



GLWA Water Transmission Main Renewal Strategy – Part 2

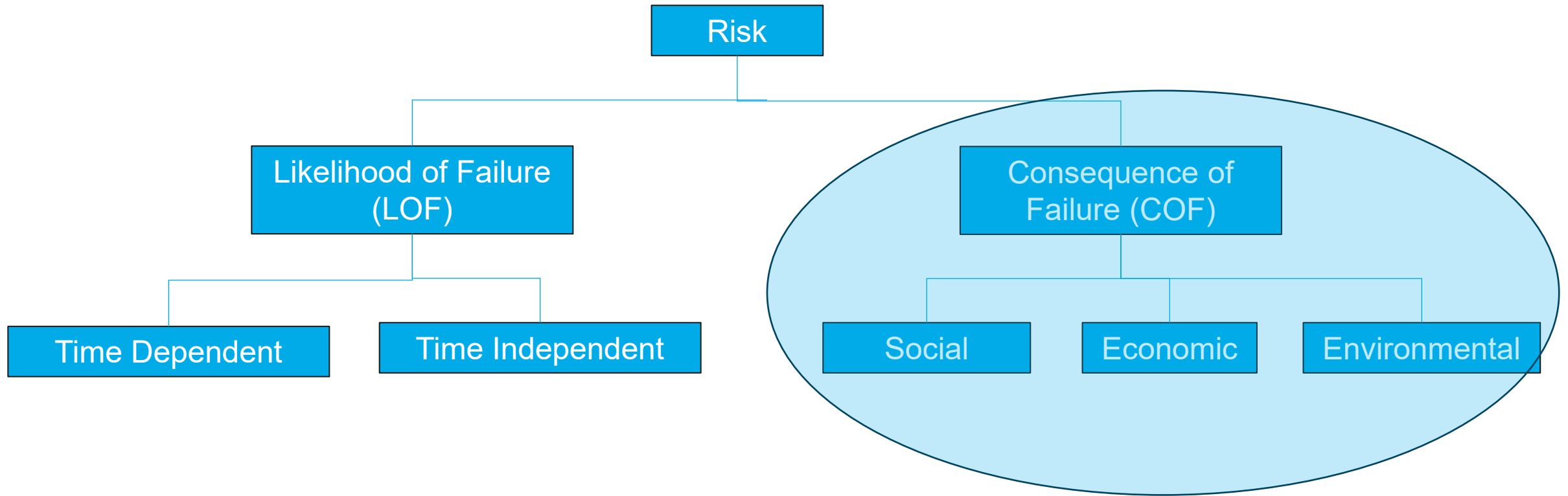
Jody Caldwell, P.E. Chief Planning Officer

Linear System Integrity Program

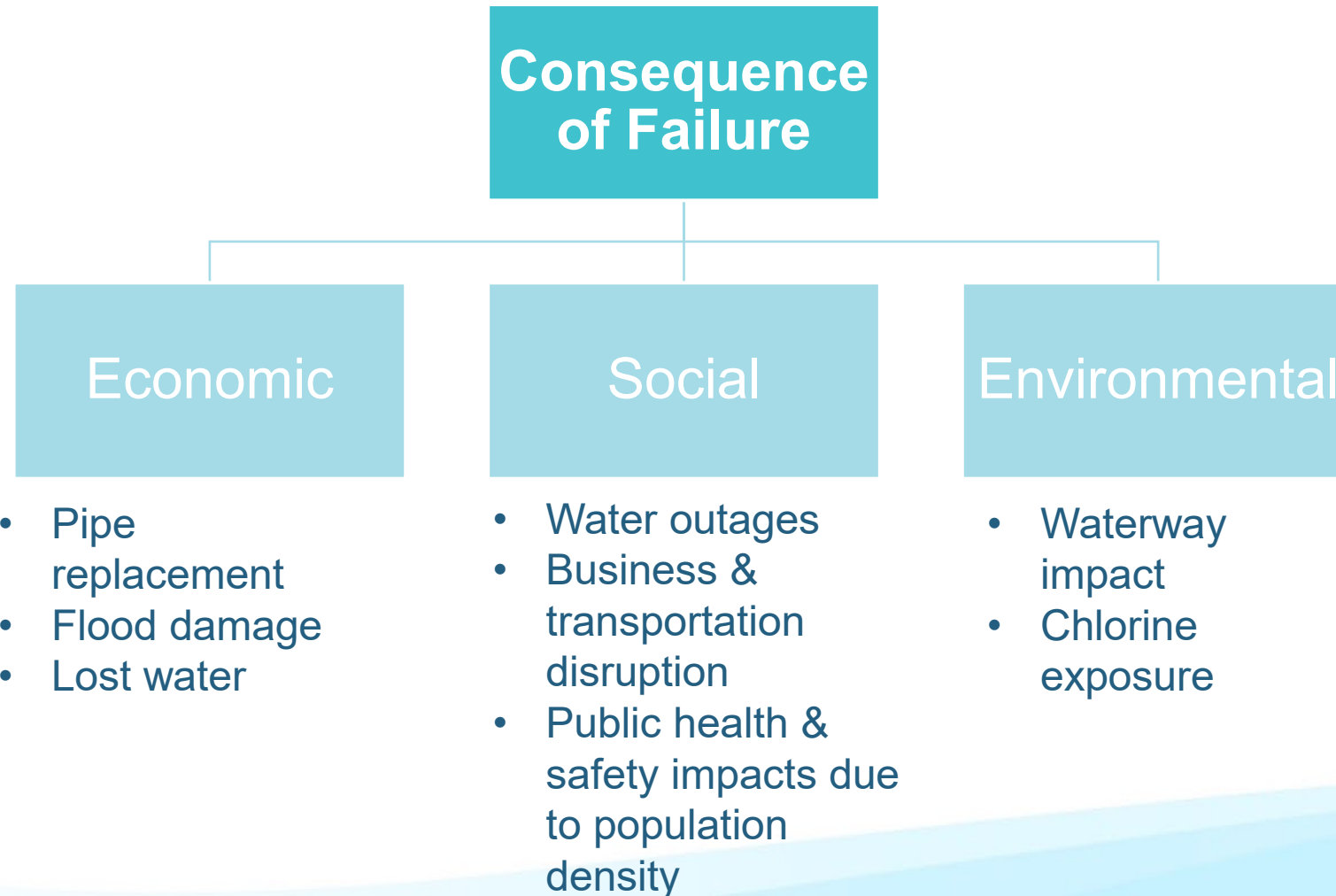
Key Take-Aways

- ◆ Transmission main risk matrix is used to prioritize management
- ◆ Evolution to a more comprehensive “Water Transmission Main Renewal Strategy” is being developed
- ◆ 16% of mains are beyond their useful life...and ever aging
- ◆ 16% of mains are candidates for decommissioning
- ◆ Long-term, annual funding is the biggest challenge

