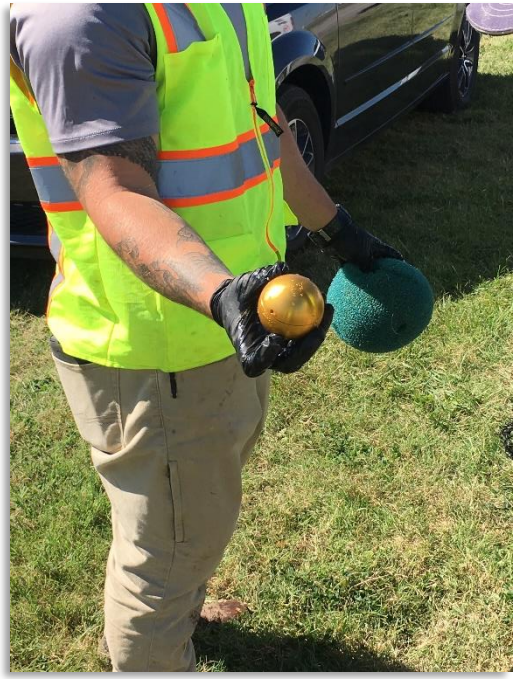
MWS PCCP Inspection Program

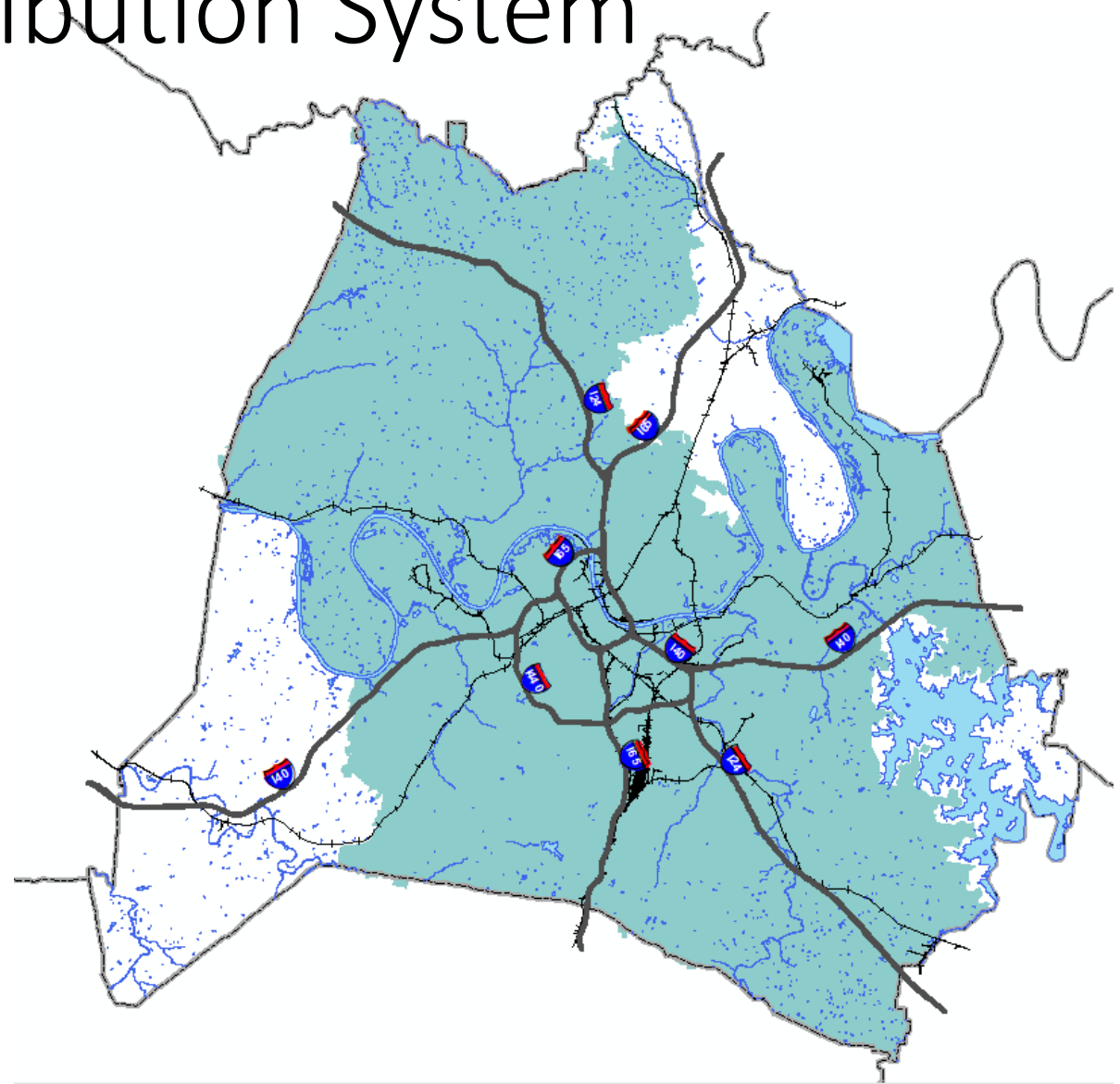


Jennifer Lind, PE

Metro Water Services

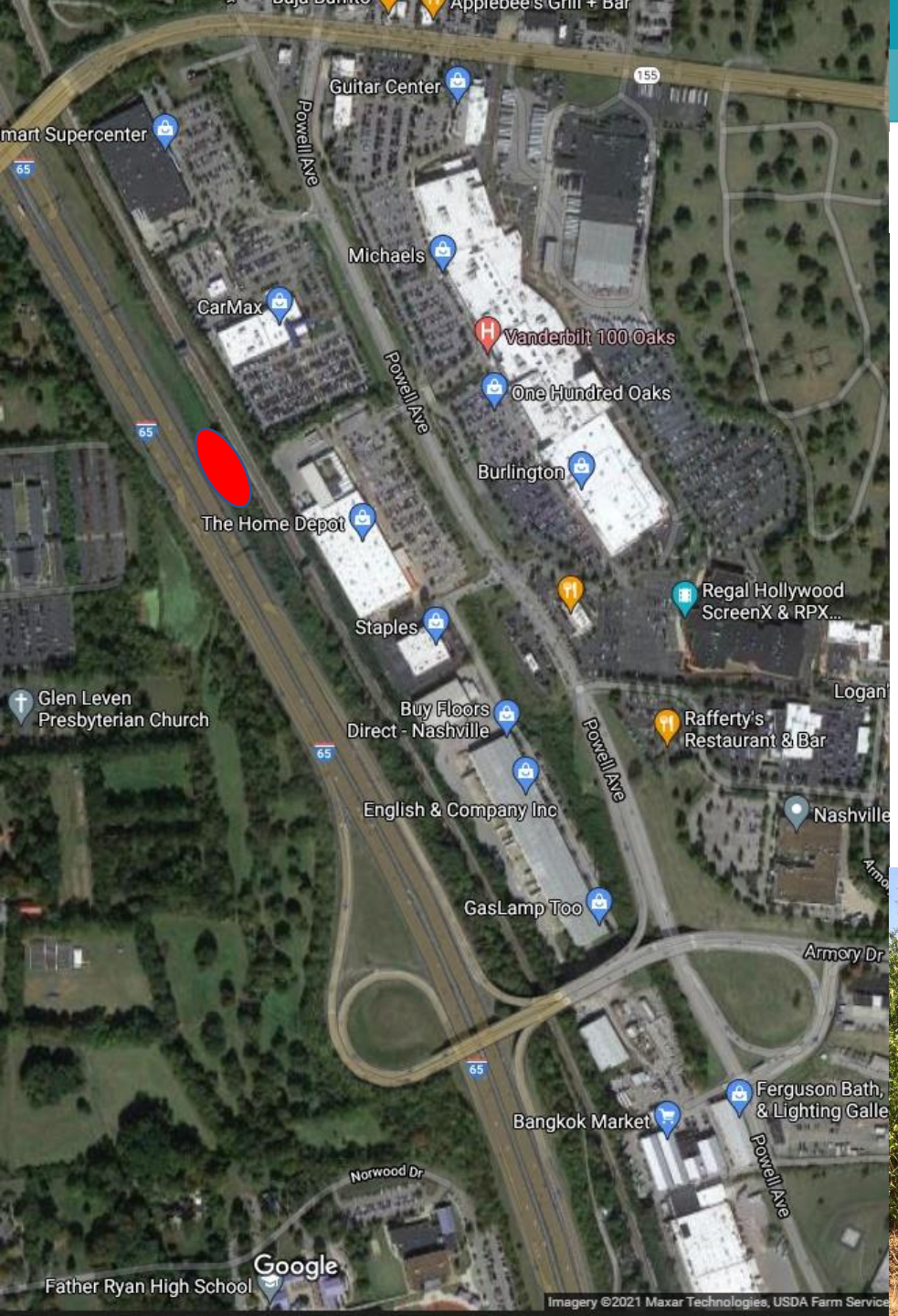
Overview of Water Distribution System

- Approx. 3,000 miles of pipes
- 56 pumping stations
- 36 storage tanks
- Over 21,000 fire hydrants
- Over 66,000 valves
- Over 204,000 customers
- Approx. 115 Million Gallons



Critical Pipe Failure Case Study

- July 30, 2014
- 30” PCCP Discharge Pipe from Thompson Ln PS
  - 1973 PCCP – Installed with Interstate 65
  - Sole feed from 3rd largest PS in system (16 MGD capacity)
- 15,000 Customers Affected
  - Less than 100 out of water completely
- 5 Day Outage



Critical Pipe Failure Case Study

- Criticality of Pipe
  - Primary feed to 15,000 customers
  - PCCP – longer repair times
  - Cross-country main located between I-65 and CSX railroad
    - Difficult to access in woods

Critical Pipe Failure Case Study

- Break Location
  - Between Interstate and Railroad Tracks
- Pipe Segment Installed on Improper Bedding
  - Years of railroad vibration on rock

