

Transmission System Integrity Plan

August 8, 2018



Presentation Outline

PART 1:

Transmission System Background

PART 2:

Proactive Approach to Pipeline Management

PART 3:

Transmission System Integrity Plan

PART 4:

Open Dialogue



Transmission System Background

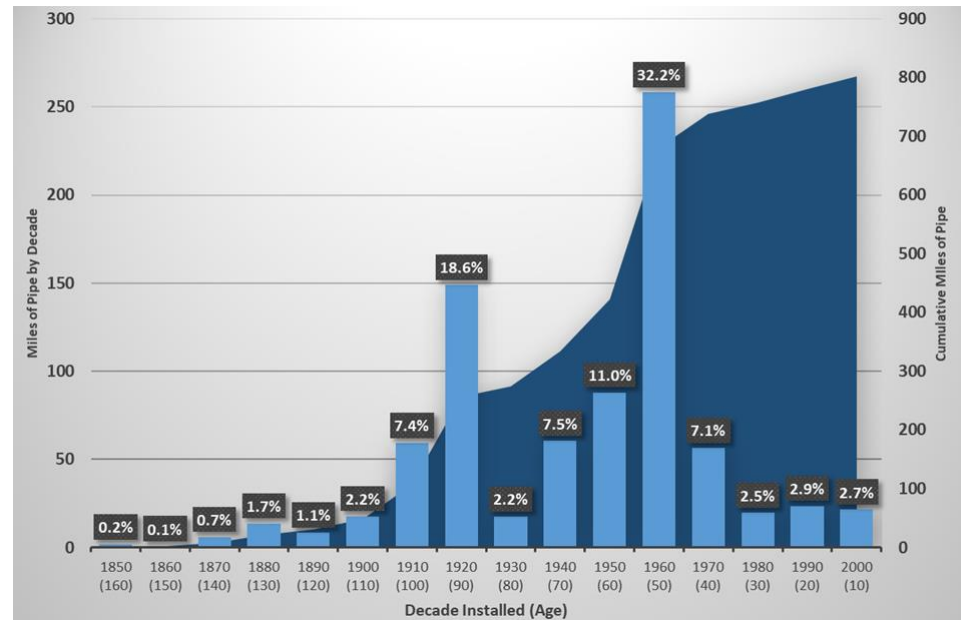
Part 1



GLWA's Transmission Main Inventory

800 miles of Transmission Main

- Concrete Pipe: 500 miles
 - Largest user of Prestressed Concrete Cylinder Pipe (PCCP) in USA, 435 miles
 - Tendency to fail in more catastrophic mode
- Metallic Pipe: 300 miles
 - Tendency to fail from corrosion and age
- Diameter
 - Range: 6 to 120 inches
 - Average: 48 inches
- Age
 - Range: 3 to 167 years
 - Average: 70 years



Program Vision

By implementing a proactive **Transmission System Integrity Program**, GLWA will:

- Increase Reliability of Transmission System to Meet Levels of Service
- Limit Failures on High Consequence Transmission Mains
- Reduce Failures on all Transmission Mains

