NJWEA - Winter Tech Transfer 2026 Cleaning and Inspection

InfoSense

Cleaning the Right Pipe at the Right Time Using Acoustics

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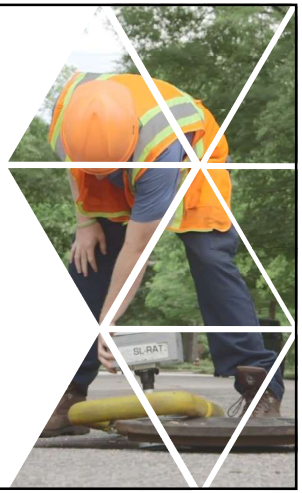

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Agenda

1. About InfoSense
2. Traditional Maintenance
3. Acoustic Inspection
4. Comprehensive Condition-Based Maintenance
5. Benefits and Case Studies

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Who We Are

- Manufacturer of the Sewer Line Rapid Assessment Tool
  - Designed and built in Charlotte, North Carolina
- Our mission is to help municipalities optimize their gravity sewer maintenance

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What We Do

- We help municipalities solve the biggest pains of sewer maintenance
  - Backups and Overflows
  - Manpower and Hiring
  - Asset Failure and H2S
  - Inflow and Infiltration (I&I)
  - Data and Crew Management

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Who We Work With

Local to the Mid-Atlantic

- Charlotte Water , North Carolina
- Baltimore County, Maryland
- Lancaster Area Sewer Authority, Pennsylvania
- Town of Cary, North Carolina
- City of Virginia Beach, Virgina
- Fredericksburg, Virginia
- New Castle County, Delaware
- Gastonia, North Carolina
- American Water-Fort Belvoir VA
- City of Durham, North Carolina
- City of Raleigh NC
- Town of Purcellville, Virginia

Little Rock Water Reclamation Authority (AR)	St. Louis Metropolitan Sewer District (MO)	Citizens Energy Group(IN)	City of Mountlake Terrace (WA)	City of Irving (TX)	Jefferson County (AL)	Santiago (Chile)
Jonesboro City Water & Light (AR)	City of Green Bay (WI)	Montgomery County (OH)	City of Pullman (WA)	New Braunfels Utilities (TX)	Augusta-Richmond County (GA)	Regional Municipality of Halton (Ontario)
Norwalk (CT)	City of Iowa City (IA)	Carmel Wastewater Utilities (IN)	City of Cheney (WA)	City of Santa Barbara (CA)	JEA (FL)	Singapore PUB
Russellville Water and Sewer (AR)	Village of Schaumburg (IL)	Evansville Water & Sewer Utility (IN)	City of Gig Harbor (WA)	City of Galveston (TX)	Hillsborough County (FL)	Toronto Water (Ontario, Canada)
City of Fort Smith (AR)	City of Springfield (IL)	Sanitation District No.1 (KY)	City of Bothell (WA)	City of Laguna Beach (CA)	Peachtree City (GA)	City of Mesa Water Resources (AZ)
City of New Bedford (MA)	City of Elmhurst (IL)	Louisville MSD (KY)	City of Snohomish (WA)	County of Lake (CA)	City of Cocoa (FL)	Castle Rock Water (CO)
Rogers Water Utilities (AR)	City of Manhattan (KS)	City of Lafayette (IN)	Douglas County Sewer District (WA)	San Rafael (CA)	Gainesville Regional Utilities (FL)	City of Saratoga Springs (UT)
City of Norwich (CT)	City of Sioux Falls (SD)	Richmond Sanitary District (IN)	City of Westport (WA)	City of Killeen (TX)	Spartanburg (SC)	Ash Creek Special Service District (UT)
Salt Lake City (UT)	Village of Bartlett (IL)	City of Portage (MI)	City of Poulsbo (WA)	City of Mansfield (TX)	City of Tulsa (OK)	Layton City (UT)
	City of Topeka (KS)	Fort Wayne (IN)	Alderwood Water & Wastewater District (WA)	Houston (TX)	Greenville (SC)	City of Saskatoon (SK)

...and over 1,000 more around the world

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Transitioning to Condition-Based Maintenance

Reactive or Rotation-Based Maintenance Protocol → Condition-Based Cleaning Maintenance Protocol

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Common Protocol For Maintaining Sewer Lines

Time-Based or Rotation-Based Cleaning Protocols

- Cleaning and inspection on set timeline
- Select neighborhood and deploy resources

