NJWEA - Winter Tech Transfer 2026 Cleaning and Inspection

•NJWEA Technology Transfer Seminar

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Force Main Inspection & Assessment

3/10/2026

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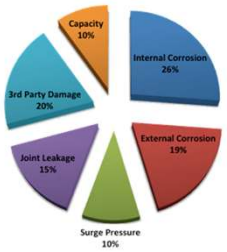
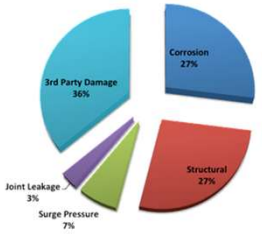
Causes of Force Main Failure

Ferrous Force Main Failures



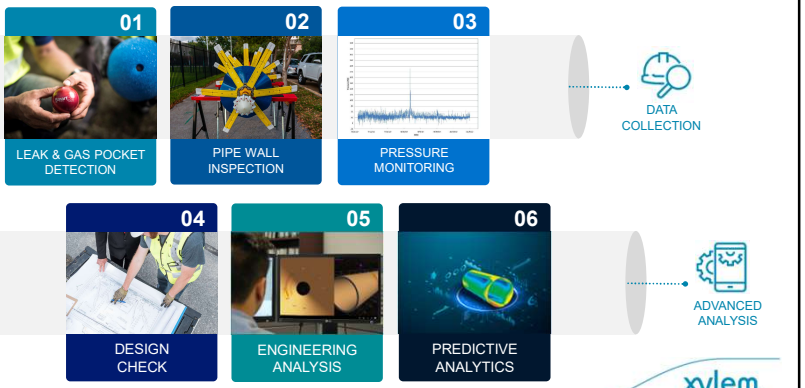
Non-Ferrous Force Main Failures



Data source: Water Environment Research Foundation – *Guidelines for the Inspection of Force Mains* (2010)

2

Typical Force Main Assessment Approach



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What is the **SmartBall** Platform?

This free-swimming inspection platform helps pipeline owners better manage their force mains by:

- Identifying and locating hidden ***leaks and gas pockets*** with high accuracy
- Confirm force main alignment
- Measuring the pressure along the pipeline to identify partial blockages and confirm pipeline elevations
- Identifying and locating potential undocumented features and pipe type changes
- Contributing current inspection data to engineering analysis used for capital planning

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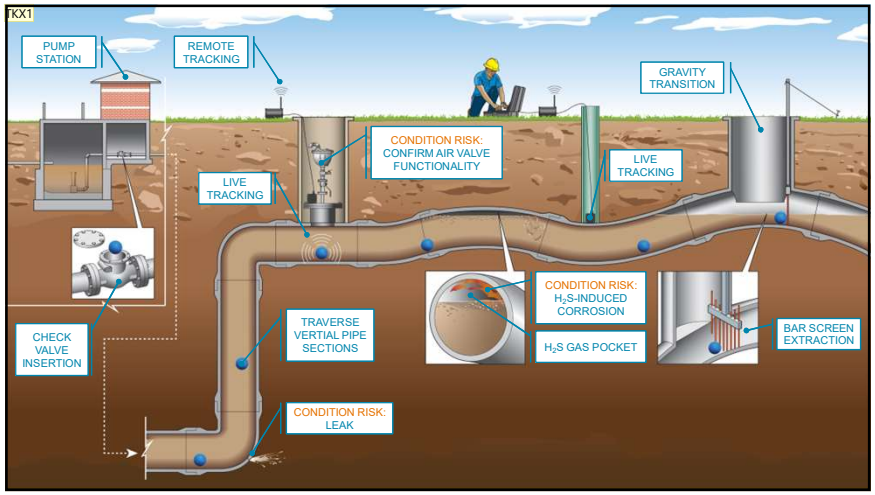

