

Leveraging Failure Modes For Proactive Planning in Asset Resilience

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Ozwater'26



SMEC simplifies the complex. We unlock the potential of our people to look at infrastructure differently, creating better outcomes for the future.



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Are We Ready for Failure?



Florida Keys (USA) – Water Main Burst (2023)



Los Angeles (USA) – Water Main Burst (2014)

Could the failures have been prevented?
Could the consequences have been reduced?

Contents

Proactive asset management

Failure mode identification

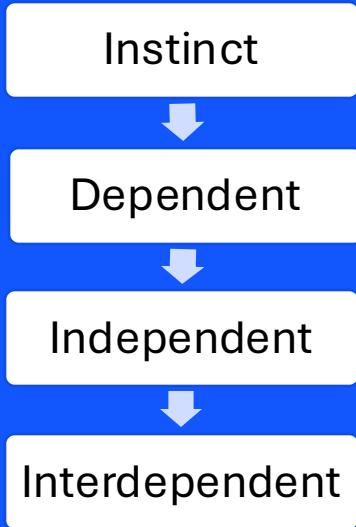
Mitigation measures

Example #1: critical DN700 MSCL pipeline

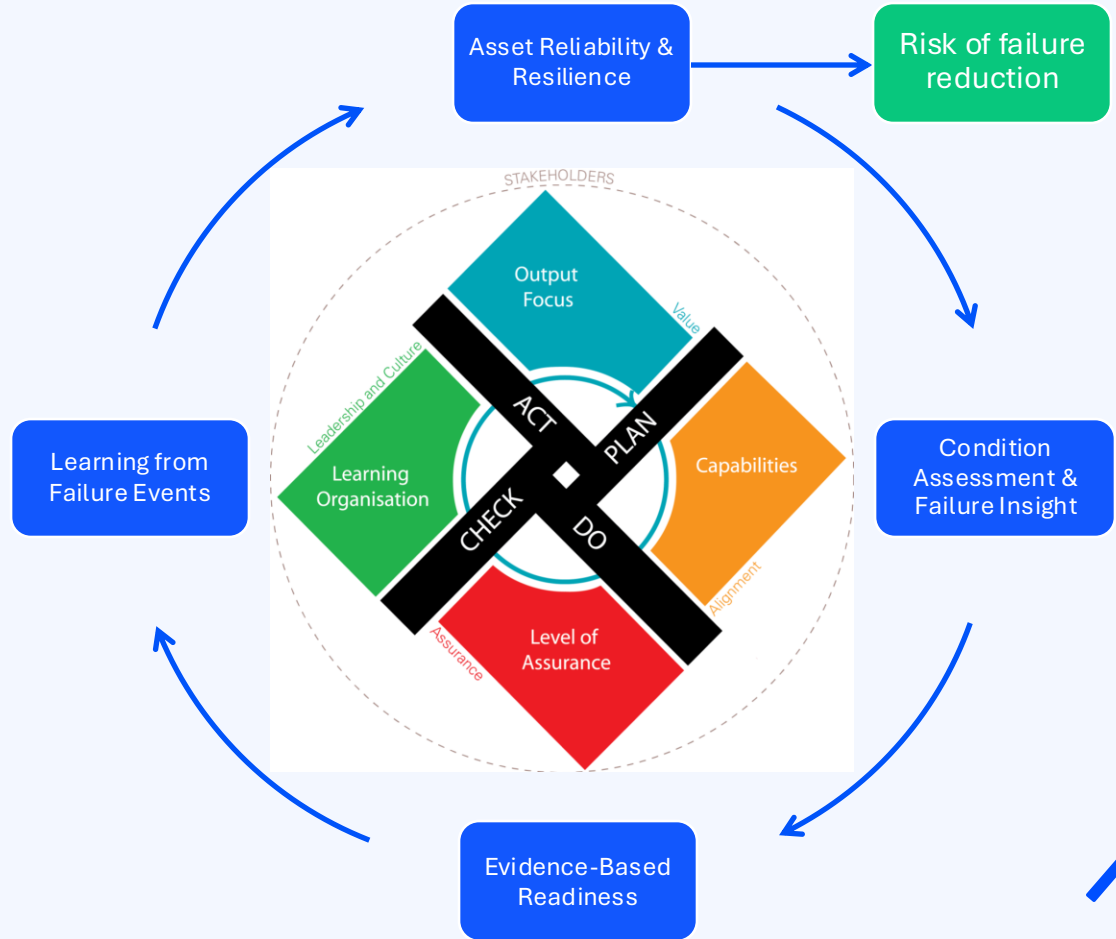
Example #2: 1900's cast iron water main



Proactive Asset Management



What is Asset Management?



Proactive Asset Management



Link Between Risk and Response

Asset Risk

- Likelihood of Failure (LoF)
- Consequence of Failure (CoF)