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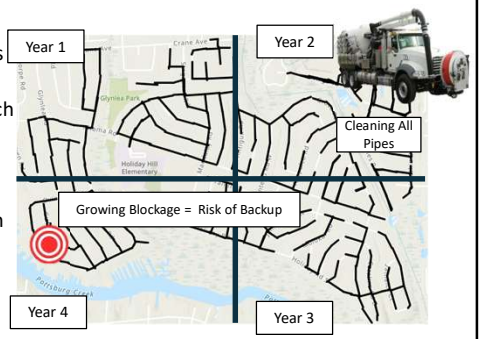
Issues with Time-Based Cleaning Protocol

- Clean every pipe segment regardless of its condition
- Not viewing entire sewer system each year
- Requires a significant amount of water to clean lines
- Uses expensive equipment with high emissions



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Acoustic Inspection Overview

Sewer Line Rapid Assessment Tool

- Released in 2012
  - Won WEF Innovative Technology Award
- Uses acoustics to assess blockages
- Experienced by over 2,000 utilities worldwide
  - 600 million feet (170M meters) assessed
- Endorsed by EPA
- Holds ASTM Standard F3220-17 for use

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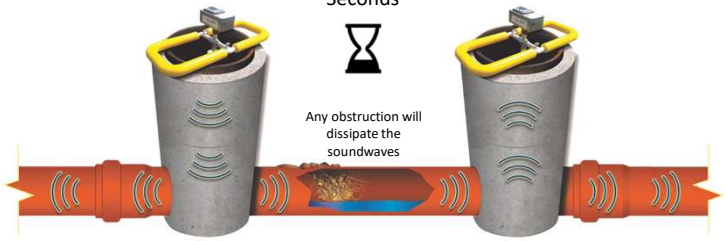
How it Works

Transmitter "yells" down the pipe

~90 Seconds

Receiver "listens" for the known signal



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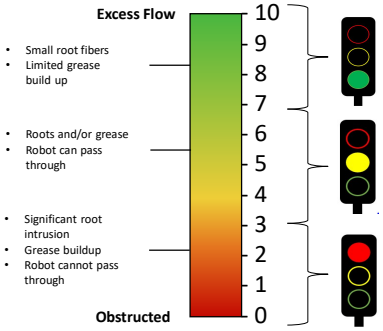
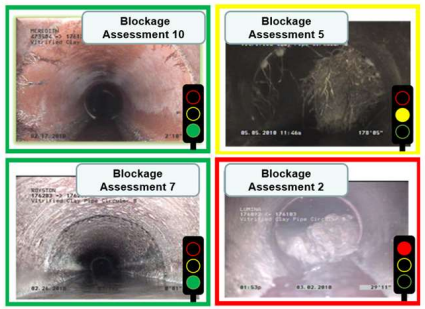
Scoring and Visual Comparison





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Condition-Based Maintenance

Send Cleaning Trucks Based on Condition Assessment

Real SL-DOG Data from JEA, Florida

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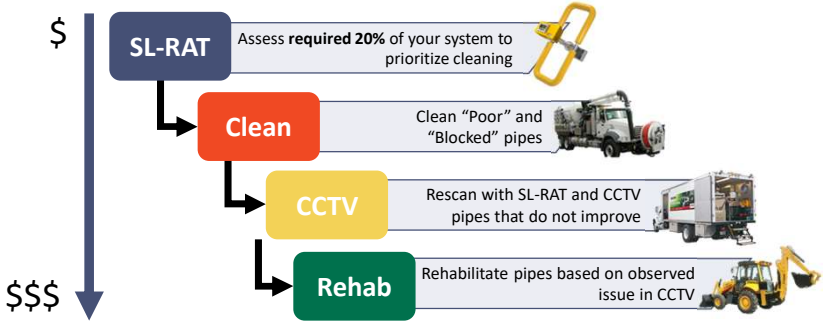
Comprehensive Condition-Based Maintenance



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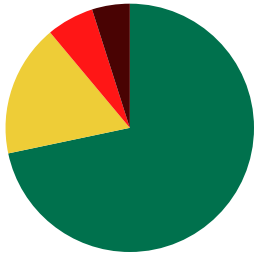
SL-RAT Global Stats

- Over 600 million feet measured
- 80/20 rule of maintenance holds!
- Top Users 2025
  - Little Rock, AR 5.7M
  - Santiago, Chile 5.7M
  - St Louis, MO 3.1 M
  - Jefferson County, AL 2.6M
  - JEA, FL 2.1 M
  - Halton, Ontario 1.98M
  - Jonesboro, AR 1.88M



