Case Study V: Targeted Cleaning



“You can see immediately what needs to be cleaned, so it takes the guesswork out and focuses your efforts.” – CharMeck Engineer

- ▶ **Goal:** Prep Downtown Charlotte, North Carolina prior to DNC
- ▶ **Approach:** Use SL-RAT to quickly identify/prioritize cleaning needs for crews
- ▶ **Effectiveness:**
 - 2 SL-RAT crews inspected 143k ft of pipe in ~ 2 weeks
 - Saved \$100k + versus traditional approach
 - Focused on 10–15% of pipes that are the most blocked & prioritized the remainder

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Applications Enabled By Acoustics

Application Area	How to Use Acoustics	
Pre-Cleaning Assessment	Prioritize/focus cleaning often see >50% cleaning reduction – “focus on cleaning the dirtiest pipes”	QUICK HITS
Condition Surveys	Quickly & economically assess large areas for asset management & planning	
Cleaning Interval Determination	Only clean specific segments when below blockage threshold	
Post-cleaning QA	Low-cost method to check cleaning effectiveness and prevent downstream SSO's	
Optimize SSES Contract Resources	Use acoustics to prioritize pre-cleaning & camera resources for contract advantage	
Performance-Based Contracting	Use acoustic inspection to enable SSO targets in cleaning/inspection contracts	FULL POTENTIAL
Condition Based Maintenance Program	The “holy grail” – economics of acoustics enables a CBM strategy to focus maintenance activity	

Parting Thoughts...

- ▶ Inspection is much Cheaper than Cleaning
- ▶ Acoustic Inspection is an Effective Method to Make Blockage Assessments
 - Quick
 - Cheap
 - Easy / Safe
- ▶ Acoustic Inspection Does Not Replace Cleaning or Detailed Inspection
 - Helps Determine how to Effectively Deploy Cleaning and CCTV resources

Additional Information



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