



# What Lies Beneath?

## Identifying and Maintaining Buried Wastewater Assets

North Texas Municipal Water District's  
Condition Assessment Program





## Agenda

- **Project Background and Drivers**
- **Condition Assessment Program (CAP)**
- **Benefits and Lessons Learned**



# UNDERGROUND CONSTRUCTION TECHNOLOGY

The Underground Utilities Event | July 13-15, 2021 | Music City Center | Nashville, TN

## REGIONAL PROVIDER: WATER, WASTEWATER, SOLID WASTE



SERVE up to **80** COMMUNITIES

Service area of 2,200 square miles in 10 counties

Serving 1.8 million people in one of the fastest-growing regions in the country

### BY THE NUMBERS

### DID YOU KNOW?



**18**

MAJOR RAW & TREATED WATER PUMP STATIONS

**6**

WATER TREATMENT PLANTS  
806+ MGD Capacity  
(million gallons/day)

**575+**  
MILES

WATER TRANSMISSION PIPELINES



**250+**  
MILES

LARGE-DIAMETER WASTEWATER PIPELINES

**13**

WASTEWATER TREATMENT PLANTS

**151+**  
MGD

WASTEWATER TREATMENT CAPACITY  
MGD (million gallons/day)



**3** TRANSFER STATIONS

up to 3,295 tons of solid waste/day

**1 million+**  
tons/year accepted at landfill





## HISTORY OF NTMWD

### 10 Original Member Cities

Farmersville, Forney, Garland, McKinney, Mesquite, Plano, Princeton, Rockwall, Royse City, and Wylie

*“We decided we were all in this together. We couldn’t do it separately.”*

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- 1951 – Created by Texas Legislature to Provide Water Service
- 1956 – Began Providing Treated WATER to Member Cities
- 1970s – Expanded to WASTEWATER Service
- 1973 – Richardson added as Member City
- 1980s – Expanded to SOLID WASTE Service
- 1998 – Allen added as Member City
- 2001 – Frisco added as Member City

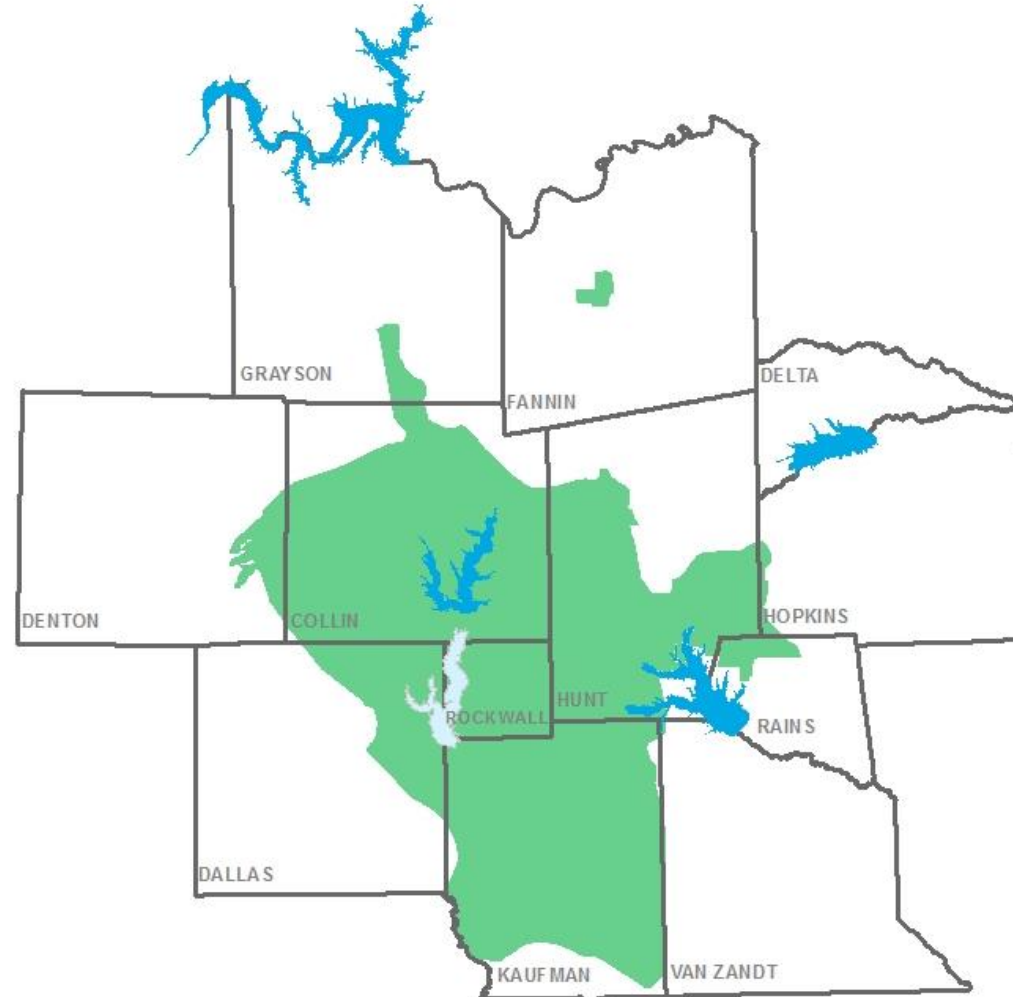


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## REGIONAL PROVIDER: WATER, WASTEWATER, SOLID WASTE

- *Serve 10-county area nearly twice the size of Rhode Island*
- *Shared systems provide cost-efficiencies for communities served*



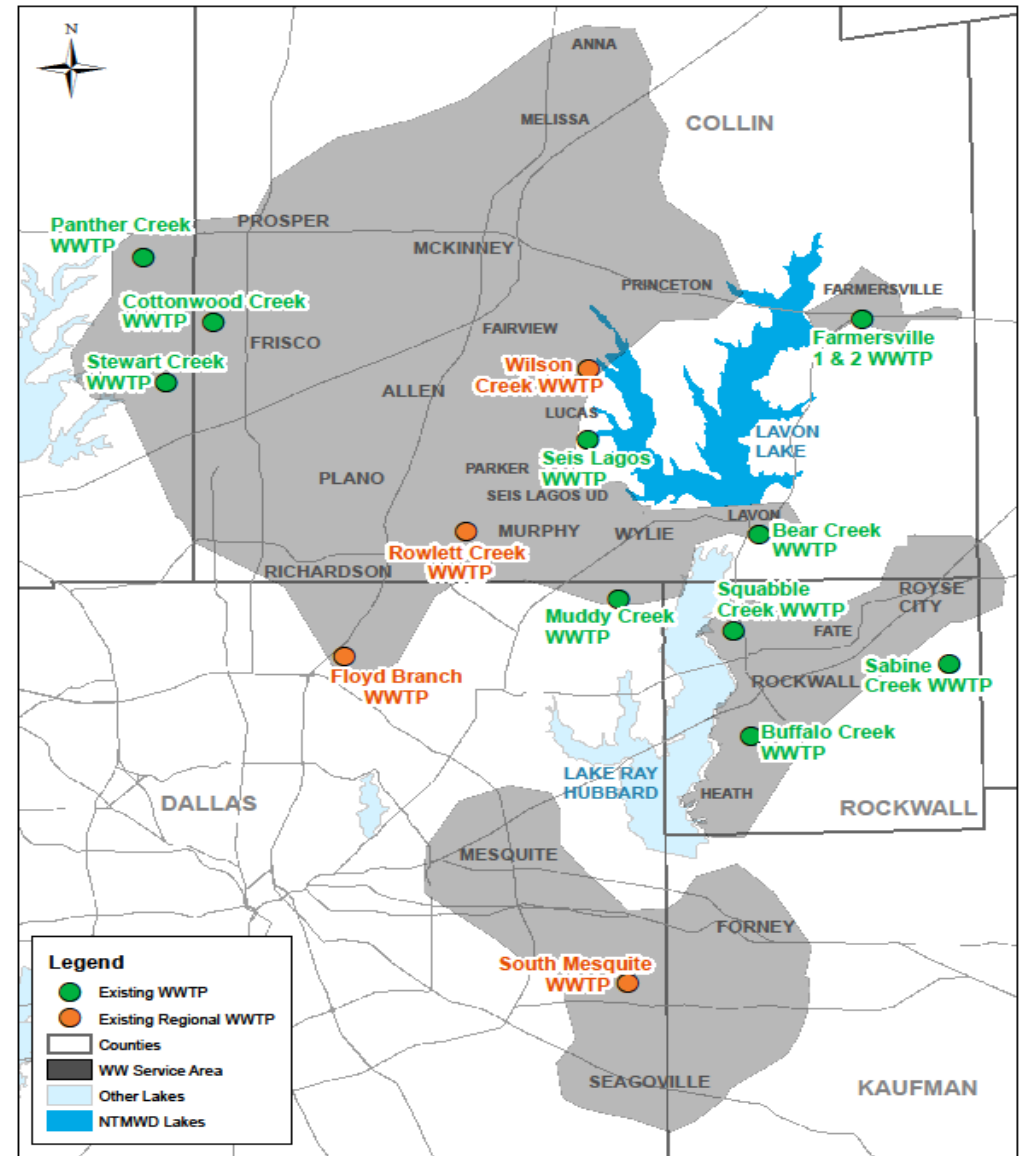


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## WASTEWATER TREATMENT

- **Entities Served**
  - 24 communities
  - Approximately 1.3 million North Texas Residents
- **Regional Wastewater System**
  - Wilson Creek WWTP 64.00 MGD
  - South Mesquite WWTP 33.00 MGD
  - Rowlett Creek WWTP 24.00 MGD
  - Floyd Branch WWTP 4.75 MGD
  - TOTAL 125.75 MGD**
- **Sewer System Plants**
  - Number of Sewer System Plants in Operation: 9
  - Total Sewer System Capacity: 34 MGD
  - Each plant is separate independent system and contracts
- **Total Wastewater Treatment Capacity: 159.45 MGD**





## Drivers and Objectives for Condition Assessment Program

- EPA CMOM and Texas SSOI Commitment
- 10-year Program to inspect the gravity Collection System
- Asset Management Approach to Identify Baseline Condition Assessment
- Single Data Repository for Inspections that integrate with GIS
- Better Data for Decisions Regarding Capital Investments
- Maximize Value of Rehabilitation Budgets for Aging Infrastructure