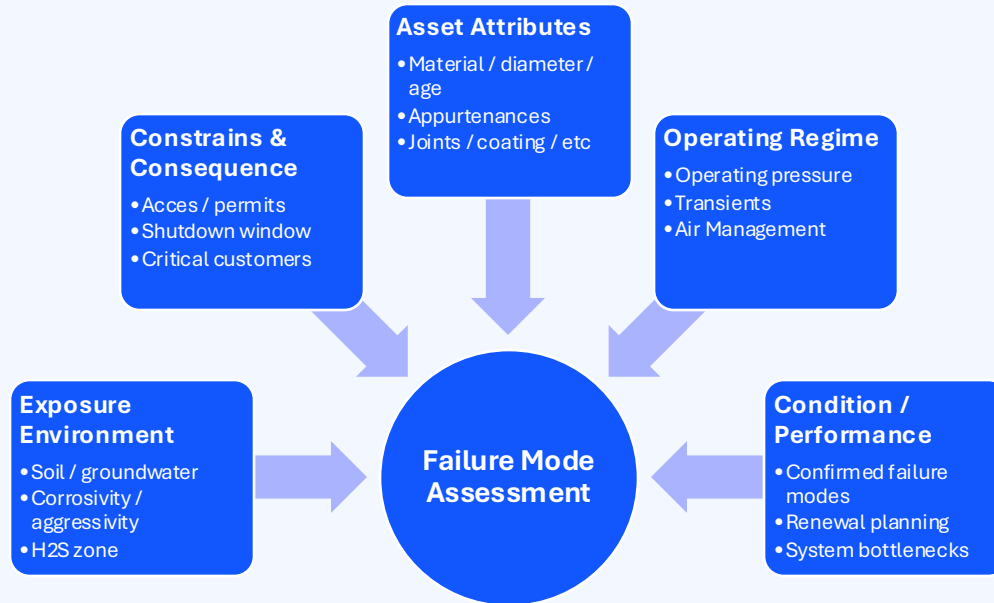
Asset Management Decisions

- Monitor
- Renew
- Prepare

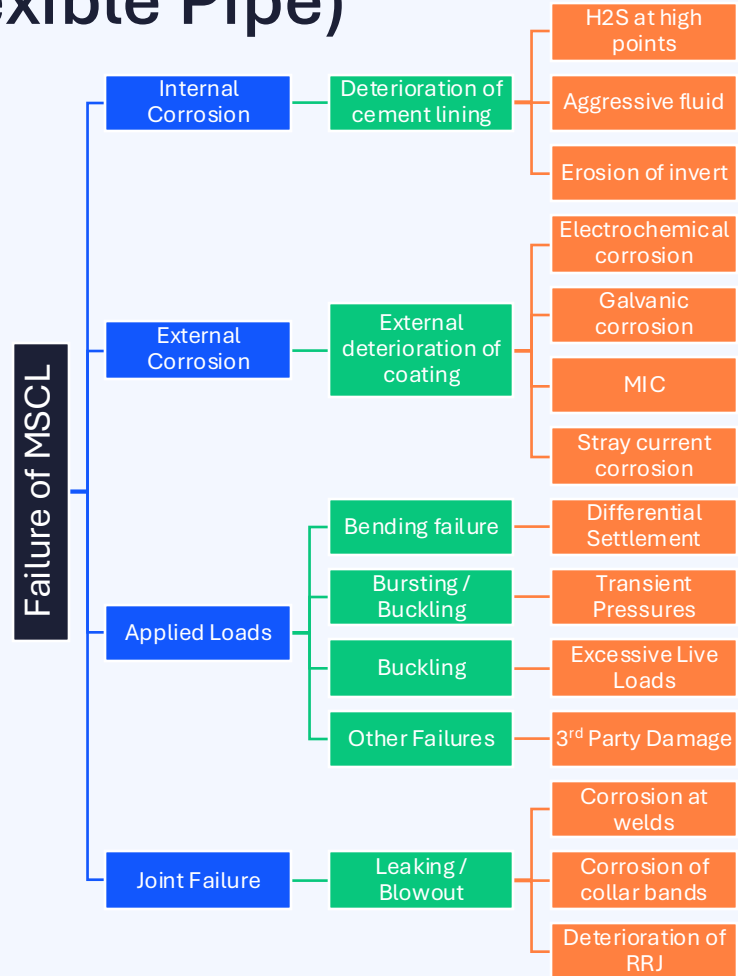
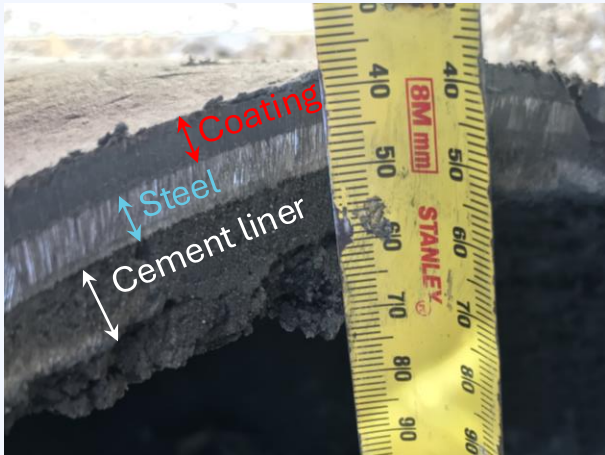
Move towards targeted risk mitigation for asset resilience



