PROVEN TECHNOLOGIES, NEW WAYS OF THINKING

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Director of Water Utilities Department
City of Arlington
THE CITY OF ARLINGTON

- Centered in the Dallas/Fort Worth metropolitan area
- Population over 370,000 (50th Largest in USA)
- City of Arlington is home to The University of Texas at Arlington, General Motors, D R Horton, The Original Six Flags, The Texas Rangers and The Dallas Cowboys
ARLINGTON WATER UTILITIES

- Daily Water Demands 35 MGD to 115 MGD
- Rated Water Production Capacity of 172.5 MGD
- 1,425 Miles of Public Water Main
  - 6-inch to 54-inch in diameter
- 1,222 miles of Sanitary Collection System
  - 6-inch to 72-inch in diameter
- Average Pipe Age 29 Years
Rethinking Renewal Prioritization

- Age rarely correlates with condition (Water Research Foundation)
- 70% to 90% of replaced pipelines have remaining life (US EPA)
- “New” technology may be proven technology
- Failure of large mains cause biggest impact
Rethinking Renewal Prioritization

• Move beyond age, material and failure focus
• Assess actual pipe condition
• Savings from focused pipe replacement fund transition to proactive replacement
Goals

• Maximizing useful life of assets
• Efficient spending of replacement dollars
• Avoid major unplanned repairs
• Make better design decisions for new mains
Green Oaks Water Transmission Main 2016 Condition Assessment

• 2.6 miles, 42”, 48” & 54”, Prestressed Concrete Cylinder Pipe (C301), 1982
• Estimated Replacement Cost $10,500,000
• Assessment Cost $286,500
Green Oaks Water Transmission Main 2016 Condition Assessment

- Assessment Results
  - 599 pipe segments
  - 27 segments with wire breaks (4.5%)
  - 6 segments with 25+ wire breaks (1.0%)
  - Cost avoidance of $7,000,000

- Diagram:
  - 572 Pipes No Distress 95.5%
  - 27 Pipes with Broken Wire Wraps 4.5%
LARGE DIAMETER SANITARY SEWER CONDITION ASSESSMENT PROGRAM

City of Arlington and University of Texas at Arlington Collaboration
66-Inch Sanitary Sewer Failure

- Installed in 1983
- 66-inch RCP Sanitary Sewer
- Repair Cost $138,000
Inspection Project Scope

- Inspect 48 miles of 24-inch to 72-inch Sanitary Sewer Main
- AWU / UTA partnership
  - Pre-Inspection Research
  - HD CCTV, Sonar and Laser Inspection
  - Laboratory Materials Testing (Planned)
  - Data Analysis and Report Summarizing Findings
  - CIP Development/Risk Based Assessment
MSI Inspection Equipment

- Multi-Sensor Inspection Platforms
- HD CCTV Camera
- Laser Ring Profiler
- Sonar
Collected Data (Good Condition)
Collected Data (Bad Condition)
Collected Data (Bad Condition)
UTA Research Enhancements

- Validated life cycle analysis
- Core sample confirmation
- Customized output
- Partnering with a nationally recognized pipe research institution
### Pipe Critical Defect Summary

**LINE INSPECTION SUMMARY**

<table>
<thead>
<tr>
<th>Asset Number</th>
<th>Inspection Number</th>
<th>Upstream Manhole</th>
<th>Downstream Manhole</th>
<th>Observed Material</th>
<th>Observed Pipe Length</th>
<th>Observed Pipe Diameter</th>
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</thead>
<tbody>
<tr>
<td>D09SL0105</td>
<td>2</td>
<td>D09MH0045</td>
<td>D09MH0108</td>
<td>VCP</td>
<td>590.8 ft</td>
<td>36 in</td>
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**OBSERVATION METRIC**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Observation</th>
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<tbody>
<tr>
<td>Distance Planned (ft.)</td>
<td>592</td>
</tr>
<tr>
<td>Percentage of Line Not Inspected</td>
<td>0%</td>
</tr>
<tr>
<td>Total Collapsed</td>
<td>0</td>
</tr>
<tr>
<td>Total Fractures Multiple</td>
<td>0</td>
</tr>
<tr>
<td>Total Fractures Hinge</td>
<td>0</td>
</tr>
<tr>
<td>Total Fractures Longitudinal</td>
<td>0</td>
</tr>
<tr>
<td>Total Fractures Circumferential</td>
<td>0</td>
</tr>
<tr>
<td>Broken</td>
<td>0</td>
</tr>
<tr>
<td>Deformed Rigid</td>
<td>0</td>
</tr>
<tr>
<td>Joint Offsets</td>
<td>0</td>
</tr>
<tr>
<td>Total Roots Occurrences</td>
<td>0</td>
</tr>
<tr>
<td>Level 5 Defects</td>
<td>0</td>
</tr>
<tr>
<td>Level 4 Defects</td>
<td>0</td>
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<tr>
<td>Total Defects</td>
<td>0</td>
</tr>
<tr>
<td>Total Debris Volume (ft³)</td>
<td>251.2</td>
</tr>
<tr>
<td>Total Deposits Volume (in³)</td>
<td>50221.4</td>
</tr>
<tr>
<td>Maximum Blockage (%)</td>
<td>18.1</td>
</tr>
<tr>
<td>Maximum Deposit Height (in)</td>
<td>2.8</td>
</tr>
</tbody>
</table>
## Debris and Deposit Blockage

<table>
<thead>
<tr>
<th>Rank</th>
<th>Line ID</th>
<th>Pipe Material</th>
<th>Pipe Diameter (in.)</th>
<th>Peak Area Blocked by Deposits (%)</th>
<th>Peak Area Blocked by Debris (%)</th>
<th>Peak Combined Blockage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D095L0101</td>
<td>VCP</td>
<td>36</td>
<td>2.6</td>
<td>9.7</td>
<td>10.2</td>
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<tr>
<td>2</td>
<td>D095L0105</td>
<td>VCP</td>
<td>36</td>
<td>1.7</td>
<td>17.26</td>
<td>18.1</td>
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<td>3</td>
<td>D095L0222</td>
<td>VCP</td>
<td>36</td>
<td>1.4</td>
<td>7.5</td>
<td>7.67</td>
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</tbody>
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**Diagram:**
- Area Blocked by Deposits
- Water Level
- Area Blocked by Debris
Results We Can Act On

Debris and Deposit Blockage

Figure A1.1.1: Deposit thickness per cross-section.

Figure A1.2.1: Debris height per cross-section.
Results We Can Act On

Root Intrusion
WHAT YOU DON'T KNOW CAN HURT YOU
66-Inch Sanitary Sewer Failure Survey Results

- Total Replacement Scope
  - 14,875’ of 66” Main
  - 3,450’ of 60” Main

- Assessment Results
  - 1,000’ Pipe with Measurable Wall Loss
  - Abandoned Meter Station (H2S Point Source)
  - Cost avoidance of $17,097,000

17,322’
Low Corrosion
94.5%

1000’
Significant Corrosion
5.5%
24-Inch Highway Crossing

- Heavily Corroded Ductile Iron Pipe
- 1 Large Obstruction
- 5ft drop at unnecessary wet well
- Pipe Age: 34 years
- Parallels creek
AWU BOLDLY GOING WHERE NO UTILITY HAS GONE BEFORE