Acoustic Inspection of Sanitary Sewer Lines to Prioritize Cleaning Operations

Alex Churchill – InfoSense, Inc.

Steve Jonson – CH2MHill

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PRESENTATION OUTLINE

- Acoustic Inspection Overview
- Project Background and Objectives
- Summary of Results
- Conclusion

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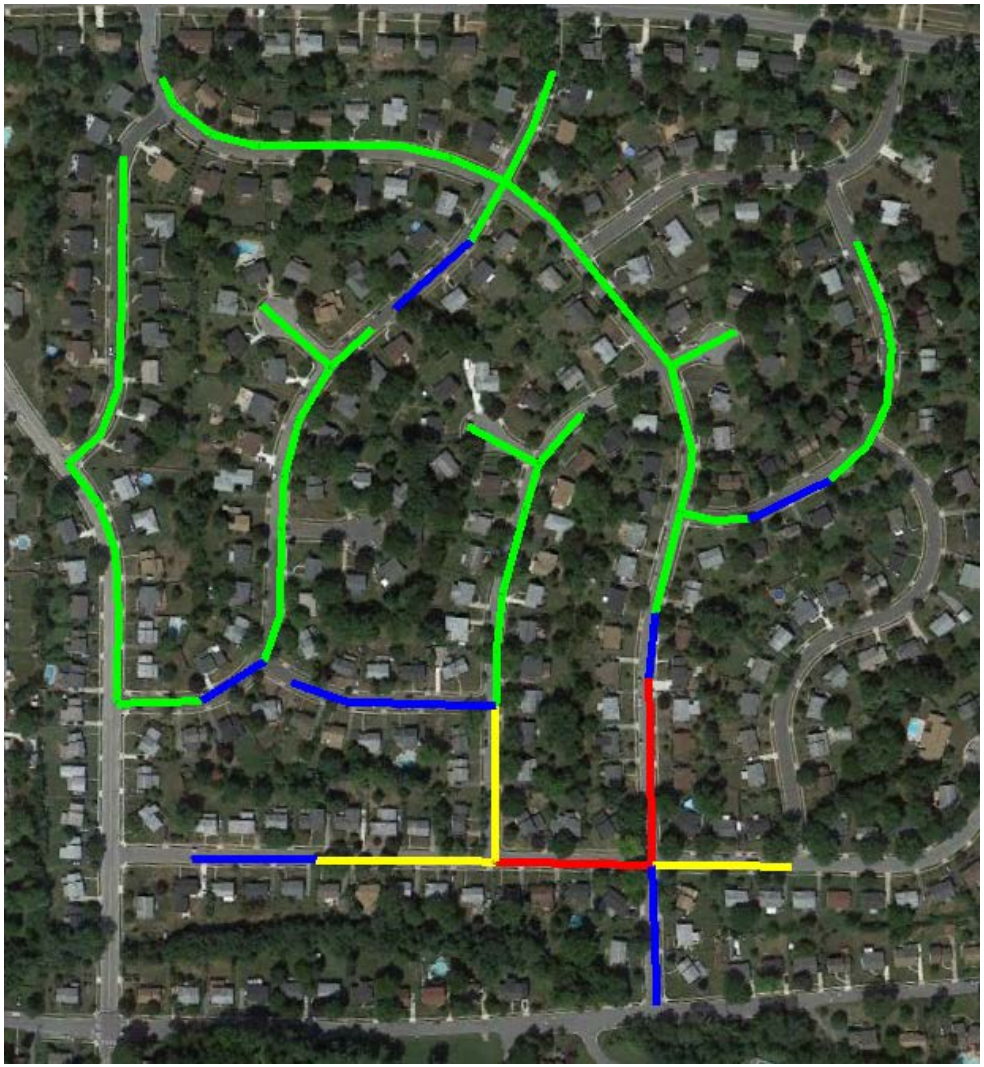
WHAT IS THE PROBLEM?

