Prioritizing Sewer Cleaning in Cincinnati with Acoustic Inspection

Todd Trabert & Randy Schneider
Wastewater Collection Division of MSD
Off-Road Sewers
Off-Road Inspection
Why Acoustic Inspection?

- EPA Tested
- Faster than CCTV
- No Flow Contact
- No Confined Space Entry
- Simple to Use
- Light Weight and Portable
- Battery Powered
- Durable
- Rapid Onsite Results – Under 3 min per segment
- GIS Integration – GPS Enabled
How Does Acoustic Inspection Work?

Transmitter
“Yells”

Receiver
“Listens”

Blockage
Gravity Sewer Asset Management (GSAM)
Gravity Sewer Asset Management (GSAM)

- Maintenance Risk Score is established by the number of cleaning activities over a 10 year period.
- More Cleaning equals higher Risk score
- Risk score drives frequency
Gravity Sewer Asset Management (GSAM)

<table>
<thead>
<tr>
<th>Maintenance Frequency</th>
<th>Consequence of Failure</th>
<th>Likelihood of Failure</th>
<th>Maintenance Risk Bin #</th>
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<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>1</td>
<td>2</td>
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<tr>
<td>8</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>7</td>
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<td>6</td>
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<td>1</td>
<td>5</td>
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<tr>
<td>5</td>
<td>3</td>
<td>2</td>
<td>6</td>
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<tr>
<td>4</td>
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<td>3</td>
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</tr>
<tr>
<td>4</td>
<td>2</td>
<td>3</td>
<td>8</td>
</tr>
</tbody>
</table>

Last Maintenance Activity Date

Transmitter “Yells”
Receiver “Listens”

Blockage

Planed Maintenance Activity Date
Field Process

Explorer for ArcGIS

Custom Workflow Field App

Flowfinity

Basic Inspection

Work Order Integration

Cityworks®
Empowering GIS
Assessment and Cleaning

WWC Equipment Rates

Search by Vehicle/Equipment Number

SL-RAT Acoustic Screening Work Order

Complete SL-RAT Evaluation
View All Records
View All Records - For Exporting

Manhole Access Inspections

View All Records
Ready for Desktop Review
Ready for Field Investigation
Review Complete
Field Investigation - Distance
<table>
<thead>
<tr>
<th>Work Order Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Order Number</td>
</tr>
<tr>
<td>Work Order Description</td>
</tr>
<tr>
<td>Sewer Segment ID</td>
</tr>
<tr>
<td>Entity ID</td>
</tr>
<tr>
<td>GIS Sewer Length</td>
</tr>
</tbody>
</table>

Completed By: Trabert, Todd

Arrival Date/Time: [ ]
Main Sewer SL-RAT Evaluation

Please complete the SL-RAT Evaluation of

Need help? SL-RAT Equipment Job Aid

Are you able to move forward with the Main Sewer SL-RAT Evaluation?

Yes

Pipe Length for SL-RAT Input 50

Enter RX Number, or use Touch Barcode Icon to Scan

SL-RAT RX Equipment Number 000104

SL-RAT Displayed Value 8
The following Comment will be added to Work Order

SL-RAT Evaluation Score of "8" completed on 6/24/2019 at 12:22 PM by Trabert, Todd.
Visual Comparison
RA T Score: 0

Camera Underwater
RA T Score:  2
RAT Score: 4

TV MAINLINE INSPECTION IMAGE REPORT

Type of Pipe: Vitrified Clay Pipe
Pipe Size: 0"
Section Length: 3'
Sewer Length: 255.9'
Crew Leader: N POWERS
Municipality: ADDY

Company: MSD
Street: 374 THREE RIVERS PKWY

Printed on: 06/21/2019 15:12

TV Date: 3/28/2018 12:00:00 AM

Maintenance Number: 4505000
Sewer Segment: 574098

RAT Score: 5
RAT Score: 6
RA T Score: 6

TV MAINLINE INSPECTION IMAGE REPORT

Metropolitan Sewer District
Wastewater Collection Division

Sewer Segment: 579171
Maintenance Number: 4505000

TV Date: 11/14/2018 12:00:00 AM

Company: MSD
Street: 11500 FARMINGTON RD

Type of Pipe: 
Pipe Size: 12"
Section Length: 0'
Sewer Length: 337.4'
Crewleader: MS SMITH
Municipality: FRSTPK
Cincinnati Acoustic Scores Totals

<table>
<thead>
<tr>
<th>Range</th>
<th>Percent of Total</th>
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<tbody>
<tr>
<td>0-6</td>
<td>40.86%</td>
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<tr>
<td>7-10</td>
<td>59.14%</td>
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</table>

Acoustic Inspection Results
~120 Million Feet Inspected in ~280 Utilities

- Poor: 11%
- Fair: 17%
- Good: 72%
## Data Analysis

<table>
<thead>
<tr>
<th></th>
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<td>6.00</td>
<td>141.29</td>
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<td>5.00</td>
<td>72.00</td>
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<td>12.00</td>
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<td>Root Cut</td>
<td>1,122.00</td>
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934,838.77  81,568.11

59,483,810.89
Data Analysis

• Nearly 5,000 Inspections with one crew in less than 1,000 hours.
• Less than $0.10 per foot to assess the maintenance condition of Assets
Data Analysis

- The tables below show the costs savings for the assets where the reading was above 6 and TV and cleaning were not needed.
- Approximately 3% of the cost to clean and 4% of the cost to TV

<table>
<thead>
<tr>
<th>Count of RAT Screenings</th>
<th>RAT Costs</th>
<th>Maintenance Recommendation</th>
<th>Estimated Maintenance Costs</th>
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<tbody>
<tr>
<td>900</td>
<td>$8,733.00</td>
<td>Cleaning</td>
<td>$306,000.00</td>
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<td>187</td>
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<td>1087</td>
<td>$11,447.00</td>
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<td>$369,580.00</td>
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<table>
<thead>
<tr>
<th>Count of RAT Screenings</th>
<th>RAT Costs</th>
<th>Estimated TV Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1087</td>
<td>$11,447.00</td>
<td>$295,664.00</td>
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Lessons Learned

• Successful in Minimizing Cleaning/CCTV
• Acoustic Screening worked in Larger Sewers
• Not Accurate in Combined Sewers during Rain
• Many Assets Inaccessible
  • Buried Manholes
  • Difficult locations
• Cleaning not necessarily needed in the 5 to 6 range
• Good opportunity to identify manhole defects
• Crews can use time onsite to perform manhole and surface condition assessments
Next Steps

• Adjust RAT Reviews down to “5” and below
• Track Follow up Work Orders
  • TV & Cleaning
  • Manhole Locating
  • Reschedule RAT Work Orders
• Modify Flowfinity App to Capture:
  • Basic Manhole Inspection
  • Ground Survey (Cave-ins, Sunken Areas)
  • Record Signs of Overflow/Surcharging
  • GIS Updates
Questions?