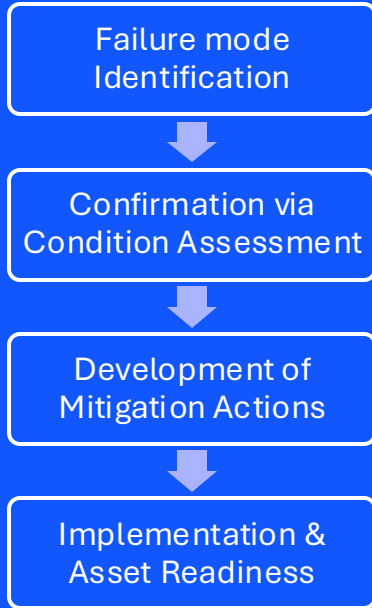
Failure Mode Assessment



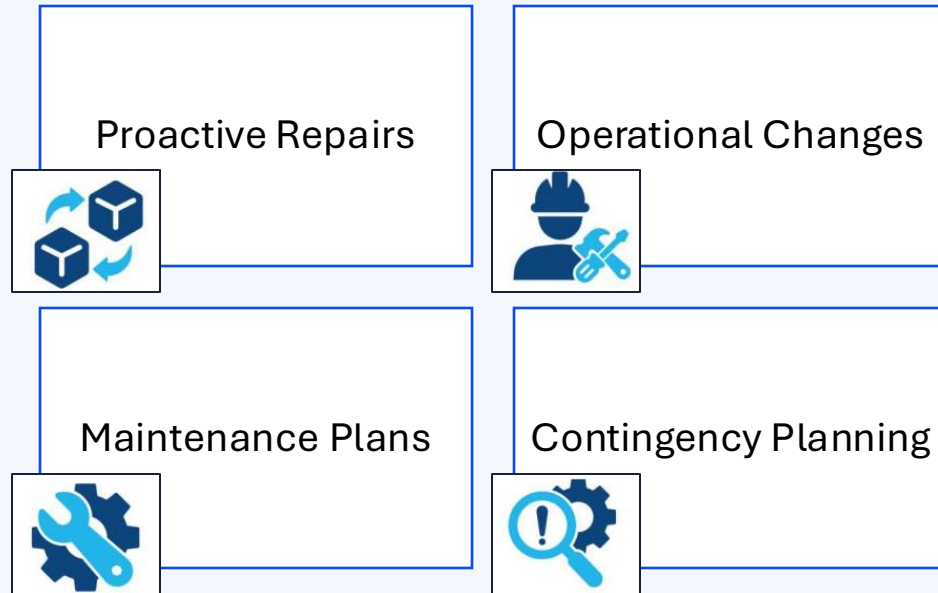
Example - MSCL Pipes (Flexible Pipe)