Good - 72% Fair - 17%
Poor - 6% Blocked - 5%

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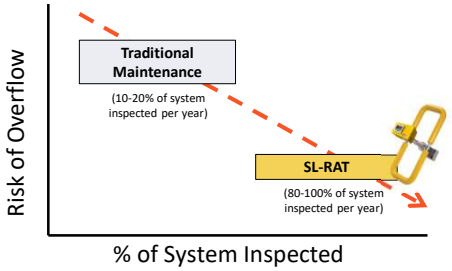
Increased Inspections Reduce Risk

- Get eyes on your entire system
  - Inspect 50+ manholes per day
  - Clean up GIS system
  - Find buried assets



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Savings Example: Long Branch, NJ

- Screen 8 miles using SL-RAT
  - Two-person crew spent 17 hours in the field
  - Saved over $28k
- Savings come from avoiding the 80% of your system in good condition
  - Save money on cleaning*
  - Spend less time in the field**
  - Reduce flushing water usage***

* Assumes cleaning cost of $1.50 per foot
**Assume average cleaning rate of 3,000 feet per day
***Assume water usage of 5 gallons per foot to clean

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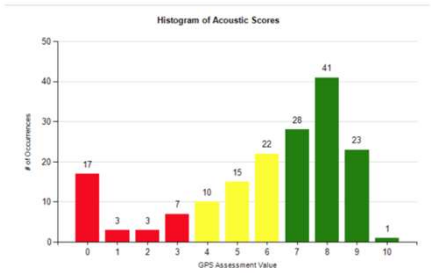
Savings Example: Long Branch, NJ

Results

10% **Blocked** 7% **Poor**

28% **Fair** 55% **Good**



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Savings Example: Long Branch, NJ

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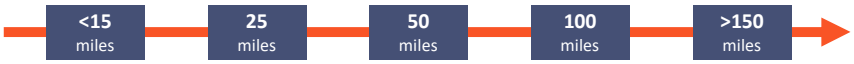
Additional Benefit Examples

How many miles do you clean annually?

(click to see how much you can save)



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Continue

Benefits – <15 Miles

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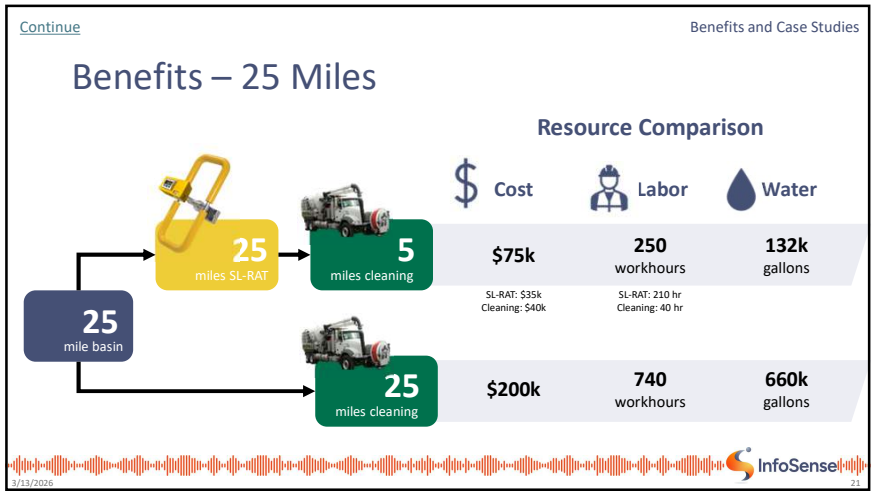

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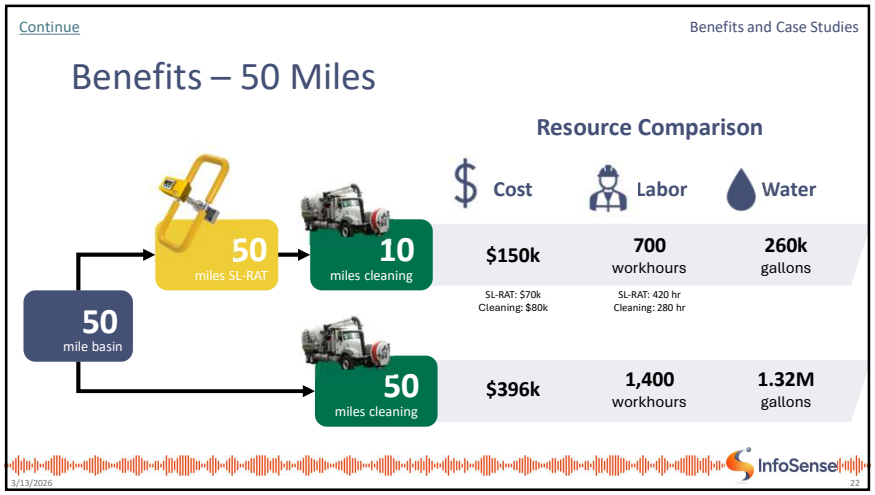