Critical Pipe Failure Case Study

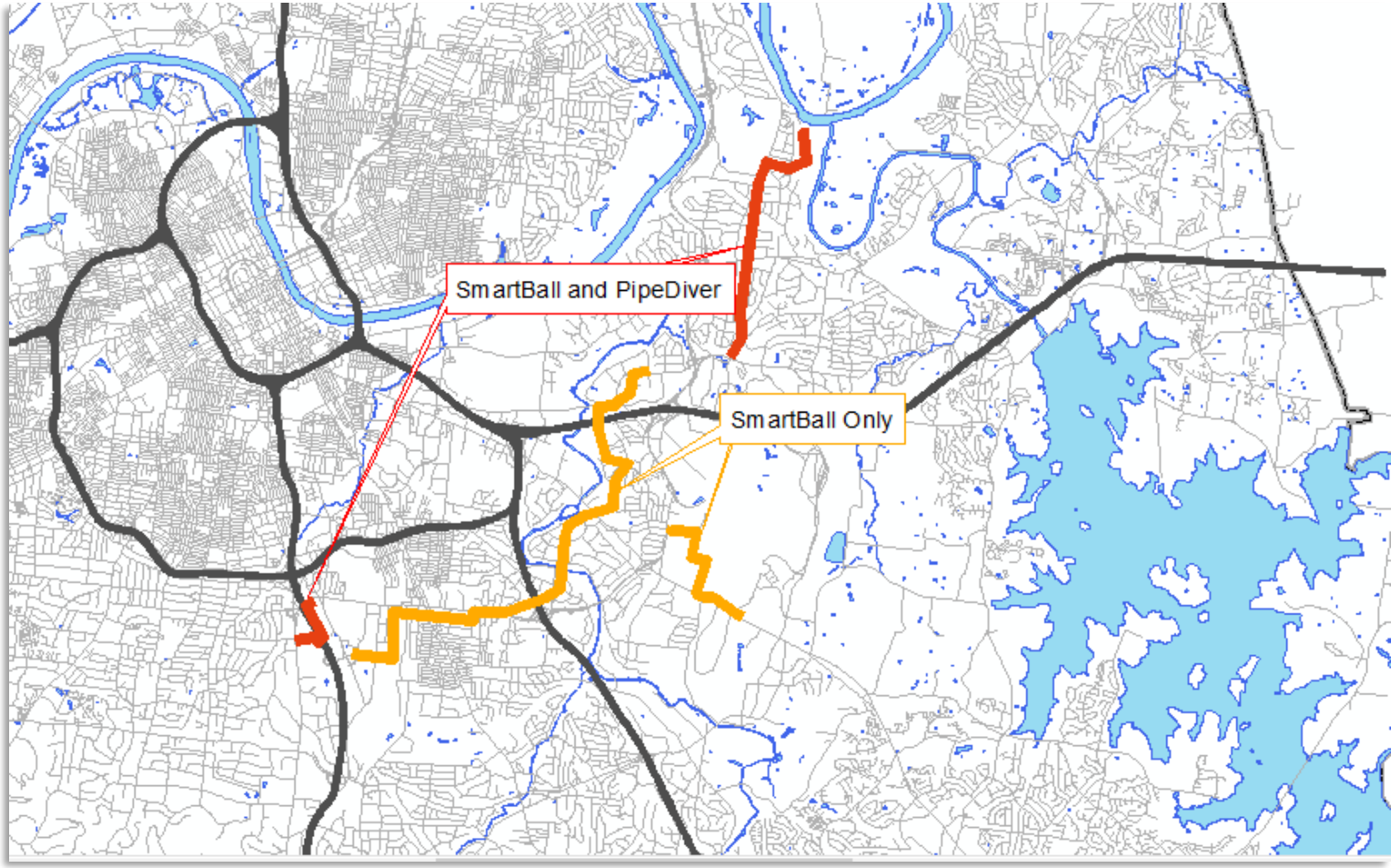
- Lessons Learned
  - Redundancy needed
  - Detailed installation and inspection of new mains is paramount – proper bedding is key
  - Inspection of critical mains once in service is necessary

Condition Assessment – Likelihood of Failure

- Historically assumed based on pipe age and material
- Transitioned from REACTIVE to PROACTIVE after the Thompson Lane Discharge break
- PureTech – SmartBall and PipeDiver Inspections
- Most “Critical” mains prioritized first for inspection

PureTech Condition Assessment

- Pressure Transient Monitoring
- SmartBall
  - Leak and Gas Pocket Detection
  - Massman 42” – 32,500 feet
  - Airport 30” – 10,400 feet
- PipeDiver
  - Electromagnetic Inspection
  - Structural Analysis
  - KR 60” – 19,200 feet
  - Thompson 30” – 5,000 feet



SmartBall®
Leak and Gas Pocket Detection

- All pipe materials 8” and greater
- Inserted and extracted while pipe is pressurized

