Final Water Resources Management Plan 2024

Appendix 10C- Leakage Strategy Appendix

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Contents

List of Figures

List of Tables

FORWARD NOTE

This document contains our final Water Resources Management Plan 2024 (WRMP24) Leakage Strategy and should be read in conjunction with the Water Efficiency Strategy Appendix (10B) which provides combined detail on our overall demand reduction strategy for WRMP24. These are new appendices that have been prepared since the Draft WRMP24 (dWRMP24) and in response to consultation comments.

Since the dWRMP24 we have revised our leakage options to meet a 50% reduction in leakage by 2040, instead of 2050. These updated options for the WRMP24 are detailed in this appendix. For the demand options considered as part of the dWRMP24 please refer to Appendix 7A.

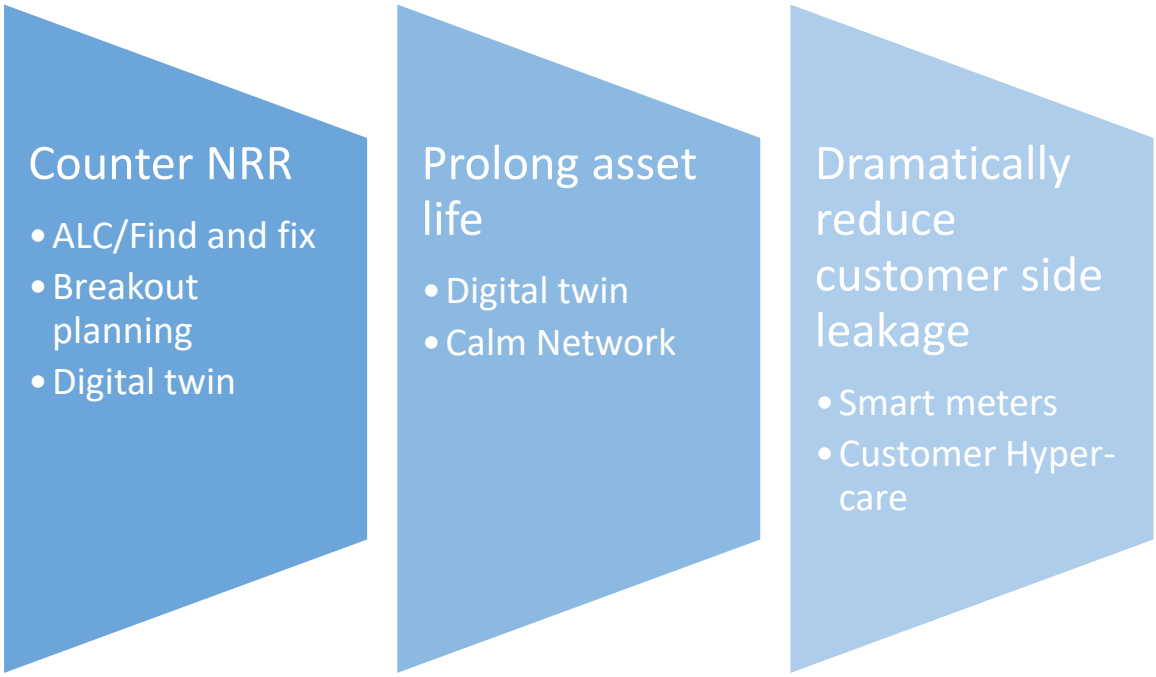
1 EXECUTIVE SUMMARY

1.1 Our Vision

Portsmouth Water is proud to have been recognised by Ofwat for its industry leading performance in managing leakage. Leakage reduction is in our DNA, and we recognise that it is consistently a high priority for our customers and stakeholders. Reducing and managing leakage is crucial for our Water Resources Management Plan (WRMP) and forms a vital component of our 'High Plus' / 'High+' demand management basket, as laid out in our final WRMP 2024 (WRMP24). As such it is a cornerstone of our vision to manage our water resources and demand effectively and efficiently, driving value for our customers and the environment of the region.

Our region is one of the driest in the country and on 1 July 2021 the Secretary of State accepted advice to include Portsmouth Water as a water company area classified as being under "serious water stress", aligning it with the rest of the Southeast region.

Our strategy for Asset Management Period 8 (AMP8) and beyond will be to manage and reduce leakage through 3 key approaches; to counter the natural rate of rise improving leakage from our own distribution network, to prolong asset life and finally to dramatically reduce customer side leakage[1].