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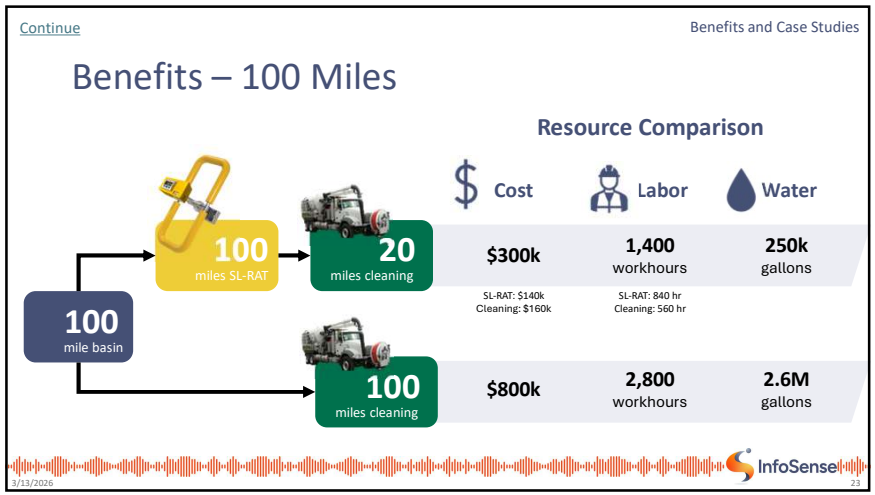

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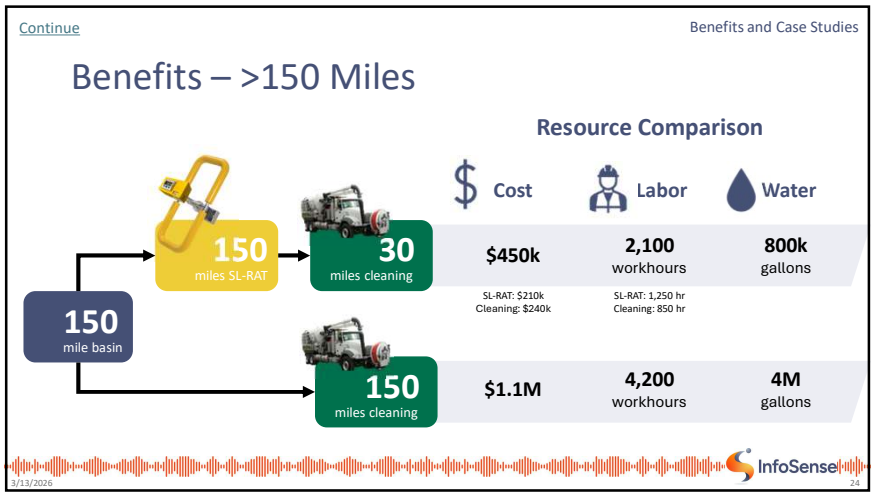

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Go Questions!

Case Studies

Hot Spot Reduction - *Virginia Beach, Virginia*
Efficiency Improvements - *Gainesville Regional Utilities, Florida*
Staffing Shortage Abatement - *Peachtree City, Georgia*
SL-RAT Service Offering – *Bend, Oregon*

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Return to Case Studies

Benefits and Case Studies

Case Study:
Hot Spot Reduction at Virginia Beach

- City Overview
  - Population: 450,000
  - 1500 miles gravity mains
  - 32,000 manholes
  - 413 Pump station
- Purchased first units in 2013
  - Expanded program to 4 units

City of Virginia Beach
Public Utilities

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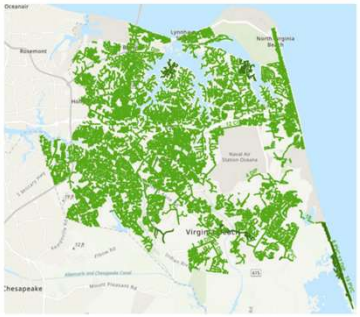
The Problem

- The Hotspot Cleaning List had grown so large that the monthly cleaning target became unattainable.
  - Missed cleanings created an increased SSO risk.
- Decision-making to add segments was too subjective and based on an opinion of cause and pipe condition.