- Overflows are a Symptom – Not the Problem

PROBLEM: INFORMATION



- Cleaning a pipe costs about the same as inspecting a pipe
- >80% of pipes less than 12”, accounts for >90% of SSOs
- Historical GIS – Helpful – But Insufficient
- Where & When to Deploy Cleaning Resources
- Cost Effective & Timely Condition Information

INSPECTION METHODS

Manhole Inspection

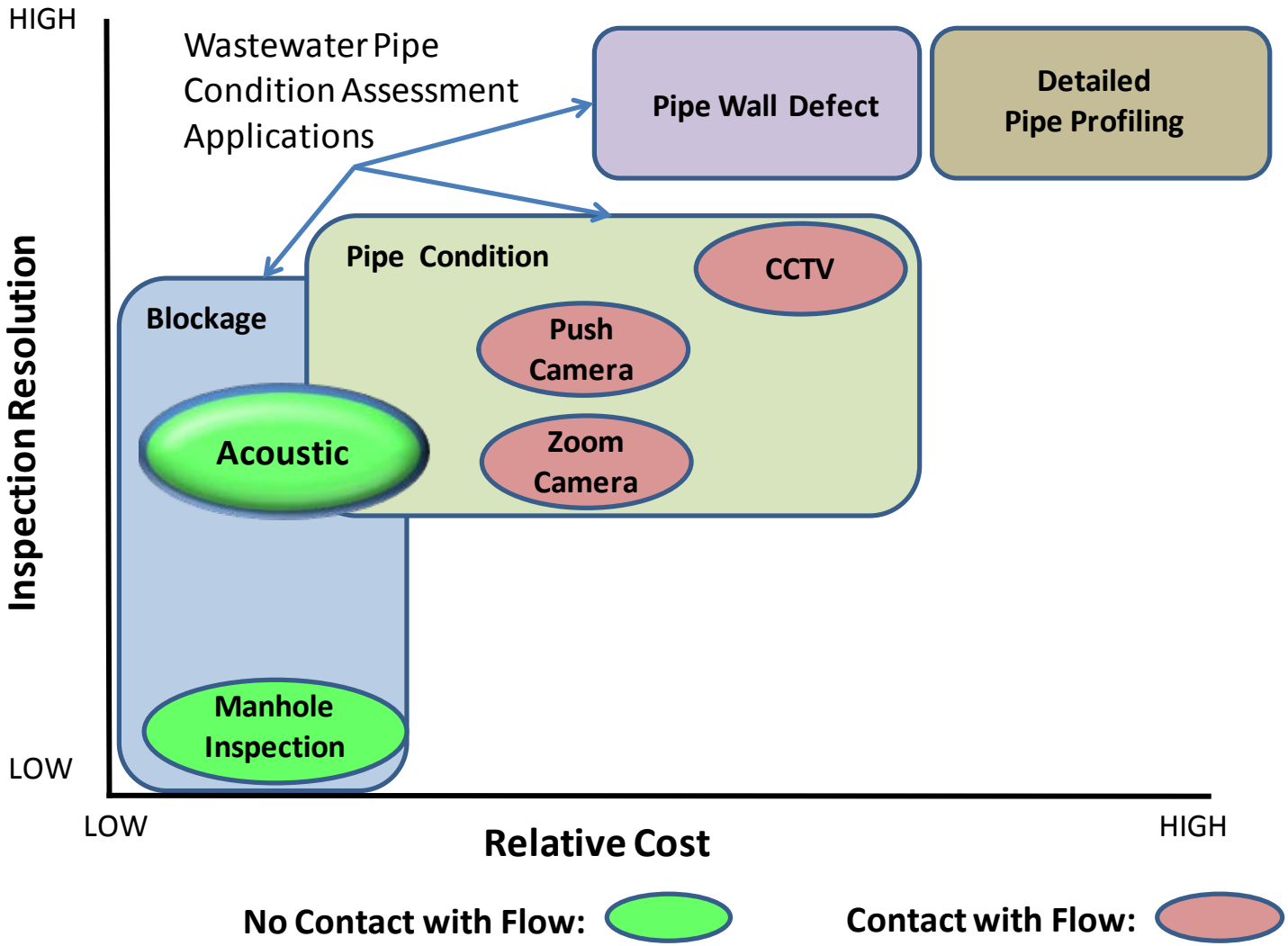