Failure Mode to Mitigation



Mitigation Measures



Worked Examples

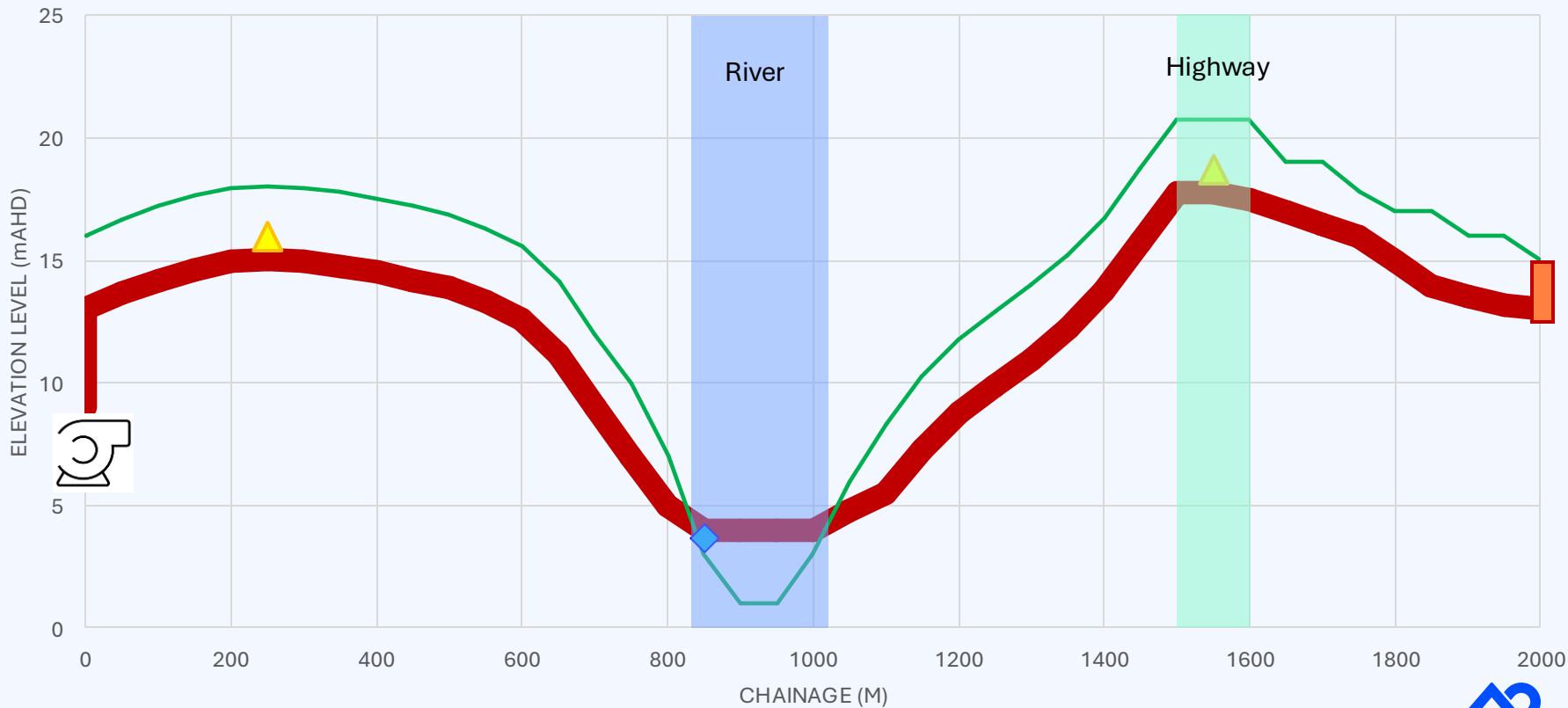
Example #1: Critical DN700 MSCL Sewer Rising Main