Proactive Approach to Pipeline Management

Part 2



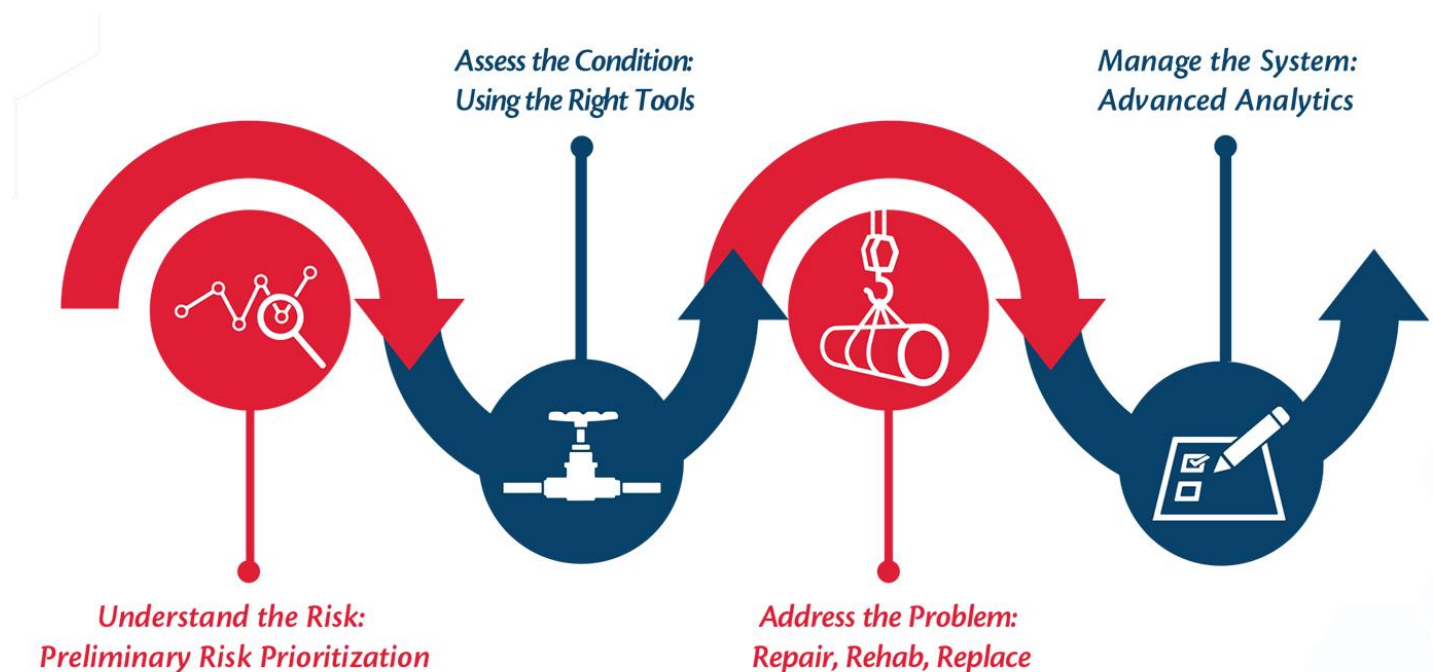
Buried Pipeline Management

- Water sector has moved past “bury-and-forget”
- Innovative, reliable solutions available for proactive management
- Condition assessment and targeted repair reduces failure and its impact
- Data drives focused investment decisions in infrastructure renewal



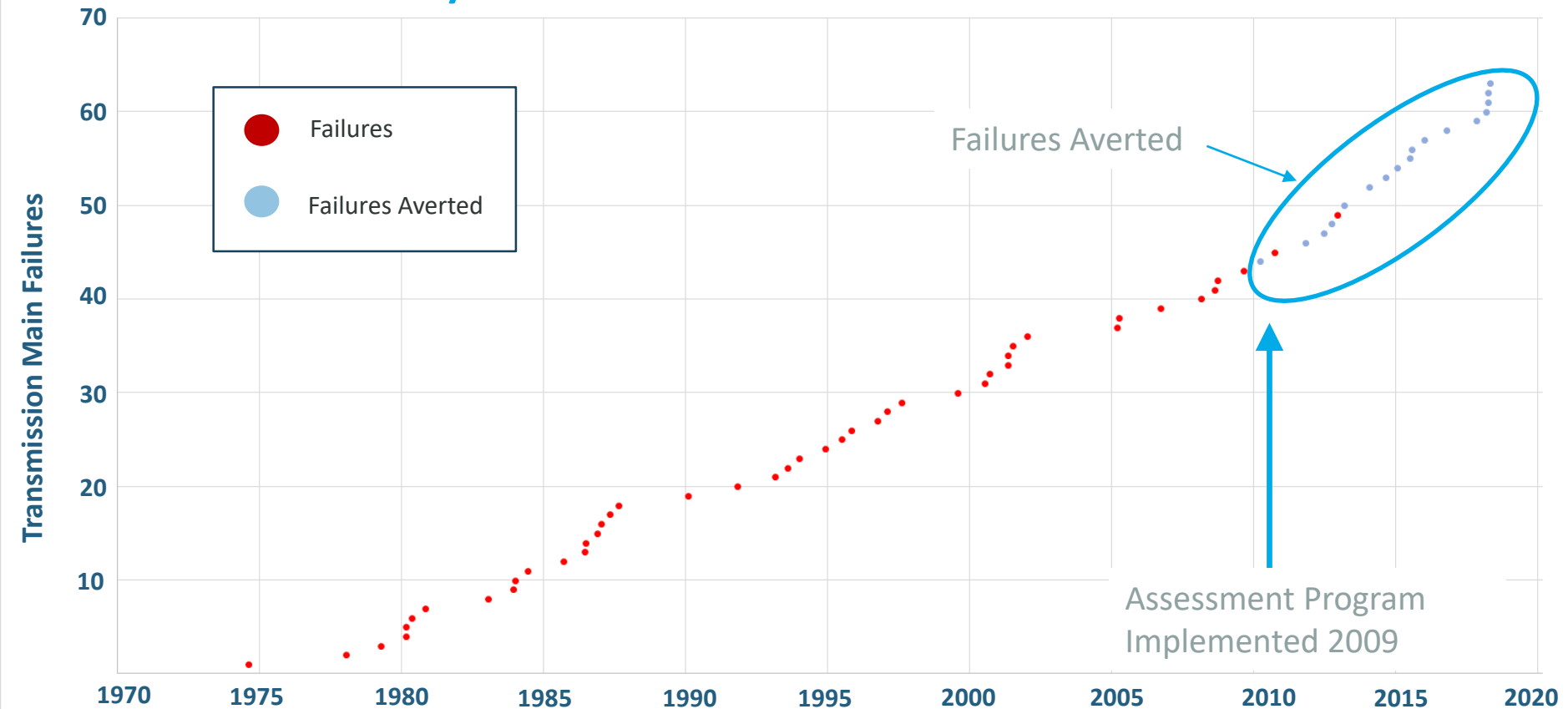
Major Findings of a Decade of Proactive Pipe Management