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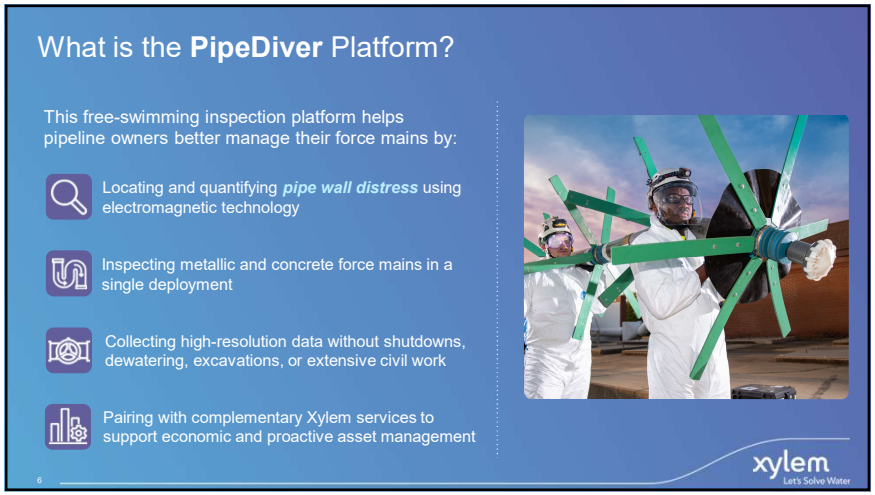

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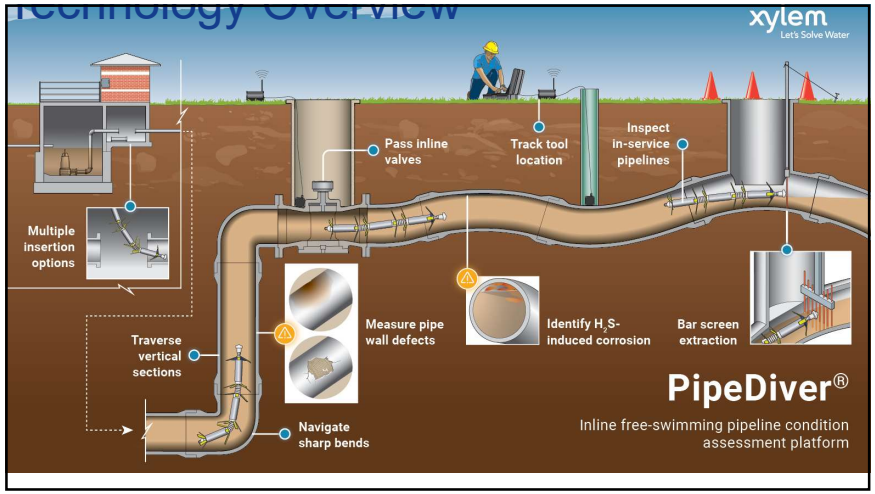

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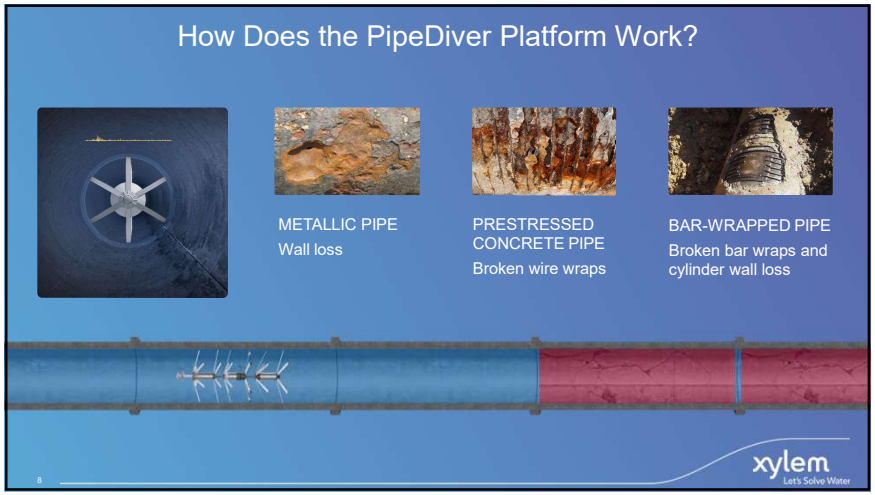

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Slide 5

TKX1 There's a lot going on with the labels. Feel free to delete some and use only the ones you want to call out during the presentation.