### Collection System Capacity, Management, Operation, and Maintenance Plan

Prepared by

North Texas Municipal  
Water District





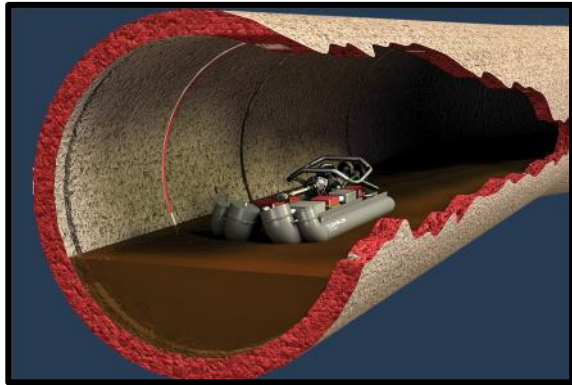
## Agenda

- Project Background and Drivers
- **Condition Assessment Program (CAP)**
- Benefits and Lessons Learned

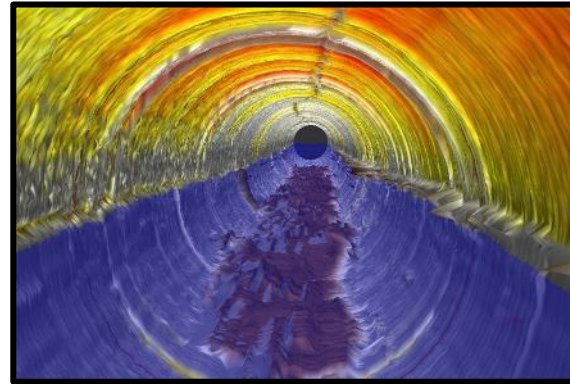




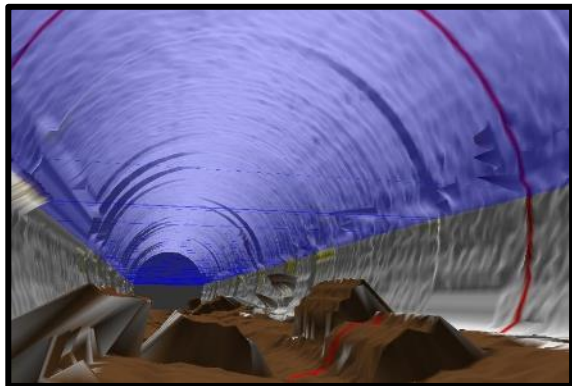
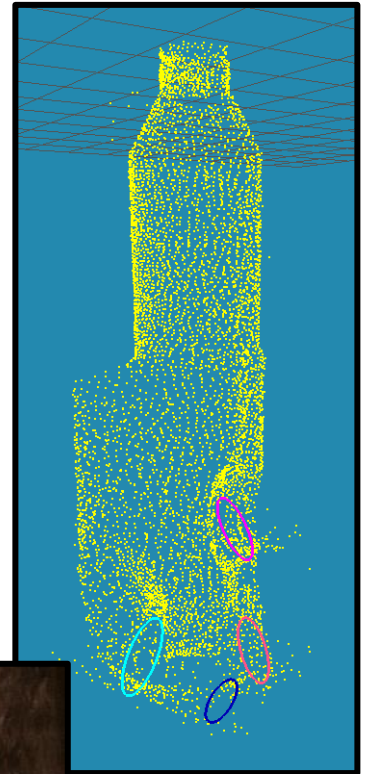
## Gravity and Manhole Inspection Technologies



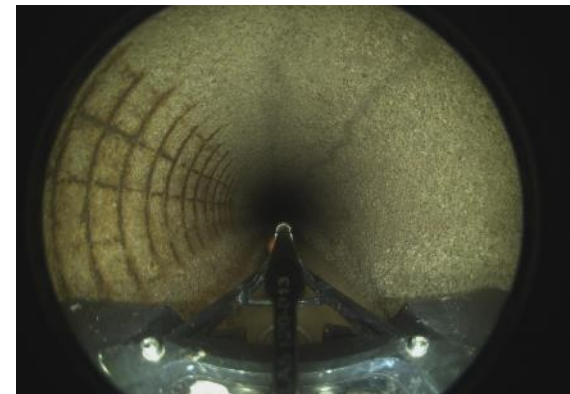
Multi Sensor Inspection (MSI)



3D Laser Inspection



Sonar Inspection



HD Video

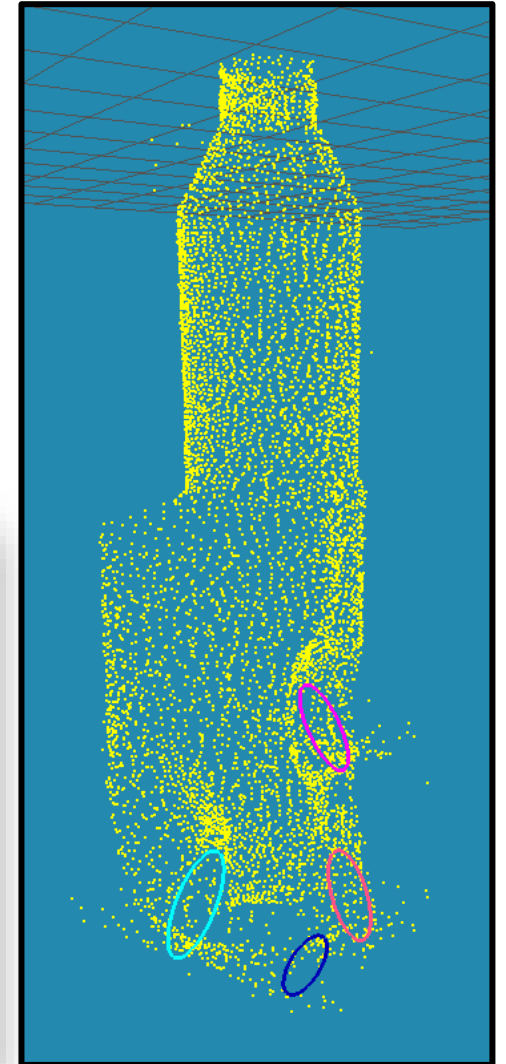


Digital Manhole Inspections



## Digital Manhole Inspections

- Accurate point cloud measurements
- Identify defects, pipeline locations and inverts, manholes, and lining materials
- No manned entry required
- Integration into CCTV management software





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## Multi-Sensor Inspections



WATTERS BRANCH WWPI45715.0010

WWMH45715 11 July 2017 Downstream 10:02:07 WWMH45710 23.0 in Polyvinyl Chloride 56.5ft

| #     | Δ2 | Distanc... | Δ1 Observati... | Dim. 1 | Dim. 2 | %    | Time | Code | Remarks                                      | Grade | Deteriorati... | R.U.L. (wa) | Clock 1 | Fail Date ( | Clock 2 | Cont. |
|-------|----|------------|-----------------|--------|--------|------|------|------|--|-------|----------------|-------------|---------|-------------|---------|-------|
| 16627 | 1  | 0          | Upstream        |        |        |      | 0    | MHUB | Original_Code: AMH Remarks: WWMH45715        | 0     |                |             |         |             |         |       |
| 16628 | 2  | 0          | Other / Gen     |        |        | 20.0 | 000  |      | Original_Code: MWL Remarks:                  | 0     |                |             |         |             |         |       |
| 16604 | 3  | 2.4        | Laser/Son...    | 2      |        |      | 5    | LSD  | Ovality to 1.6%                              | 0     |                | 0           |         | 0           |         |       |
| 16605 | 4  | 2.4        | Laser/Son...    | 0      |        |      | 5    | LSD  | Debris to 0.0"                               | 0     |                | 0           |         | 0           |         |       |
| 16606 | 5  | 50         | Laser/Son...    | 2      |        |      | 147  | LSD  | Ovality to 2.5%                              | 0     |                | 0           |         | 0           |         |       |
| 16607 | 6  | 50         | Laser/Son...    | 0      |        |      | 147  | LSD  | Debris to 0.0"                               | 0     |                | 0           |         | 0           |         |       |
| 16608 | 7  | 54.7       | Laser/Son...    |        |        |      | 156  | LSG  | Point of Interest - Pipe deformed until 70h  | 0     |                | 0           |         | 0           |         |       |
| 16609 | 8  | 61.1       | Laser/Son...    | 5      |        |      | 169  | LSD  | Maximum Debris - To 4.9"                     | 0     |                | 0           |         | 0           |         |       |
| 16610 | 9  | 66.4       | Laser/Son...    | 20     |        |      | 179  | LSD  | Maximum Ovality - To 19.5%                   | 0     |                | 0           |         | 0           |         |       |
| 16611 | 10 | 100        | Laser/Son...    | 2      |        |      | 245  | LSD  | Ovality to 1.7%                              | 0     |                | 0           |         | 0           |         |       |
| 16612 | 11 | 100        | Laser/Son...    | 0      |        |      | 245  | LSD  | Debris to 0.0"                               | 0     |                | 0           |         | 0           |         |       |
| 16613 | 12 | 147.6      | Laser/Son...    |        |        |      | 339  | LSG  | 3D Laser Sonar Scan - Internal Pipe Overview | 0     |                | 0           |         | 0           |         |       |
| 16614 | 13 | 150        | Laser/Son...    | 2      |        |      | 344  | LSD  | Ovality to 2.5%                              | 0     |                | 0           |         | 0           |         |       |

00:02:54/00:14:26

Project: NIMWD\_SnapShot File: X:\NIMWD\Media\_Files\Picture\WWPI45715.0010\_WWMH45710\_LSO\_9.jpg Distance: 0% of CD used. 0% Free Space. 1/16/2018 9:58 AM



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## Digital Manhole Inspections



