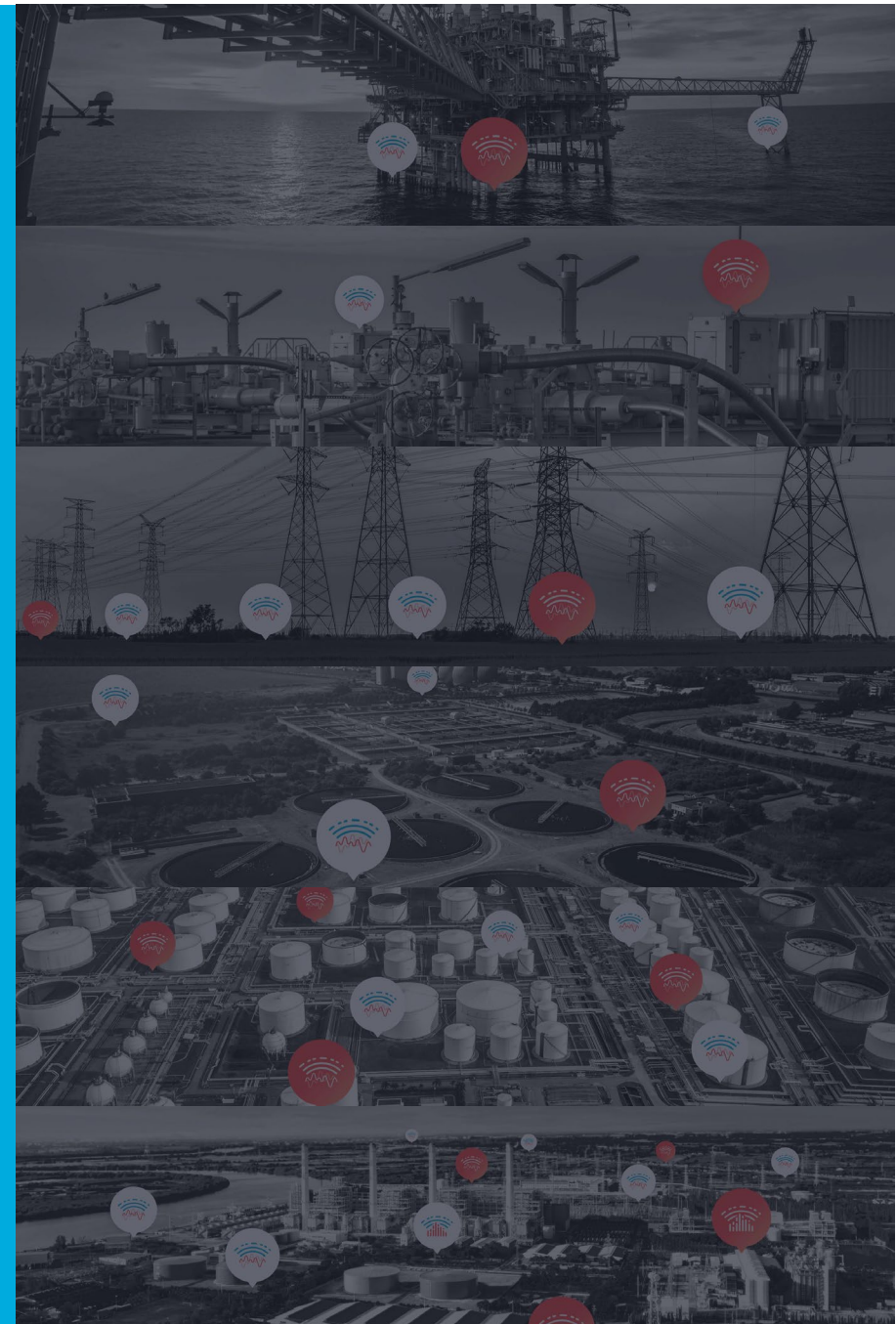




Proactive Management of Critical Pipelines to Prevent Corrosion, Reduce Risk, & Lower Non-Revenue Water

BIWWEC 2024
Kuching, Malaysia



Presentation Outline

1. Why do pipes leak?
2. Proactive v Reactive approaches
3. What is Cathodic Protection (CP)?
4. Benefits of CP remote monitoring
5. Summary

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1. Why do pipes leak?

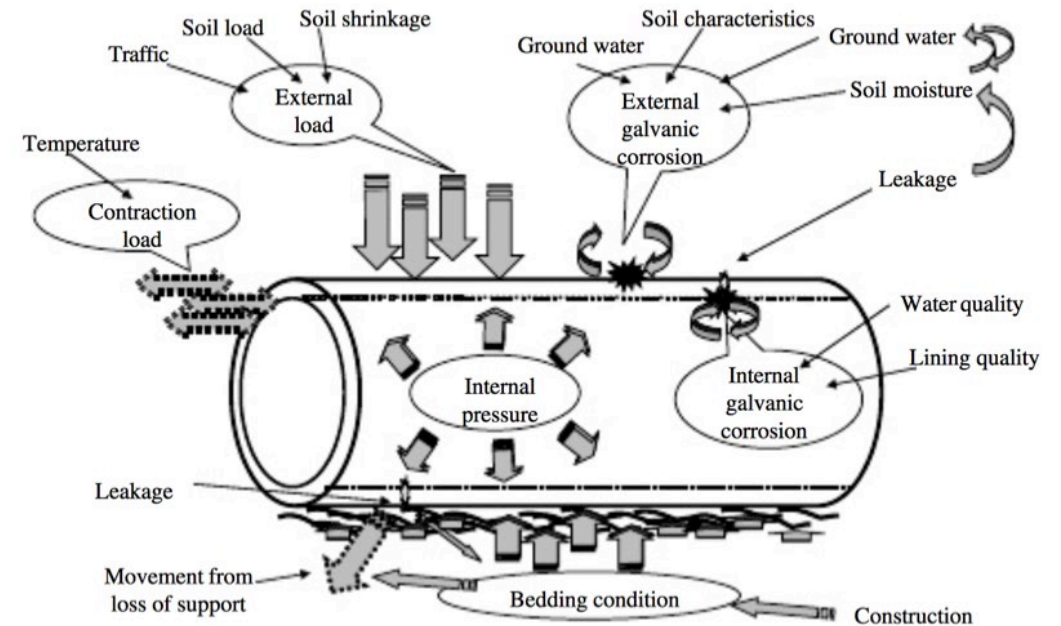




Why do Pipes Fail?