Twigg, Kristina - Xylem, 2022-10-06T18:58:54.844

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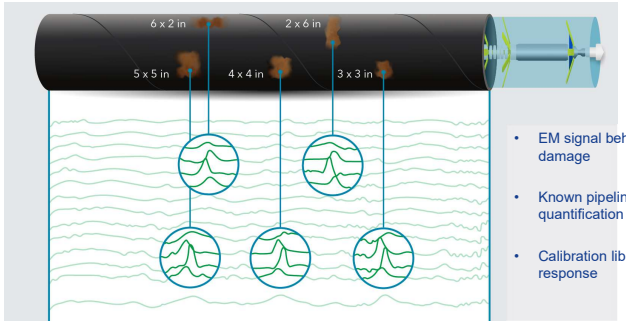
Electromagnetic Inspection



- EM signal behaves differently in areas with damage
- Known pipeline properties inform damage quantification
- Calibration library used to understand signal response

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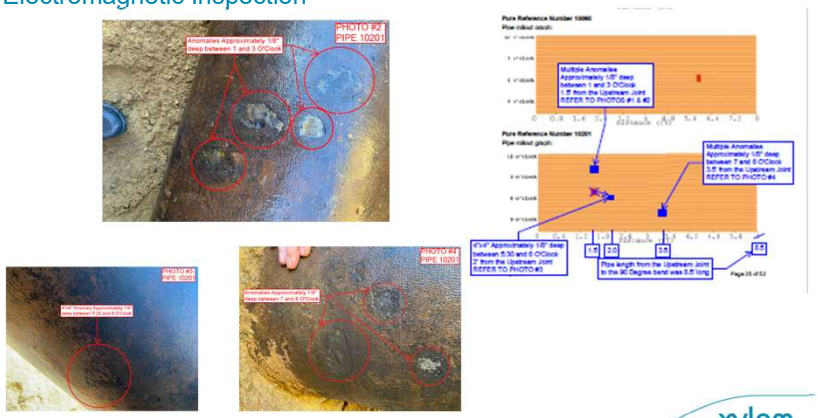
Electromagnetic Inspection



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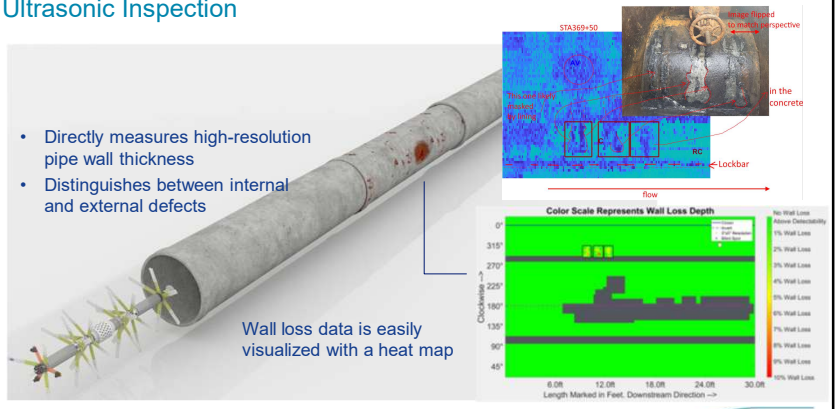
Ultrasonic Inspection

- Directly measures high-resolution pipe wall thickness
- Distinguishes between internal and external defects



Wall loss data is easily visualized with a heat map

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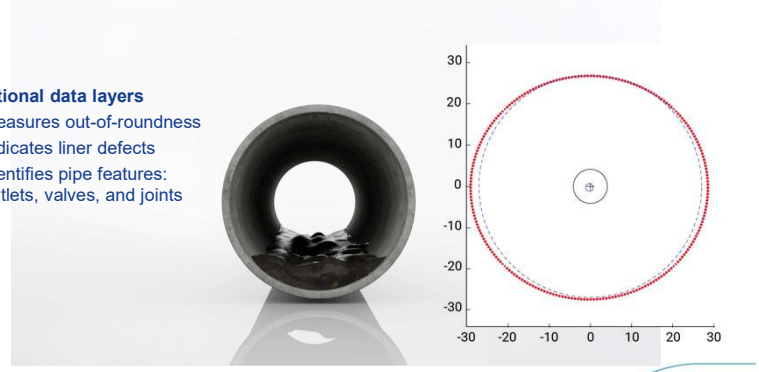
Ultrasonic Inspection