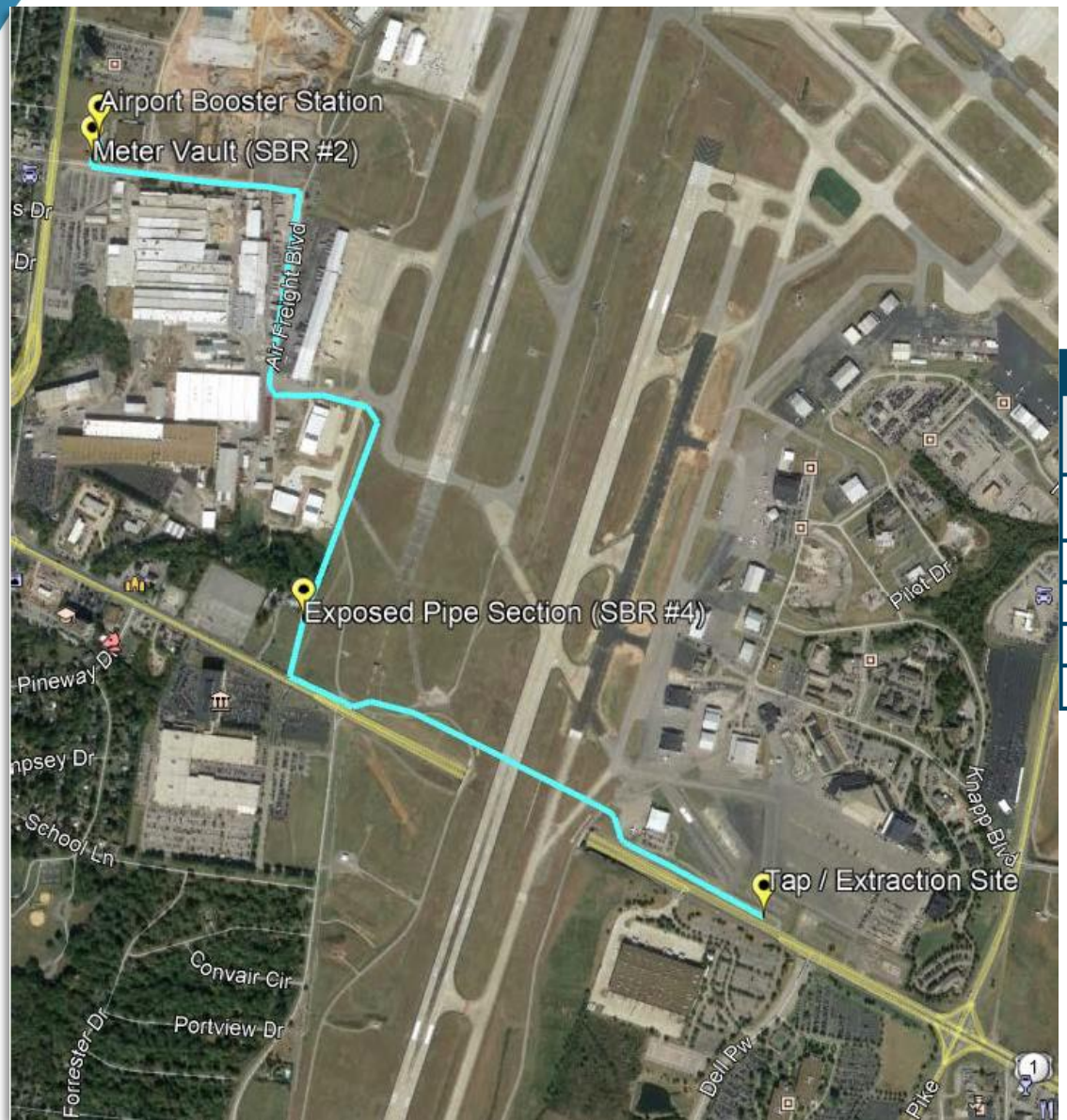
SmartBall Insertion – Massman and Airport