Factors affecting buried pipes:

- Construction materials
- Installation methods
- Joint problems
- Ground shifts
- Temperature cycles
- **Corrosion**
- Third party damage
- Unplanned traffic loads
- **Pressure surges**
- **Operating Pressure**



Non-Revenue Water



Global NRW

346 M m³/day or 126 B m³/year
39 Billion USD

Malaysian NRW (in 2020)

36% or 6,579 MLD

Average Repairs

11,000/month in Johor
135,000/year in Selangor



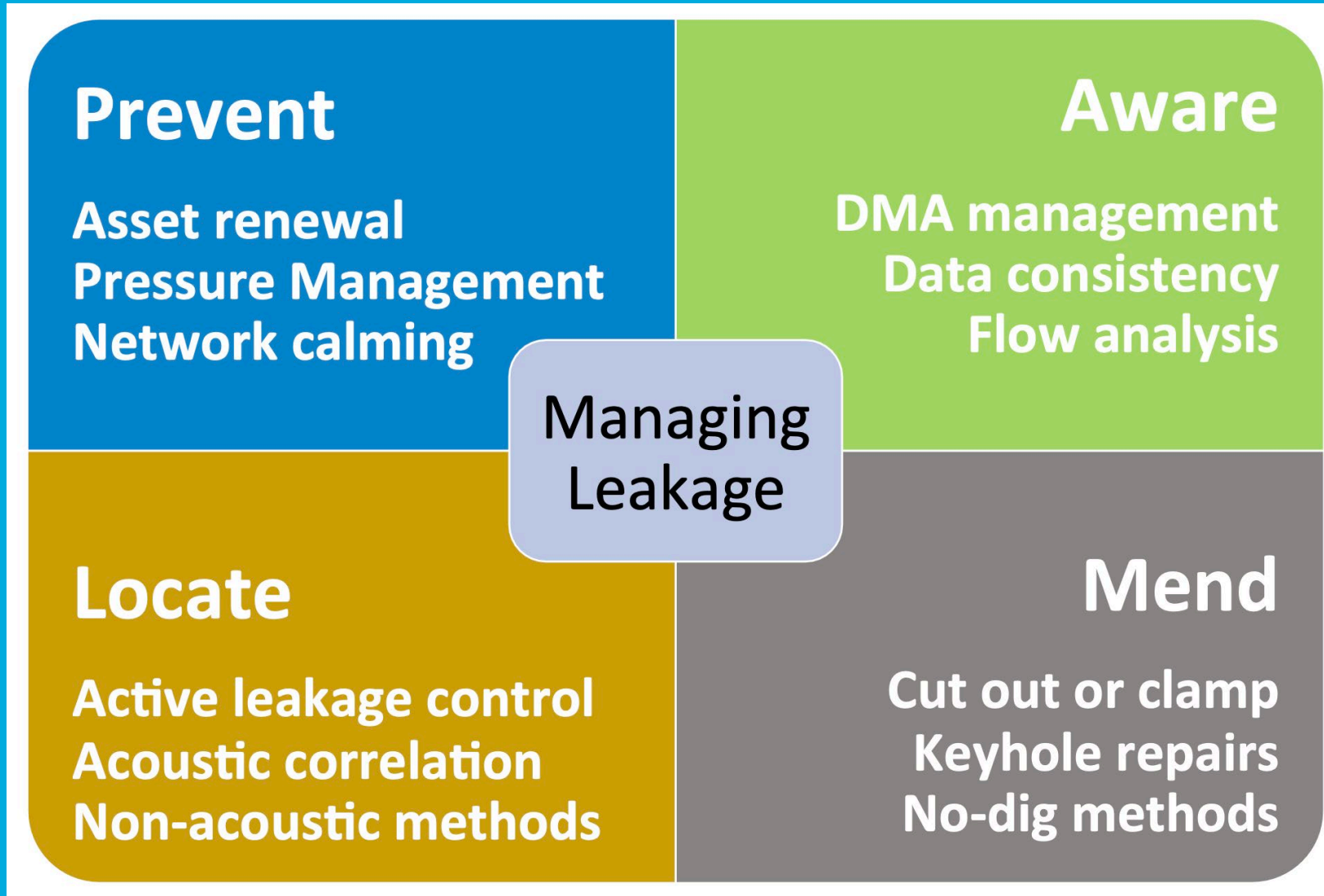
11.9 bil. kg CO₂

is generated annually in treating
non-revenue water globally

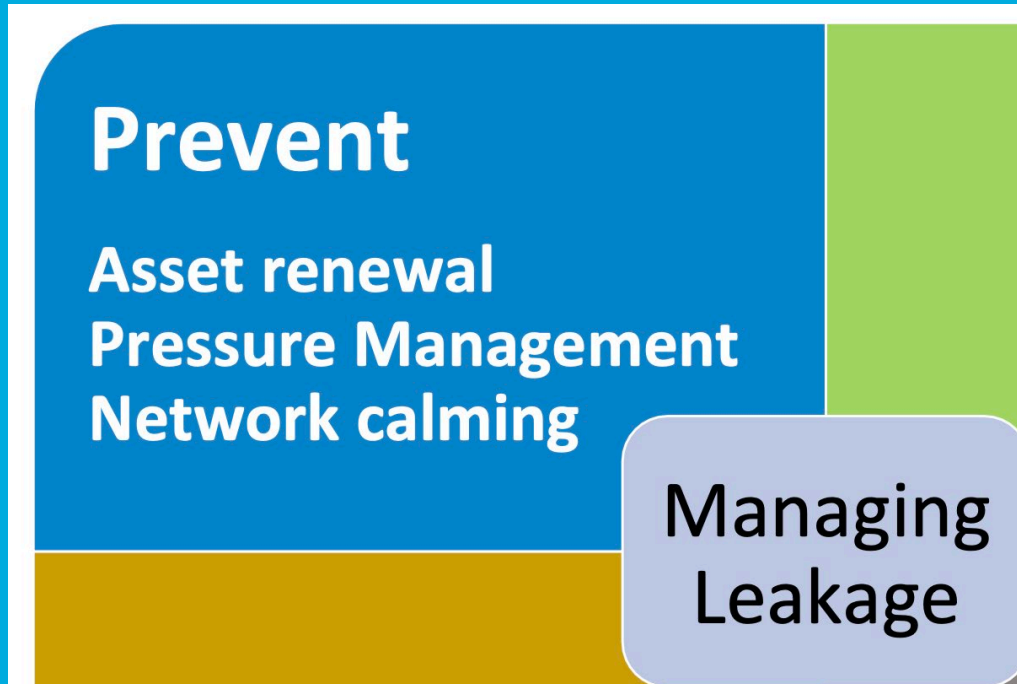
2. Proactive v Reactive approaches



UK PALM Model



PREVENT – Extending Asset Life

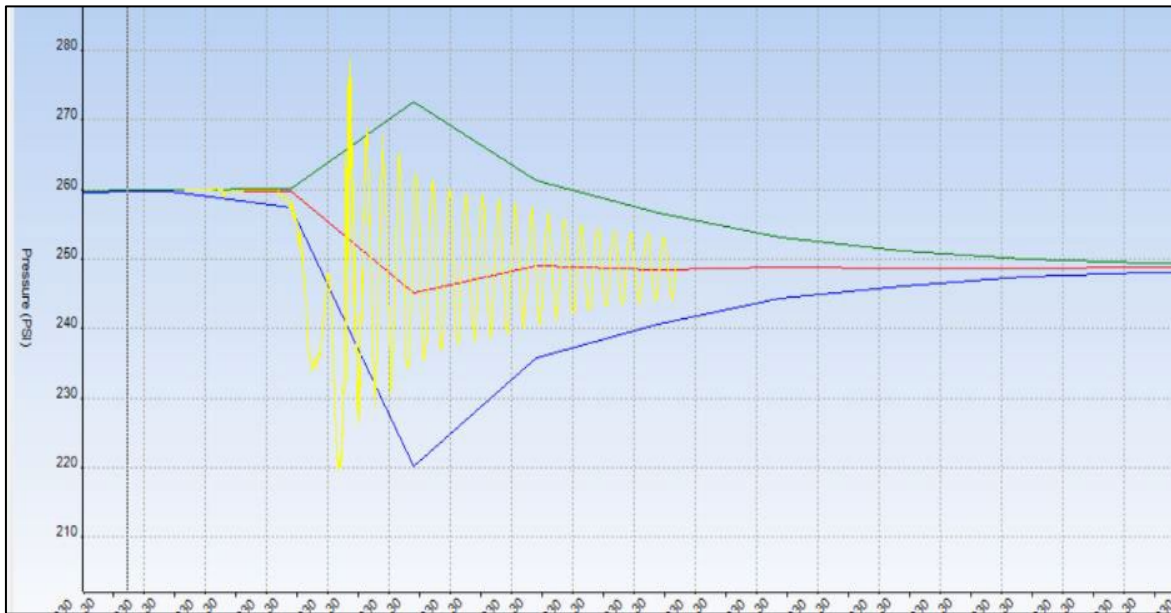


Network Calming



DIRECT RELATIONSHIP BETWEEN TRANSIENTS AND PIPE BURSTS

Overview of High-Speed Transients



Definition of a Transient