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CM1
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Initial Results

- Significantly reduced the number of pipes cleaned in year one

Frequency (days)	Sum Pipe Length (linear feet)	Total Annual Cleaning (linear feet)	No. Pipe Segment (#)
30	7,993	95,916	48
60	30,588	183,528	170
90	93,444	373,776	519
180	95,242	190,484	507
365	66,630	66,630	334
Total	**293,897**	**910,334**	**1,578**

Before SL-RAT

Frequency (days)	Sum Pipe Length (linear feet)	Total Annual **Cleaning** (linear feet)	No. Pipe Segment (#)
30	1,791	21,492	6
60	0	0	0
90	8,589	34,356	49
180	2,025	4,050	39
365	0	0	0
Total	**12,405**	**59,898**	**94**

After SL-RAT

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Slide 28

CM1 Highlight numbers

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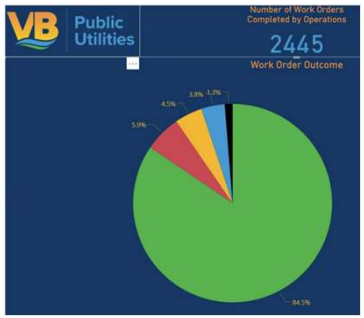
Ongoing improvements

- Significant Cleaning Reduction
  - 89.6% - No Action Needed/Potential Re-Baseline/Baseline Needed
  - 5.9% - Mainline Stoppage
  - 4.5% - Create Cleaning Work Order
- Minimize SSOs
  - No Repeat SSOs
- Continues to adjust cleaning and inspection frequencies based on scores



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Benefits and Case Studies

Case Study:

Efficiency Improvements at Gainesville Regional Utilities

- 100+ year old gravity system
  - 38% of the system is 50+ years old and has not been renewed (CIPP lined)
- 177 lift stations
- 671 miles of gravity sewer
- 16,200 manholes
- 39 collection system staff

GRU More than Energy

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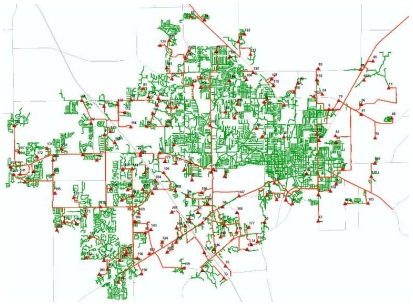
SWAMP Program

- System Wide Assessment & Maintenance Plan (Swamp)
  - Includes SL-RAT inspection initiative
- Before 2022 implementation
  - CCTV inspections by map grid (25-35 mi/yr)
    - ~19 Years to inspect the entire system
  - Increasing SSO's, blockages, cave-ins
  - High level of reactive/unplanned work



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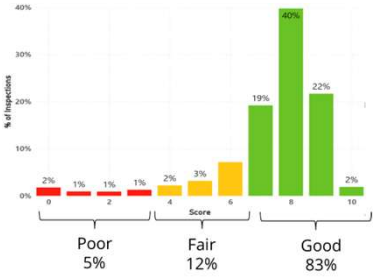
SWAMP Program SL-RAT Results

- 2-person crew (GRU Staff)
- Average 1–1.5 miles per day
- 3-5 days per week
- Inspection results after one year
  - 390 miles inspected
  - 9,300 pipes inspected
  - 58% of system covered
  - 17% of pipes need cleaning (0-6 Scores)



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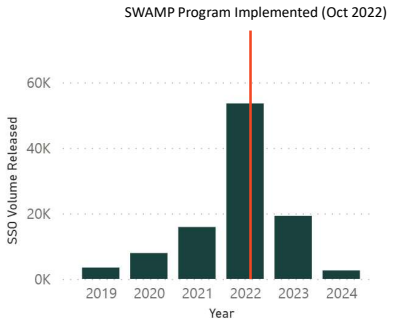
SSO Reduction