Linear System Integrity Program Risk Assessment



RISK – Consequence of Failure



Prior Consequence of Failure (CoF) Determination

- 💧 Weighting developed and implemented by a cross-functional team
- 💧 Note % assigned to:
 - 💧 Hydraulic Criticality = 80%
 - 💧 Health/Safety & Financial Impact = 20%
- 💧 New factor needed for population density

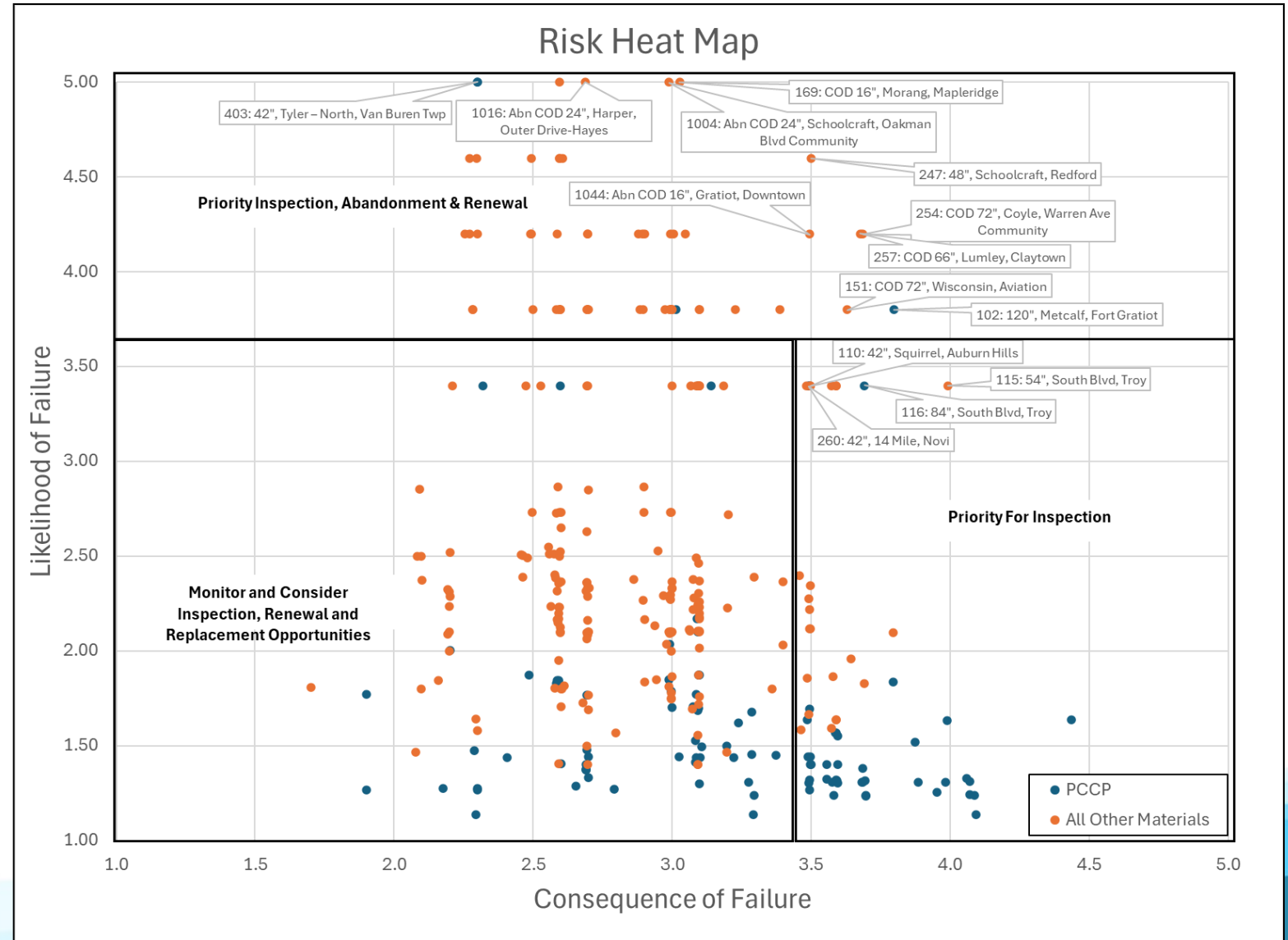
Category	Percent Weight	LSIP Proxy	1	2	3	4	5
Regulatory Compliance	50%	Hydraulic Criticality (demand shortfall and customer impacts)	Model indicates no demand shortfalls or customer impacts	Event causes up to 10 MGD demand shortfall or up to 5 MGD customer impacts	Event causes up to 20 MGD demand shortfall or up to 10 MGD customer impacts	Event causes up to 30 MGD demand shortfall or up to 15 MGD customer impacts	Event causes more than 30 MGD demand shortfall or more than 15 MGD customer impacts
Impact to Service Levels	10%						
Public Trust	10%						
Public Impact	10%						
Financial Impact	10%	Pipe Diameter	24-inch or less or is unknown	Up to 48-inch	Up to 60-inch	Up to 96-inch	More than 96-inch
Health & Safety	10%	Transportation Disruption (combination of distance to road and AADT) and Flooding (distance to buildings)	None of the criteria for a health and safety score of 2 or more is met	Pipe is within 250 feet of a rail, within 150 feet of a road with less than 6,000 AADT, or within 300 feet of a building	Pipe is within 150 feet of a rail, within 150 feet of a road with 6,000-9,000 AADT, or less than 200 feet of a building	Pipe is within 100 feet of a rail, within 150 feet of a road with 9,000-20,000 AADT, or less than 100 feet of a building	Pipe intersects a rail, is within 150 feet of a road with more than 20,000 AADT, or intersects a building