- A hydraulic transient, also known as water hammer or hydraulic shock, is a sharp pressure surge /wave produced when water flow is forced to stop suddenly or change direction abruptly
- Caused by sudden changes in flow on a pressurized pipeline which increases or decreases the pressure very quickly.
- The impact of such a sudden increase or decrease in pressure can be significant and could severely affect the operation and safety of the entire pipeline.

The occurrence and causes of pressure transients in distribution networks

**Scottish
Water**

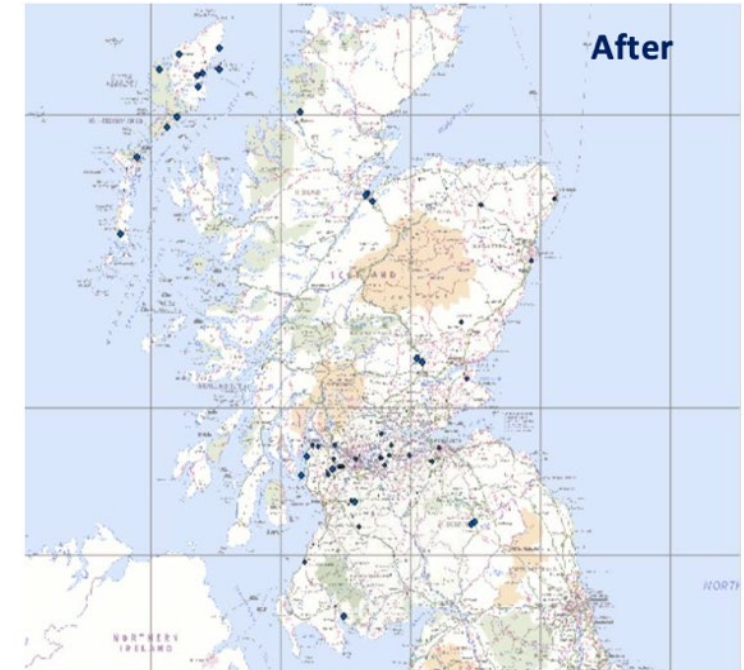
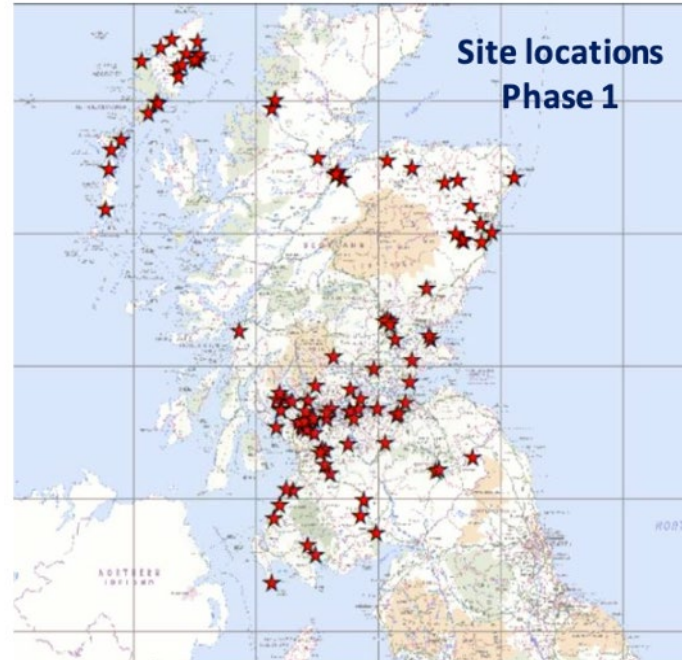
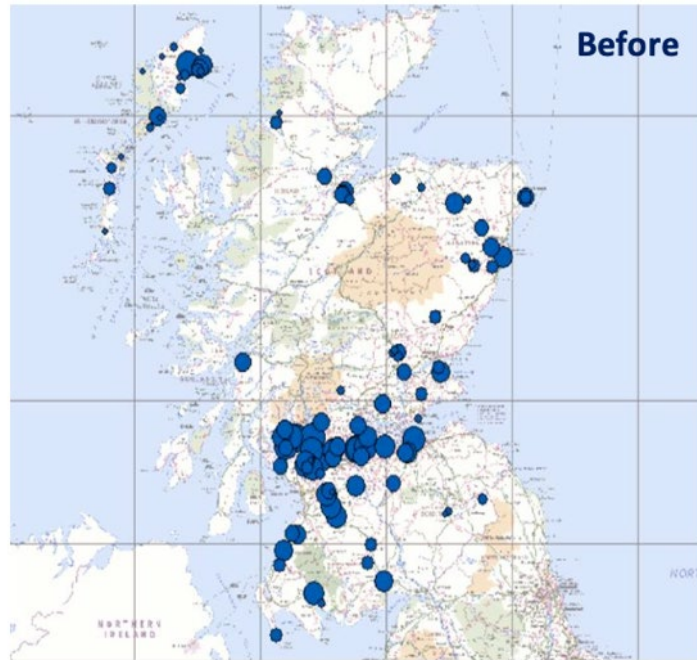
Trusted to serve Scotland

“The aim of the project is to identify, then eliminate, pressure transients caused by treated water pumping stations around Scotland”

Key Steps (Phase 1)