- **64%** reduction in gravity SSO volume from 2022 to 2023
- System Inspection Frequency reduced to **2.5 years**
  - 15-20 Years Using Traditional Methods
- **85% less expensive** than traditional CCTV per foot



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Benefits and Case Studies

Case Study:

Staffing Shortage Abatement in Peachtree City

- Condition-Based maintenance program discontinued due to staff turnover.
  - Revitalized program after finding unit in supply closet
- 180 miles of sanitary sewer
- 38,000 people
- 6 full-time staff

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Program Results

Miles Inspected with SL-RAT: **54 Miles**

Cleaning only lines that score <=4

Required Cleaning: **0.6 Miles**

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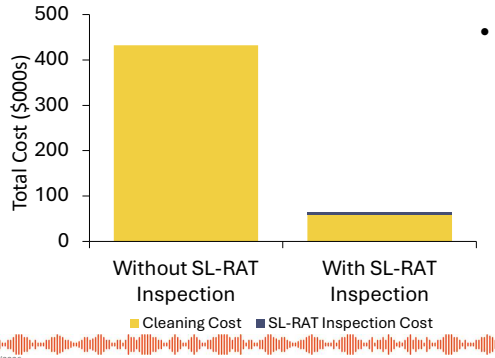
Program Results (cont.)



- Issues Discovered
  - Root Growth
  - Asphalt Chunks
  - Surcharged Manholes
  - Grease Buildup

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Benefits and Case Studies

Service Case Study: Bend, Oregon

- Purchased SL-RAT Unit in 2017
  - Over 4000 measurements taken
  - Over 830,000 feet measured
  - ~90% of lines measured score "Good"
- Service project in 2023
  - Increases City's overall inspection scope
    - 67,000 feet
    - 300 manholes
    - 10-days

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Service Project Timeline

1 – 2 Weeks	2 Weeks	1 Week
Project Planning	Data Collection	Final Deliverables
• Shapefiles are converted into working GIS Map • Live Dashboard is created to track real-time progress	• Service team inspected up to 20,000 feet per day • Follows ASTM Standard F3220-17	• Service Recap outlining results • Interactive GIS Dashboard

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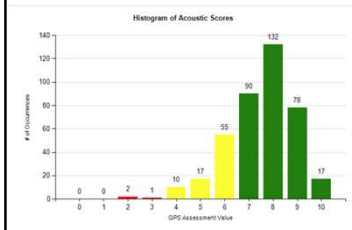
1% of Lines Recommended For Cleaning

Measurement Totals
402 total measurements



0% BLOCKED
1% POOR
20% FAIR
79% GOOD

Anticipated Benefit Summary

Total Feet Assessed	Estimated Cost to Clean All Pipe @ $1.00-$2.00/ft	After Assessment Feet Requiring Cleaning	Estimated Cost to Clean low score pipe (<=4) Pipe @ $1.15/ft	Anticipated Cost Saved After Assessment
68k	$68-136k	3k	$3.5k	$64.5-131.5k

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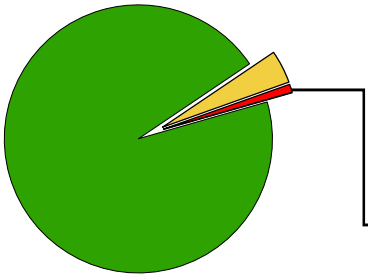
1% of Manholes Recommended For Additional Inspection



331 Manholes Inspected:
The majority inspected had no issues

Issues Found
Bad Collar
Sources of Infiltration

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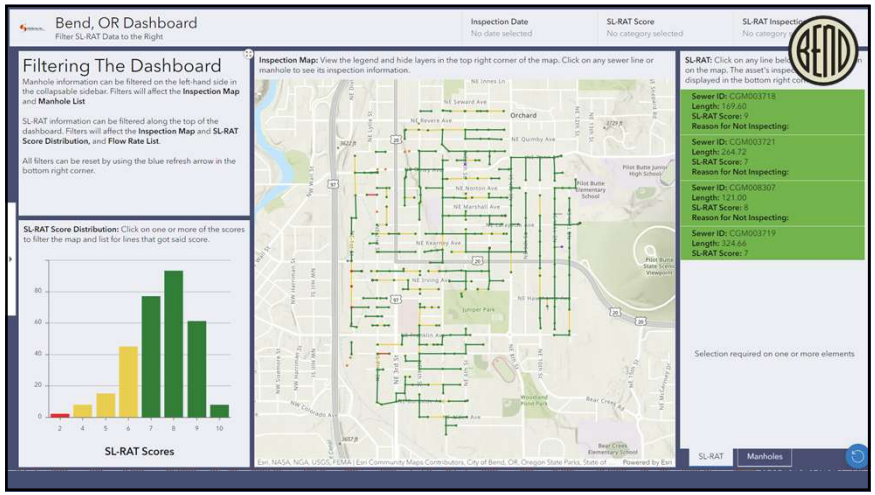

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Questions?