ACOUSTIC

Zoom Camera

Push Camera

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

INSPECTION METHODS



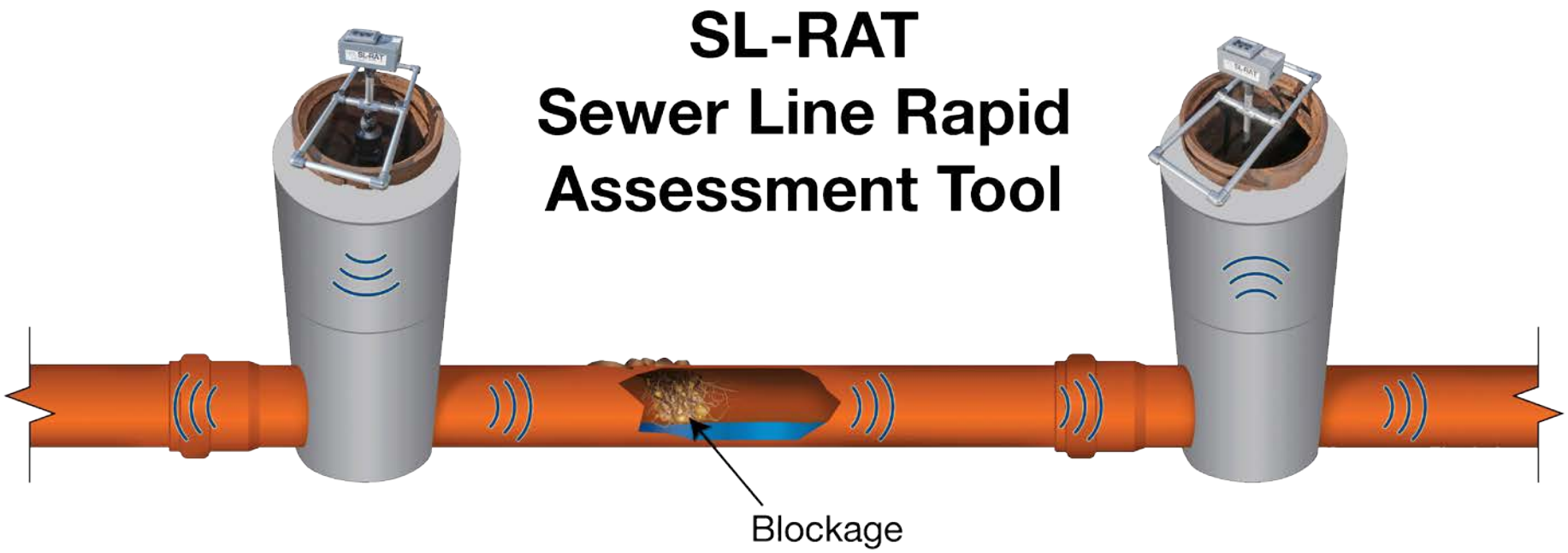
ACTIVE ACOUSTIC PIPE INSPECTION BACKGROUND

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

- Over 3M feet inspected
- Rapid assessment helps better focus cleaning and CCTV resources

ACOUSTIC INSPECTION TECHNOLOGY

- How Does it Work?