NEW Consequence of Failure (CoF) Scoring

CoF Score	Proposed Weighting	Proxy	1	2	3	4	5
Regulatory Compliance	40%	Hydraulic Criticality	No demand shortfalls or customer impacts	<10MGD demand shortfall or <5 MGD customer impacts	10-20 MGD demand shortfall or 5-10 MGD customer impacts	20-30MGD demand shortfall or 10-15 MGD customer impacts	>30MGD demand shortfall or >15 MGD customer impacts
Impact to Service Levels							
Public Trust							
Financial Impact	10%	Pipe Diameter	<24"	24"-48"	48"-60"	60-96"	>96"
Health & Safety	10%	Rail Distance	>250ft from a rail line	<250ft from a rail line	<150ft from a rail line	<100ft of rail line	Intersects Rail Line
		Road Distance	>150ft from road	Within 150ft of a road with AADT <6,000	Within 150ft of road with 6,000-9,000	Within 150ft of road with AADT 9,000-20,000	Is within 150ft of road with >20,000 AADT
		Building Distance	>300ft from building	<300ft from a building	<200ft from a building	<100ft from a building	Intersects a Building
Public Impact	40%	Size of water main and proximity to buildings	Break on small or medium diameter main not near significant building density	Break of small diameter main near medium building density	Break on medium diameter main near medium building density OR Break on small diameter main near high building density	Break of medium sized water main near high building density OR Break of large diameter main near medium building density	Break on large diameter main in high building density areas

LSIP Overall Risk Matrix

- Regions developed to align with management categories
- Used as an initial pass to prioritize pipe groupings within each region
- Requires more detailed evaluation at the project group level during project planning