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Appendix

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Implementation

Purchase

- Recommended for established utilities
- Willing to devote the time to establish new maintenance protocol
- Includes
  - Training and Customer Support
  - One Year SL-DOG Subscription

Service

- Recommended for utilities who want cheap condition data without the hassle
- Full turnkey solution
- No administrative overheard
- Includes
  - GIS deliverables
  - Manhole Inspection

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Service Solution

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Service Offering

InfoSense Service Solution

- Trained InfoSense crew inspects 10-15k ft/day
- No admin overhead cost for client
- Minimal day-to-day management for client

- Custom deliverables
- Data QA/QC included

- Priced attractively per foot*
- Includes basic manhole inspections
- No capital investment

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Service Offering

Service Project Timeline

Phase 1	Phase 2	Phase 3
Project Planning	Data Collection	Final Deliverables
• Shapefiles are converted into working GIS Map • Live Dashboard is created to track real-time progress	• Service team inspects 10-15k feet per day • Follows ASTM Standard F3220-17	• Service Recap outlining results • Interactive GIS Dashboard • Photograph of every manhole inspected

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Included Basic Manhole Inspections

- Completed during SL-RAT inspections
- Data recorded in GIS
- Two pictures taken of every manhole
  - Lid and collar
  - Inside chamber

Inspection Fields

Manhole Condition

- Cover/Frame Condition
- Collar Condition
- Structure Condition
- Bench/Channel Condition

Backup Risks

- Inflow and Infiltration
- Debris

Mapping Inaccuracies

- Buried Manholes
- Location Changes
- Unmapped Assets

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Manhole Inspection Fields

Field	Common Problems	Rating
Cover (1)	• Mislabeled lids • Cracked lids • Buried under asphalt	Good/Fair/Poor/Urgent
Collar (2)	• Broken bricks • Cracks in cement	Good/Fair/Poor/Urgent
Structure (3)	• Broken bricks • I/I Source	Good/Fair/Poor/Urgent
Bench/Channel (4)	• Debris • I/I Source • Eroded channels	Good/Fair/Poor/Urgent
Inflow and Infiltration (5)	• Active surcharge • Signs of previous surcharge	None/Mild/Significant/Urgent
Debris (6)	• Gravel or bricks • Trash	None/Mild/Significant/Urgent

Real Photos from Past Projects

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Manhole Issues Are Frequently Independent of Blockage Issues

A surcharged manhole results in a score of 0

Debris in manhole but no flow impact

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Who We Work With

Local to the Midwest

- St. Louis Metropolitan Sewer District (MO)
- City of Green Bay (WI)
- City of Iowa City (IA)
- Village of Schaumburg (IL)
- City of Springfield (IL)
- City of Elmhurst (IL)
- City of Manhattan (KS)
- City of Sioux Falls (SD)
- Village of Bartlett (IL)
- City of Topeka (KS)
- St. Louis Metropolitan Sewer District (MO)
- City of Green Bay (WI)

Little Rock Water Reclamation Authority (AR)	Charlotte Water (NC)	Citizens Energy Group(IN)	City of Mountlake Terrace (WA)	City of Irving (TX)	Jefferson County (AL)	Santiago (Chile)
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City of New Bedford (MA)	Fredericksburg (VA)	Louisville MSD (KY)	City of Snohomish (WA)	County of Lake (CA)	City of Cocoa (FL)	Castle Rock Water (CO)
Rogers Water Utilities (AR)	New Castle County (DE)	City of Lafayette (IN)	Douglas County Sewer District (WA)	San Rafael (CA)	Gainesville Regional Utilities (FL)	City of Saratoga Springs (UT)
City of Norwich (CT)	Gastonia (NC)	Richmond Sanitary District (IN)	City of Westport (WA)	City of Killeen (TX)	Spartanburg (SC)	Ash Creek Special Service District (UT)
Salt Lake City (UT)	American Water-Fort Belvoir (VA)	City of Portage (MI)	City of Poulsbo (WA)	City of Mansfield (TX)	City of Tulsa (OK)	Layton City (UT)
	City of Durham (NC)	Fort Wayne (IN)	Alderwood Water & Wastewater District (WA)	Houston (TX)	Greenville (SC)	City of Saskatoon (SK)

...and over 1,000 more around the world

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Case Study: Green Bay, WI

Objective: Optimize cleaning program to more efficiently allocate resources and reduce sanitary sewer overflows.

