



from
**Southern
Water.** 

Harnessing digital twin technology to drive business and cultural change within the water industry

Presented by: Joe Denver & Dr Rob Ingham
Date: 13th June 2024



Introductions



Joe Denver

Principal Asset Management
Consultant

Binnies



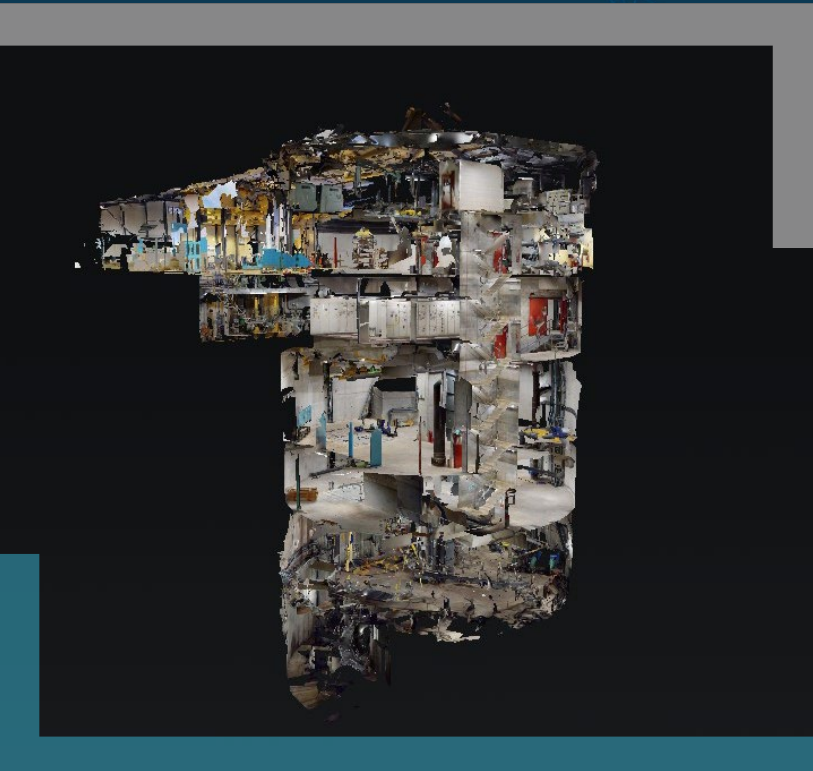
Dr Rob Ingham

Transformation Project
Manager (Water)

Southern Water



Harnessing digital twin technology to drive business and cultural change within the water industry



Presentation Contents

- Problem Statement
- The Solution
- Embedment
- Results
- Challenges & Next Steps