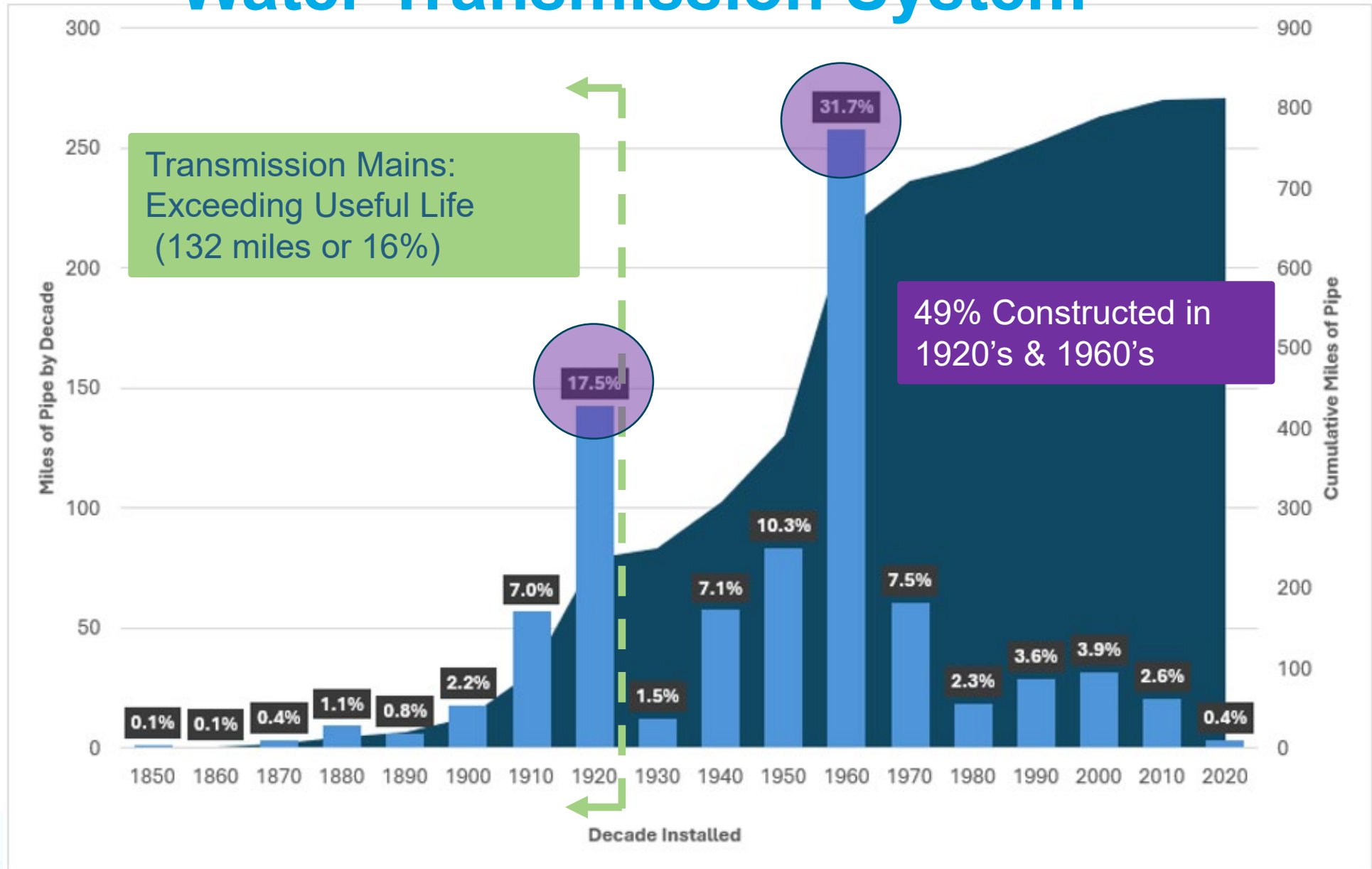


GLWA Transmission Main Categories

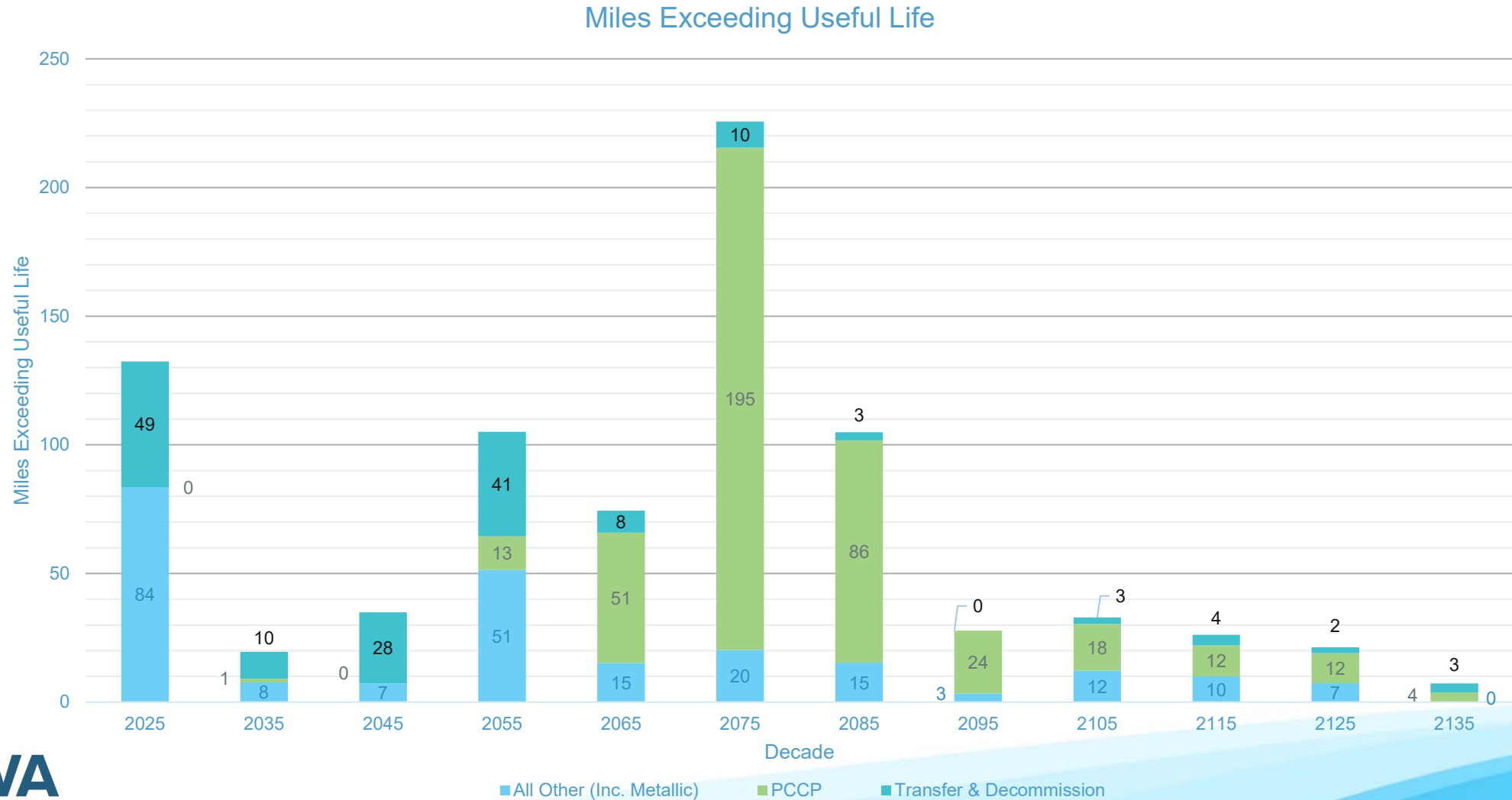
- 💧 Transfer candidates have been evaluated and may be necessary for DWSD operation
- 💧 Decommissioned candidates have been evaluated and may not be needed for GLWA or DWSD operation

Transmission Main Management Category	Miles
To Be Transferred or Decommissioned	161.7
Prestressed Concrete Cylinder Pipe (PCCP)	416.6
All Others (Including Metallic)	233.8
Total Miles of Transmission Main	812.1

Water Transmission System



Transmission Main Exceeding Useful Life



Comprehensive Transmission Main Renewal Strategy Objectives & Discussion

- ◆ Reduce overall system risk
- ◆ Minimize failures on high-risk mains
 - ◆ I.e., Utilize Risk Matrix to prioritize management of the transmission main
- ◆ Management strategies differ by transmission main type
 - ◆ Primarily due to the ability to obtain accurate condition assessment data
- ◆ Management (condition assessment and/or renewal) of transmission mains is very challenging due to:
 - ◆ Complexity of operations
 - ◆ Ability to take the main out of service
 - ◆ Coordination between other capital projects within the system

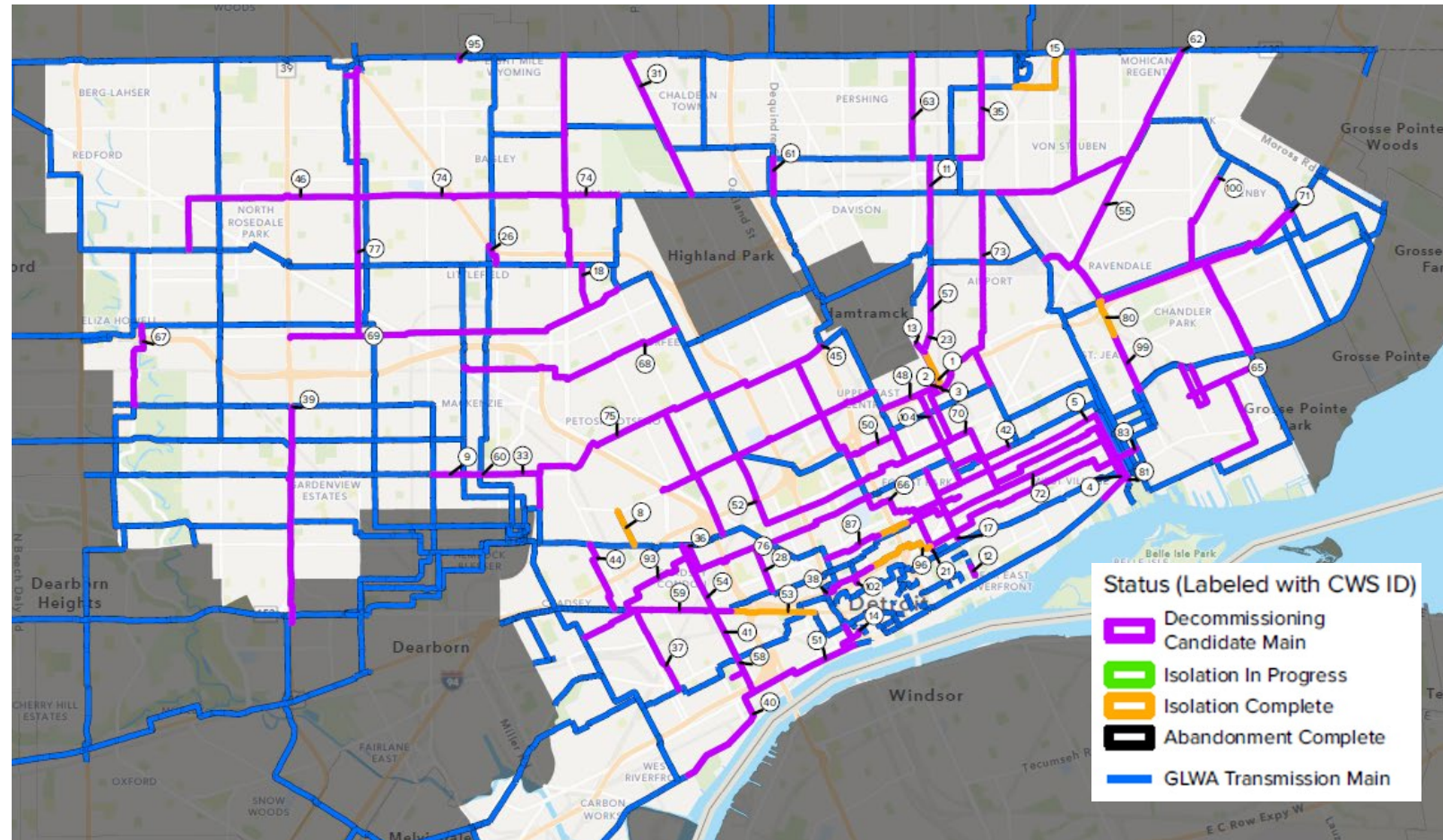
Comprehensive Transmission Main Renewal Strategy Management