- Population – 107,000
- Incorporated - 1854
- Brown County
- Paper and Packing Industry
- Over 110 square miles

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NJWEA - Winter Tech Transfer 2026 Cleaning and Inspection

Wastewater System Overview

- City of Green Bay Public Works maintains 465 miles of sanitary sewer
- Green Bay Metropolitan Sewerage District (New Water)
  - Built in 1975
  - Treats on average 41 million g/day from both Green Bay and 14 other surrounding communities
  - Maintains 78 miles of interceptors

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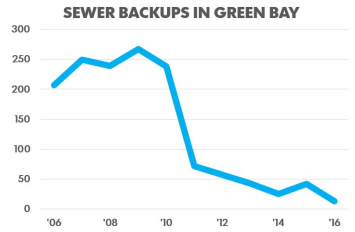
Program Before Acoustic Technology

- Goals
  - **Clean at least 500k feet of pipe per year**
  - **CCTV at least 500k feet of pipe per year**
- Hotspot Program – clean problem spot annually or more and areas around hot spot
- Reduce Sanitary Sewer Overflows (SSOs)



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Overview of Acoustic Program

- Purchased 1st SL-RAT August 2016
- Purchased 2nd SL-RAT May 2019
- Implemented condition-based maintenance strategy
- First two years of program
  - Inspecting over 1.4 million feet/year
  - Overkill – could not keep up with cleaning

After two years into program

- Inspecting ~500k ft of pipe per year
- Year-round sewer pipe inspection using acoustic technology
- Data managed in Cartegraph

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SL-RAT Workflow Overview

- 2 vehicles/2 crew members average about 50-60k feet/week
- SL-RAT scores directly inputted into ArcGIS mobile Collector app on tablet by operators in the field
- Scoring System
  - 0-5 – Fail – pipe segment is cleaned
  - 6-10 – Pass – no additional work required
- Jetting work order tickets generated automatically in ArcGIS for anything equal to or less than 5
- Examine/CCTV repeat failures for structural issues

SL-RAT Screened Footage

Year	Pass (ft)	Fail (ft)
2019	218k	342k
2020	544k	342k
2021	193k	261k
2022	349k	192k
2023	224k	168k
2024	182k	276k

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NJWEA - Winter Tech Transfer 2026 Cleaning and Inspection

Collection System Overview

- ~5 Year Maintenance Cycle both cleaning and CCTV
- Cleaning & Televising 500-600k ft/yr
- 17 crew members
- Equipment
  - 2 vans
  - 4 Vactors
  - 2 CCTV Trucks
  - CleverScan – manhole inspections
- ArcGIS

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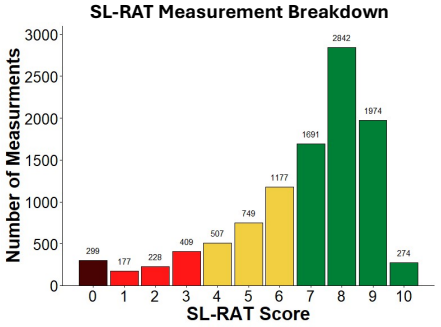
Green Bay SL-RAT Histogram

	Footage	Percent
Segment Cleaned (0-6)	30k	23%
No Cleaning Needed (7-10)	221k	77%



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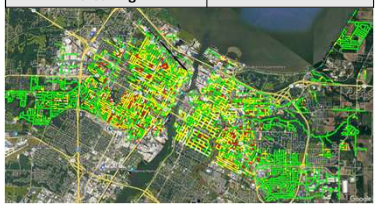
Acoustic Program Results

- Reduction in cleaning footage
- Increased visibility to entire system
- Reduction in SSOs
  - "These efforts include using sonic waves to gauge whether pipes are obstructed and closed-circuit television cameras to hunt down blockages and defects." – Green Bay Press Gazette

Total Footage Screened since 2019	**3.29 mil**
Total Footage Cleaned	**1.71 mil**
Total Footage Avoiding Cleaning	**1.58 mil**



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