LEAKAGE MANAGEMENT: SUPPLEMENTARY INFORMATION

A short update on the latest work in leakage management around Australia. Pair with WSAA's 2019 report **Reducing Leakage in Australia.**

9 PILLARS OF LEAKAGE MANAGEMENT STRATEGY (UNITYWATER)

Unitywater, based in South East Queensland, recently developed this strategy which is planned for implementation over the coming years.

4 PILLARS (TRADITIONAL APPROACH)

- **Pressure Management** – reduce pressure to reduce the leakage and burst rate, often through using DMAs.
- **Active Leakage Detection** – actively monitoring for leaks through DMAs, e.g. flow, pressure, acoustic data, and field crews to pinpoint the leak location.
- **Pipeline and Asset Management** – replacing underperforming assets reduces leakage.
- **Speed and Quality of Repairs** – fast repairs reduce leakage.

ADDITIONAL PILLARS AT UNITYWATER

- **Water Balance** – revising standard assumptions in IWA to reflect real losses based on data every 5 years.
- **DMA Reporting** – improve the MNF threshold for DMAs with data from smart meters, DMA flow meter calibration, closed valve integrity testing and PRV maintenance.
- **Meter Replacement** – replacement of domestic meters reduces apparent losses and targeting large customer meters for replacement. Plus, measuring water theft through targeted metering.
- **Digital Neighbourhood Plan** – digital meters, data transmission networks, acoustic loggers, pressure transience monitors (calm networks), building staff capability.
- **Bulk Metering** – verification of bulk supply meters annually, and installation of smaller verification meters.

DIGITAL SMART METERS AND LEAKAGE MANAGEMENT (SOUTH EAST WATER)

South East Water, based in Melbourne, is undertaking one of the largest digital meter rollouts in Australia so far, with more than 30,000 now installed across a range of customer groups and housing types.

5,000 digital smart meters with vibration sensors were installed in a DMA. The meters are static (no moving parts), use a global open standard for communications, a cloud architecture to allow scaling and have an expected battery life of 15 years.

Detection of leaks on service lines is very high accuracy (99+%), detection of leaks on water mains is slightly different, it detects a leak and determines approximate location which allows a field crew to be sent to pinpoint the location. Expected NRW reduction is 1%.

The aim is to get a report each morning with leak locations identified and prioritised for repair, and then conduct the repairs before customers are aware of a leak.

The smart meters selected can include additional sensors (such as the vibration sensor that was used for leakage detection). This shows that, where a smart metering program is planned, by selecting a smart meter that facilitates the connection of other sensors a utility can get lots of additional benefits for marginal extra costs.

Future Ideas for Development

- Integration of water quality sensors.
- Integration of high frequency pressure measurement (calm networks).
- Provide customer feedback on water use by device in their home by using flow use characteristics of different equipment to determine what is operating and how much water it is using.
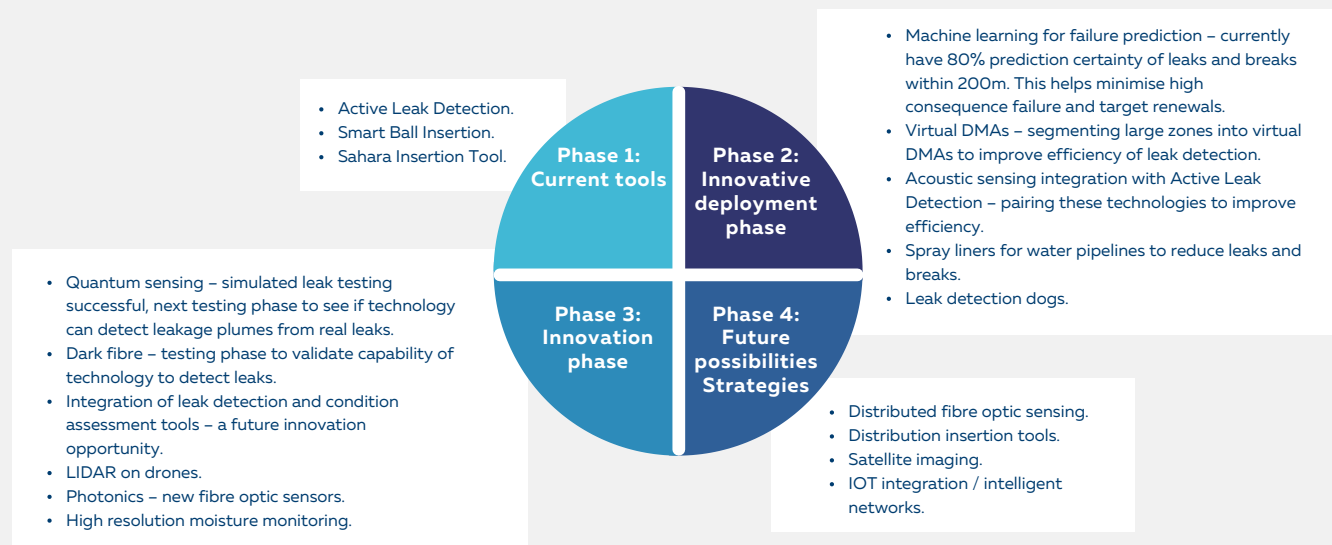
The 2019 **Reducing Leakage in Australia** report showcases the efforts by water utilities to reduce leakage in their own systems.