ViewT

- Asset
- PO Number
- Weather
- Date Cleaned
- Surveyed By: JAW
- Certificate Number: U-105-597
- Sheet Number: 65
- Date
- Purpose: Pre rehabilitation survey
- Additional Info: ADDED MANHOLE
- Pre-cleaning
- Customer: NORTH TEXAS MUNICIPAL WATER DI
- Work Order
- Inspection Status: Remote Inspection
- Evidence Surcharge: No
- Potential for Runoff
- Manhole Number: WWMH # 45861
- Access Type: Manhole
- MH Use: Sanitary
- Category
- Owner: NOTH TEXAS MUNICIPAL WATER DIS
- Rim to Invert: 24.3
- Rim to Grade: 0
- Grade to Invert
- Year Built
- Year Renewed
- Cover Condition Missing: False
- Cover Type Bolted: False
- Cover Type Vented: False
- Cover Type Solid: True
- Cover Type Locking: False
- Cover Type Hatch Single: False
- Cover Type Hatch Double: False
- Cover Type Inner Cover: False
- Cover Type Gasketed: False
- Cover Type Lamphole: False
- Cover Material: Cast Iron
- Hole Number: 0
- Hole Diameter

DN 1200    Z: 90"    L: 5.80 m    Pos: 3h, 9"    Bl: 23"

| Distance | Observation Text | Dimension 1 | Dimension 2 | Percent | At Joint                 | Clock Position 1 | Clock Position 2 | Remarks | Continuous | Component | Observation Code | VCR Time | Digital Time | Has Step                 |
|----------|------------------|-------------|-------------|---------|--------------------------|------------------|------------------|---------|------------|-----------|------------------|----------|--------------|--------------------------|
| 0        |                  |             |             |         | <input type="checkbox"/> | 12               | 12               |         |            | CMI       | SCP              |          |              | <input type="checkbox"/> |
| 0        |                  |             |             |         | <input type="checkbox"/> |                  |                  |         |            | ADD       | MGO              |          |              | <input type="checkbox"/> |
| 0        |                  |             |             |         | <input type="checkbox"/> |                  |                  |         |            | ADD       | MGO              |          |              | <input type="checkbox"/> |
| 0        |                  |             |             |         | <input type="checkbox"/> |                  |                  |         |            | ADD       | MGO              |          |              | <input type="checkbox"/> |
| 0.6      |                  |             |             | 10      | <input type="checkbox"/> | 12               | 12               |         |            | CMI       | ISSR             |          |              | <input type="checkbox"/> |
| 0.6      |                  |             |             |         | <input type="checkbox"/> | 12               | 12               |         |            | CMI       | SAV              |          |              | <input type="checkbox"/> |
| 2.4      |                  |             |             |         | <input type="checkbox"/> | 12               | 12               | S01     |            | COI       | SRI              |          |              | <input type="checkbox"/> |
| 16.4     |                  |             |             |         | <input type="checkbox"/> | 12               | 12               | F01     |            | COI       | SRI              |          |              | <input type="checkbox"/> |
| 16.5     |                  |             |             |         | <input type="checkbox"/> | 12               | 12               | S02     |            | WI        | SAV              |          |              | <input type="checkbox"/> |
| 22.8     |                  |             |             |         | <input type="checkbox"/> | 12               | 12               | F02     |            | WI        | SAV              |          |              | <input type="checkbox"/> |
| 22.8     |                  |             |             |         | <input type="checkbox"/> | 12               | 12               |         |            | B         | SAV              |          |              | <input type="checkbox"/> |



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## GIS Integration into IT Pipes

The screenshot displays the IT Pipes software interface. On the left, a data table lists pipe segments with columns for Location, From Node, To Node, GIS Diameter, and Measured Di. The main area is a GIS map showing a residential neighborhood with a network of pipes overlaid in green. A pop-up window for a specific pipe segment (WWPI42716.0010) provides detailed information.

| Location    | From Node | To Node   | GIS Diameter | Measured Di. |
|-------------|-----------|-----------|--------------|--------------|
| 145750.0... | WWMH45750 | WWMH45740 | 24           | 20           |
| 145740.0... | WWMH45740 | WWMH45730 | 24           | 20           |
| 145730.0... | WWMH45730 | WWMH45720 | 24           | 20           |
| 145720.0... | WWMH45720 | WWMH45715 | 24           | 23           |
| 145715.0... | WWMH45715 | WWMH45710 | 30           | 23           |
| 145710.0... | WWMH45710 | WWMH45705 | 30           | 23           |
| 145705.0... | WWMH45705 | WWMH45700 | 24           | 29           |
| 145700.0... | WWMH45700 | WWMH45692 | 21           | 29           |
| 145690.0... | WWMH45690 | WWMH45685 | 21           | 20           |

WWPI42716.0010 (1 of 2)

- OBJECTID: 1023
- LEGACY\_ID: 1362
- Name: Rowlett Crk/Russell Crk
- YR\_INST: 1986
- MATERIAL: RCCP 301
- DIAMETER: 39
- COEFF: 0.013
- Owner: Plano
- Aer\_Cross:
- [Zoom to](#)





## Condition Assessment Program Goals and Progress

|   | Total   | FY17    | FY18    | FY19    | FY20    | FY21*    |
|---|---------|---------|---------|---------|---------|----------|
| <b>Cumulative Gravity Pipeline (LF)</b> |         |         |         |         |         |          |
| Goal                                    | 710,000 | 71,000  | 142,000 | 213,000 | 284,000 | 355,000  |
| Actual                                  |         | 101,605 | 168,536 | 254,770 | 339,736 | 371,183  |
| <b>Cumulative Manholes</b>              |         |         |         |         |         |          |
| Goal                                    | 1,800   | 180     | 360     | 540     | 720     | 900      |
| Actual                                  |         | 263     | 993     | 1,257   | 1,290   | 1,352    |
| <b>Cumulative Force Main Inspection</b> |         |         |         |         |         |          |
| Actual                                  |         |         |         |         | 5 miles | 10 miles |

\*In progress, final quantities pending



## Remaining Useful Life (RUL) Scores

|       |                  |                  |                  |                 |                |
|-------|------------------|------------------|------------------|-----------------|----------------|
| Score | 1                | 2                | 3                | 4               | 5              |
| RUL   | 36 - 50<br>years | 21 - 35<br>years | 11 - 20<br>years | 3 - 10<br>years | 0 - 2<br>years |

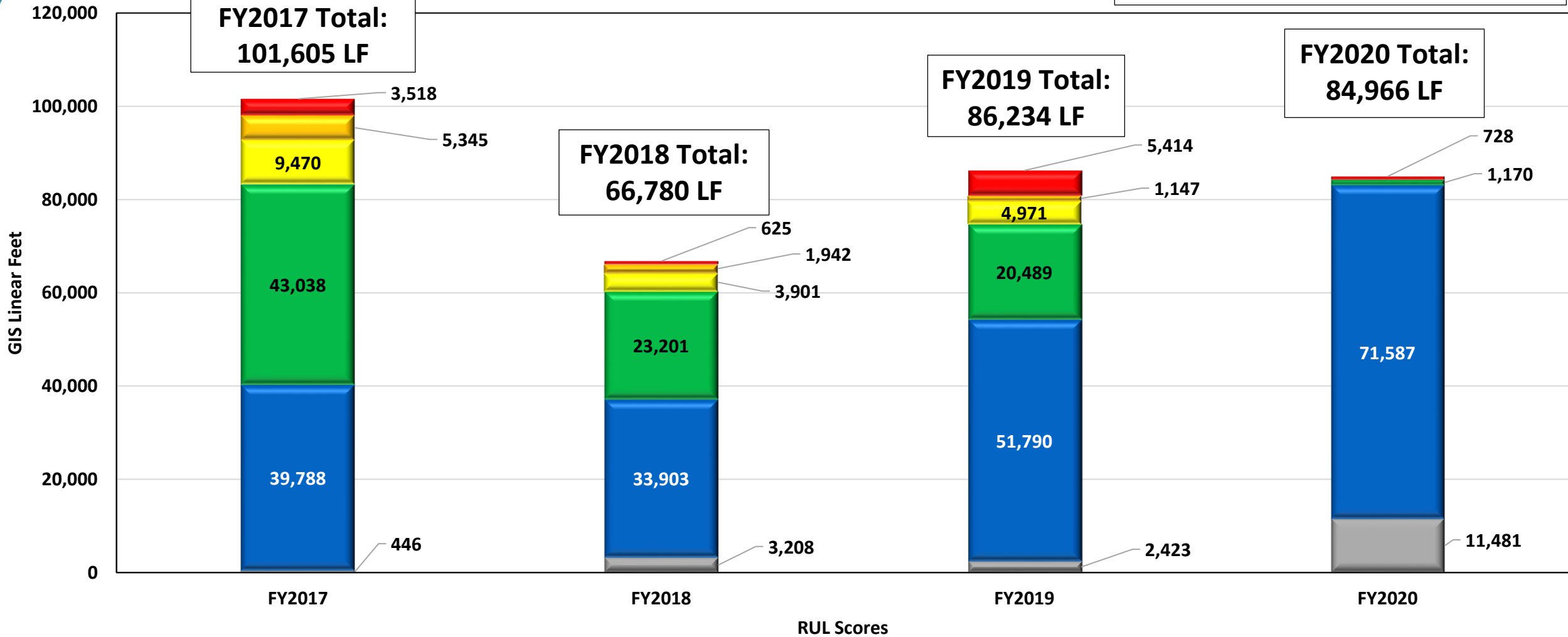


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## Pipeline Inspection Results