- Massman 42” – 32,500 feet

Airport 30” – 10,400 ft

Inserted at Pump Station

- Isolated check valve and removed top flange



SmartBall - Airport

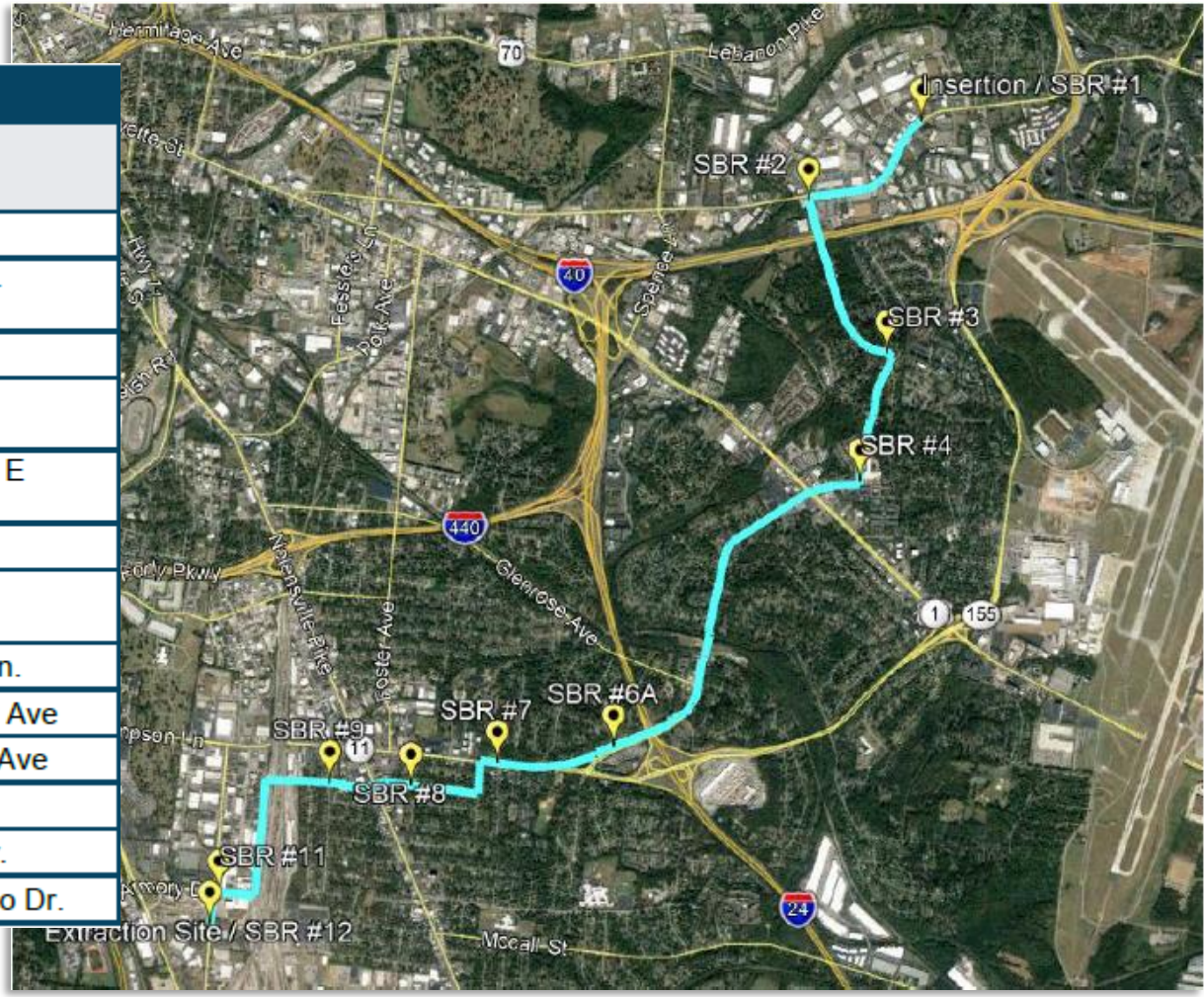
Table 3.1: SmartBall Tracking Locations

SBR No.	Feature Description	Distance from Insertion (feet)	Reference Location
1*	Insertion Pump Station	0	Airport Booster Station
2	ARV	218	Meter Vault outside Booster Station
3	ARV	2,047	North side of Air Freight Blvd
4	ARV	5,896	Exposed pipe next to Monell's Restaurant
5	Extraction	10,460	Tap / Exposed Pipe, south of airport

SmartBall - Massman

Table 3.3: SmartBall Tracking Locations

SBR No.	Feature Description	Distance from Insertion (feet)	Reference Location
1	Insertion / ARV	0	East of Elm Hill Pk and Appleton Dr.
2	ARV	3,377	SW corner of Elm Hill Pk and Massman Dr. Intersection
3	ARV	7,435	West of Patricia Dr. on Massman Dr.
4	ARV	10,524	North of the Patricia Dr. and Thompson Pl. intersection
*5	ARV	14,958	In front of Glencliff Presbyterian Church on E Thompson Ln
*6	ARV	17,806	East of Glencliff Rd. on E Thompson Ln
6A	Exposed Pipe	19,668	East of Glencliff Rd. on E Thompson Ln, excavated pipe
7	ARV	22,377	In front of Wingate Church on Thompson Ln.
8	ARV	25,019	Intersection of Simmons Ave and Tanksley Ave
9	ARV	26,880	Intersection of Louis Dr. and Tanksley Ave
*10	ARV	29,587	In front of MJW on Armory Dr.
11	ARV	31,723	East side of Sidco Dr. on Armory Dr.
12	Extraction / ARV	32,586	In front of the Houston Barracks on Sidco Dr.



SmartBall Extraction

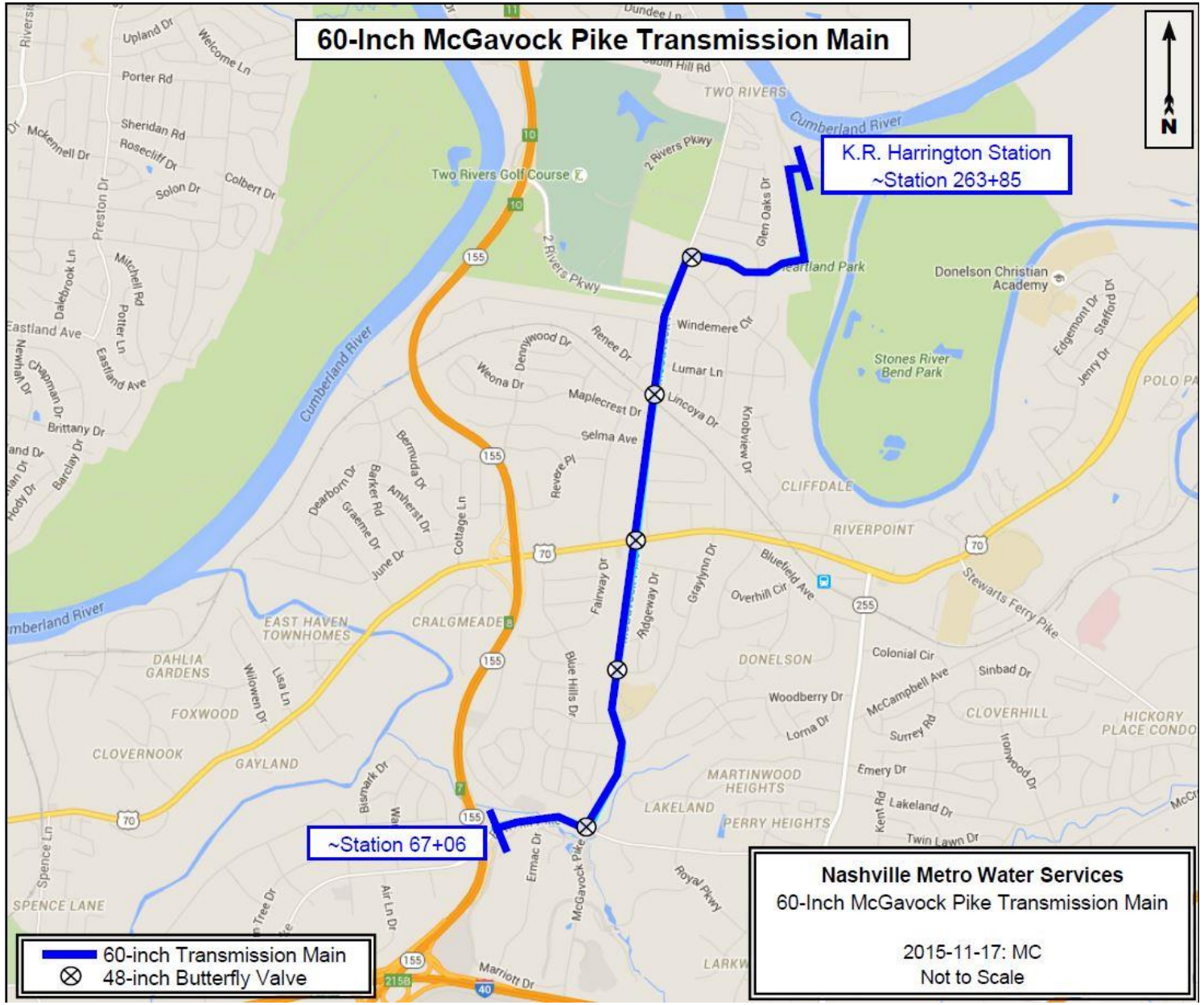
PipeDiver®
Electromagnetic Inspection and Structural Analysis