ACOUSTIC SCORING

No Obstructions — 10

Root Fibers Limited Growth
Grease Limited Build Up — 8

Root Fibers and/or Grease
Camera Can Pass — 5

Root Fibers and/or Grease
Camera Cannot Pass — 2

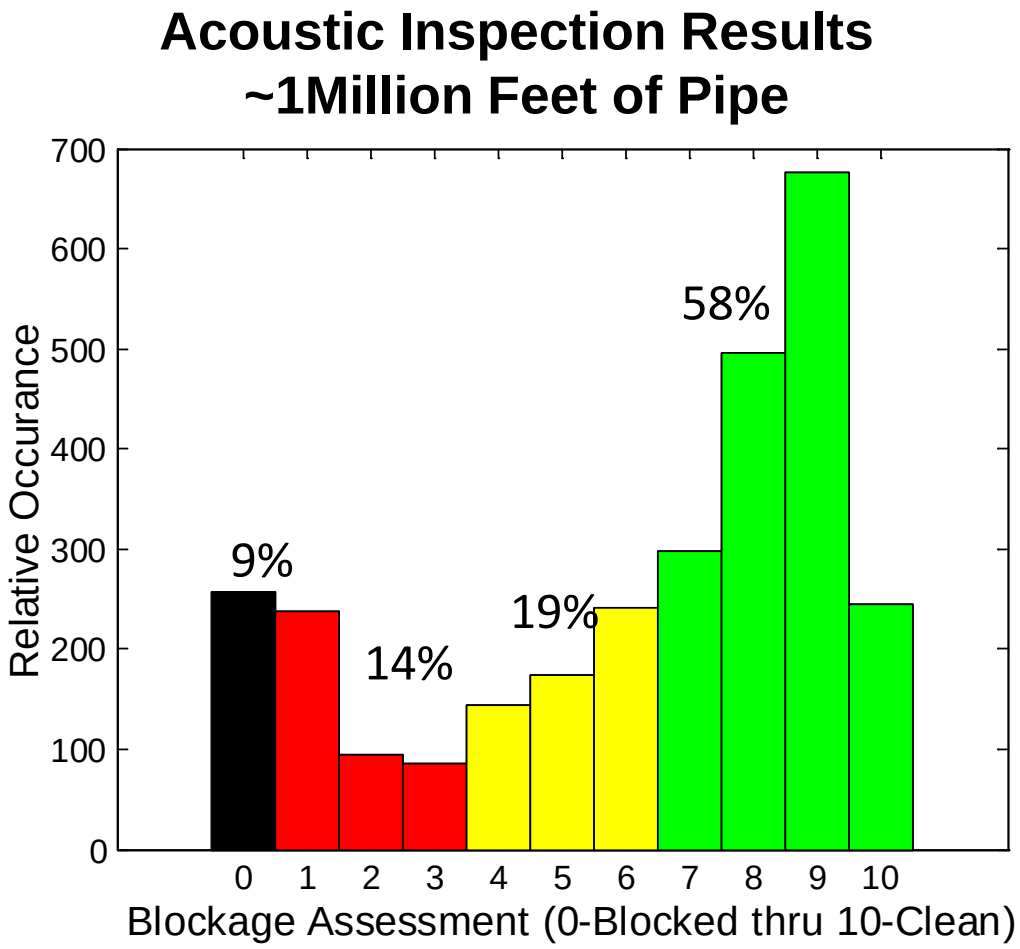
Obstructed — 0

Blockage Assessment 10

Blockage Assessment 5

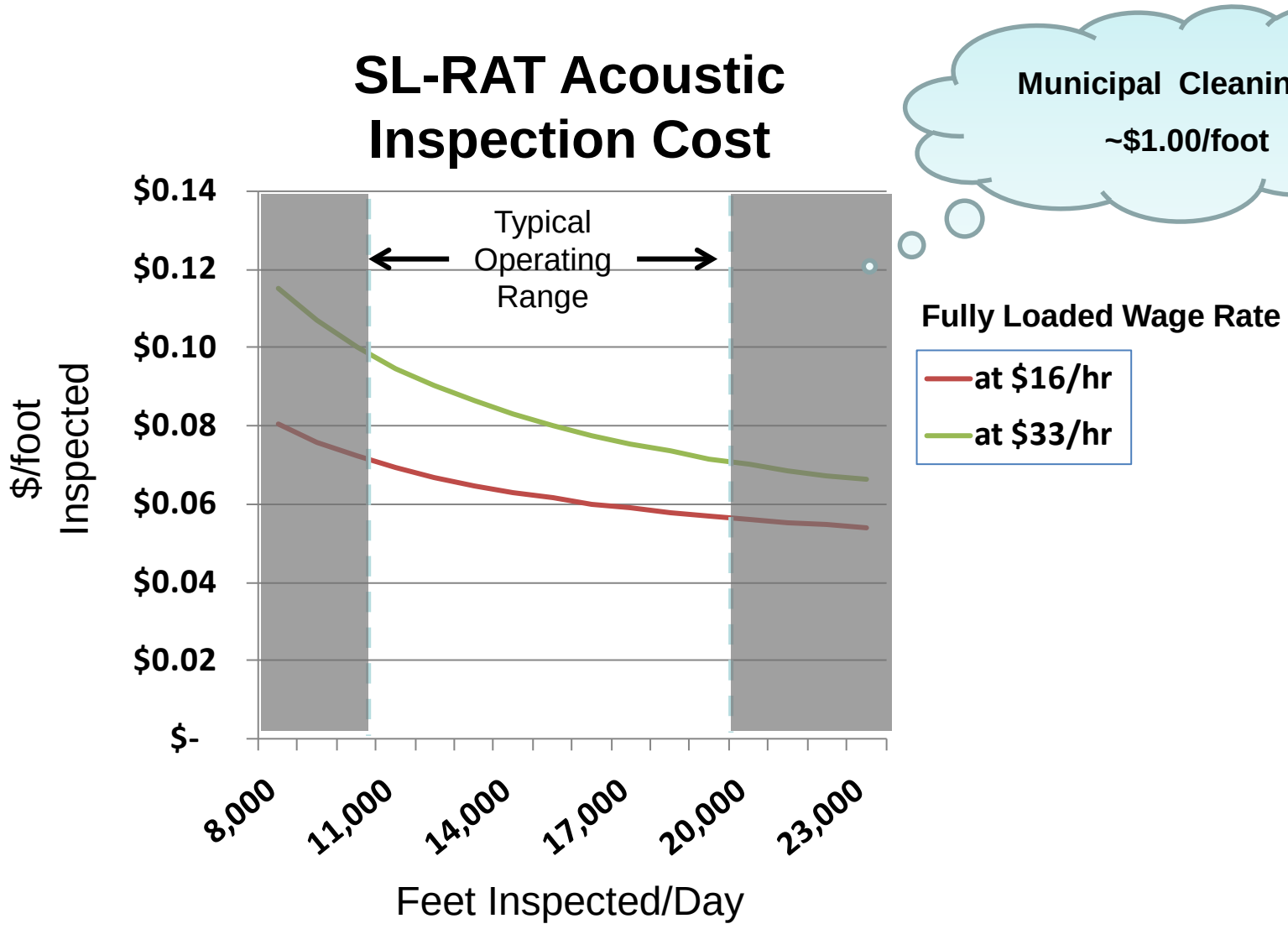
Blockage Assessment 2

HOW MUCH CLEANING IS WASTED?



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

COST EVALUATION



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

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PROJECT BACKGROUND

- Ft. Leonard Wood, MO
  - Established in 1940
  - Trains 80,000-90,000 military and civilians every year
  - 62,911 acres
  - 78 miles of sewer lines
    - 6” – 42” diameter
    - 41% VCP, 53% PVC, 6% RCP

PROJECT OBJECTIVES

SL-RAT is primarily used as a prioritization tool for cleaning/camera operations in 6” to 12” sanitary sewer lines

- Evaluate acoustic inspection as a tool for inspecting sanitary sewer lines
- Compare acoustic inspection results with pole camera
- Compile data of overall system condition at Ft. Leonard Wood