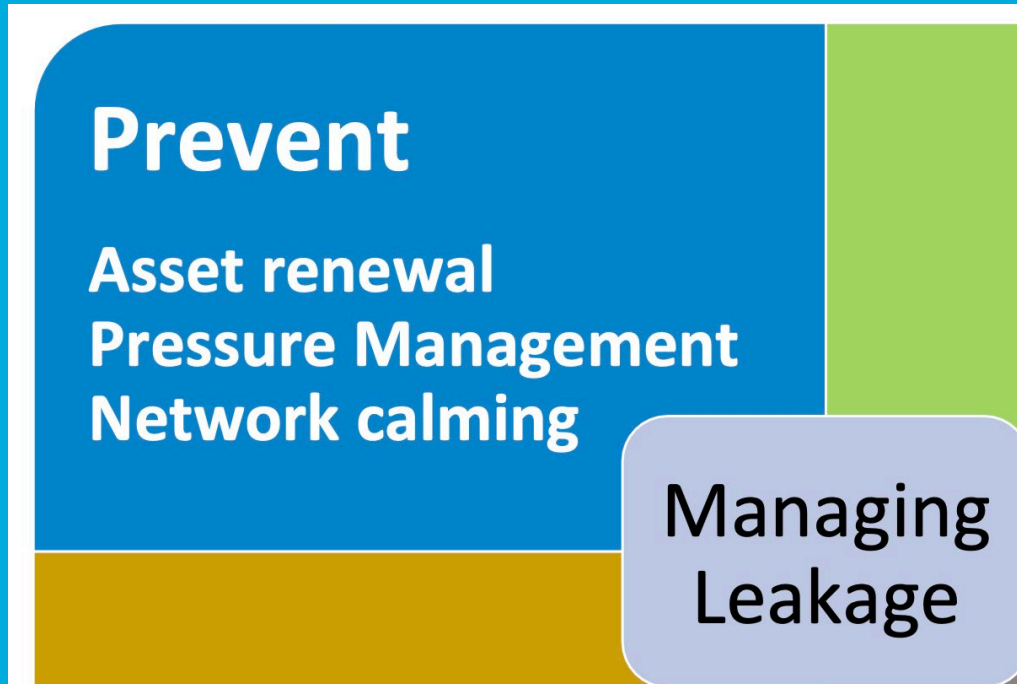
- Desk top study to identify pumping sites
- Detailed burst pipe analytics carried out based on pipe age, diameter material and property density
- GIS burst analytic model developed, measuring associated burst over a specified distance, actual burst against predicted normalised burst rate from SW burst model
- Partner engagement with GCR Tech to develop logger capabilities
- Testing and model verification
- 100 TWP sites taken into full scale delivery
- 10 Service reservoir sites taken into full delivery

Overall Project Results



- Reduced bursts from 5,644 to 1,194 across the network
- 1,752 fewer customer contacts for water quality complaints
- Pump rating calculated against hours run = £308,908 estimated saving
- Carbon savings in Tonnes CO₂ = 272.6

PREVENT – Extending Asset Life



Corrosion Control

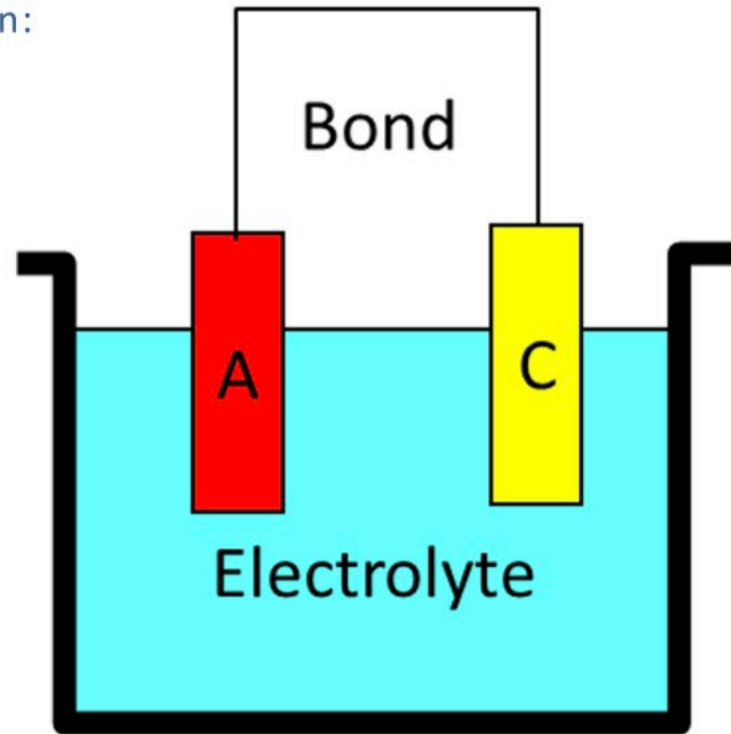
What is Corrosion?

Corrosion is a natural electrochemical phenomenon of metals when they encounter moisture and air to form oxides.

► Four essential parts of a corrosion reaction:

- Anode
- Cathode
- Electrolyte
- Conductive Bond

Batteries are just corrosion cells.



Types of Corrosion Control

BARRIER COATINGS



CATHODIC PROTECTION



3. What is Cathodic Protection?



CP Applications

CP systems are typically fitted to:

- Pipelines
- Wharves, jetties and platforms
- Underground storage tanks
- Above ground storage tanks
- Process and industrial plants
- Steel in concrete (rebar)