339,585 LF Inspected of 710,000 LF Total  
48% Complete



\*GIS Footage at Time of Inspection

■ Sonar Only ■ 1 ■ 2 ■ 3 ■ 4 ■ 5

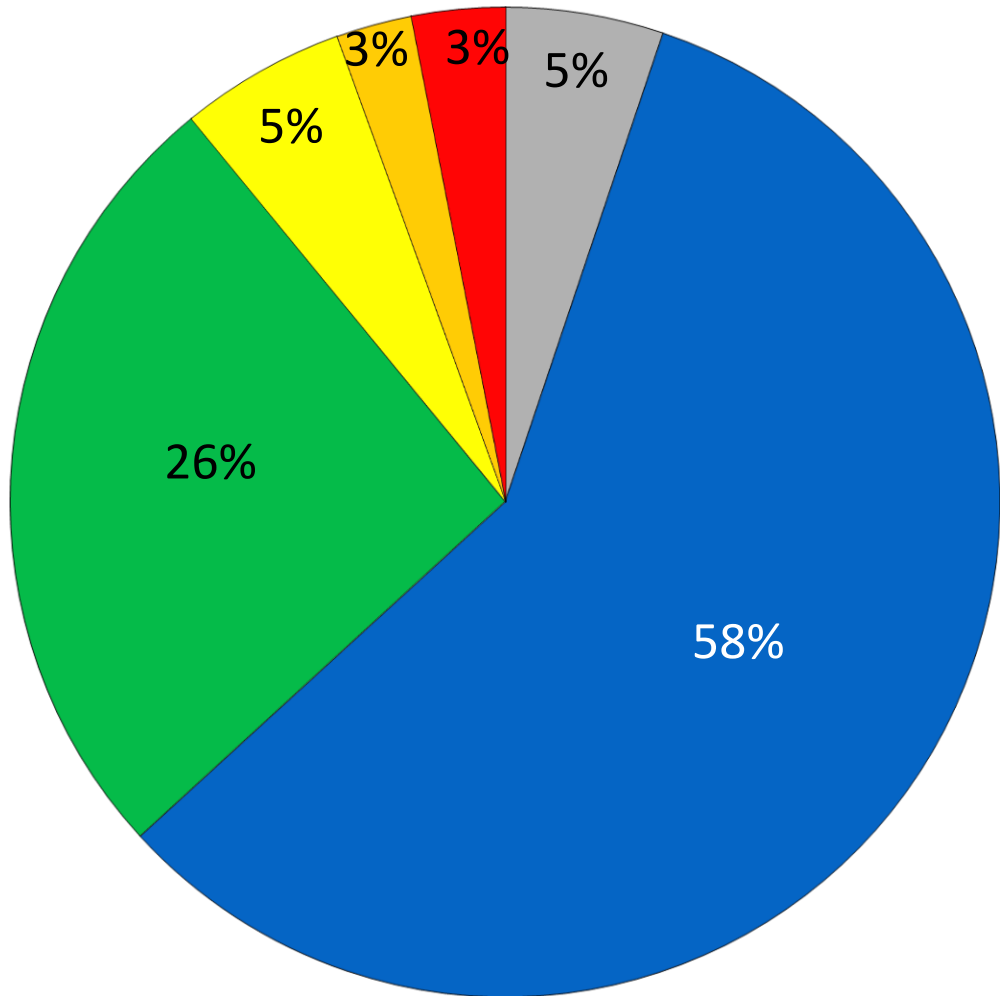




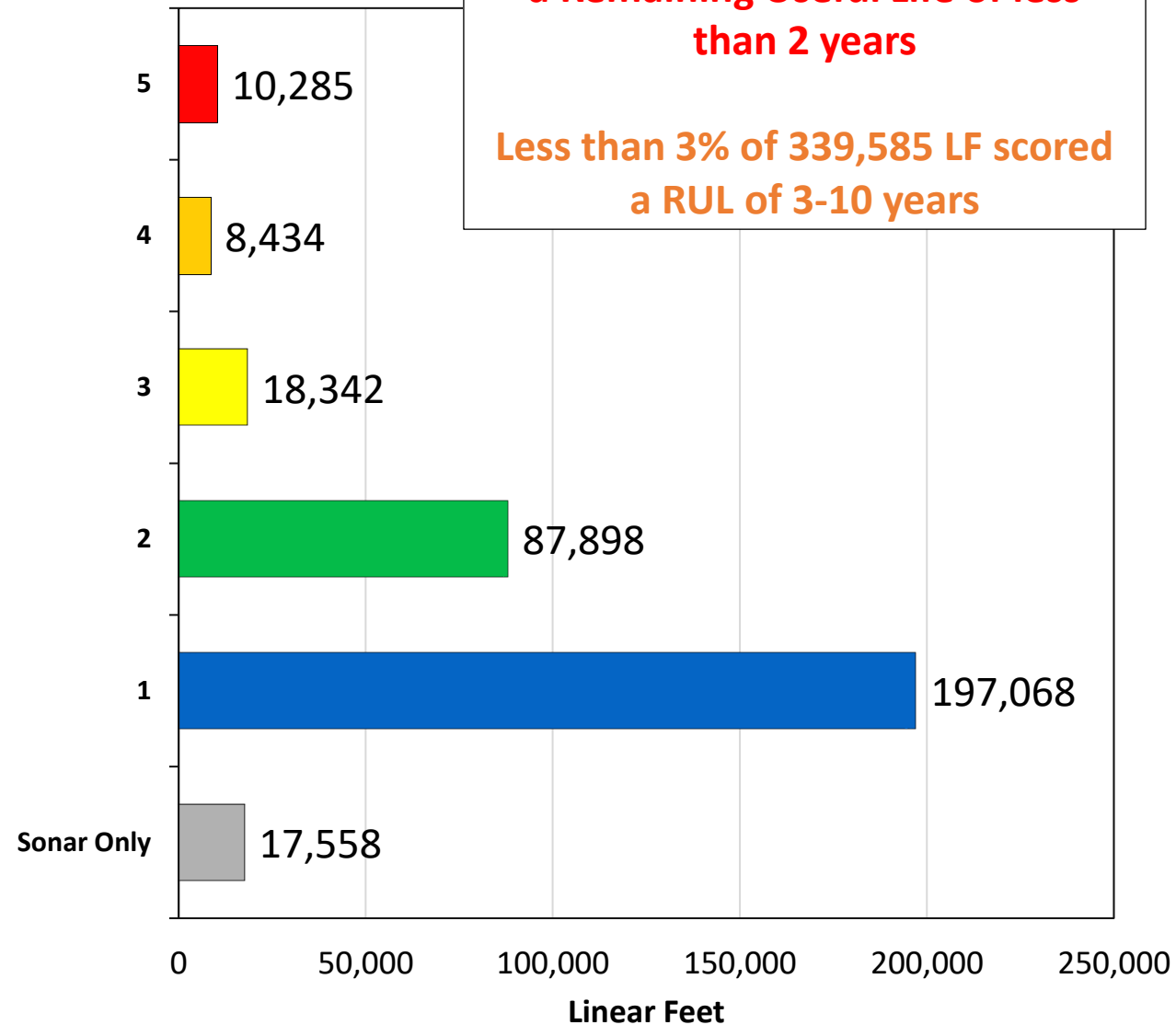
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## Pipeline Inspection Results



■ Sonar Only ■ 1 ■ 2 ■ 3 ■ 4 ■ 5



**Less than 3% of 339,585 LF scored a Remaining Useful Life of less than 2 years**

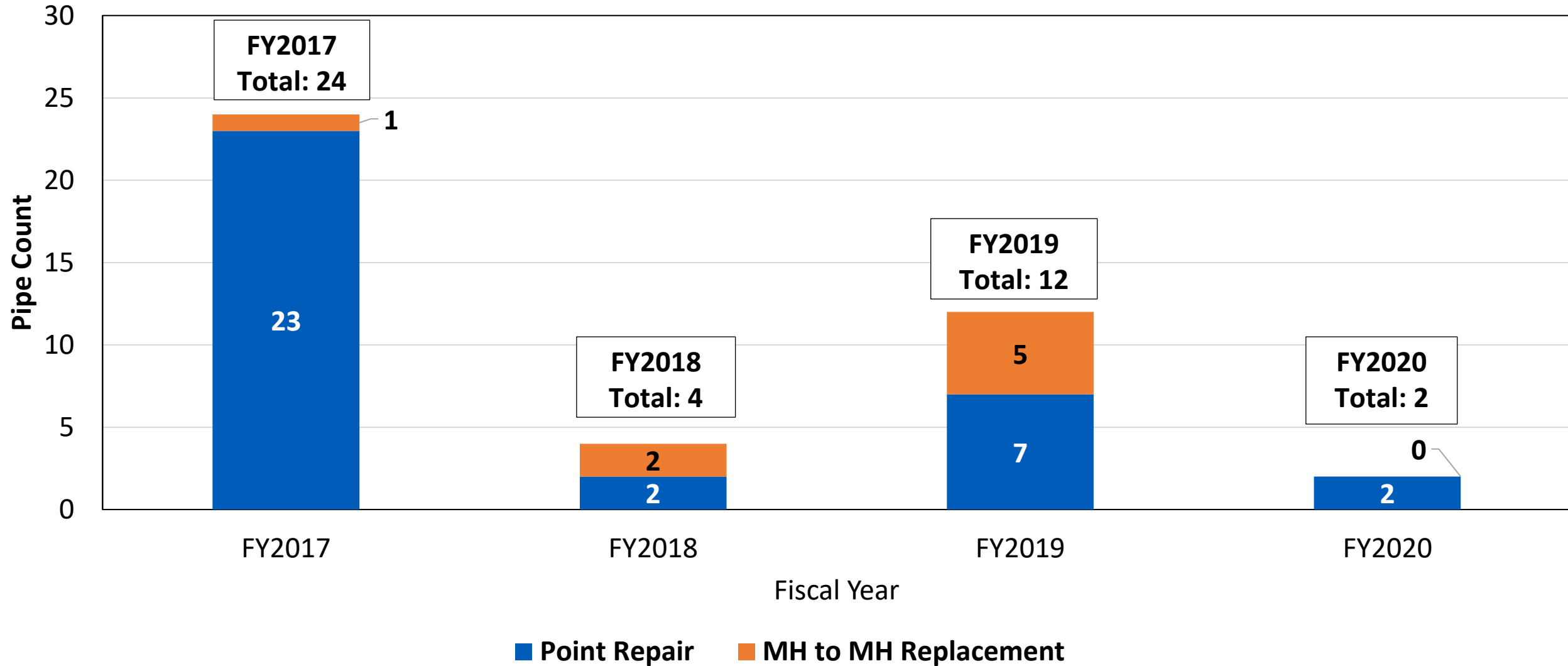
**Less than 3% of 339,585 LF scored a RUL of 3-10 years**