1.2 Industry route map

This leakage reduction strategy follows the approach outlined in Water UK's Leakage Route Map to 2050, which we actively contributed to developing. The route map sets out an adaptive planning pathway to achieve a 50% leakage reduction by 2050 and outlines an 8-step pathway from defining the baseline through to WRMP/Periodic Review 2024 (PR24) inputs. The Leakage route map, produced by Water UK with the support of multiple water companies including Portsmouth Water, sets out the adaptive pathway and the principles of PALM (Prevent, Aware, Locate, Mend), and this forms the foundations on which the Portsmouth Water's strategy has been created.

[1] For the context of this report, customer side leakage is considered to be supply pipe leakage which forms part of total leakage. This does not include internal plumbing losses which would be considered as consumption and therefore considered within the Water Efficiency Strategy Appendix (10B).

The UK water industry have collectively committed to the National Infrastructure Committee targets, including the headline commitments to reduce leakage by 50% by 2050, and to deliver a reduction in leakage of 15% over AMP7 (which was embedded as a PR19 performance target). The Public Interest Commitment also saw the industry sign up to the tripling of the rate of sector wide leakage reduction by 2030, aligning to PR24 and WRMP24 outcomes.

The 50% leakage reduction by 2050 has become the benchmark through the National Framework (Environment Agency, 2020). The framework endorses an approach of using regional plans to achieve the objectives. Portsmouth Water are within the Water Resource Southeast (WRSE) group and have actively participated in the creation of the regional plan to collectively meet these targets, joining up to make the best value overall decisions for the environment and our customers.

The Defra document "Environmental Improvement Plan 2023" confirmed the PIC[2] 50% reduction by 2050 target and went on to include interim leakage targets of 20% by 31 March 2027, 30% by March 2032 and 37% by 31 March 2038, relative to a 2017/18 baseline.

1.3 50% reduction by 2040 (10 years ahead of Industry target)

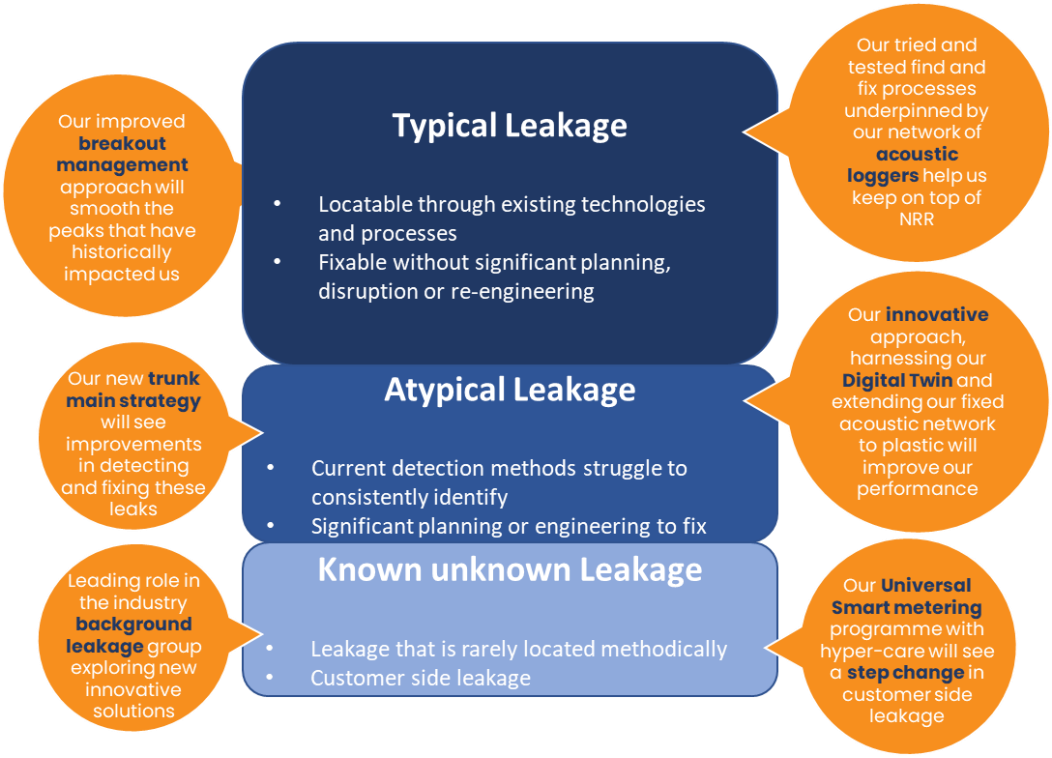
After careful consideration and engagement with our customers and communities through our draft WRMP24 consultation we are committing to a target of hitting the 50% leakage reduction by 2040, 10 years ahead of the industry commitment. We also meet the interim targets identified by Defra's Environmental Improvement Plan 2023. This reflects our sector position and our commitment to meeting the needs of our local communities and the environment. We believe that this will not only deliver environmental value, but also real terms value to our customers who already enjoy the lowest bills in the UK.