- Increased pipeline reliability
- **Risk-prioritized assessment** allows for targeted renewal
- No silver bullet
- Pipe management approaches and technologies are rapidly evolving

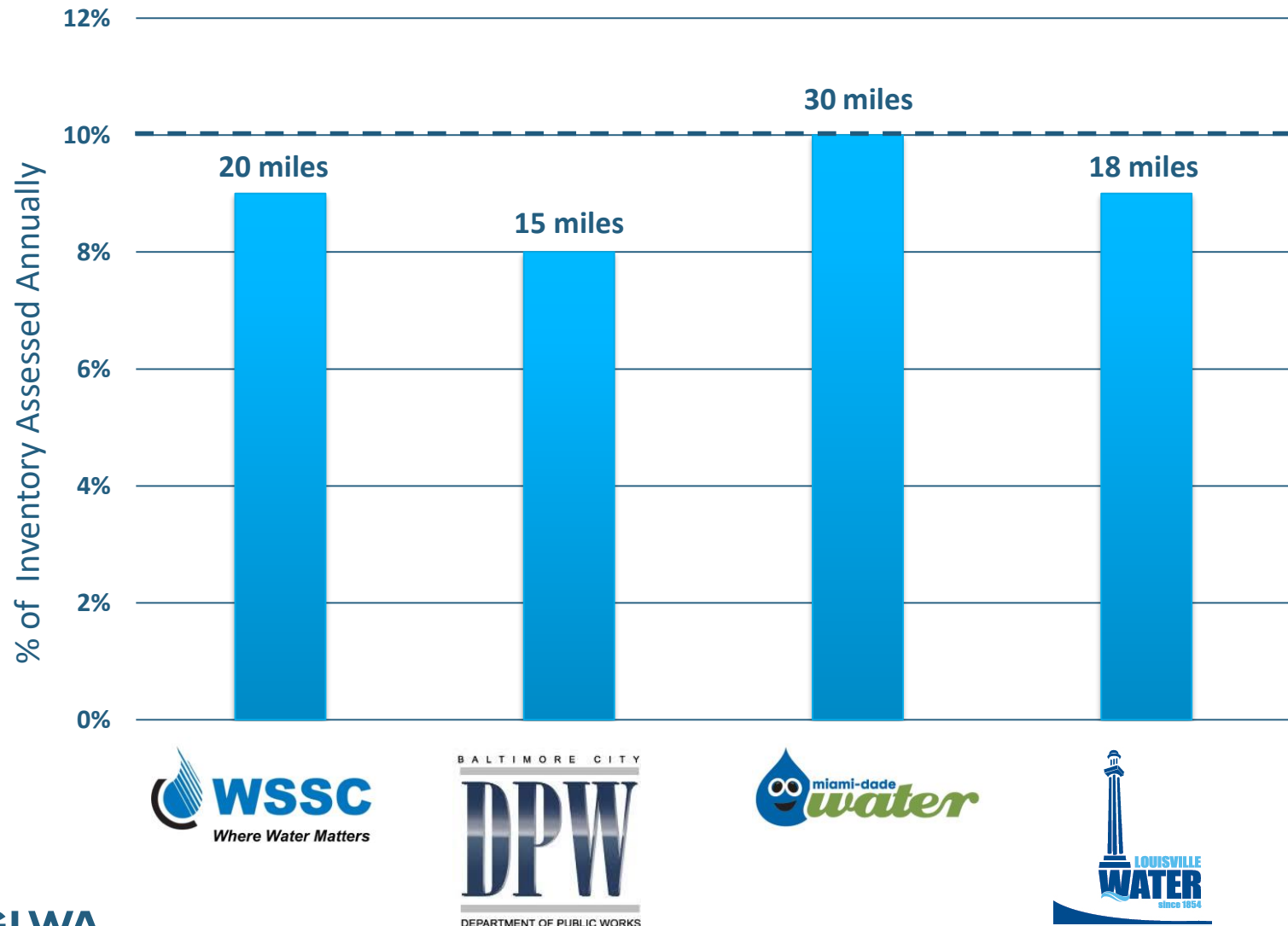


Major Findings of a Decade of Proactive Pipe Management

Peer Utility Data - Cumulative Transmission Main Failures



What are Peer Utilities Doing?