# UNDERGROUND CONSTRUCTION TECHNOLOGY

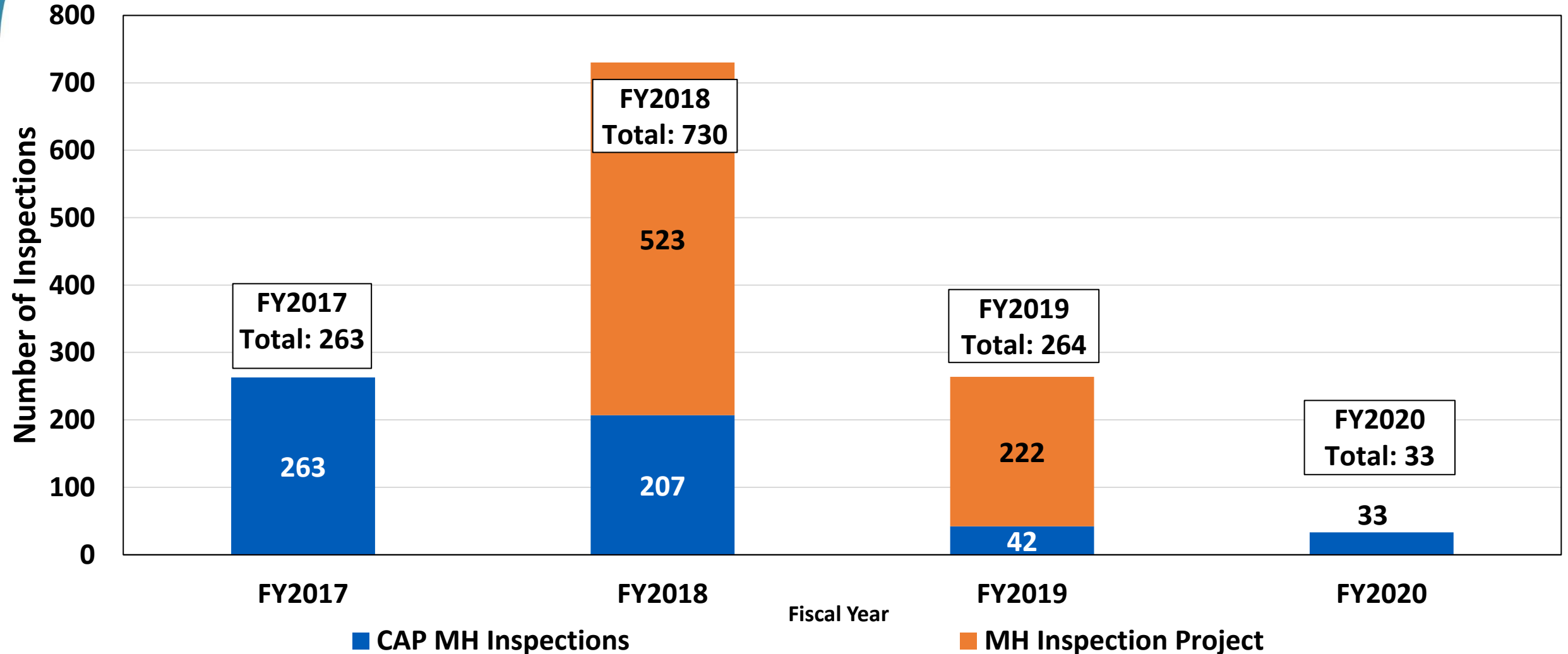
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## Pipeline Inspection Results