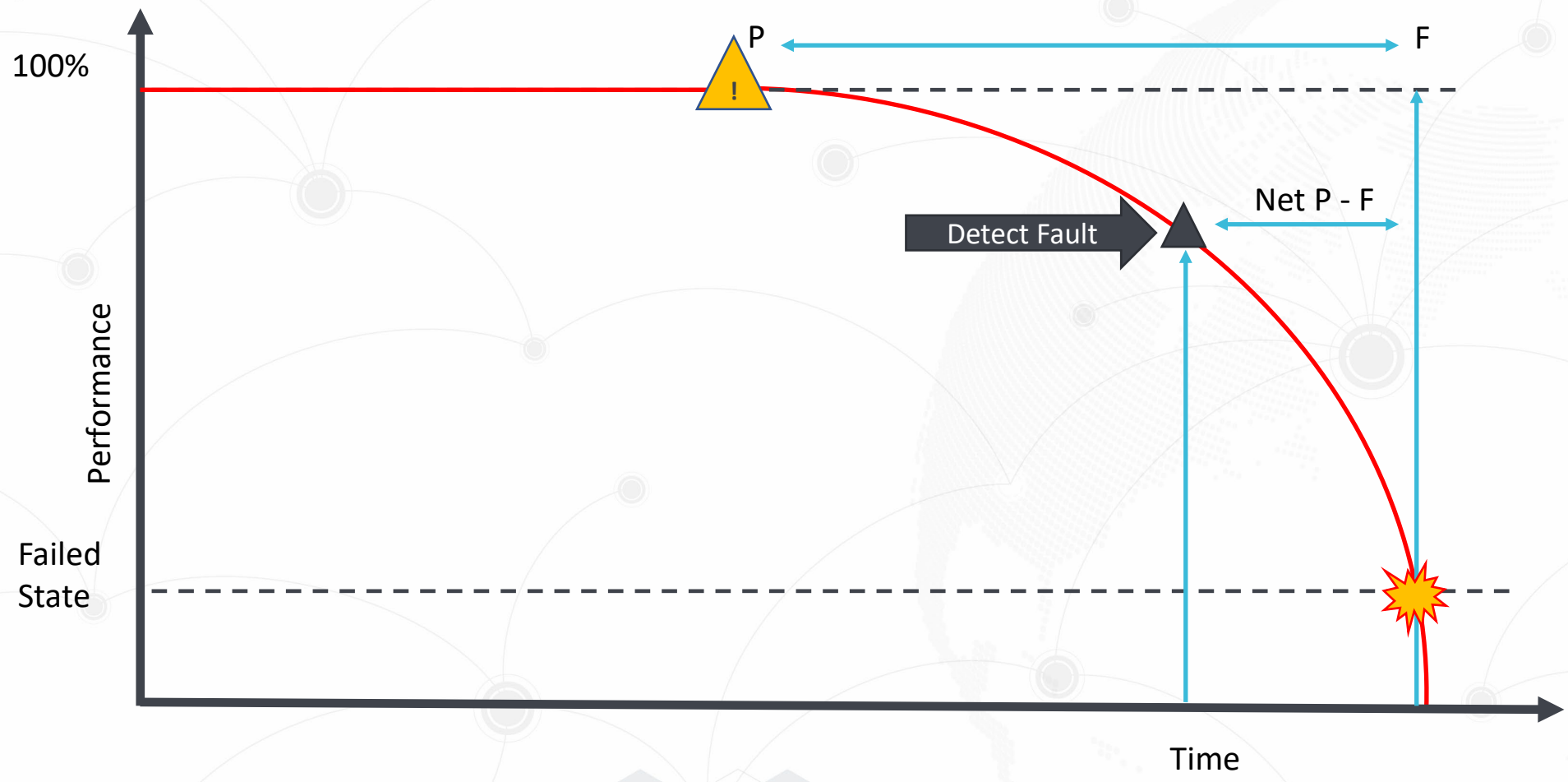
Problem Statement



- Poor asset data quality
- Low preventative maintenance completion rate
- Low confidence in effectiveness of preventative maintenance strategy
- Lack of clear, standardised job instructions
- Lack of staff engagement

- High asset failure rate
- High volume of reactive maintenance – 70% avg.
- High volume of pollution and loss of supply events
- High volume of penalty fines
- High pressure from government, regulatory bodies, and local communities to see improvements





Project Overview



- Planned Maintenance Project developed to drive overall asset health and reliability improvements.
- Focusing on improving operational awareness and management of asset health through:
 - Implementation of standardised human senses tours based on FMECA output.
 - Provision of Standard Operating Procedures to provide clear and concise guidance for Ops.
 - Training of field teams to support project embedment.
- Originally scoped to cover 100 high risk Wastewater Pumping Stations, re-scoped to encompass entire Southern Water operational estate.



Project Deliverables

Asset Data Capture

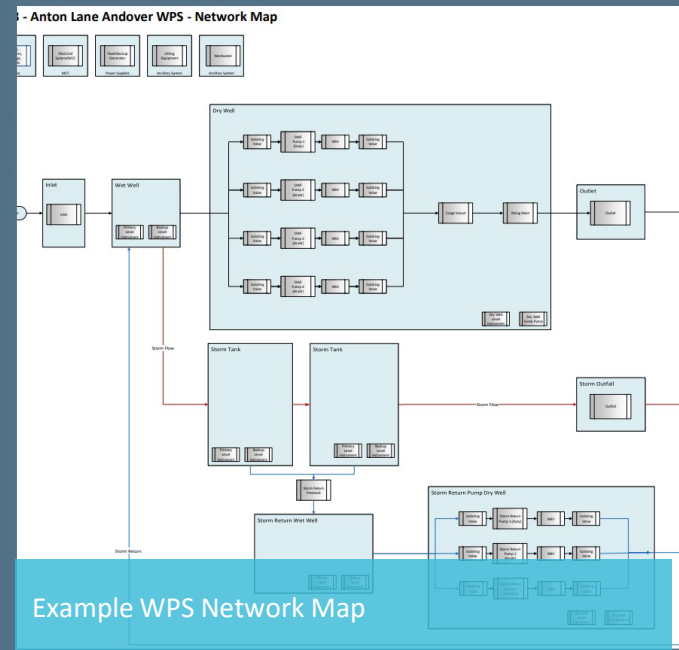
- Surveyed >100 sites across SW estate
- Completed on Clean Water, Wastewater, and Network sites
- Inclusion of 3D Photogrammetry