Additional data layers

- Measures out-of-roundness
- Indicates liner defects
- Identifies pipe features: outlets, valves, and joints



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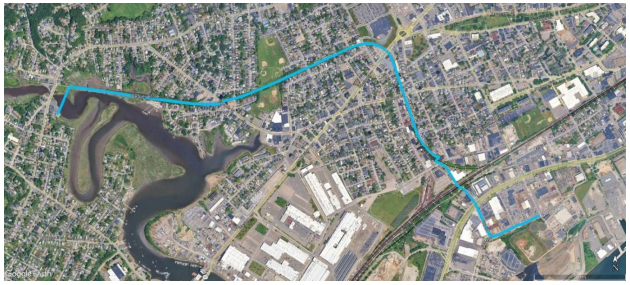
Ultrasonic Inspection Proof of Concept Inspection



Scope:
- 30-inch ductile iron pipe (Class 56, PE wrap)
- 12,560 ft (2.38 miles)
- Steel casing near insertion and road crossings

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Inspection Execution

Inspection run sequencing:
1. Ultrasonic platform
2. Electromagnetic platform
3. Electromagnetic platform

No precleaning/flushing completed

Real-time tool tracking

Significant ragging noted on Run 1
- Ragging not observed in Run 2 or 3

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Electromagnetic Inspection Results

No acoustic events (gas pocket, leaks)

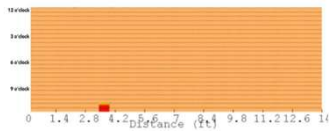
Signal degraded in steel-lined sections

One pipe identified with wall loss
- Minimum detection threshold 3"x3"x30%

Ultrasonic tool acted as cleaning pig, removing debris
- Quieter acoustic signals
- Minimal sediment related noise in EM data

Table 2.2: Pipes with Anomalies Consistent with Wall Loss

Pure Reference Number	Upstream Station	Pipe Length (feet)	Anomaly Longitudinal Position (feet from Upstream Station)	Anomaly Circumferential Position (degrees - looking toward Downstream Station)	Anomaly Area (square inches)	Estimated Depth of Pipe Wall Loss (% of nominal thickness)	Note
10662	0+53	14	3.5	340	40	35	1



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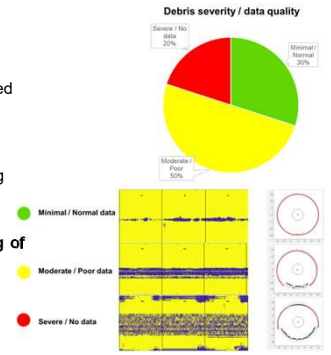
Ultrasonic Inspection Results

- Ultrasonic signal response not impeded by wastewater or encasement
- **Debris was the primary limiter**; effectively served as an initial cleaning pass
- **Profiling data aids in understanding of debris location and severity**



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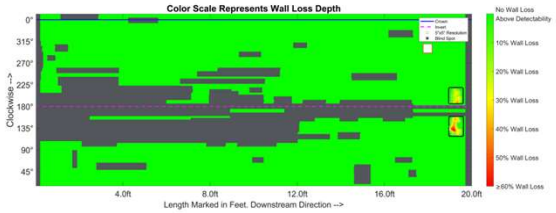
Ultrasonic Inspection Results

Wall loss detection despite debris:

- ~30% had normal data coverage
- 37 pipes with wall-loss defects identified (compare to 1 for EM)
- Wall loss ranged between 20% and 60%, all external



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Conclusion

- **Ultrasonic inspection of metallic wastewater inspection proven**
- **Data quality is manageable**: debris loading and cleanliness—not technology limits—drive data variability

Profiling data adds valuable context for non-standard conditions:

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