Example #2: 1900's Cast Iron Water Main

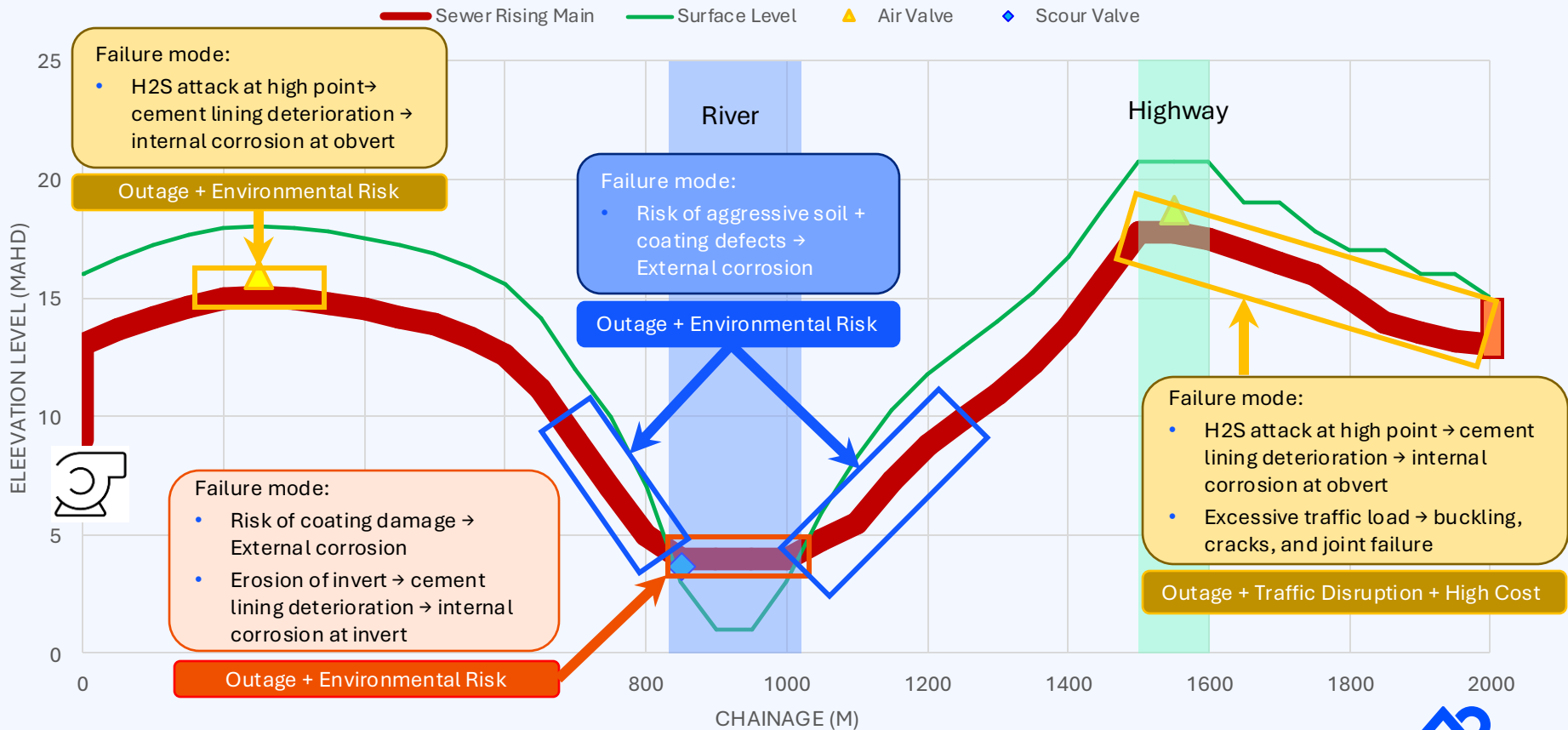


DN700 MSCL SEWER RISING MAIN LONG SECTION

— Sewer Rising Main — Surface Level ▲ Air Valve ◆ Scour Valve



DN700 MSCL SEWER RISING MAIN LONG SECTION



Example #1: Mitigation Measures

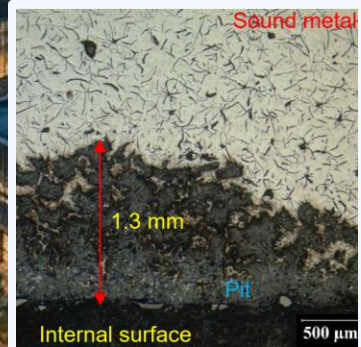
Failure Mode	Evidence	Risk	Mitigation Actions	Mitigation Category
Deterioration of internal cement lining at high point due to H2S accumulation leading to internal corrosion of steel at obvert under highway	Desktop / Condition Assessment	Extreme	<ul style="list-style-type: none"> • Pre-approved TMP • Pre-approved FCP • Organise critical spares 	Contingency Planning
			<ul style="list-style-type: none"> • Automatic air valves • Chemical dosing 	Operational Changes
Erosion of cement lining at invert along crossing leading to corrosion of steel at invert	Desktop / Condition Assessment	Extreme	<ul style="list-style-type: none"> • Regular inspection • Upstream grit removal 	Maintenance Plans