Binnies team completing asset data capture

FMECA & Network Maps

- Process-specific FMECAS to create maintenance task lists
- Network Maps to support FMECA and site teams



Example WPS Network Map

Standard Operating Procedures

- Templated and Site-Specific approach
- Creation of standardised job instructions
- Used to drive best practice

SOUTHERN WATER
100183 ANTON LANE ANDOVER WPS
SITE LEVEL STANDARD OPERATING PROCEDURE

Frequency	34 Days	Duration	300 MINUTES
Tools	Lid Ultra-Clean Tools/Hand Tools/ Personal Gas Detector	Consumables	Rag for cleaning

Health & Safety
SOUTHERN WATER STANDARD PPE TO BE WORKED AT ALL TIMES WITH
ADDITIONAL REQUIREMENTS AS PER RISK ASSESSMENT

Hazard Description	Southern Water Hazard Mitigation	Hazard Symbol
Safe entry procedures Confined space entry Gas monitors	SIB 000, 001.1, 001.2, 002 - Confined spaces SIB 003 - Personal Gas Monitors SIB 031 - Instruction for Single Person Working SIB 008 - Enclosed Areas which are NOT Confined Spaces SIB 007 - Potentially Explosive Atmospheres Follow site guidance when entering dry wells.	EX
Falls from height	SIB 100 - Working at Height	2
Working near or near water	SIB 201 Working on, Near or Over Deep or Fast Flowing Water SIB 206 - The Safe Isolation of Plant and Equipment	2
Electrocution hazard	SIB 423 - Manual Handling Operations SIB 402 - Lifting Tackle & Appliances SIB 404 - Lifting of process Equipment	2
Lifting, Moving, carrying	SIB 206 - The Safe Isolation of Plant and Equipment SIB 151 - "Do Not Operate" Tags SIB 154 - Machine Guards	LS
Automatic start up Moving plant & machinery	SIB 002 - Manual Oils and Other Substances that may Cause Harm to Your Skin.	2

SOUTHERN WATER
100183 ANTON LANE ANDOVER WPS
SITE LEVEL STANDARD OPERATING PROCEDURE

This task shall be carried out by a Southern Water competent person in line with procedures and safety instructions set out by Southern Water.

Always follow the company procedure for "Working at Heights, Confined and Enclosed areas".

- Check condition of drywell, pumping out any ground water that is present, remove any rag and debris. Any rags that have been identified are to be regarded as required or a follow-on MOC for Asset Maintenance to be read.
- As required, check condition and operation of the drywell pump and float switch.
- Check pump pump for abnormal noise/ vibration.
- Record the condition of the drywell.
- Check function of site lighting. Raise follow on WO to repair any failed lights.
- Check operation of any barriers, handrails, and gates around openings.

Record condition of the Dry Well (1-5)

If site has Storm Pumps and operational circumstances allow

Always follow the company procedure for "Working at Heights".

- Check pump for abnormal noise/ vibration and for signs of wear.
- Record the condition of the dry well pump.
- Condition (1-5)
- Repeat each step for each Storm pump installed.

At the MCC, ensure the ultrasonic controller display is working and clean if required.

- Check instrumentation providing a reading within the defined range.
- Check and clean transducer head where possible and safe to do so, making sure there are no obstructions.
- Ensure cables and fittings are secure and fit for use.

Example Site SOP

Author: Asset Standard & Reliability
Reference: MTR SOP P0100183
Version: V2.1
Date created: August 2022
Next Review Date: July 2024



Project Deliverables

Maintenance Task Refresh

- Review of existing maintenance tasks
- Removal of non-value add activities
- Ensure tasks mitigate failure modes
- Documentation refresh

SOUTHERN WATER MAINTENANCE TASK MANUAL MTMEF0563
Emergency Lighting Inspection

This task shall be carried out by a Southern Water competent person in line with procedures and safety instructions set out by Southern Water. Non-Southern Water employees shall undertake work in accordance with the general contract conditions in line with procedures and safety instructions set out by Southern Water.