What are Peer Utilities Doing? (Assessment Only)

Peer Utility	2016 Cost	2017 Cost	Transmission Main Inventory (Miles)	% Pipe Assessed Annually (Average)
WSSC	\$6.7M	\$5.6M	235	9%
City of Baltimore	N/A	\$1.4M	200	8%
Miami Dade WASD	\$1.1M	\$2.3M	300	10%
Louisville Water Company	\$1.3M	\$3.9M	200	9%

Assessment and Renewal Program Goals

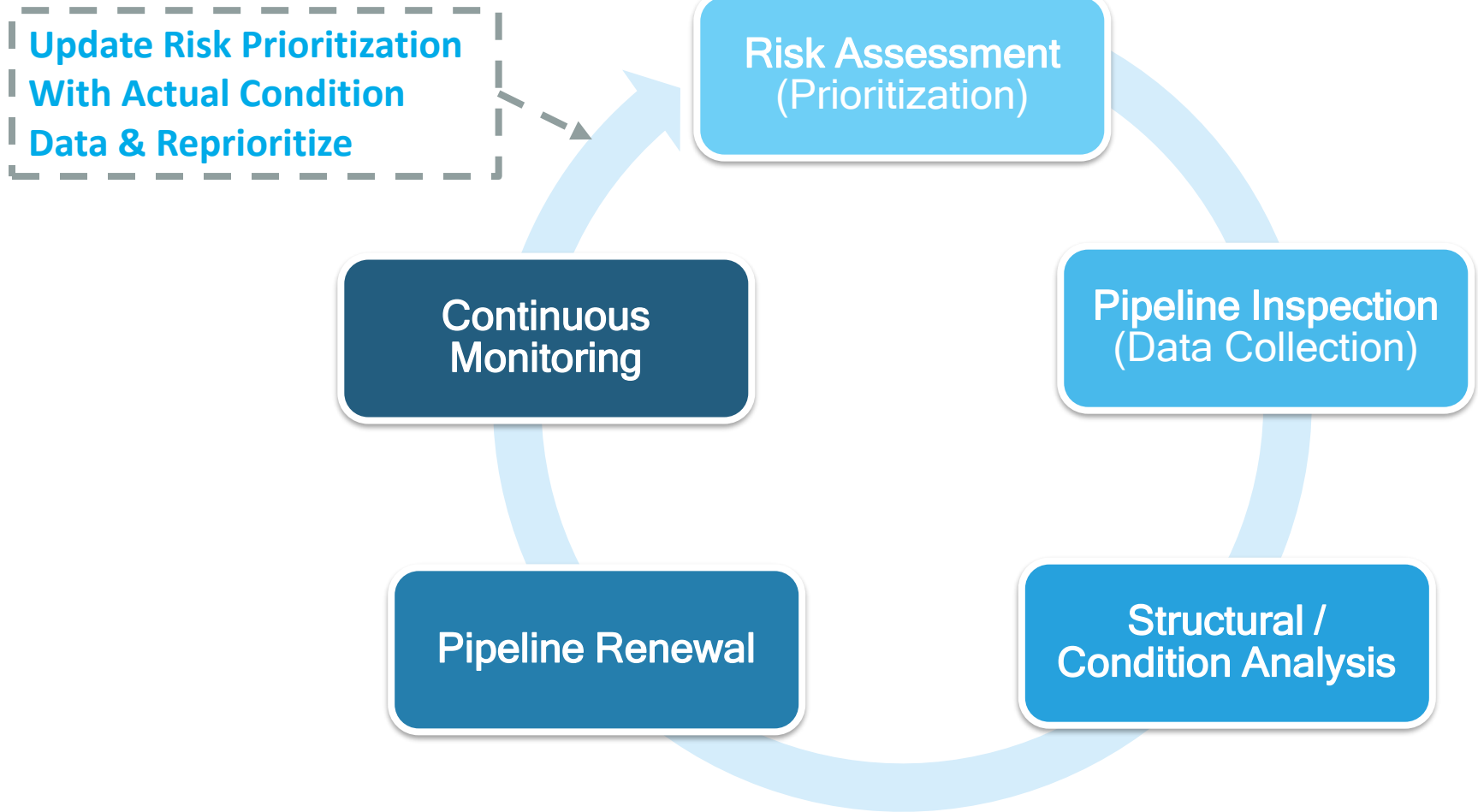
- Address highest risk concrete pipe first
 - 48-inch 14 Mile Road (Assessment Q3/Q4 of 2018)
 - 120-inch Huron to Imlay
 - 96-inch Imlay to North Service Center
 - 84-inch / 72-inch North Service Center to Franklin
- Address all high risk pipe based on a defined timeframe
- Continue to address remaining transmission mains following a schedule optimized by risk and budget