OIL & GAS ENERGY



MUNICIPAL WATER
& UTILITIES



TANKS & VESSELS



POWER GENERATION



OFFSHORE PLATFORMS

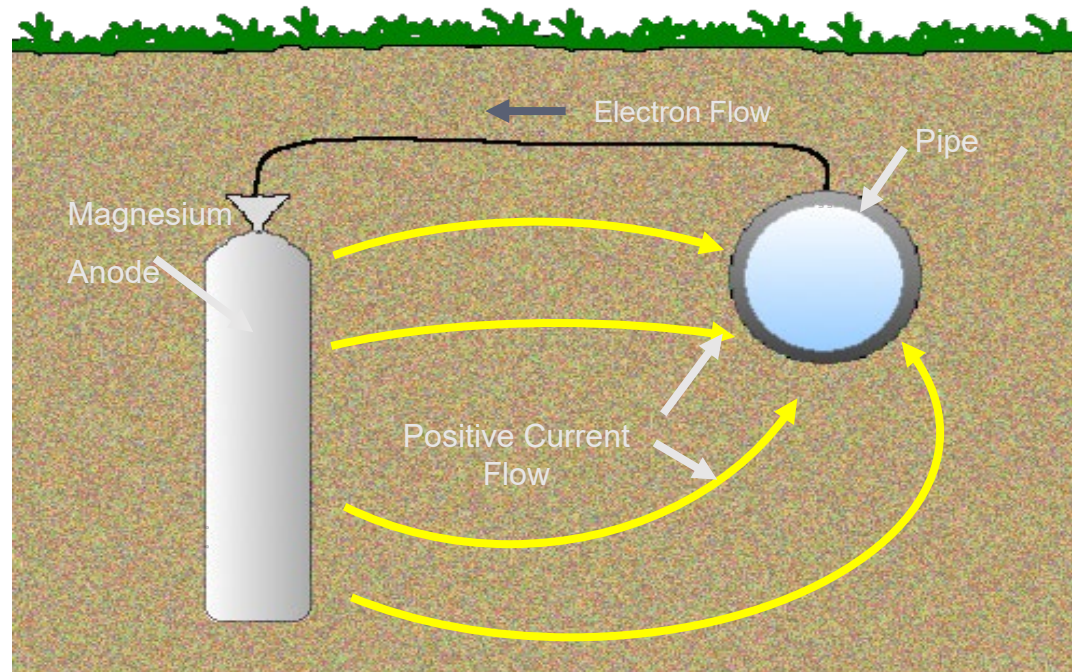


WIND TURBINES

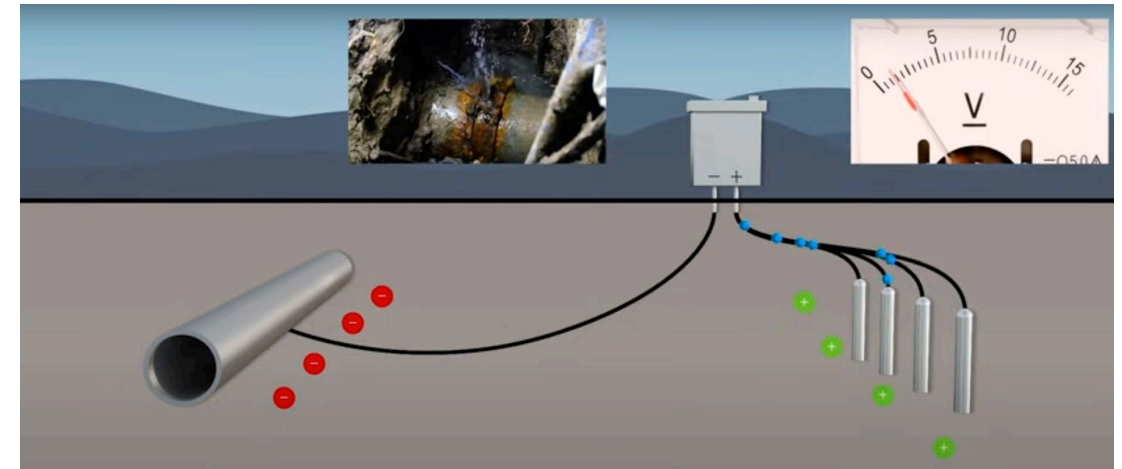


Types of Cathodic Protection

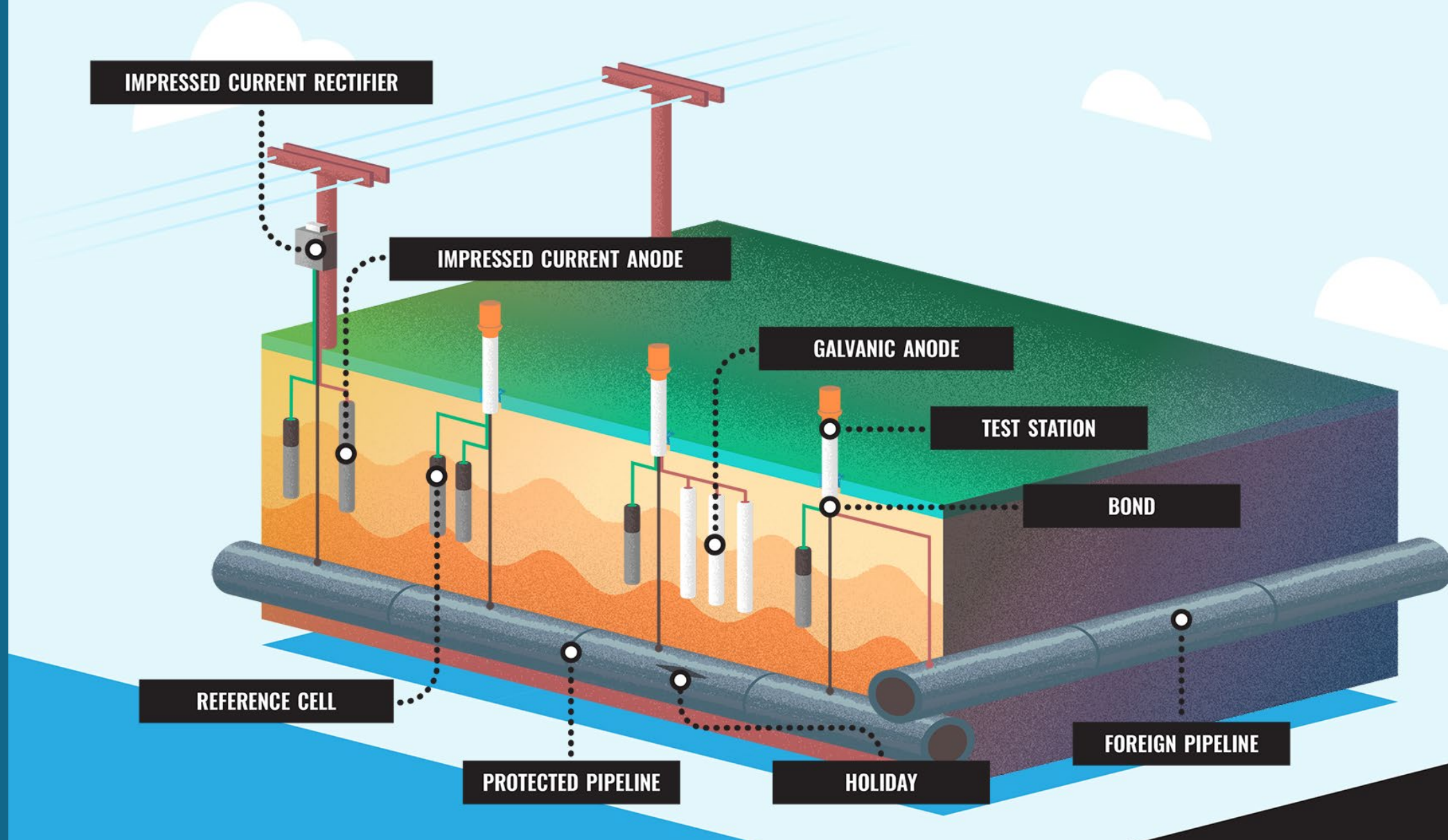
GALVANIC [SACRIFICIAL] ANODE



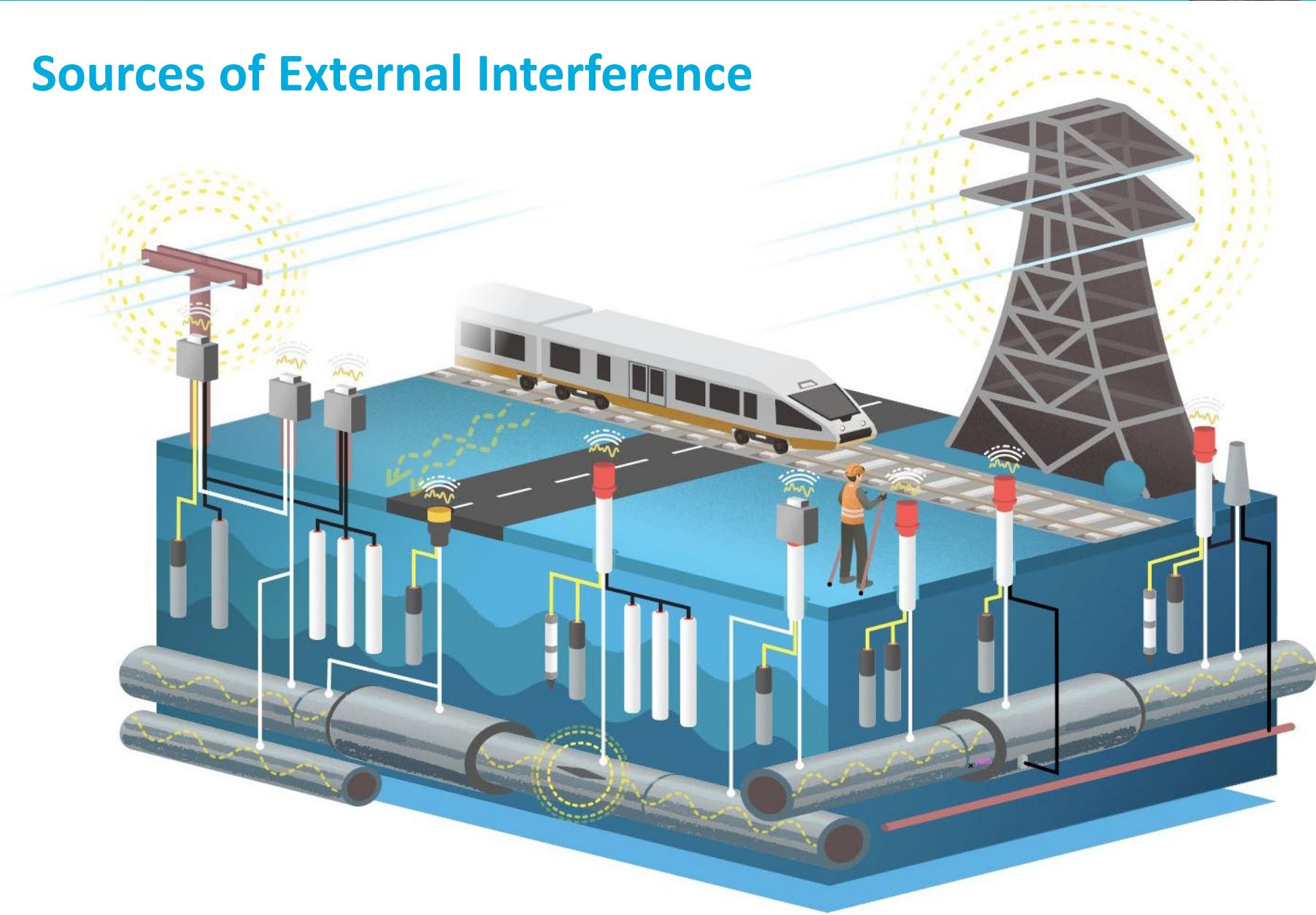
IMPRESSED CURRENT



Common Cathodic Protection Assets



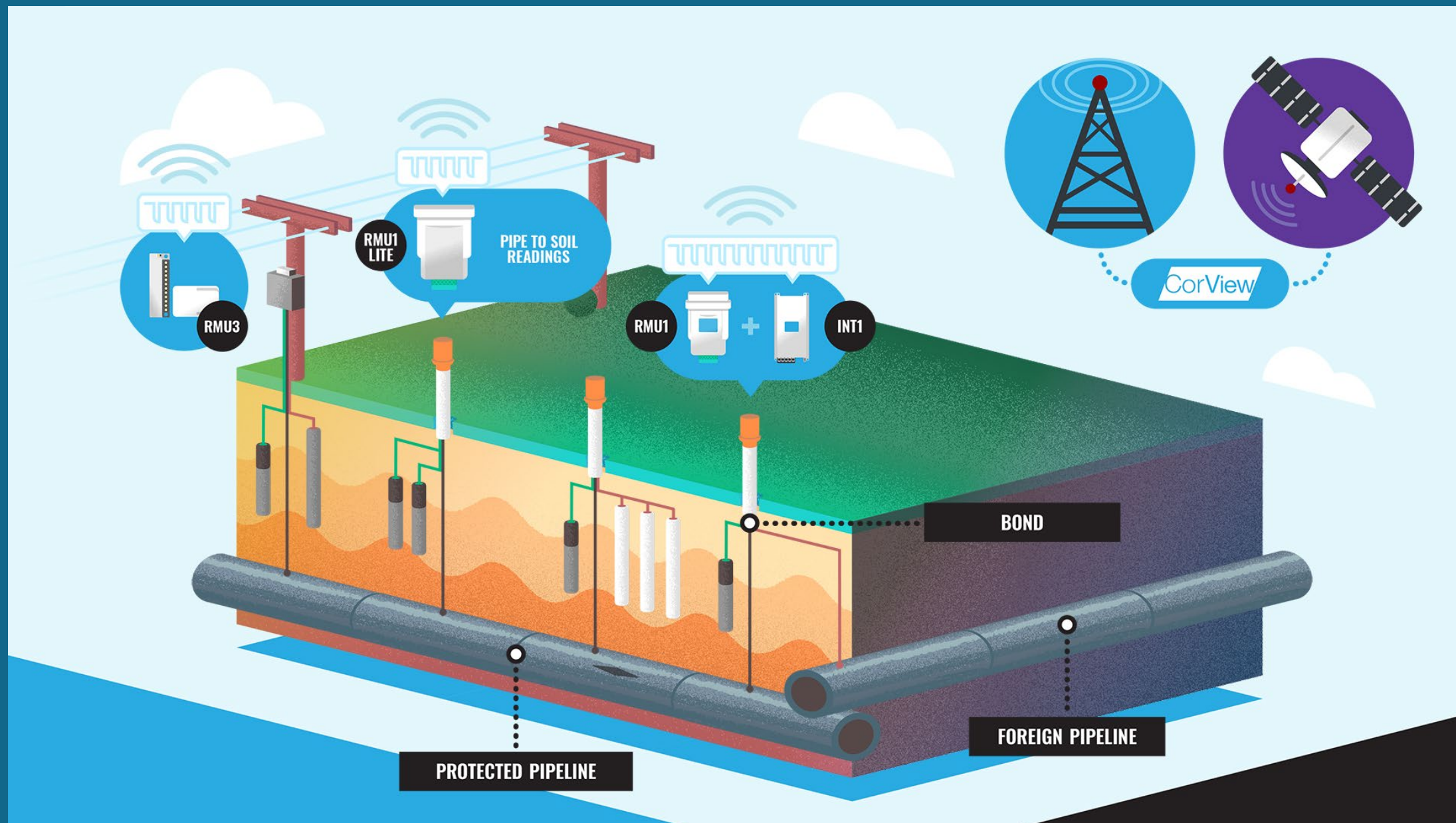
Sources of External Interference



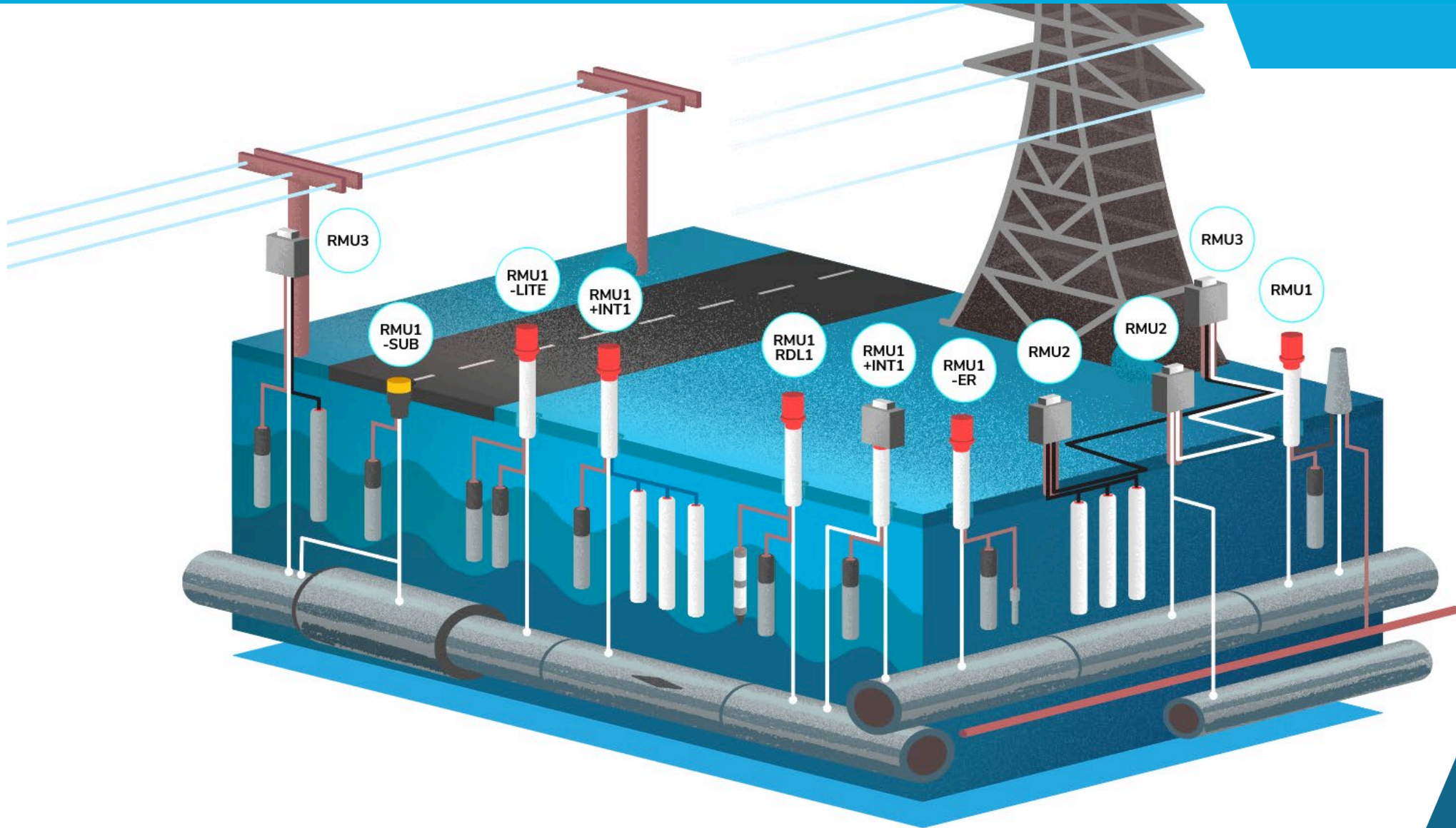
Reading Requirements for CP Compliance

	Sources of Data	Regulated Frequency
Fixed Assets	Rectifiers	Every 2 months
	Pipe-to-Soil Test Stations	Every 6-12 months