1.4 Innovating and managing the Natural Rate of Rise

Our strategy outlines how we intend to manage the natural rate of rise (NRR) and make further inroads into network leakage, even as that becomes more challenging as we deliver record low levels of leakage for our region. We will continue to innovate and explore the best value options to enhance our work in this area and believe that the next significant advance in leakage reduction in AMP8 will be enabled through our aspiration to install smart meters at all household and non-household connections to our network to become the first fully smart water supply company in England. Our continued work on refining our digital twin network model by 2033/34 will give us true visibility of where water goes for the first time, enabling us to make inroads into both our own and customer-side leakage.

[2] Leakage is also one of five Public Interest Commitments (PIC) the entire water sector has signed up to. A Leakage Routemap to 2050 | Water UK

The work basket and approach for leakage making up the natural rate of rise can be characterised as below:



1.5 Summary

We have carefully considered all the options available to us to achieve the targets set out in WRMP24. We have embraced innovation, and firmly believe that our approach which includes our industry leading digital twin, our universal smart metering with hyper-care programme and continued exploration and exploitation of best practice industry tools and processes, will ensure that we continue to play a leading role in the UK for leakage management. We have ensured that we are always delivering best value for our customers and the environment, seeking to find the best value point that delivers excellence for both.

We believe that our plan is innovative and that we have embraced the innovation that is available to us. We have carefully crafted a programme of work that is beneficial to our customers, the environment, and the region we share with them, whilst identifying the best value options to ensure fair bills and great outcomes.

2 OUR CURRENT STRATEGY AND EFFECTIVENESS

2.1 Introduction

In this section we discuss the characteristic of our network, our current approach to tackling leakage and the effectiveness of that approach.

2.2 Our network today

Portsmouth Water has a network consisting of over 3,380km of water mains. We serve over 324,000 homes and business with an average Distribution Input (DI) of 178 million litres of water per day (with a seasonal variation of between 160 – 240Ml/d). In 2021-22, leakage made up around 15% of total distribution input.

The source of this water is predominantly groundwater from the Chalk of the South Downs to the north of our region, feeding down to our largest population centres on the coastal plain. The geography of the region enables us to manage the pressure of up to 70% of our network with 4 strategic pressure reducing valves (PRVs). We have 30 PMAs (pressure managed areas) that are further pressure managed through local PRVs.

Our network mains composition is currently roughly 50% metallic and 50% plastic and other materials. Over time the ratio will increasingly become biased to plastic/other as new mains constructed through development and mains, we renew ourselves are almost universally a plastic composition.

2.3 Our current strategy

In common with the UK Water Industry as a whole, our network is sub-divided into smaller units, 30 District Metered Areas ('DMAs') and 120 Strategic Metered Areas ('SMAs'), in order to manage quality and to quantify and manage leakage. These areas are metered for overall water usage and are managed for integrity to ensure that only metered inflow and outflow connections are in use, allowing consumption to be understood and leakage calculated through industry best practice methodologies.

We have relatively low metering penetration, with currently just 36% of household (HH) properties metered, whilst our high use non-households (NHH) are also logged for usage, utilising Waternet to hold and manage our data.

Of the 50% of our network that is metallic, 90% is monitored for leakage through fixed acoustic sensors. This means that approximately 45% of our network is covered by fixed acoustic loggers. During Asset Management Period 7 (AMP7), a five-year period running from 2020/21 to 2024/25, we will replace approximately 2,500 of the loggers with NarrowBand-Internet of Things (NB-IoT) versions due to 'GPRS' redundancy.