- 16” – 120” diameter
- Designed for use on PCCP mains
- Can be used on all metallic pipes
- Can utilize CCTV to video inside pipe during inspection

K.R. Harrington WTP

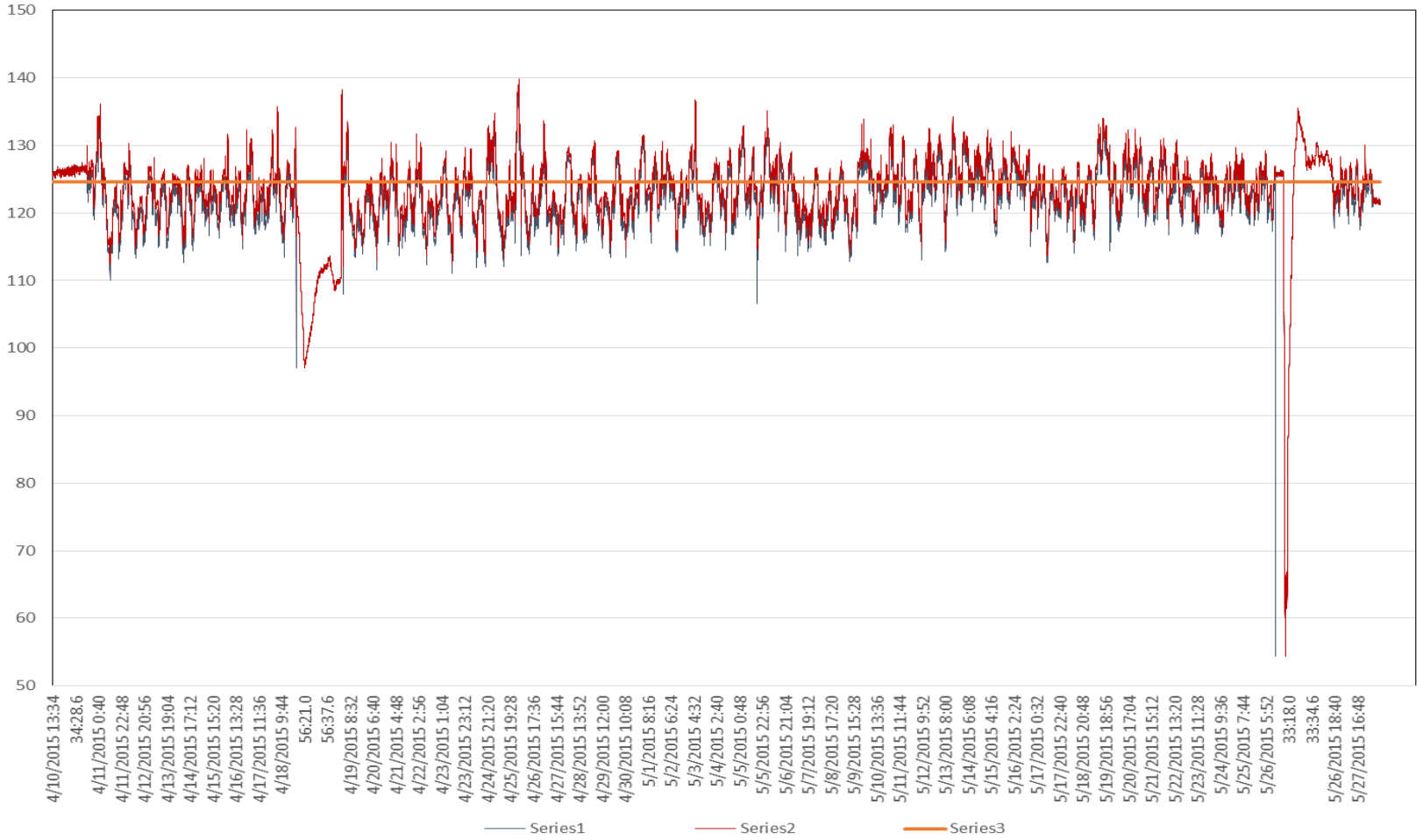
- 60” PCCP water transmission main – critical asset
- Manufactured in 1974 by Interpace
- 2 miles replaced in 2005 due to multiple breaks
- March 2015 – break in remaining 3 mile section