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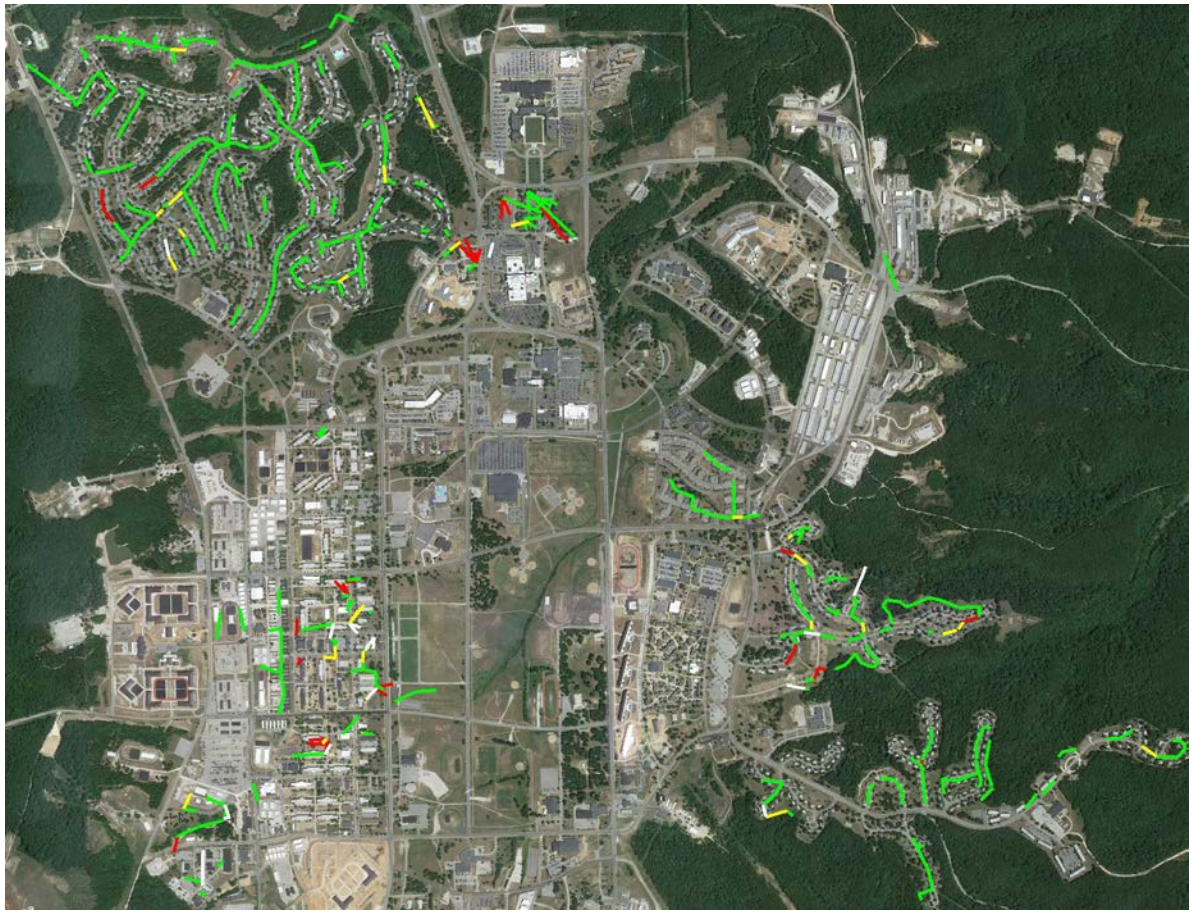
SUMMARY OF RESULTS

- Performed 460 Acoustic Measurements (89,571 ft) (included several repeat measurements for verification)