			<ul style="list-style-type: none"> • Reduce flows / velocity 	Operational Changes
External deterioration of the coating leading to external corrosion of unprotected steel	Desktop / Condition Assessment	High	<ul style="list-style-type: none"> • Install (or repair) CP system • Repair critical defects 	Proactive Repairs



Example #2: 1900's CI Trunk Water Main in High Density Area



Movement of joints due to varying ground conditions leading to leakage



Graphitic corrosion due to external / internal exposure conditions

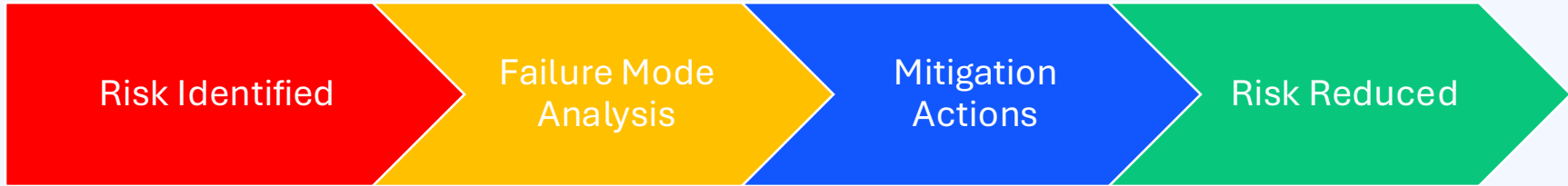


Internal corrosion / tuberculation in unlined sections



Catastrophic failure due to overloading (transients, traffic, etc)

Embedding into Practice



Failure mode analysis translates risk into actionable readiness

Key Takeaways

Failure is inevitable

Chaos is optional

Preparedness is engineered





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