1. Pressure Transient Monitoring
2. SmartBall
3. PipeDiver



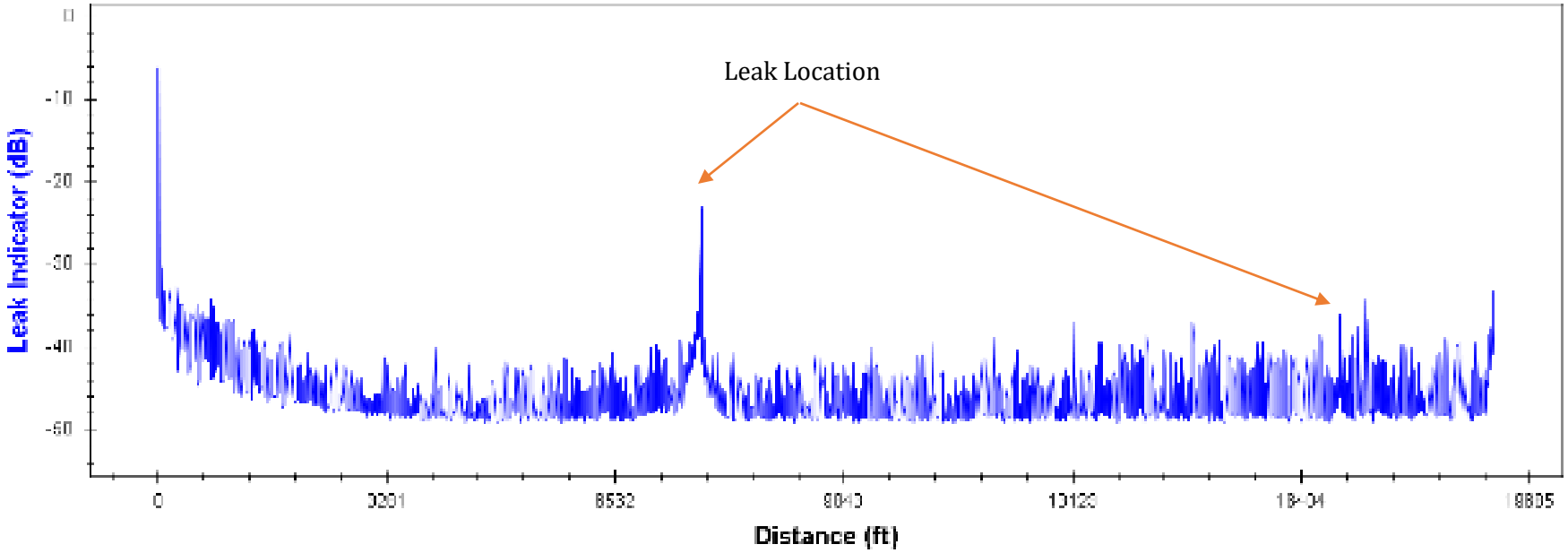
Pressure Monitoring Results

- Maximum = 138.6 psi
- Average = 122.6 psi
- 2 transient events detected
  - <15% pressure rise
  - Caused by valve operation within plant
  - Remains within design pressure of 210psi



SmartBall Results

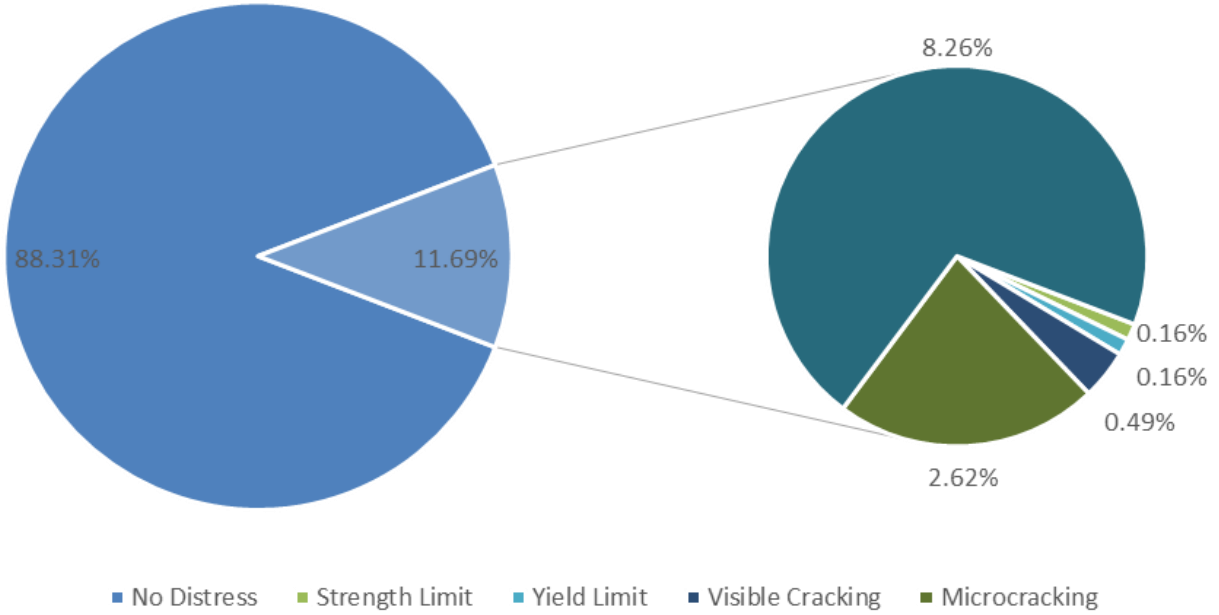
- 2 Leaks Detected
- No Air Pockets Detected