SUMMARY OF RESULTS

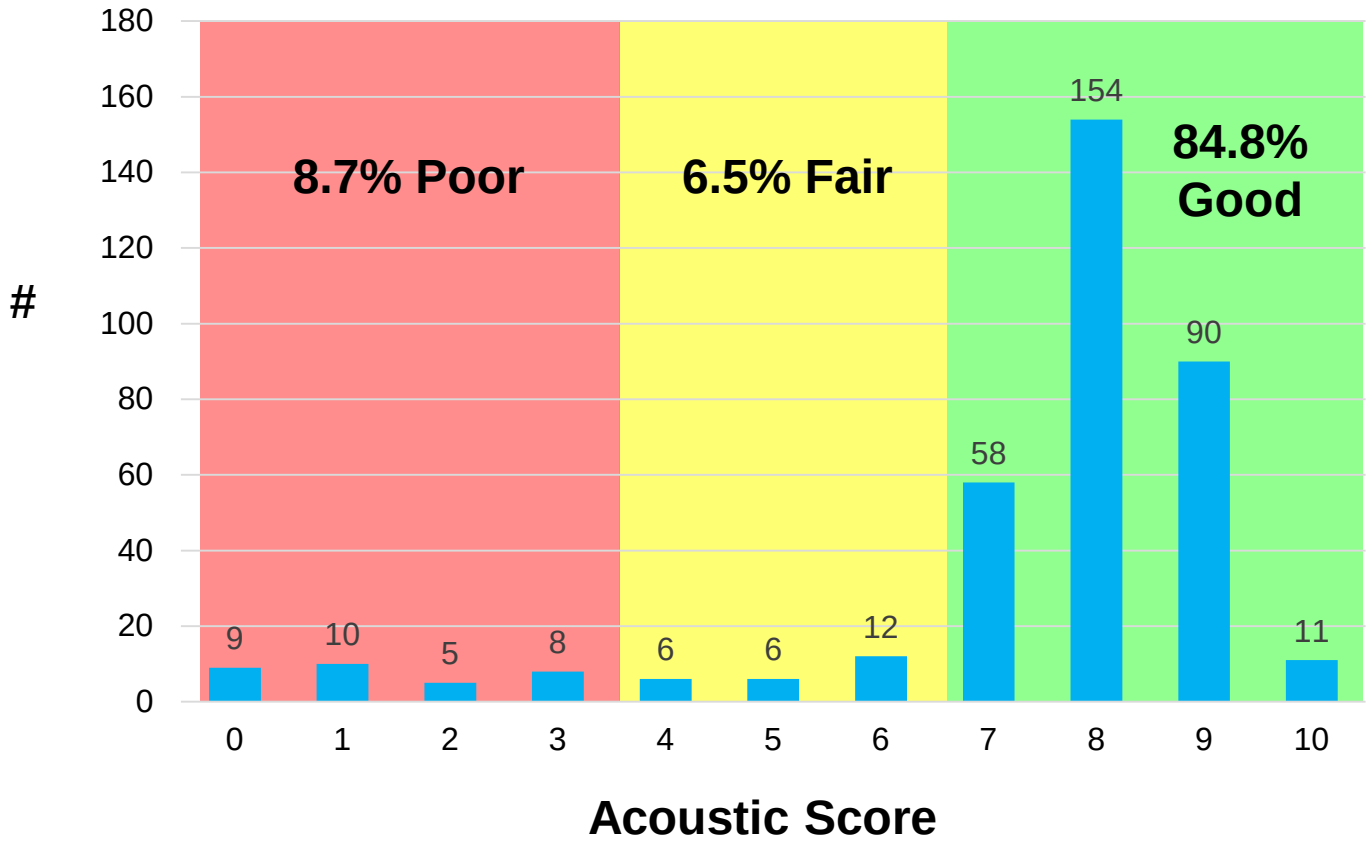
- Acoustic inspection performed in 12 days
- 391 unique segments inspected (75,355 ft)



Legend:
SL-RAT In Field
Pipe Assessment
0:
1-3:
4-6:
7-10:

FT. LEONARD WOOD

Histogram of Acoustic Scores



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APPLICATION OF ACOUSTIC INSPECTION

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	

CONCLUSION

- Acoustic Inspection was shown to be an Effective Method to Make Blockage Assessments
  - Quick
  - Cheap
  - Easy / Safe
- Acoustic Inspection identified pipe blockages that were not picked up by a zoom camera
- Acoustic Inspection Does Not Replace Cleaning or Detailed Inspection
  - Helps Determine how to Effectively Deploy Cleaning and CCTV resources

QUESTIONS?

InfoSense, Inc
Innovating Acoustic Inspection Technology™

877-PIPECHK (877-747-3245)
achurchill@infosenseinc.com
www.infosenseinc.com