Transmission System Integrity Plan

Part 3



TRANSMISSION SYSTEM INTEGRITY PROGRAM CYCLE



Pipeline Prioritization – Risk Based Approach

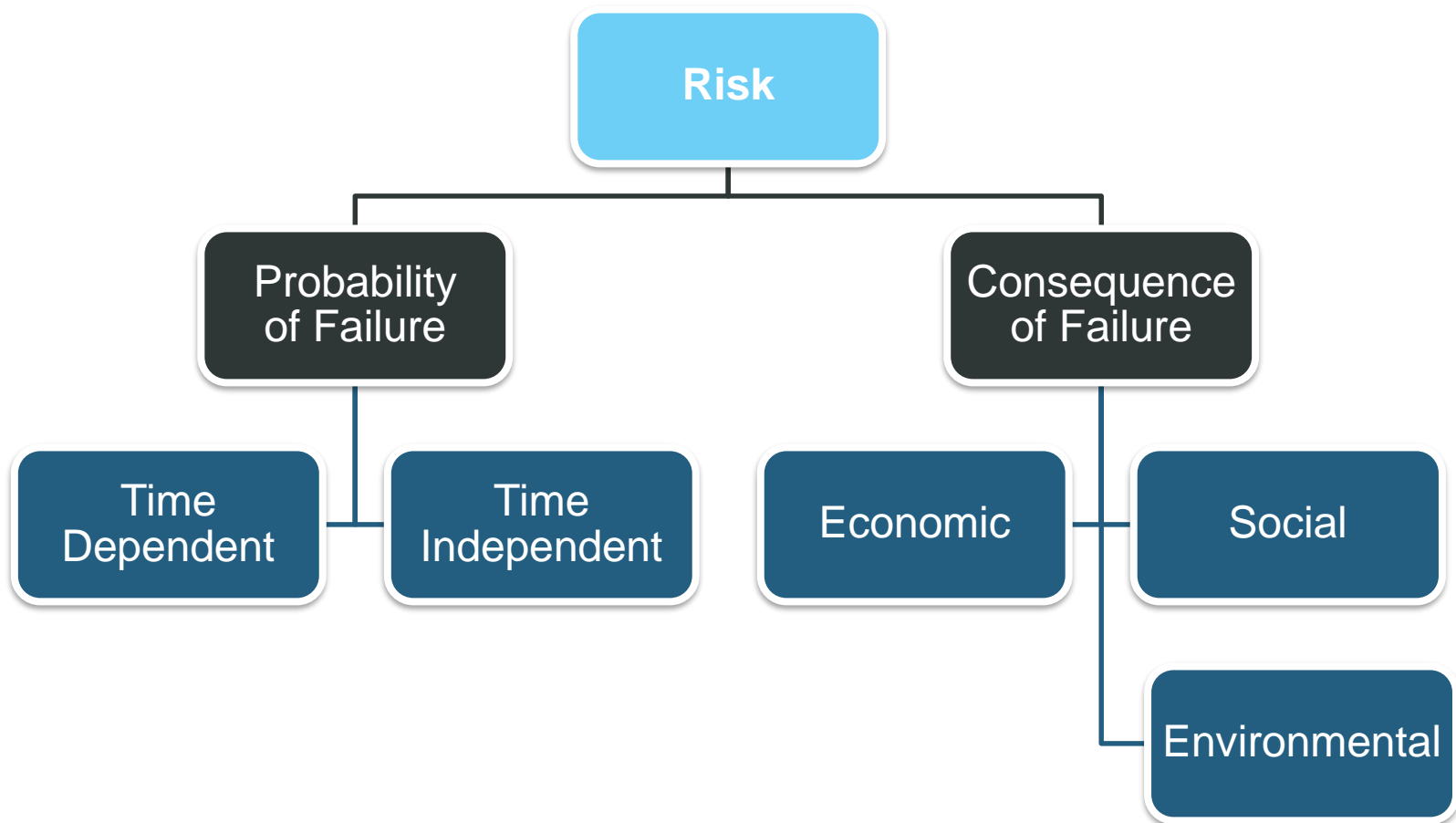
$$\text{RISK} = \text{PROBABILITY} \times \text{CONSEQUENCE}$$