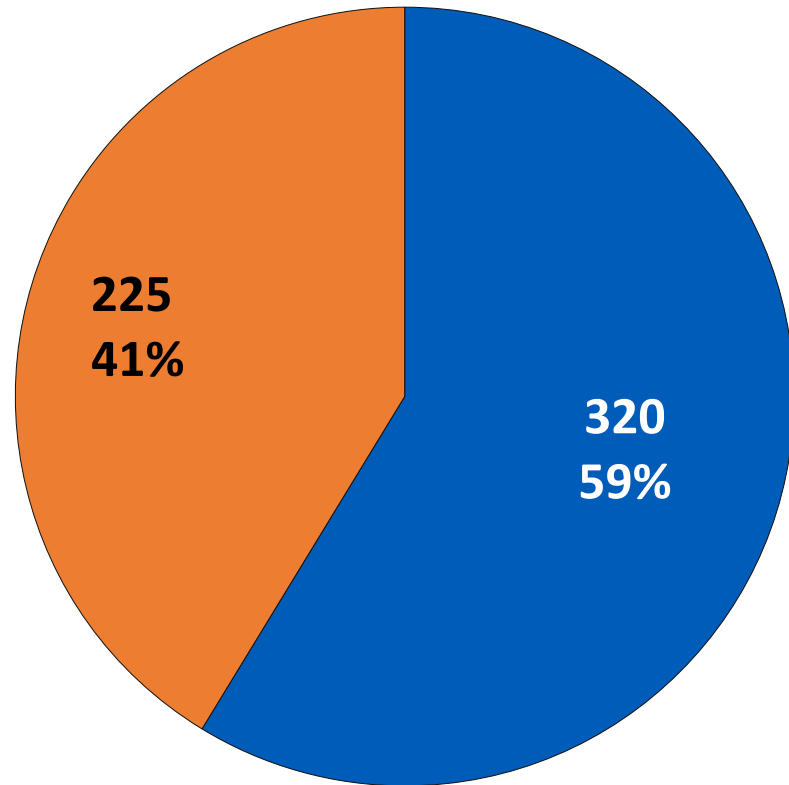


## Manhole Inspection

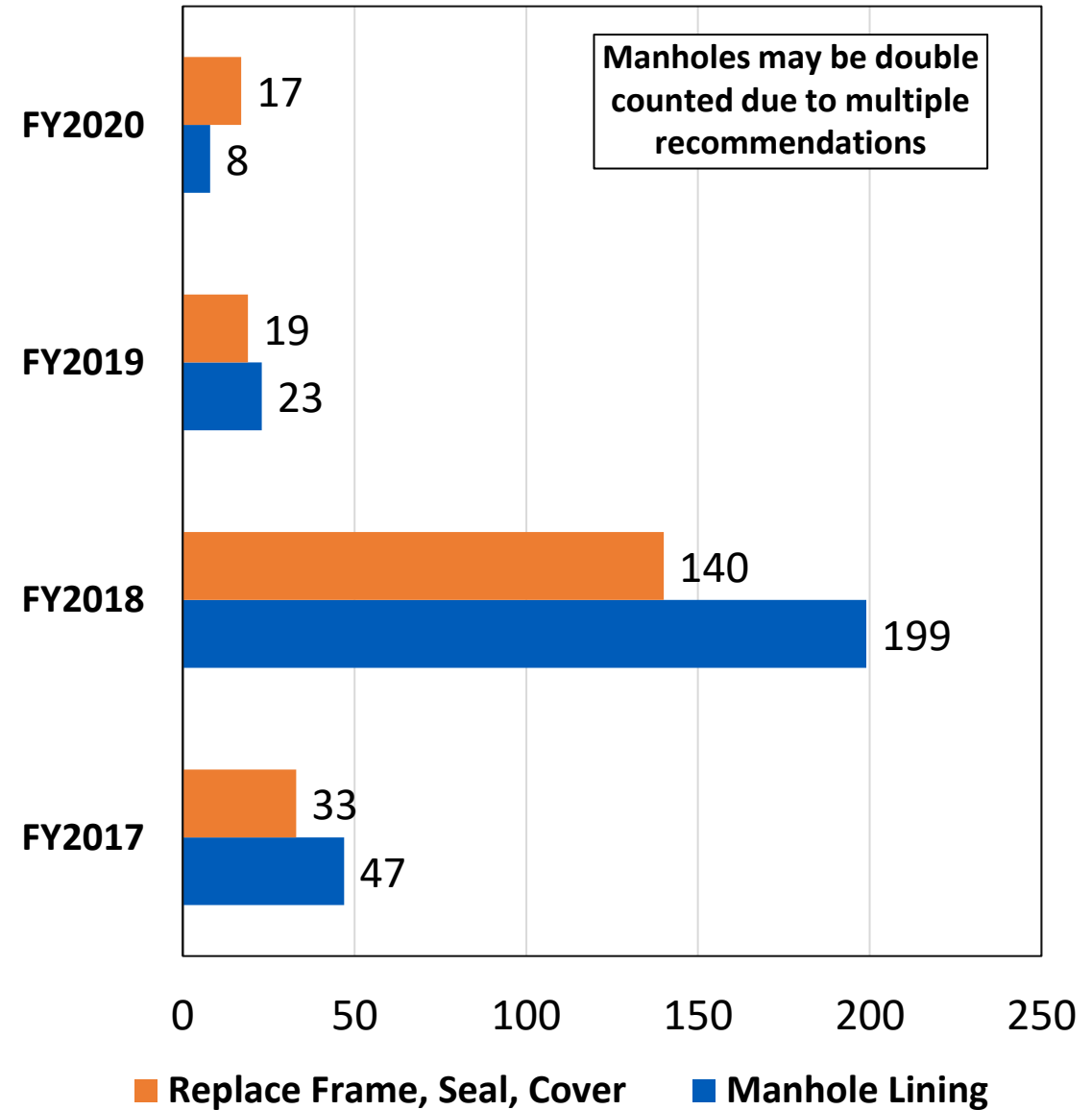




## Manhole Inspection Results

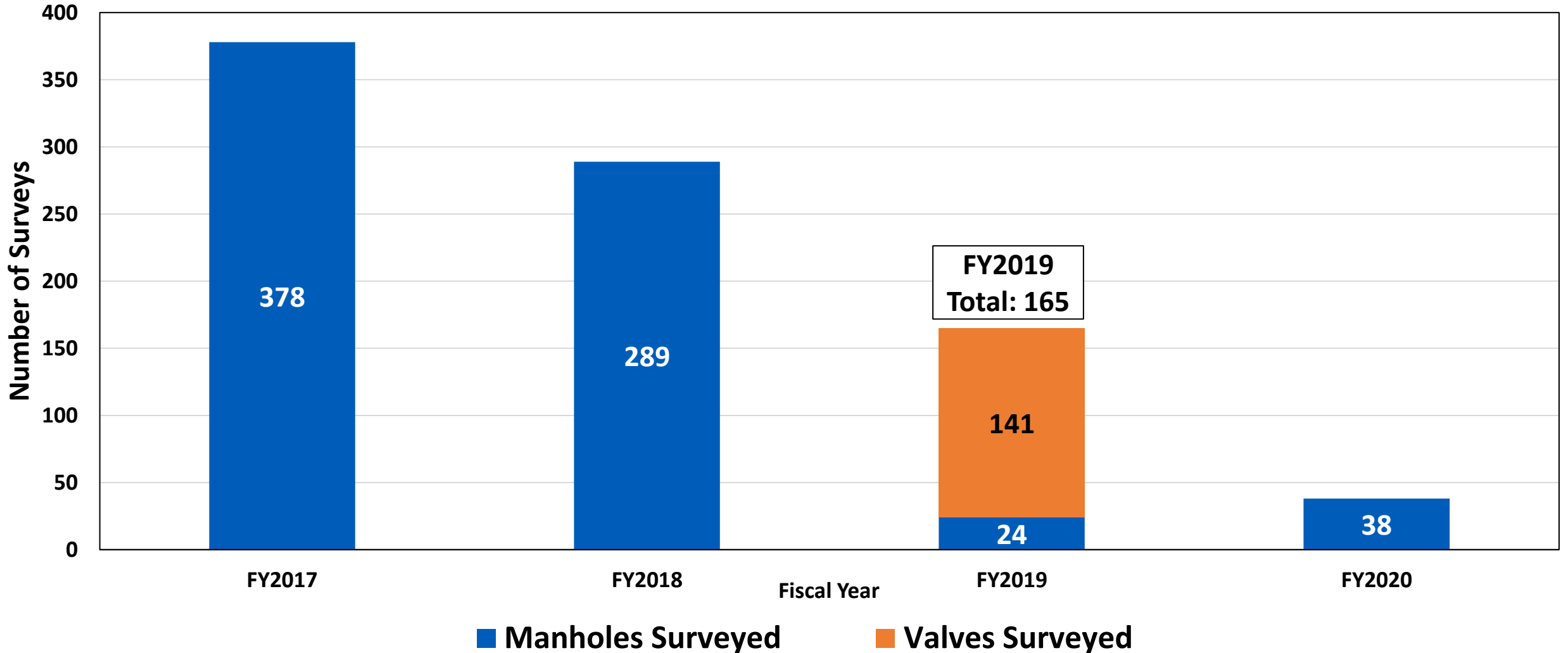


- CAP Inspections with Recommendation
- CAP Sound Inspections





## Manhole and Valve Surveys





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## GIS Improvements





## GIS Improvements

Approximately 50 manholes raised, inspected, and surveyed in FY2019 & FY2020





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## Force Main Inspection



**pure**  
TECHNOLOGIES  
a xylem brand

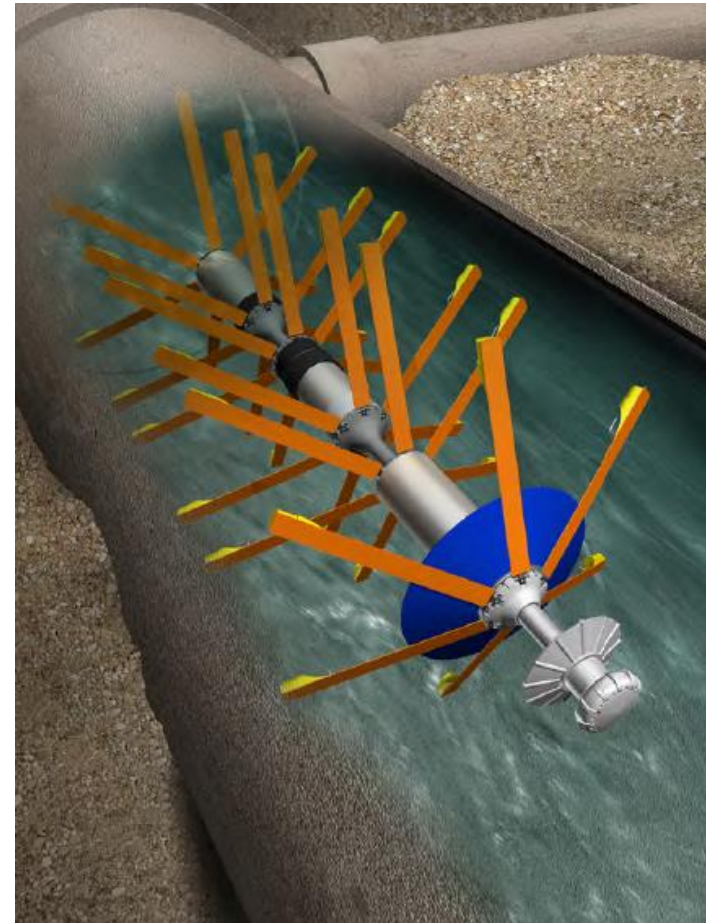




## Inspection Tools/Process



SmartBall<sup>®</sup> acoustic leak and gas pocket tool



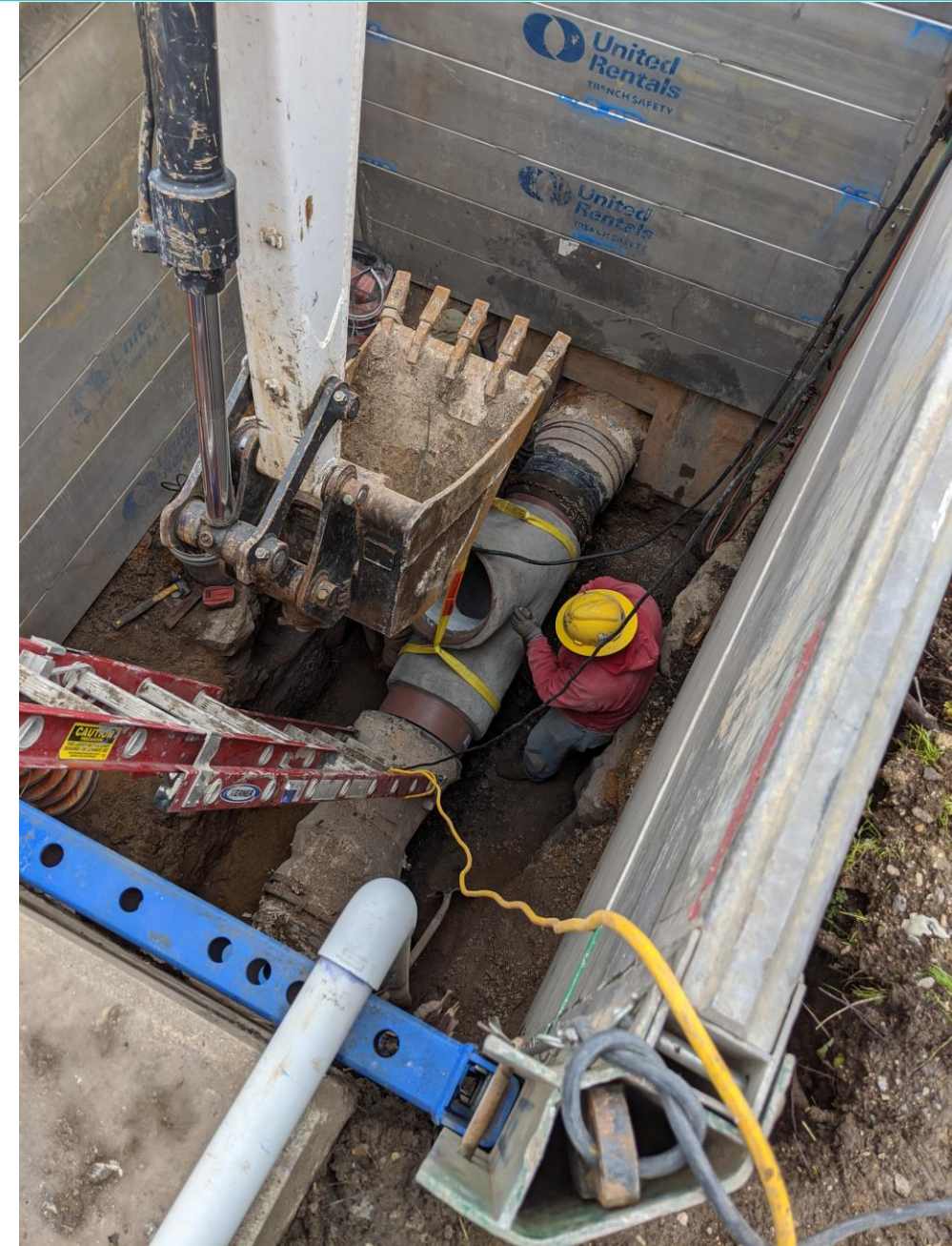
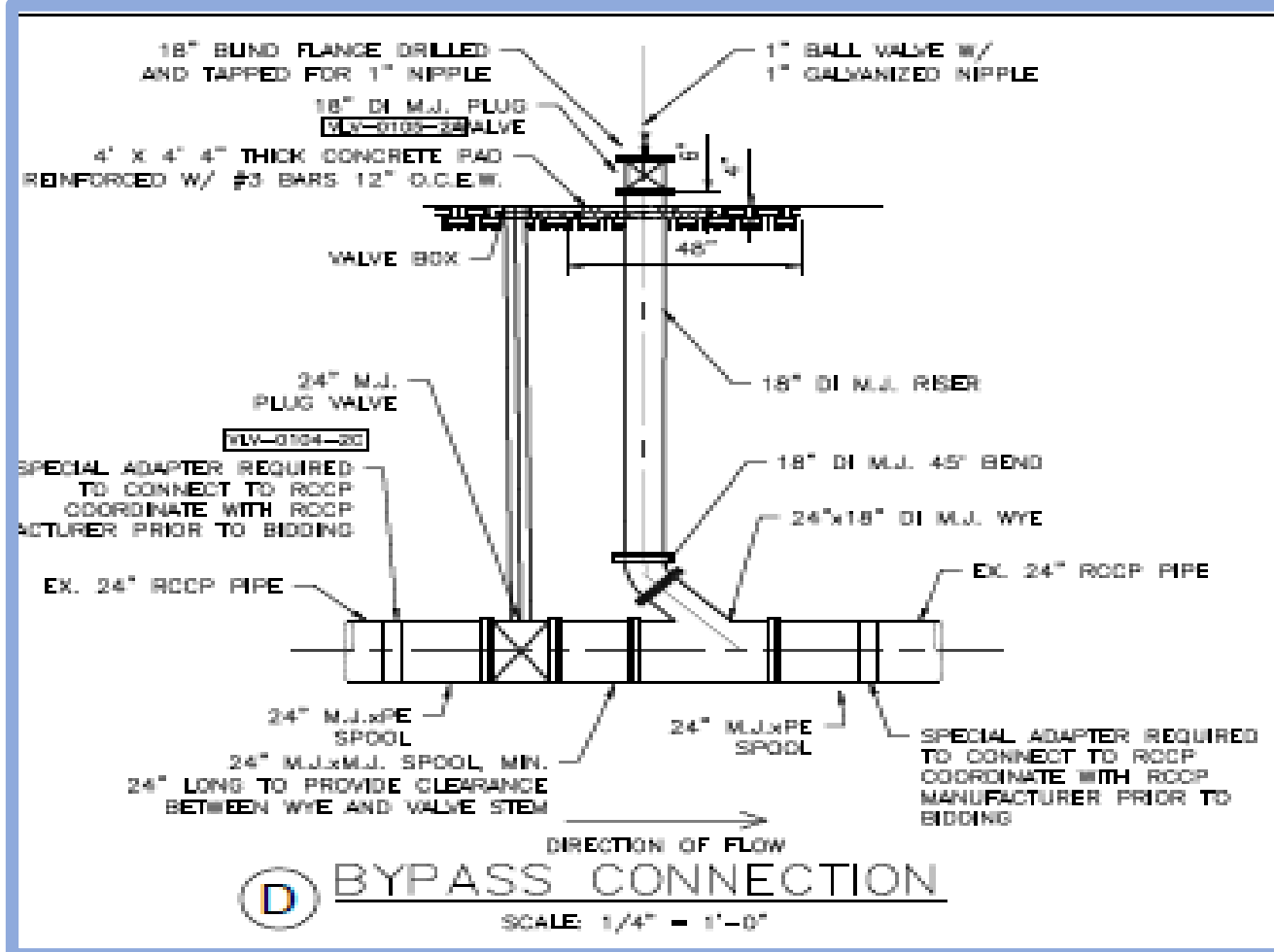
PipeDiver<sup>®</sup> electromagnetic tool