	Critical and non-critical bonds	Critical (2 months), non (6-12 months)
	CP Coupons (AC & DC)	Site & use-case specific
	ER Probes	Site & use-case specific
	Casings	Every 12 months
	Other sensors	Site & use-case specific
Survey	Annual Surveys	Every 12 months
	Close Interval Survey	Every 3-10 years
	In-line Inspection	Every 3-10 years
	Other Surveys	Every 3-10 years

*Often defined as
'Test Points'*



Strategic Cathodic Protection Automation



4. Benefits of remote monitoring



Key Impacts of Remote Monitoring

1



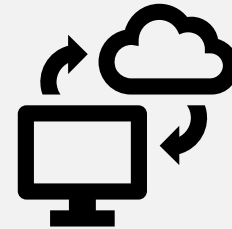
Safety

2



**Operating &
Capital
Improvements**

3



**Asset & Data
Integrity**

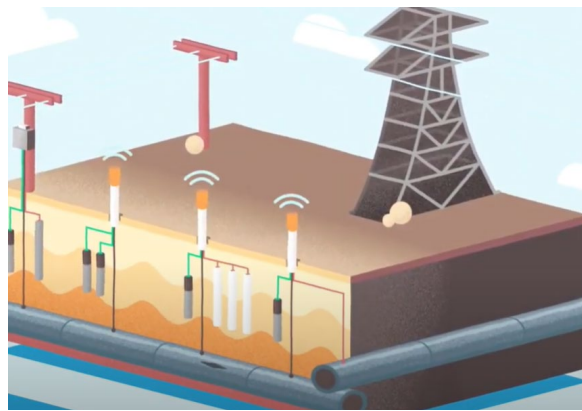
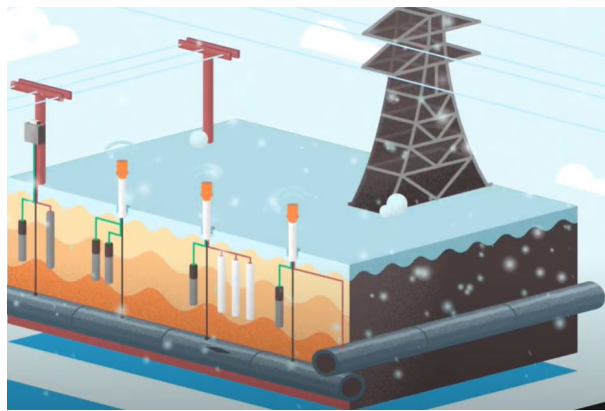