Frequency
12M

Duration
4hrs

Failure Mode
Battery Failure, Corrosion, Control System Failure, Mechanical Damage, Bulb Failure

Asset Group
EEDC

Health & Safety
SITE STANDARD PPE
Follow all standard SMS procedures
ADDITIONAL SAFETY
Tools Required
Fire Safety Logbook
Fish key

Consumables

SOUTHERN WATER MAINTENANCE TASK MANUAL MTMEF0563
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To update asset details
Use form MTM 402 (Asset Revision)

To update task details
Use form MTM 401 (Maintenance Revision)

Step 1: Functional Test and Inspection

- Confirm indicators are Operational - Confirm that relevant indicator lights are operational - these should be green or red LEDs on each light fitting. Note - a modern self-testing fitting will display a green light if healthy, red if failed, whereas an older fitting will display a red light if healthy.
- **Walk the route** - Walk the route checking:
 - o Access and Egress always on lighting is operational and on.
 - o Guarding, labels and covers are present and fitted correctly.
- **Simulate Power Failure** - Simulate a power failure by operating the test switch with a fish key (if test switch is present). Test switch is not present, cover these are work order for installation of test switch, and then simulate power failure as a one off by removal of fuses or switching the MCB.
- **Lighting Activation** - Emergency lighting should activate within half a second to be compliant.
- **Walk Route and Check Function** - Walk the route of the emergency lighting, confirming that each indicator and sign are energised from its battery and are operating correctly.
- **Ensure Operation is Appropriate Time** - Allow the battery to fully discharge to ensure they maintain operation for the minimum duration listed below. Periodically walk the route to confirm all emergency lights are maintaining their function.

Specific Run-time and response times

Asset	Run-time	Response Time
Emergency Lighting	1.5 hours	0.5 seconds
Emergency Lighting	1.5 hours	0.5 seconds
Emergency Lighting	1.5 hours	0.5 seconds

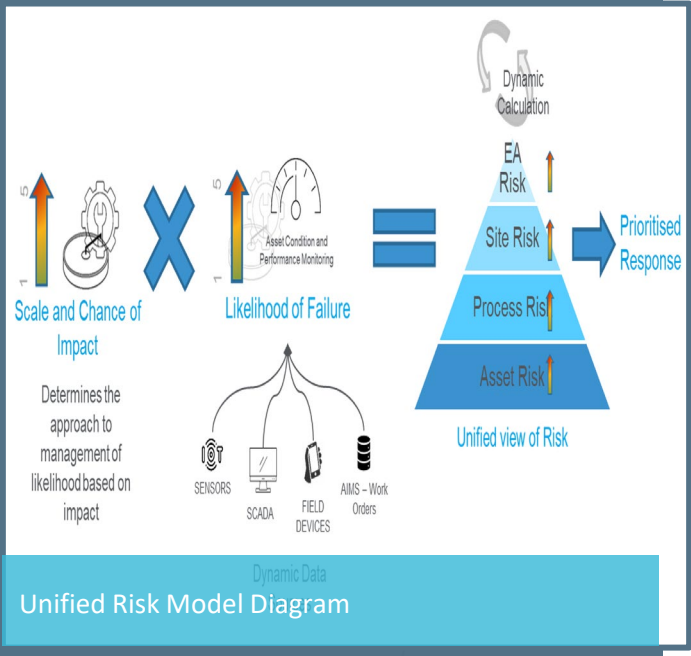
Step 1: Pre-Maintenance Checks

- Before taking any asset out of service, consider impacts and gain necessary approvals.
- Confirm asset details completed by available information and submit an MTM 402 (Asset Revision) if any changes are required.
- Integrate the task history by the fish key to ensure all components are working correctly and that any tagged faults from the last inspection are rectified during the inspection and test.
- Inform occupants in the vicinity of the area (staff, contractors, or colleagues) that you are about to undertake a test of the emergency lighting system. Ensure occupants are instructed that they should drop any tasks and avoid working until the test is complete.
- Walk the lighting route during the procedure when you are impacted by loss of lighting.

Dynamic Data
Unified Risk Model Diagram

Unified Risk Model

- New dynamic approach to managing asset risk
- Looks at all impacting factors
- Uses dynamic data to reflect changing likelihood of failure



Training & Embedment

- Train operational staff on new ways of working
- Gain familiarity with new tools & equipment
- Field-based embedment checks



Slide 1 of 150





Brede WSW

Today we will be walking around Brede WSW. Before we get into the course, the trainer will explain how the training environment works...