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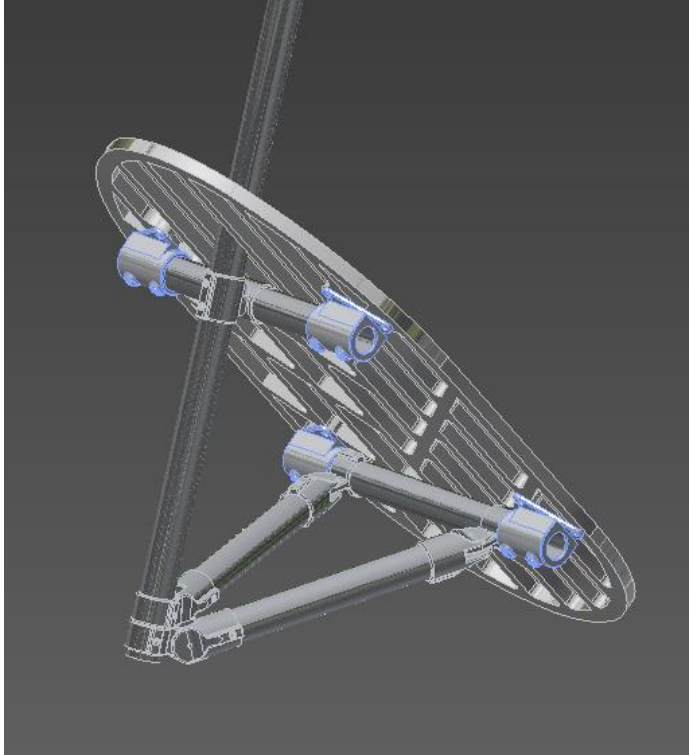
## Pre-Inspection Construction



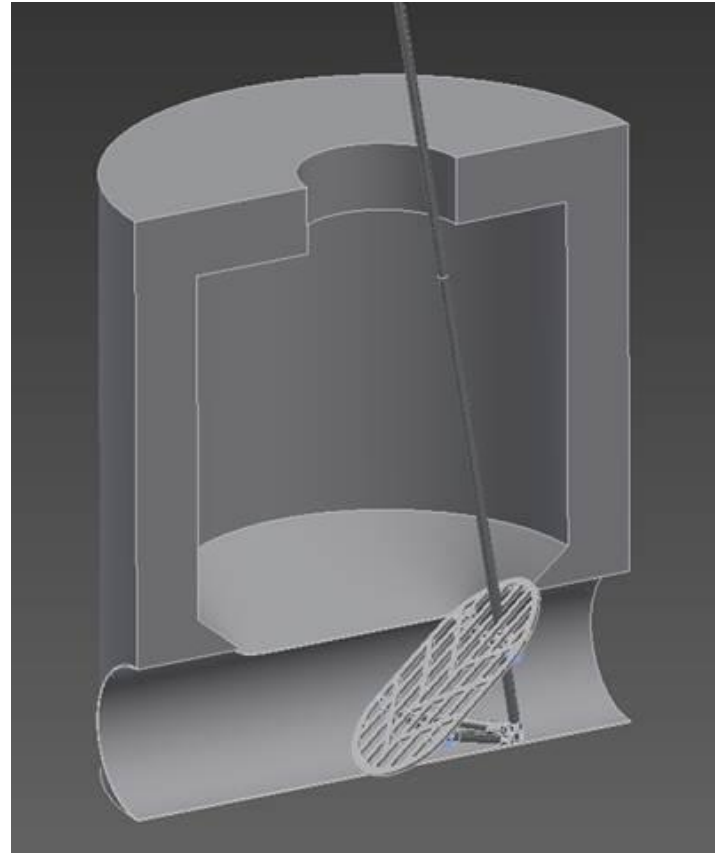
Added insertion point for PipeDiver access



## Custom Grate

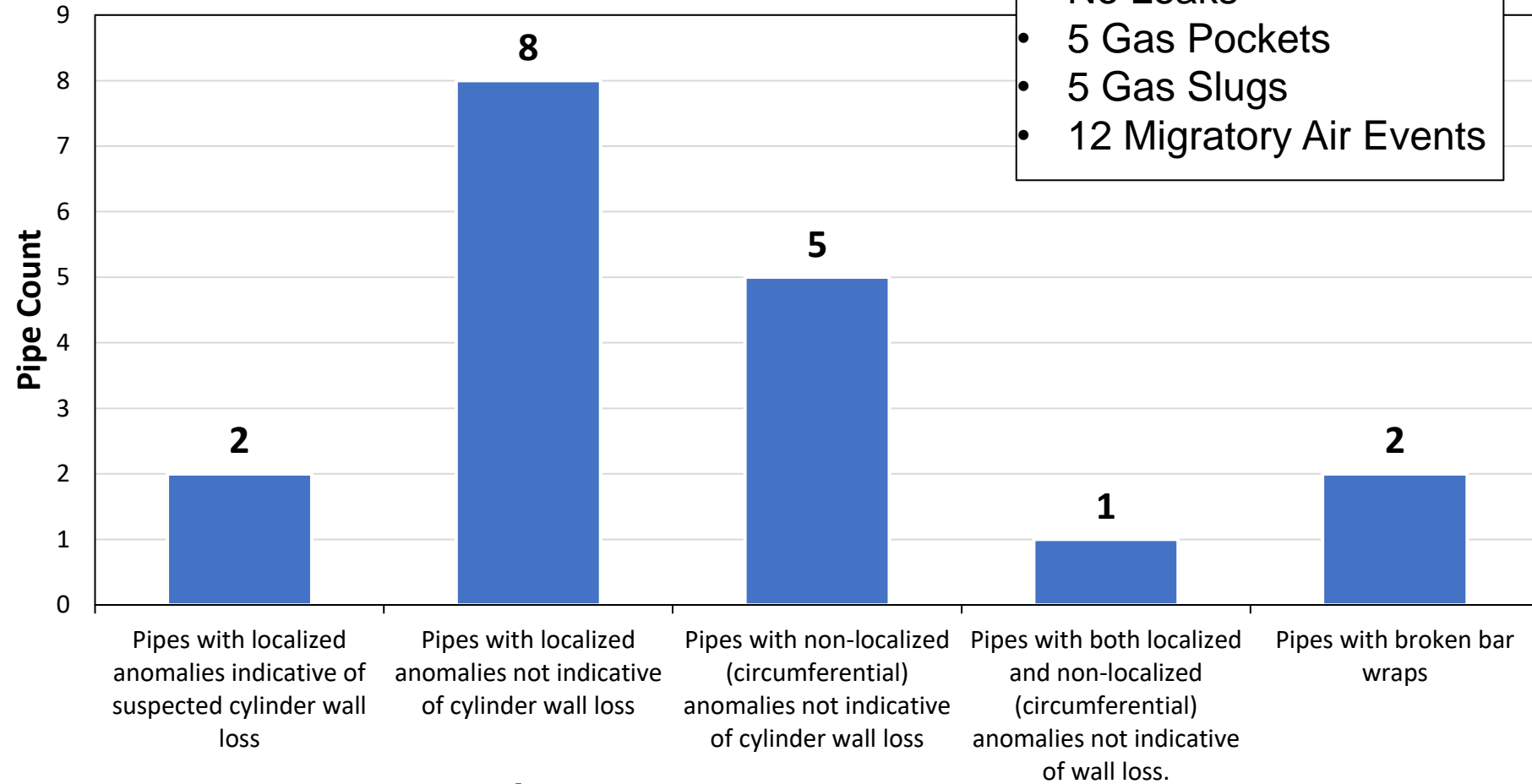
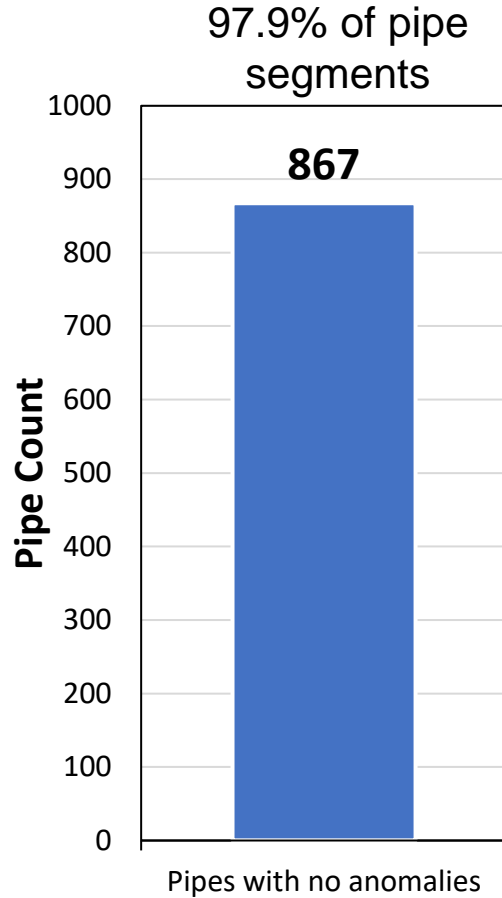