- ◆ Use best and most cost-effective means and technology to manage the varying transmission main categories
 - ◆ Transfer and Decommission Candidates:
 - ◆ Material varies
 - ◆ Testing and coordination of transfer and decommission mains with DWSD based on priority
 - ◆ Prestressed Concrete Cylinder Pipe:
 - ◆ Use technology to perform condition assessment and strategically renew pipe segments
 - ◆ Reinspection required every 7 to 10 years
 - ◆ All Other Mains (Including Metallic):
 - ◆ Utilize technology where practical to assess condition
 - ◆ Systematically replace main based on prioritization (typically those pipes exceeding their useful life)

Cohort 1

Water Main Candidates for Decommissioning

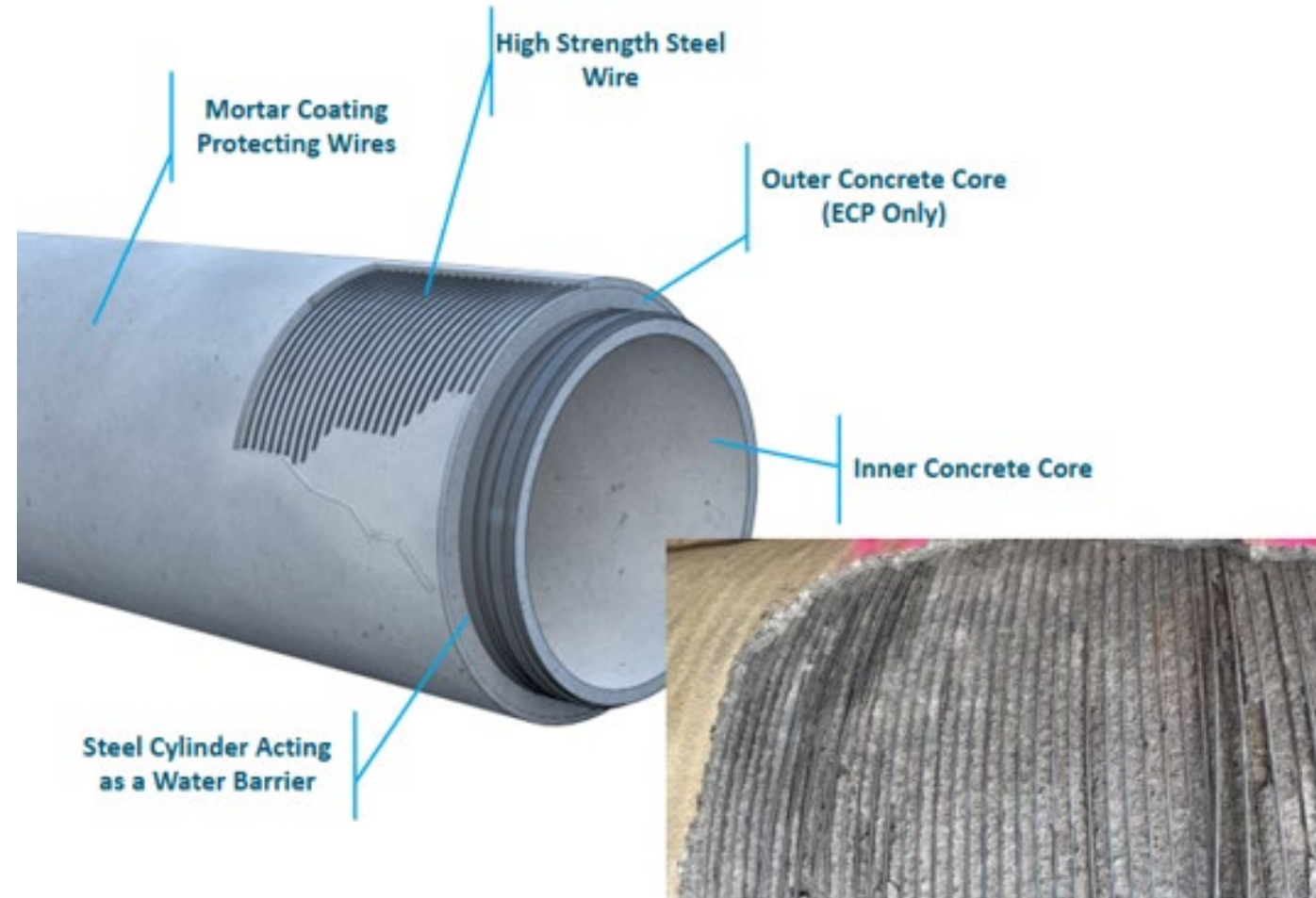
- Approximately 127 miles
- Based on prior hydraulic modeling and agreement with DWSD
 - Specific water mains identified
 - Documents the process for decommissioning
- Requires:
 - Construction activities required to disconnect main and inject flowable fill
 - Coordinated communication plans



Cohort 2

Prestressed Concrete Cylinder Pipe (PCCP)