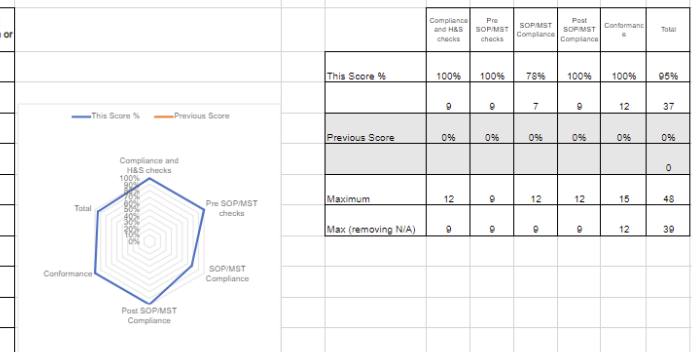
Project Embedment

- On-Site embedment checks completed across all business areas
- Completed on a 1-2-1 basis with Ops teams
- Circa 200 embedment sessions completed across Wastewater & Clean water
- Embedment checks included confirming Ops can use new systems and tools, and are following procedures correctly

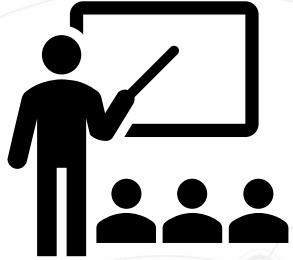
	Issue Number: 0.7 (working draft) Date of Issue: 25 May 2023					
Document Name: Quality Assurance Template for Operators and Technical	Issue and Authorised by:					
Who is completing the QA? Rob K	Who is being QA'd?					
Date: 25/5/2023	Area/Work being QA'd: Horsebridge WSW					
The accompanying evidence "Completing a Procedure QA" can be accessed here						
0 - No Evidence, 1 - Some/Very Little Evidence, 2 - Significant Evidence, 3 - Full Evidence or Not Applicable						
Compliance and H&S checks	N/A	0	1	2	3	Comments/Observations/Opportunities
Was the user in attendance with all appropriate PPE, safety equipment and required tools (chamber lifters, gas monitor etc.)					X	
Were all H&S behaviours and activities appropriate for the tasks carried out					X	
Were accidents, near misses or incidents reported appropriately (if required)	X					
Did the user demonstrate best practice in the activities carried out					X	
	100%					
Pre SOP/MST checks						
Was the user in attendance with tablet, fully charged and documents downloaded (if in poor reception area)					X	
Can the user navigate the SOP via the Asset Care Plan using the tablet device?					X	
Did the user have an SOP job available on their WAMMI device?					X	
	100%					
SOP/MST Compliance						
Do they follow all the steps correctly (20-40 minutes)				X		
Do they capture the required data as specified in the SOP/MST				X		Assets assessed were scored, with justification
Did they raise a reactive work order, as per the existing prioritisation matrix (if required)	X					Equipment requiring WO already actioned
Did they identify any further issues that should be captured or require further action / escalation (if required)					X	Identified numerous errors in the SOP - photos, detail, missing assets, etc.
	78%					
Post SOP/MST Compliance						
Has any incorrect information been identified on the SOP. If so, have the revisions/amendments been accurately captured?					X	Document already marked up and process completed together on site with myself
Can the user demonstrate how to send updated document to the O&M revisions email address, including attaching new photos?					X	
Has WAMMI job been fully updated, closed and transmitted (to ensure the job has been closed and update back to CC/TP&S)?					X	
If the job could not be completed, have they appropriately logged and recorded the reason	X					
	100%					
Conformance						
Is the user comfortable using the tablet device (is some further training/development or additional hardware required)?					X	
For users who are yet to be signed off for LTD, do they have the confidence and the competence to carry out this task?	X					
When asked, does the user identify that Proactive Maintenance is the right business approach to take?					X	
Does the user appear to be engaged with the Proactive Maintenance initiative as a new way of working?					X	Very engaged and positive
Is there evidence that the user is showing a proactive attitude towards the new way of working?					X	
	100%					
Total	96%					