Our trials of using similar acoustic loggers on plastic pipes during AMP7 delivered variable results; we installed 275 loggers, but found the technology gave us too many false positives to make the technology viable in the short-term and we will not persist with that particular technology in those pipes going forward. We will however continue to explore innovation in this area as over 50% of our network is currently made up of plastic pipes and this proportion will grow over time.

We are refreshing the entire Portsmouth region hydraulic modelling set, fully calibrating it and deploying additional sensorisation throughout AMP7 in order to develop a network digital twin that will become the mainstay of our leakage and network management over coming AMPs.

2.4 Observed behaviour of our network

Our abstractions are predominantly from the Chalk aquifer, but for much of the region the chalk is overlain by clay. Ground movement caused by drought (high water content rapidly drying and shrinking), or cold weather (freeze/thaw action freezing high water content) makes us susceptible to both summer and winter leakage breakouts, as the relevant climatic conditions lead to ground movements that stress the network. However, the generally milder winters on the South Coast of England do temper the impacts of winter breakouts when compared to other regions in the UK.

Chalk surface geology can also make leakage detection harder (relative to clay surface geology) as burst location can be masked by the tendency of leaking water to soak away through the porous chalk, rather than breakout on the ground surface.

2.5 Recent performance

Managing leakage is a constant battle due to the Natural Rate of Rise (NRR) of leakage, as well as seasonal impacts on pipes. Our NRR is 7.2 Ml/d which is the amount of extra leakage there would be

at the end of the year if we deployed no active leakage detection and only fixed bursts (reactive intervention). On top of this, we have freeze/thaw conditions in the winter, and in the summer, we have ground movement caused by dry conditions. This can increase leakage exponentially if not addressed. In 2021-22 we fixed a total of 2,755 leaks within the network compared to 2,590 in 2019/20. Despite this increase in leaks fixed, leakage increased as explained below.

We started this AMP achieving record low levels of leakage for the Company. This performance was facilitated by the investment made on remote detection equipment and increased resource levels, helped by benign weather conditions.

Taken as a trend over the AMP up to the end of 2022, our performance steadily deteriorated (there was a steady rise in leakage as shown on Figure 1). Whilst our leakage performance was below where we expected it to be, performance was more nuanced than a steady deterioration. What we actually observed was a sequence of leakage breakout events and subsequent recoveries over a period from January 2021 to January 2023.