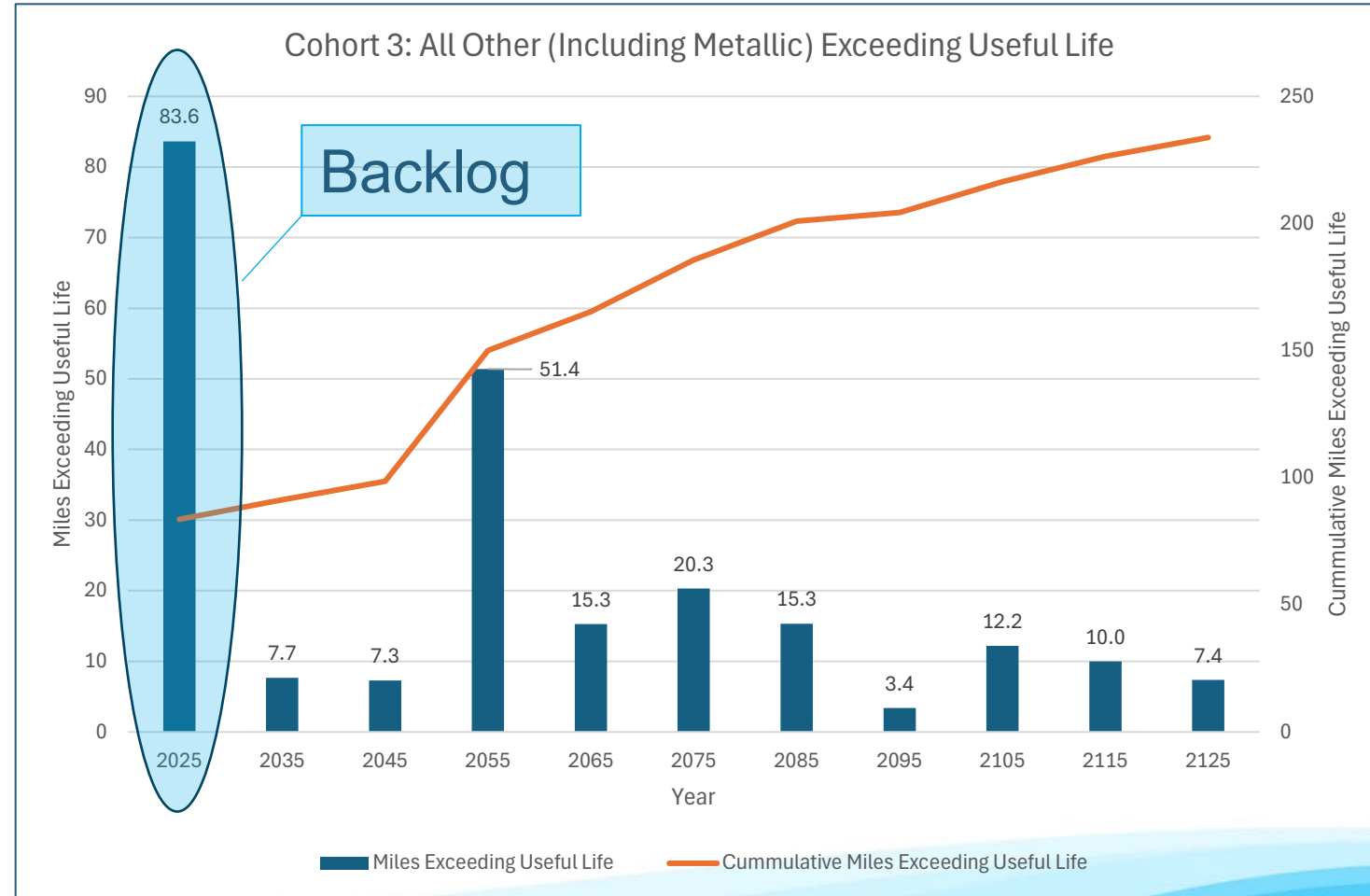
- ◆ Approximately 417 miles
- ◆ Primary focus of the Linear System Integrity Program to date
- ◆ Fails due to broken wire wraps
- ◆ Failure typically occurs catastrophically
- ◆ Manufacturing practices in the 1960's and 1970's have contributed to premature failures
- ◆ Management includes inspection and target renewal



Cohort 3

All Other Mains (Primarily Metallic Pipe)

- Approximately 234 miles
- Large quantity of mains exceeding useful life
 - Expected useful life is between 80-120 years (depending on material vintage)
- Prioritize based on risk and inspection results
 - Use leak detection and other assessment technologies to inform risk
- Management includes complete lining or replacement