No.	Concern / Cause / Countermeasure	Assigned to	Planned Completion or Status



Results to Date



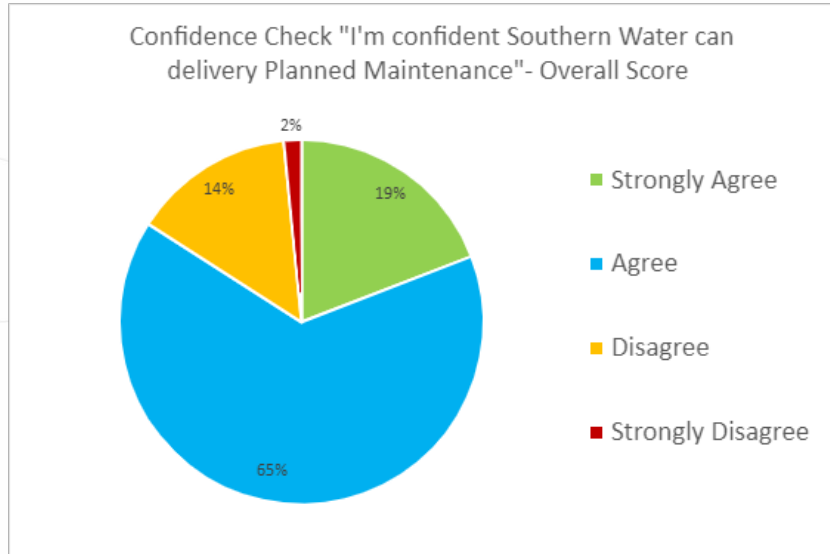
500+ employees trained



67 training courses delivered



4.58/5 overall satisfaction score



84% of staff confident changes will land

"The course exceeded my expectations; the interactive element was especially engaging"

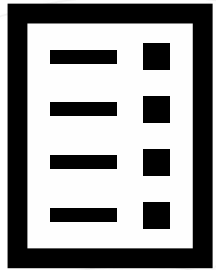
"I normally don't get much out of training, but I found this course engaging and interesting really helpful in terms of knowledge for myself being relatively new"

"Very good course. Really helpful and good ideas. What's been needed to move forward with technology."

"This was the best and most engaging course!"



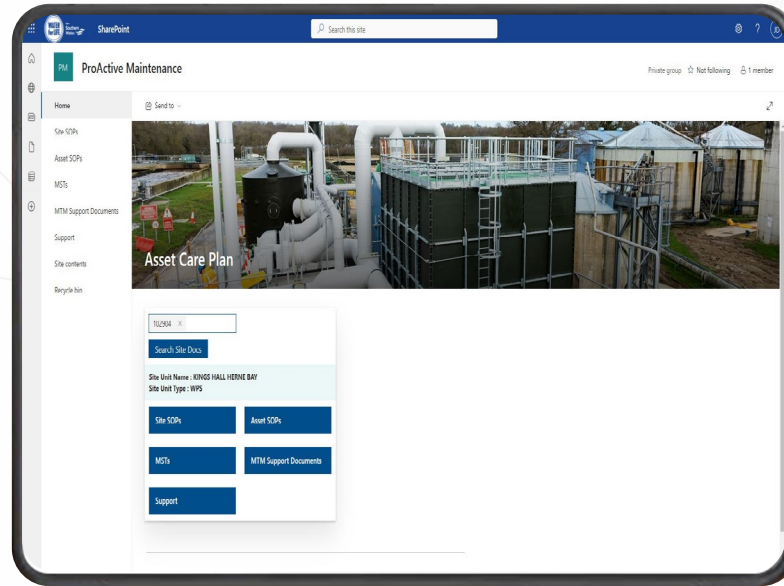
Results to Date



Up to 80%
schedule
compliance



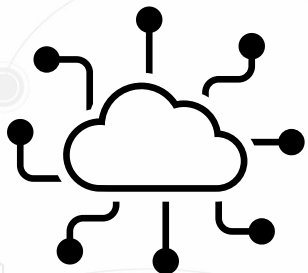
Asset
condition
conversations



25% uplift in
registered
assets



40% error
margin
corrected in
asset data



c.20,000
Operational
documents
created

Challenges

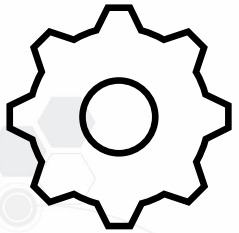
- Organisational culture
- Key Stakeholder buy-in / change fatigue
- Lack of Operational grip
- Impact from parallel initiatives not delivering (inc. enabling activities)
- Data management systems
 - Poor data availability
 - Poor data quality
 - Lack of confidence in available data
- Existing CMMS & supporting systems not able to accept new data inputs (asset condition scores)
- Further resistance due to teams seeing it as an additional burden, rather than a way to break the reactive cycle



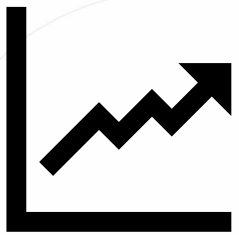
Next Steps



Introduction of
IBM Maximo
CMMS



Asset Condition
Scoring
Capability



CBM
Implementation

Isle of Wight Pilot





from
Southern
Water. 



Thank you for listening,

Any Questions?