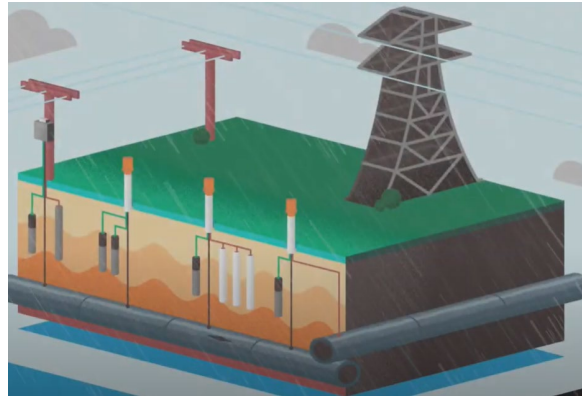
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Environmental

Safety

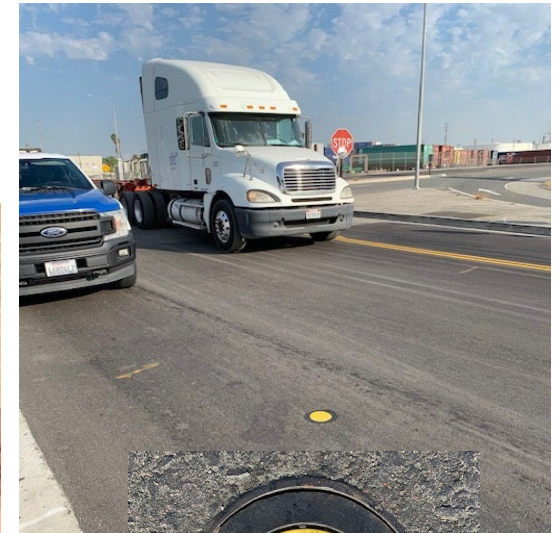
Remote Access & Windshield Time



Induced AC



Test Points in Traffic ROW



Operating & Capital Improvements

Operating Efficiency

- Avoid manual tasks (e.g. data collection, install interrupters)
- Reduce or eliminate admin
- Improved incident response via Alarms
- Proactive O&M
- Shift workload to high impact areas – help prioritize CP
- Better data to drive high value decisions (e.g. mitigate digs)

Capital Efficiency

- Informed risk matrix
- Asset life extension (e.g. pipeline or groundbed)
- Capital planning & deferral