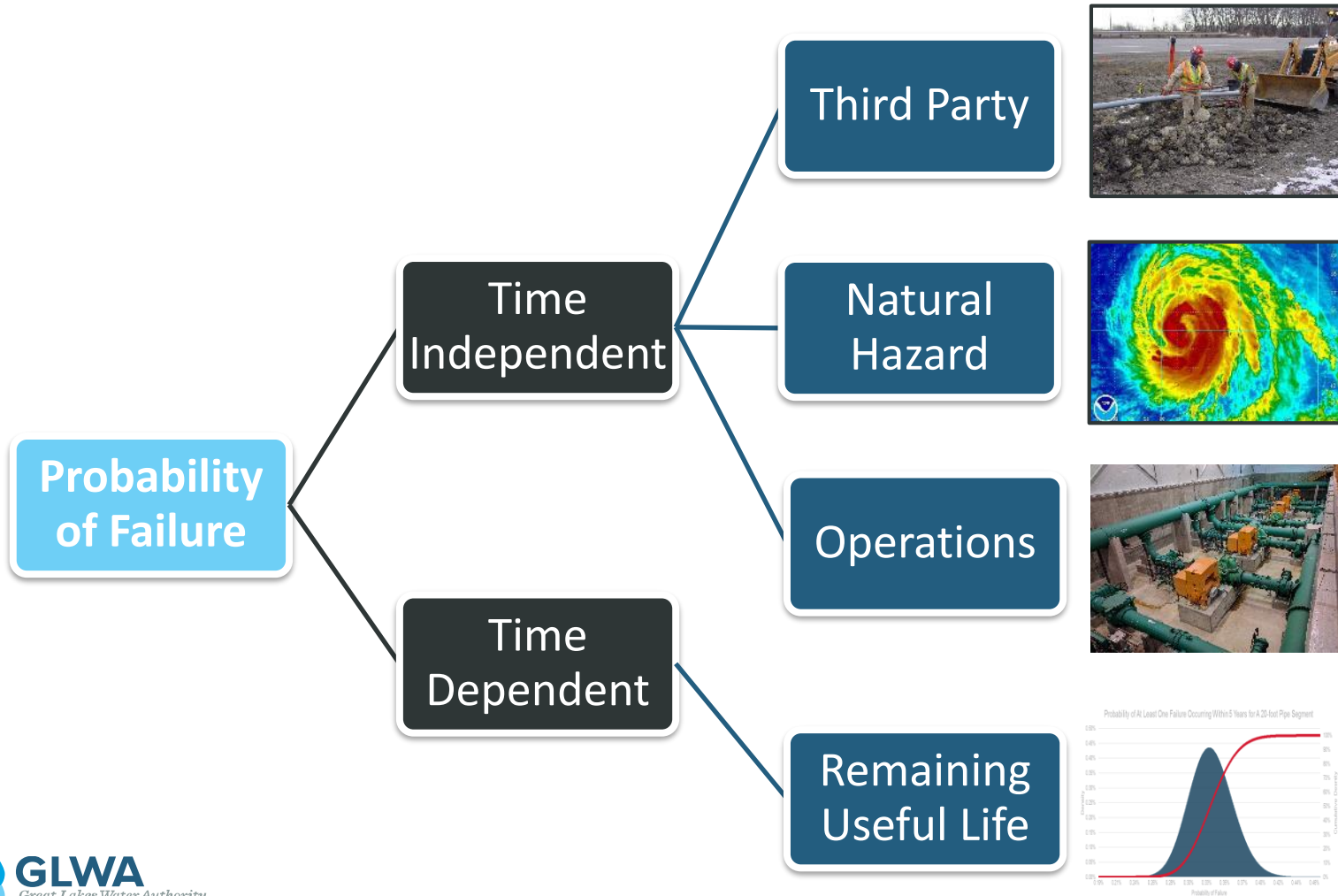
Probability that a
Failure Will Occur

Impact if a Failure
Occurs

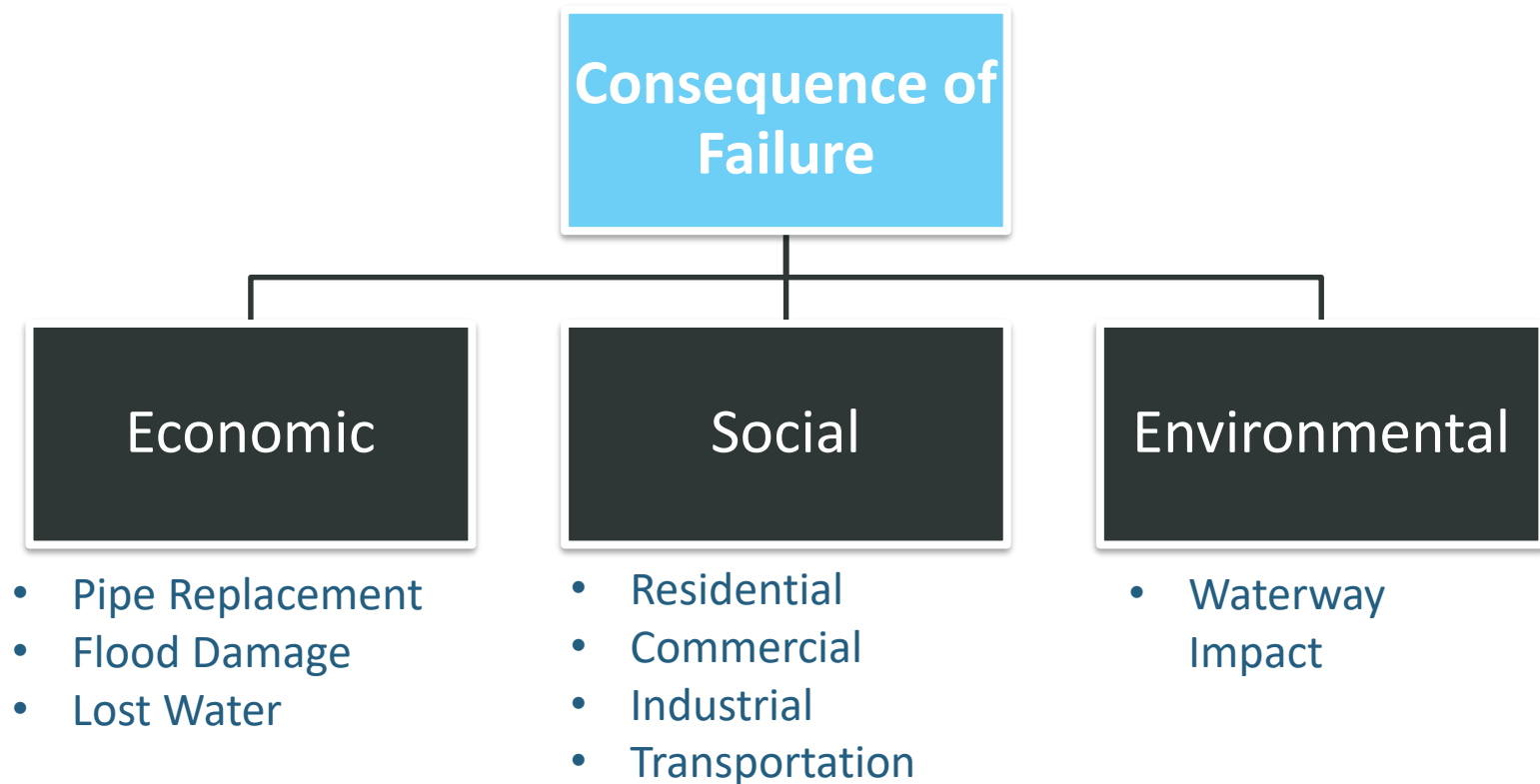
How is Pipeline Risk Determined?