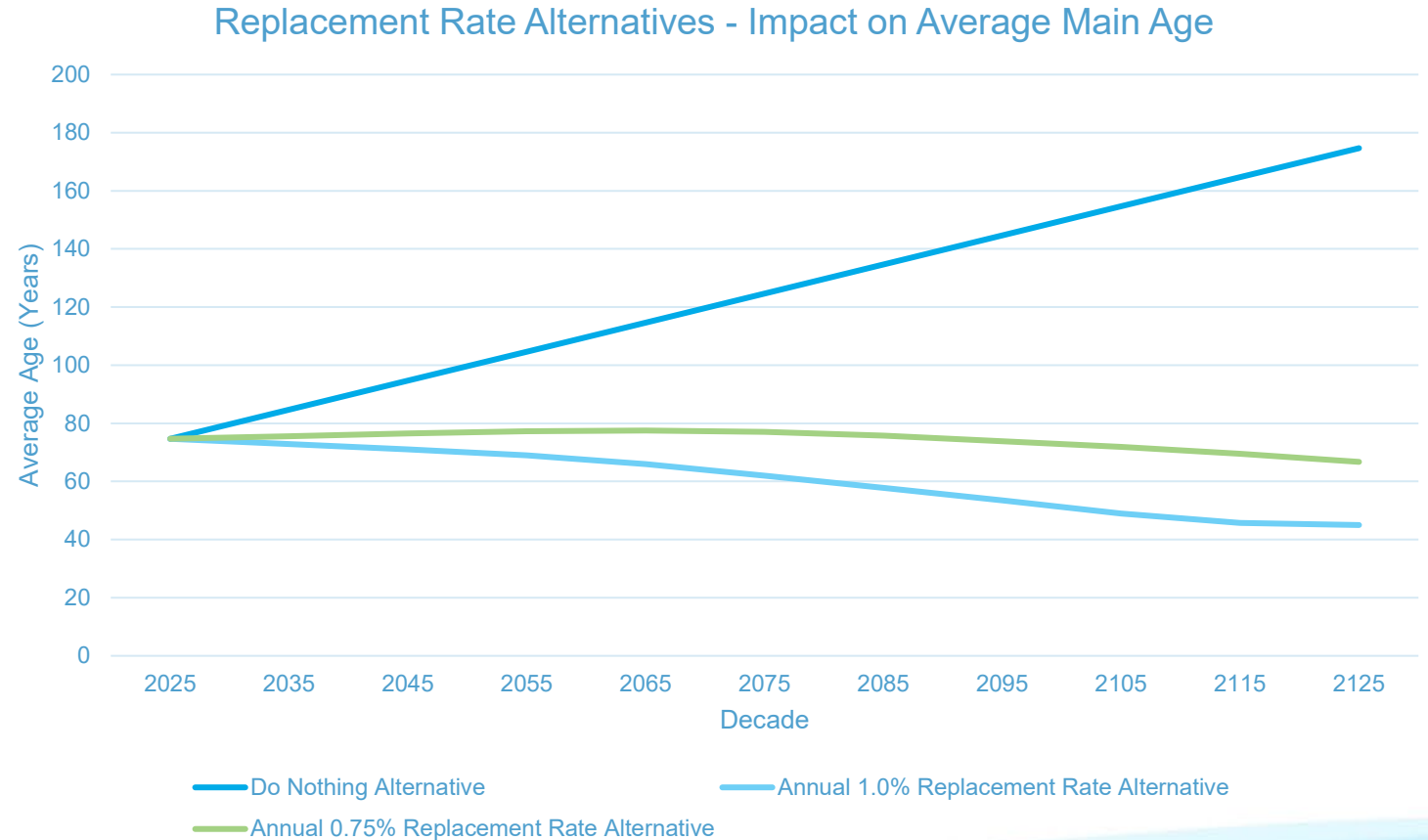


Cohort 3

All Other Mains (Primarily Metallic Pipe)

💧 Average Age Analysis

- 💧 Each alternative (except Do Nothing) assumes annual funding levels at the associated replacement percentage
- 💧 Industry standard is variable due to water system age, but generally between 1-2% replacement rate per year

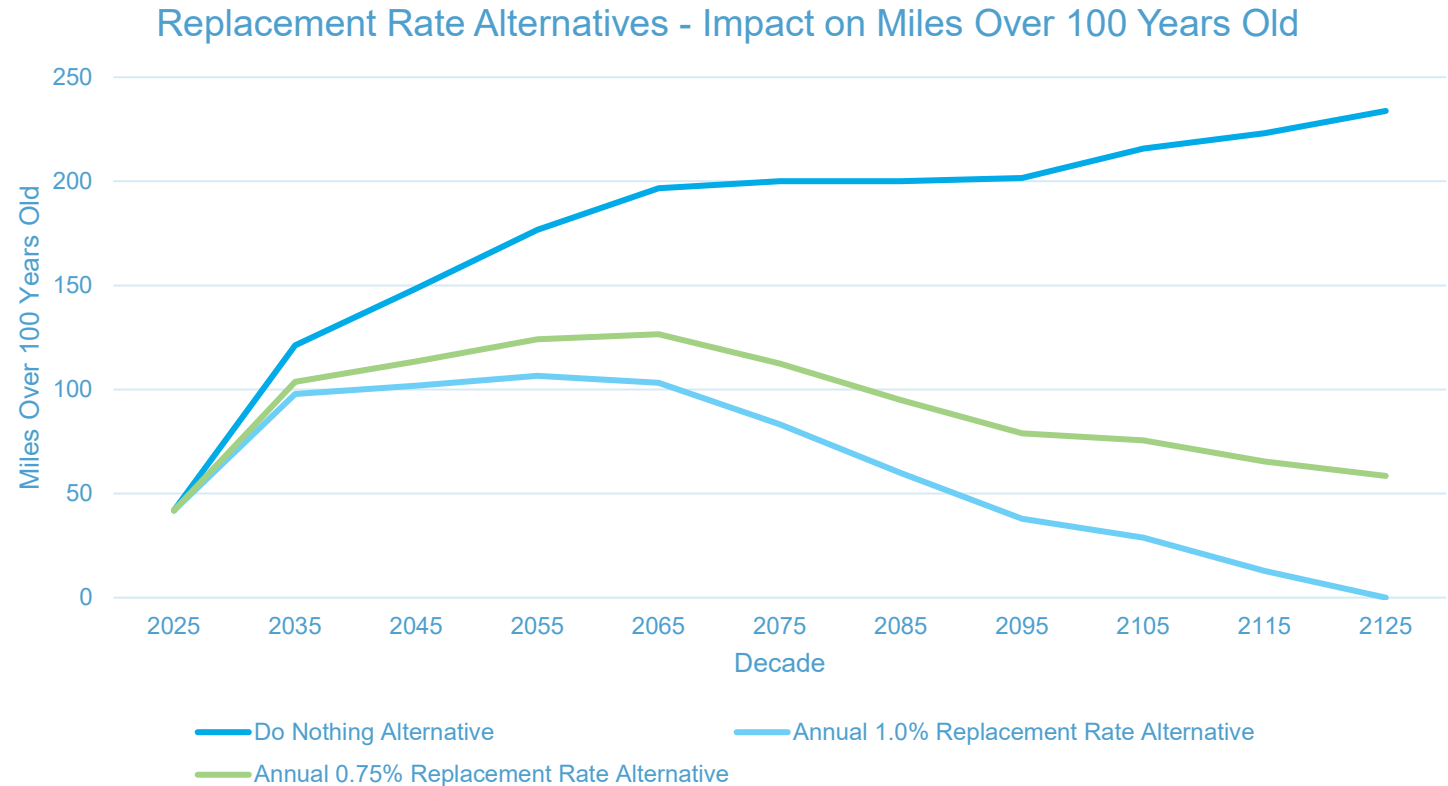


Cohort 3

All Other Mains (Primarily Metallic Pipe)

💧 Miles Over 100 Years Old Analysis

- 💧 Each alternative (except Do Nothing) assumes annual funding levels at the associated replacement percentage



Transmission Main Renewal Strategy Challenges

- ◆ Funding
- ◆ Affordability
- ◆ Staffing – Ramp up to comprehensive strategy will be required
- ◆ Limitation with condition assessment technology
- ◆ Failures will continue until risk is mitigated over time
- ◆ Vendor capacity
- ◆ Coordination with other CIP projects
- ◆ Local projects coordination

Example 1: Annual Renewal Strategy by Cohort

Assume annual funding level to:

- Decommission mains over 10 year period
- Continue PCCP inspection & renewal
- Renew 1% of “All Other” transmission mains