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WATER SERVICES ASSOCIATION OF AUSTRALIA

SYDNEY WATER'S LEAKAGE MANAGEMENT APPROACH

Australia's largest water utility supplying 5 million people, Sydney Water is undertaking a range of leakage management strategies in various stages of deployment.

Phase 1: Current tools
- Active Leak Detection.
- Smart Ball Insertion.
- Sahara Insertion Tool.

Phase 2: Innovative deployment phase
- Machine learning for failure prediction – currently have 80% prediction certainty of leaks and breaks within 200m. This helps minimise high consequence failure and target renewals.
- Virtual DMAs – segmenting large zones into virtual DMAs to improve efficiency of leak detection.
- Acoustic sensing integration with Active Leak Detection – pairing these technologies to improve efficiency.
- Spray liners for water pipelines to reduce leaks and breaks.
- Leak detection dogs.

Phase 3: Innovation phase
- Quantum sensing – simulated leak testing successful, next testing phase to see if technology can detect leakage plumes from real leaks.
- Dark fibre – testing phase to validate capability of technology to detect leaks.
- Integration of leak detection and condition assessment tools – a future innovation opportunity.
- LIDAR on drones.
- Photonics – new fibre optic sensors.
- High resolution moisture monitoring.

Phase 4: Future possibilities Strategies
- Distributed fibre optic sensing.
- Distribution insertion tools.
- Satellite imaging.
- IOT integration / intelligent networks.

Outcome: Over 9000 ML saved in water losses: more than $20 million over the past two years.

URAL WITH SYSTEM CORRECTION FACTORS

Sydney Water is trying to improve the accuracy of measurement of Unavoidable Annual Real Losses by the application of System Correction Factors.

The 1999 URAL equation has some limitations and may over-predict or under-predict real losses particularly when the zone size is small, or pressures are outside the range of 45-60 metres head.
Where an over-estimation occurs, the area may have a background leakage target level that is too high. This area would benefit from additional leak detection and reduction activities. Where an under-estimation occurs, the area may not be able to reduce leakage to the target level, and additional resources spent on leakage in the area would be better spent elsewhere.

Components of the system correction factor include: fixed and variable area discharges, influence of pipe materials on pressure, and leak flow rates relationships.

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REDUCING LEAKAGE IN AUSTRALIA

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YARRA VALLEY WATER INSTALLS DMAS

Yarra Valley Water, based in Melbourne, has undertaken a program to cover its service area with District Metered Areas and has covered 33% of the network with DMAs (including virtual DMAs).

Expecting that an additional 0.5 GL in water will be found for every 20% of the network covered due to the DMAs (target exceeded in the last two years). Target DMA size approximately 30km of pipe and 3000 connections.

The benefits are realised through:

- **Improved response times**
- **Targeting ALD and DM program**
- **Improve private mains leakage response**
- **Minor metering improvements**
- **Reducing non-revenue water**

Working through data cleaning and automation for data generated from DMA sensors.

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