Factors Impacting the Probability of a Pipe Failing



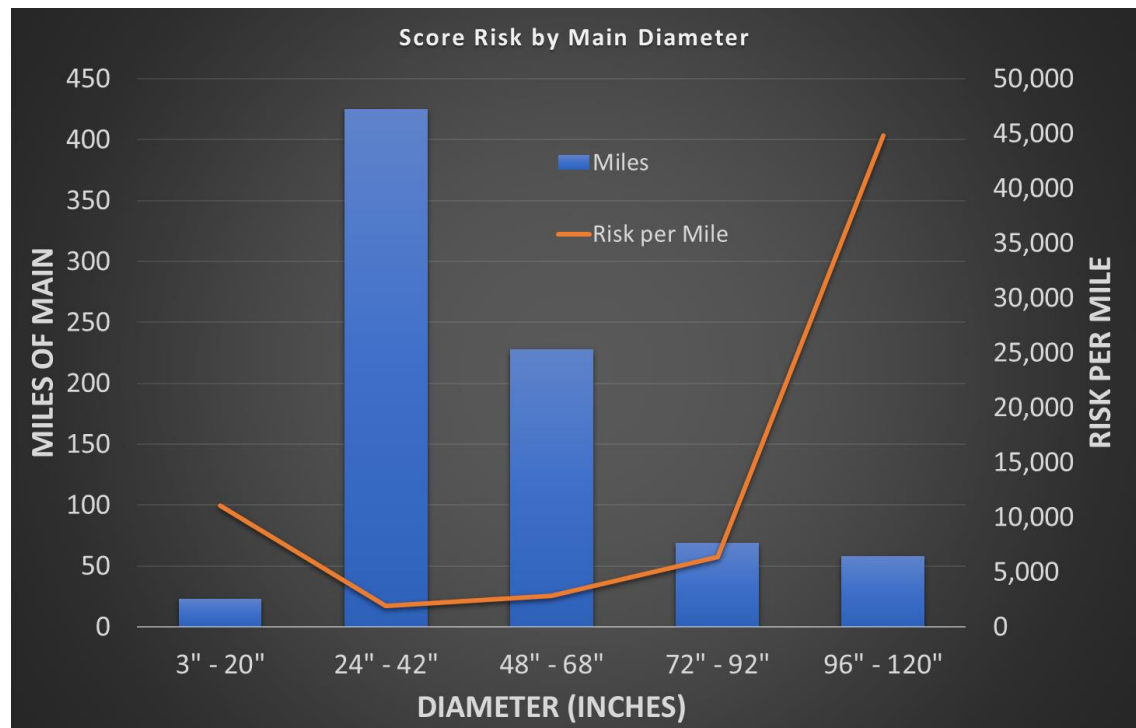
Factors Impacting the Consequence of a Pipe Failing



Transmission System Risk Results

Risk used to inform and prioritize:

- Assessment
- Renewal
- Monitoring
- Maintenance
- Capital Investment



Transmission Main Integrity Program Objectives



Pipeline Risk Management



**Budget Optimization
(Business Case)**



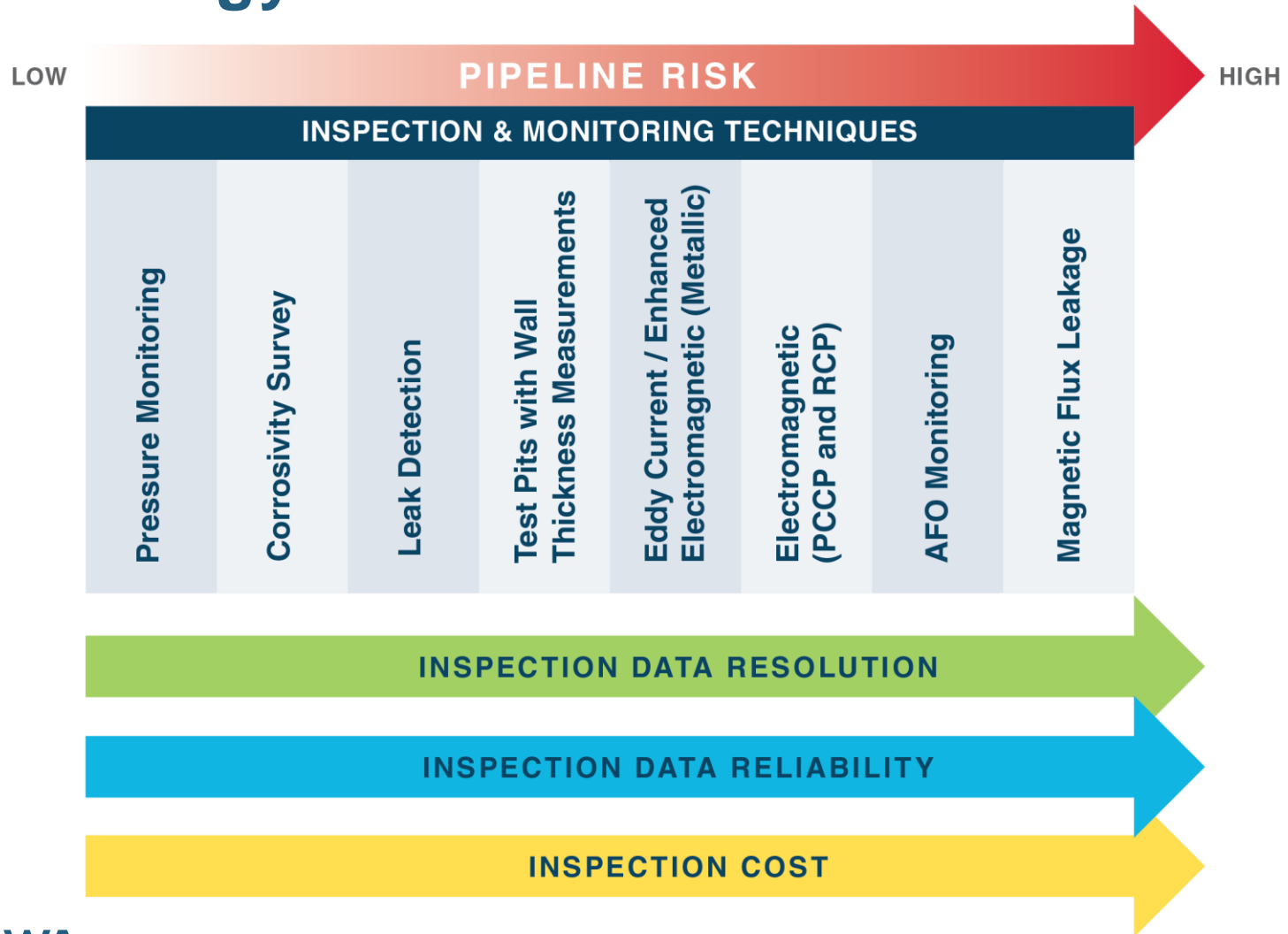
**Best-In-Class
Transmission System
Management**

What Does it Take to Be Best-in-Class?








10 Key Ingredients

1. Integrated Operational Excellence
2. Coordination
(w/ member partners, internal stakeholders, contracted companies)
3. Public Relations and Outreach
4. Clearly Defined Team Amongst Different Groups
5. Total Pipeline Management
(Address all pipeline features & integrate with other GLWA work)
6. Emergency Preparedness
7. Remain Opportunistic
8. Innovation
(technologies, data management, process, dynamic risk model)
9. Understand Limitations of Innovative Approaches
10. Boots on the Ground
(maximize inspected pipe)

Condition Assessment Technology Selection



Condition Assessment Technology Selection

Technology	Unit Cost (\$/mi)	Risk Tier 1	Risk Tier 2	Risk Tier 3	Risk Tier 4
Risk / Break Analysis	\$250				
Pressure Monitoring	\$1,000				
Leak Detection	\$30,000				
Test Pits	\$25,000				
Electromagnetic	\$100,000				
Magnetic Flux Leakage	\$135,000				
Acoustic Fiber Optic Monitoring	\$135,000				

Getting it Done Takes a Dedicated Staff



A best-in-class program requires:

- Dedicated technical staff (internal / external)
- Operations crews dedicated to the program
- Timely response for repairs
- Internal flexibility as the program progresses

Keys to Success

- ✓ Foster strong relationship between operations, engineering, and asset management
- ✓ Define and adhere to schedule
- ✓ Technical team with practical operational knowledge
- ✓ Resilient to staff turnover
- ✓ Quantify and communicate program success
- ✓ Strong but flexible processes
- ✓ Be prepared for emergencies





Summary

- State-of-art, scientifically defensible approach to pipeline risk management
- Apply data to drive decision making processes to manage pipeline risk
- Make GLWA's Transmission System Integrity Program industry best



Open Dialogue

Part 4



GLWA

Great Lakes Water Authority