Custom fit to the discharge manhole to capture the inspection tools





## Force Main Inspection Results



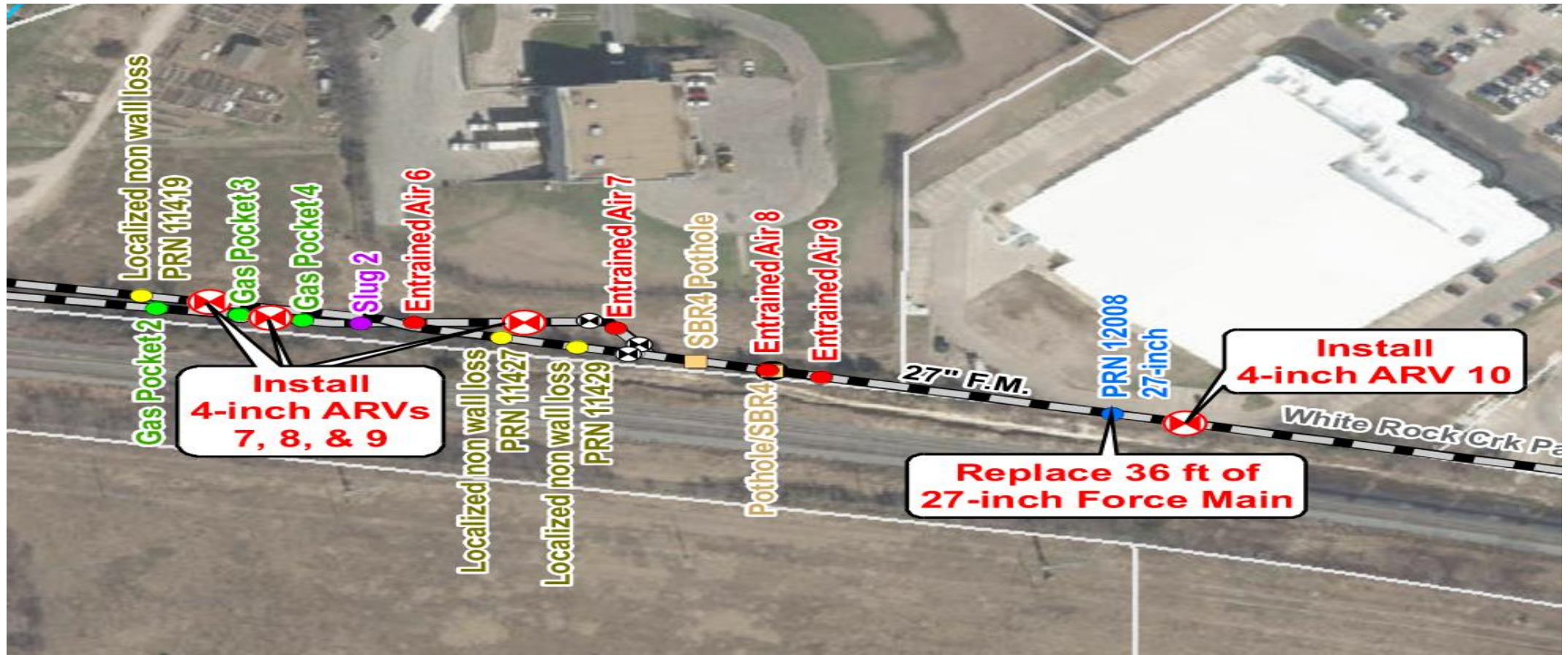
- Acoustic Results**
- No Leaks
  - 5 Gas Pockets
  - 5 Gas Slugs
  - 12 Migratory Air Events

Total number of pipe segments: 885 pipes



## Force Main Recommendations

1. Identified ARV and rehab locations
2. NTMWD budgeting and planning rehab projects





## Agenda

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## Benefits of Condition Assessment Program To Date

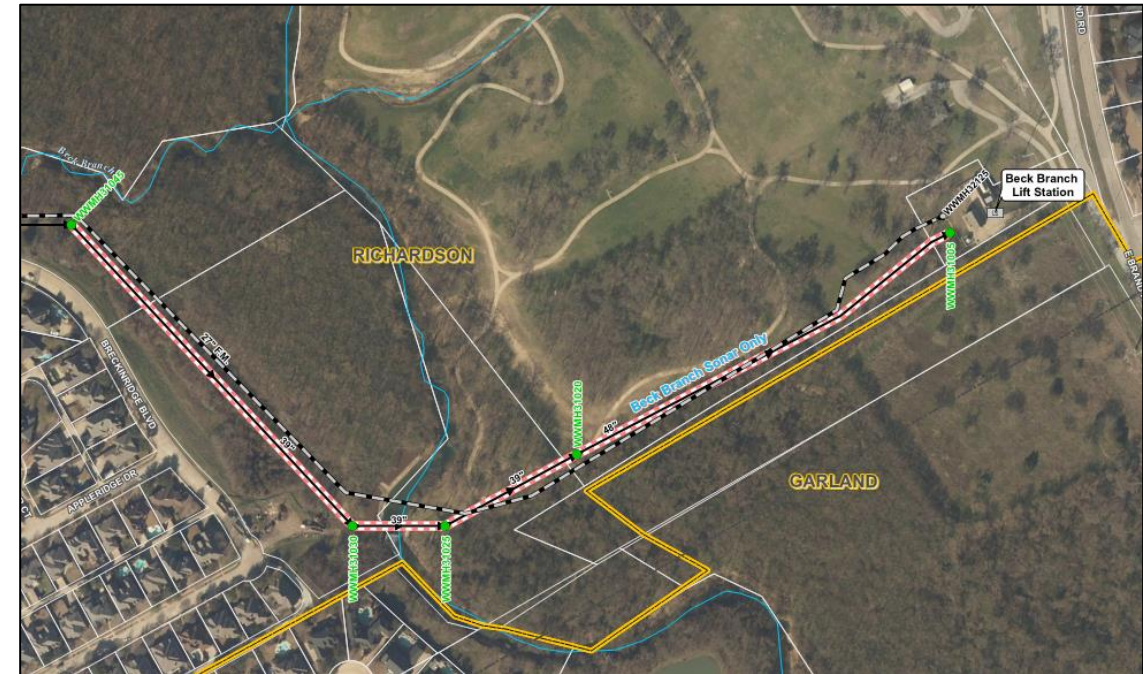
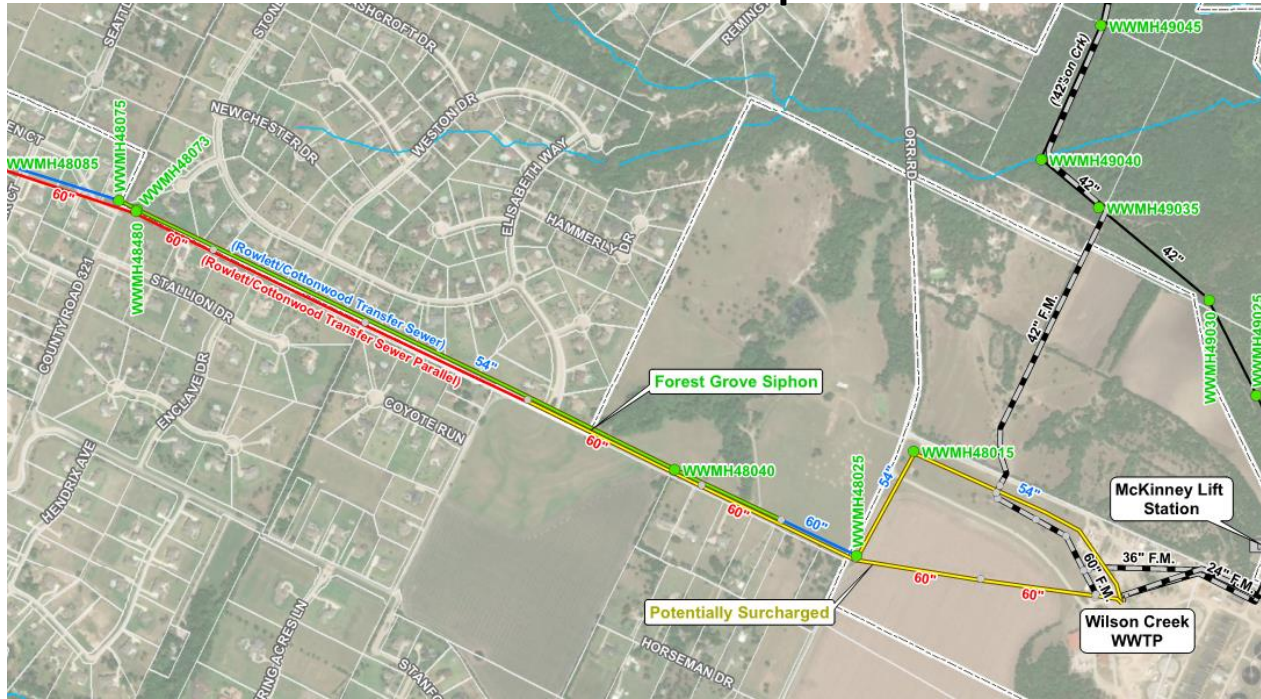
- Enhanced understanding and knowledge of asset condition
- Restoring capacity through detailed cleaning and debris removal where needed
- Increased proactive maintenance
- Increased GIS accuracy from manhole surveying
- Data integration with IBM Maximo, GIS, ITPipes, and hydraulic model



## Benefits of Condition Assessment Program To Date

### Proactive Cleaning

- Beck Branch Interceptor
- Forest Grove Siphon
- West Rowlett Creek Siphon







## **Acknowledgements**

**NTMWD**

**Freese and Nichols, Inc.**

**Xylem, Pure Technologies, Inc.**

**White Rock Consultants**

**Ace Pipe Cleaning**



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## QUESTIONS?

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