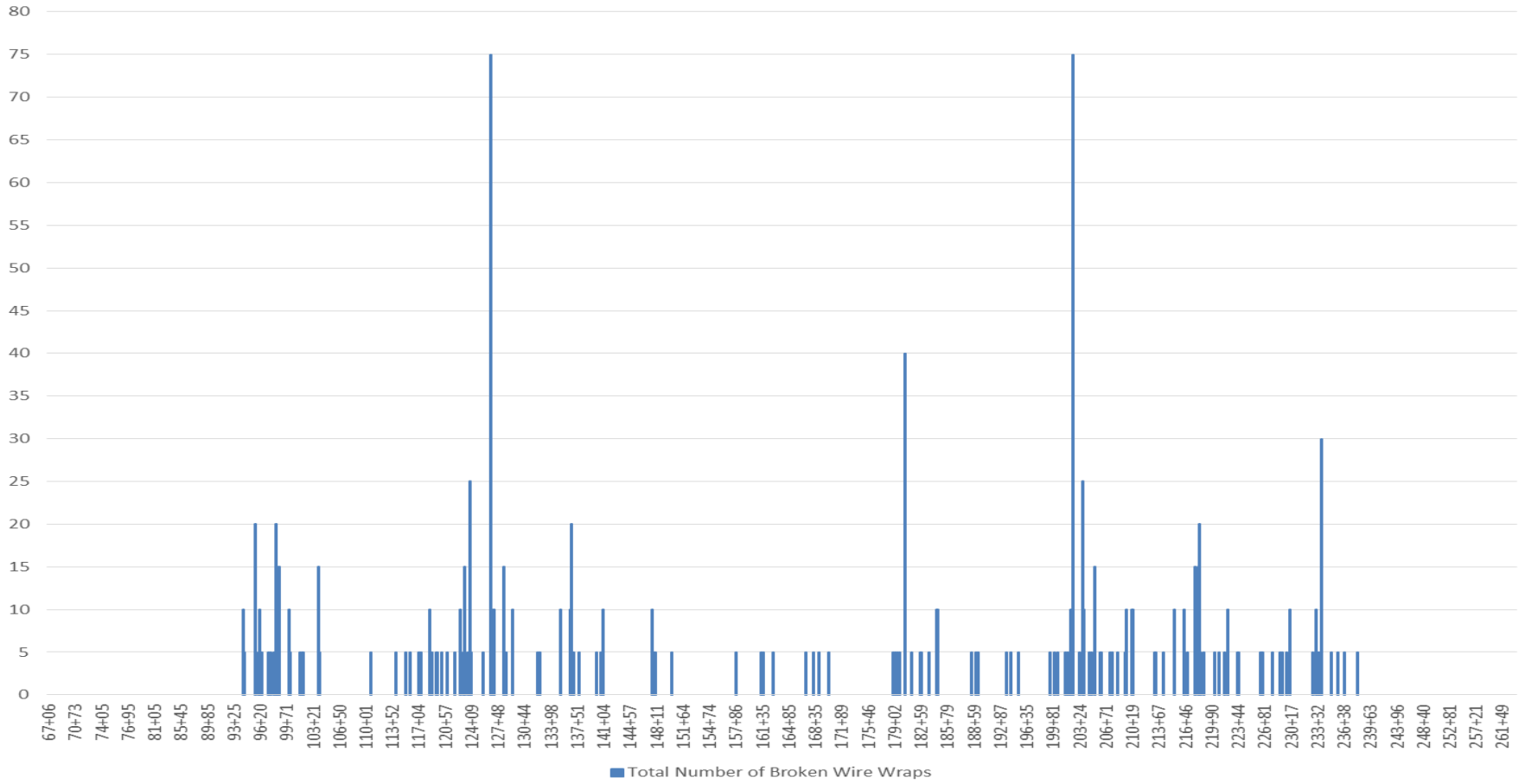
PipeDiver® Electromagnetic Inspection

PipeDiver Results

Summary of Inspected Pipes							
Pipeline	Number of Inspected Pipes	Pipes with Distress		Anomalous Pipes		Thicker Cylinder Pipes	
		No.	Percent	No.	Percent	No.	Percent
McGavock Pike Transmission Main	1,202	143	11.9	3	0.25	122	9.98



PipeDiver Results



Conclusions and Recommendations

- Pressure transient events occur during normal operating procedures, but amplitude of event remains within design pressure.
- Two (2) leaks to be repaired.
- 143 pipes (12%) exhibit distress
  - Four (4) pipes require immediate repair
  - Remaining pipes are in serviceable condition and should be re-inspected to identify any increased deterioration within 5 years

Lessons Learned

- ***Proactive inspections can save money compared to Reactive emergency repairs***
  - ***Customers out of water, bad publicity, health and safety concerns***
- ***Plan Ahead***
  - ***Time of year/day and proper velocities***
  - ***Create access points***
  - ***Communicate with all stakeholders***

Future of Program

Continue	Continue to inspect critical transmission mains using PipeDiver every 5 years
Increase	Increase SmartBall inspections to search for leakage in transmission mains and pump station discharge mains • Focus on areas of high pressure and large pressure swings