Water Main Type	Total Miles	Annual Percentage	Annual Length Inspection or Renewal	Years to Complete Cohort	Annual Cost (1,000s)*
Cohort 1: Water Main Decommissioning	127.3	10%	12.7	10	\$ 18,849
Cohort 2: PCCP Water Main Inspection & Renewal**	416.6	5%	20.83	20	\$ 15,872
Cohort 3: All Other (including Metallic) Water Main					
Water Main Renewal:	233.8	1%	2.3	100	\$ 25,694
Water Main Leak Detection & Repair:	233.8	5%	11.7	20	\$ 440
Totals:	777.6		48.0		\$ 60,855
Less Existing Average LSIP Program Funding:					\$ (7,640)
Total Budget Increase:					\$ 53,214

*Additional GLWA resources are not included in cost estimates

**Continuation of the existing PCCP inspection and renewal program

Example 2: Annual Renewal Strategy - Decommission & 1% Renewal

Assume annual funding level to:

- Decommission mains over 10 years
- Renew 1% of all transmission mains

Water Main Type	Total Miles	Annual Percentage	Annual Length	Years to Complete Cohort	Annual Cost (1,000s)*
Cohort 1: Water Main Decommissioning	127.3	10%	12.7	10	\$ 18,849
Cohort 2 & 3: PCCP and All Other Water Main	650.4	1%	6.5	100	\$ 72,514
Totals:	777.6		19.2		\$ 91,363
Less Existing Average LSIP Program Funding:					\$ (7,640)
Total Budget Increase:					\$ 83,723

*Additional GLWA resources are not included in cost estimates

Example 3: Annual Renewal Strategy – **1% Renewal All Mains**

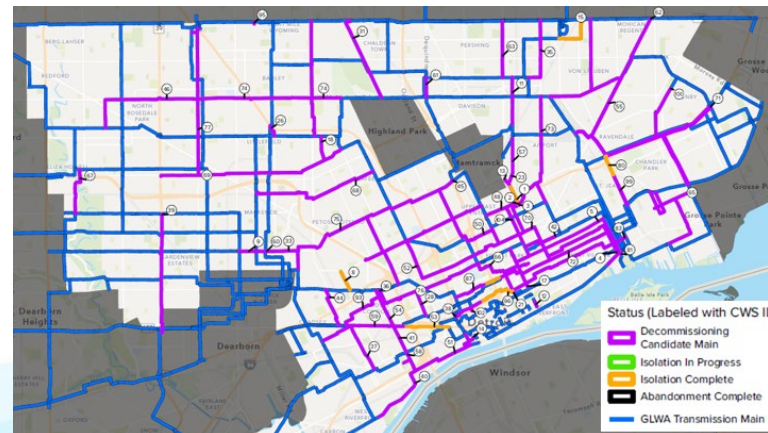
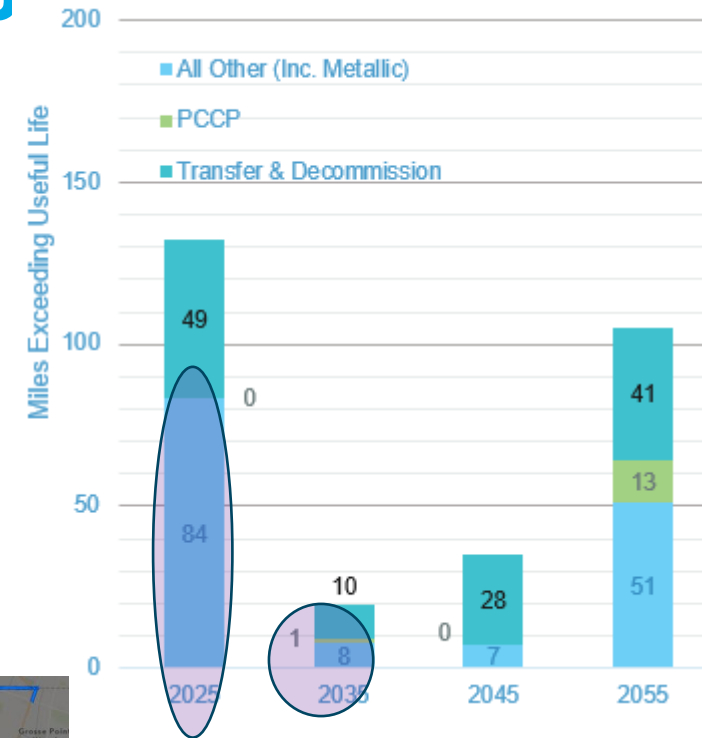
- Assume annual funding level to:
 - Renew 1% of all transmission mains

Water Main Type	Total Miles	Annual Percentage	Annual Length	Years to Complete Cohort	Annual Cost (1,000s)*
All Transmission Main	777.6	1%	7.8	100	\$ 86,709
Less Existing Average LSIP Program Funding:					\$ (7,640)
Total Annual Budget Increase:					\$ 79,069

*Additional GLWA resources are not included in cost estimates

Investments To Address Mains Beyond Useful Life & Decommissioning

Transmission Main Management	Miles	Management Strategy	Estimated Cost
Mains Exceeding Useful Life	83.6	Renew / Replace	\$886M
Mains Exceeding Useful Life By 2035	9.1	Renew / Replace	\$85M
Decommission	127.3	Decommission	\$188M
Total	220.0		\$1.159B



Conclusions

- ◆ Our current level of investment, while significant, cannot reduce our current frequency of water main breaks
- ◆ Without increased funding, the rate of failures will increase due to the age of the transmission mains
- ◆ GLWA has developed an approach to minimize, but not eliminate, this increased risk to the transmission system
- ◆ Examples indicate an annual programmatic budget of approximately \$75 million is necessary to proactively manage the transmission network

Next Steps

- ◆ The financial team will be evaluating funding strategies to ramp up to \$75 million over a 10-year period
- ◆ GLWA planning and operations will develop a phased in resource plan to achieve this strategy
- ◆ GLWA will continue to seek State and Federal partners to fund the significant backlog of mains:
 - ◆ Exceeding useful life
 - ◆ Decommissioning

Linear System Integrity Program

Key Take-Aways

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- ◆ 16% of mains are candidates for decommissioning
- ◆ Long-term, annual funding is the biggest challenge

A dynamic background image featuring a close-up of water splashing, with droplets and bubbles visible against a light blue sky. The lower half of the image is overlaid with a semi-transparent blue band.

Questions & Discussion