*Increasingly
impactful*

Asset & Data Integrity

Enabling Better Data Collection

Data quality

- Consistency
- Removed human interpretation

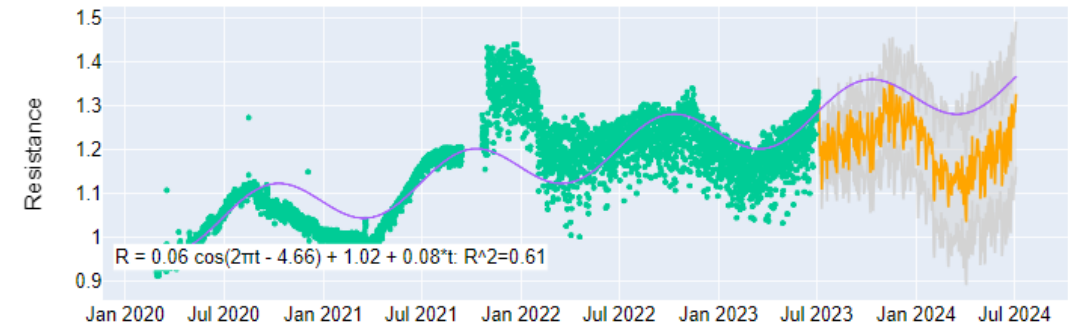
Data quantity

- Helps counter compliance-only mindset

Increased visibility

- Data on assets where previously 'visible' once a year
- Enables new activities

Groundbed Remaining Life Forecast



Statistically Derived Alarm Limits



Environmental Impact

Remote Monitoring Contributes to Reduction of GHG Emissions:

- CO2 emissions from reducing windshield time, helicopter access
- Reduce fugitive gas emissions from leaks, bursts
- Established communications backbone across remote pipeline assets
- Ensure delivery of natural gas is as efficient, safe, and sustainable as possible
- Protect hydrogen pipelines of the future

*Compared with manual data collection, an install base of **20 RMUs offsets over 8.5 Metric Tons of CO2 emissions per year**, equal to the total annual energy consumption of 1 home.*

5. Summary



VALUE PROPOSITION



Reduce Operating Expenses

- Minimize resource use
- Improve efficiency
- Operate by exception



Limit Safety Incidents

- Reduce windshield time
- Improve contractor safety
- Eliminate hazardous exposure



Maintain Regulatory Compliance

- Meet regulatory requirements
- Automate regulatory reporting
- Eliminate HS&E Incidents



Boost Efficiency

- Minimize failures
- Improve communication
- Ensure proper maintenance



Ensure Asset Integrity

- Automate integrity tests
- Predict equipment failures
- Optimize process monitoring



Improve Decision Quality

- Increase data reliability
- Enable useful AI/ML
- Create data-driven culture



Eliminate Production Downtime

- Predict process breakdowns
- Automate preventive maintenance
- Enable continuous monitoring



Drive Sustainable Impacts

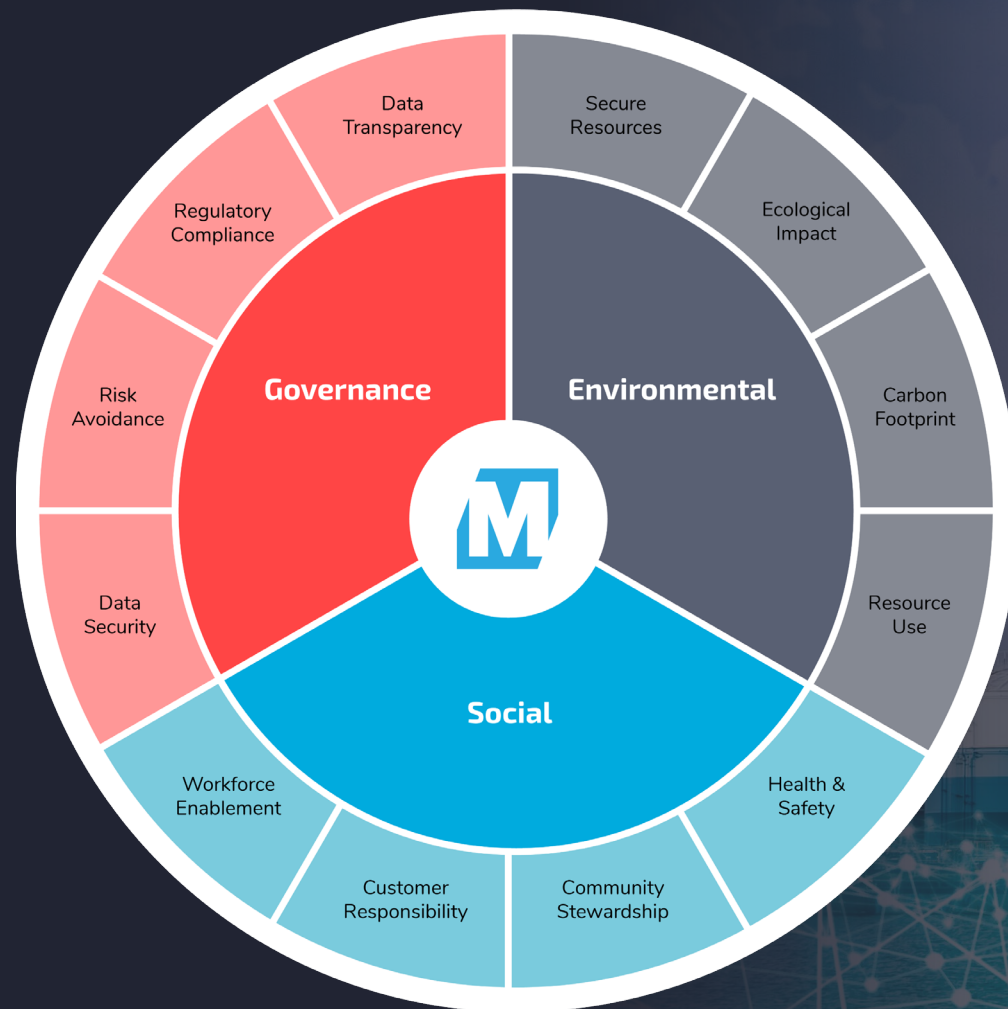
- Reduce emissions
- Minimize use
- Eliminate waste



Extend Equipment Life

- Minimize wear and tear
 - Avoid failures
- Improve maintenance & service





BETTER DATA DRIVES IMPROVED ESG INITIATIVES

Real Time Data helps improve ESG performance and streamlines reporting on ESG factors by connecting your business and your shareholders to the critical assets that drive sustainable operations.

The backbone of any ESG strategy is accurate, reliable data that enables transparency that leads to results. Online platform solutions not only assist with ESG targets but also provide the necessary reporting through Industrial IoT solutions and guaranteed data services.

What's the worst that can happen?



Water nightmare! Taps run dry in hundreds of homes after burst 3ft-wide pipe turns north London streets into a RIVER leaving up to 150 residents counting the costs of flood damage to their properties

- Pipe burst leaves dozens of people in Finsbury Park, North London, trapped in homes without water
- Residents trying to stop rising water levels entering their homes as engineers battle to fix the issue
- London Fire Brigade sends 12 fire engines and 80 firefighters to scene with roads under 3ft of water
- Twitter users joked about situation, with one writing: 'Woken up to find our flat now has a river view'

By MARK DUELL FOR MAILONLINE

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London, UK



Los Angeles, USA

Thank You!



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