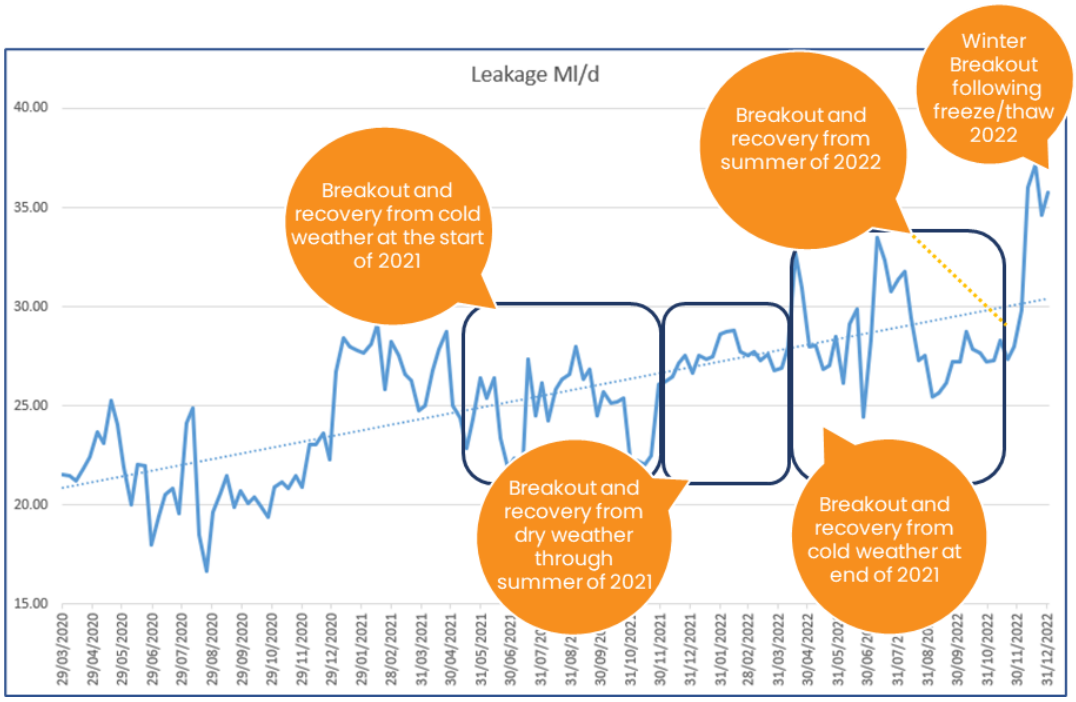


Figure 1 Leakage trends during AMP7 to the end of 2022

We successfully mitigated the 2 breakout events of 2020/2021, but our performance began to deteriorate with the winter event of 2021/2022. That winter saw 2 separate breakout events of c.5Ml/d each, from which we never fully recovered as more breakouts emerged.

Following the fourth breakout, which took place during the very dry summer of 2022/23, a root cause assessment was undertaken to understand the causes of our recent performance. Informed by that work, a recovery plan was put in place. Subsequently, progress against this plan was routinely reported to the Board at least monthly, with more focussed communication when required. We have also been monitoring progress on a tactical level with Senior Management several times a week.

A significant breakout took place with the freeze thaw weather conditions in December 2022. The breakout increased our nightline by over 9 Ml/d overnight, with the majority of this abnormal demand resulting from burst pipes on both our network and also customer-side. Just under 3 Ml/d was swiftly recovered through customer self-repairs and repairs of easily identified bursts on our network, with an additional 5 Ml/d recovered through extensive leakage recovery activity by May

2023. This resulted in almost a 25% reduction in leakage in four months, however it was not a full recovery to pre-breakout levels.

To recover the tail of the impact of this weather event, and fully recover from previous events, an enhanced recovery plan was launched, increasing resourcing and the capability to deploy wider resources earlier in the event of future breakout events. As a result, breakout response planning has improved significantly. We are still recovering from the previous breakout events; however, we remain in a position of confidence that through focus on Active Leakage Control (ALC) and resources, along with managing the response plan, leakage will continue to reduce to meet those levels forecast in the WRMP24.

3 OUR CURRENT LEAKAGE PROGRAMME

Our current approach utilises a suite of find and fix techniques that are tried and tested in our past performance and across the industry.

3.1 Industry routemap

The PALM model (prevent, aware, locate, mend) forms the basis of our approach and is laid out in the industry route map as best practice ("A Leakage routemap to 2050", Water UK, 2022). We have a programme of activity that aligns to the PALM model (including Data) as shown in Table 1.

Table 1 PALM themes and Portsmouth Water Activity

PALM Theme	Portsmouth Water Activity
Prevent	• Calm networks (training of operators) • Calm networks (pressure management including PRVs) • Development of Digital Twin
Aware	• Fixed acoustic networks
Locate	• FIDO leak bugs • Sounding
Mend	• Prioritised work basket based on outcomes • R&M incentivisation • Mains replacement
Data	• Fixed and mobile logger analysis

3.2 Current Approach

3.2.1 Find and Fix / Active Leakage Control

Portsmouth Water operate Active Leakage Control (ALC) through a find and fix approach to our leaks and this remains a crucial element of our strategy as we manage the NRR, the leakage a water company would expect to occur should no intervention (leakage repairs) take place.

Significant leakage reduction in previous years has been driven by optimising the repair workbasket and operating on a points-based system which reflects the volume of water lost through leaks. The leakage detection and repair teams have been out-achieving weekly target score on a regular basis, enabling faster recovery from leakage breakouts than expected. However, the increased frequency

and severity of outbreak events due to recent extreme weather conditions has resulted in requirements that have exceeded the capacity of the detection and repair teams to resolve.

During AMP7 these outbreaks significantly impacted our leakage glidepath. The lessons learned and our new breakout management plans make us confident we can get leakage back on track and better manage risks throughout AMP8. Resources from mains laying gangs are now redeployed to repair work once a trigger is hit, to bring find and fix in line with the increased target scores to defeat the higher number of breakouts. We are also utilising non-leakage resources in detection with new technologies that require less formal leakage training and competency to enable faster mobilisation of increased resources after breakout events.

3.2.2 FIDO Leak Bugs

In AMP7 we have partnered with FIDO, who are the manufacturers of the 500 leak bugs we acquired in early AMP7. 'FIDO direct' is a service offering we have begun as a trial where the manufacturer has committed to extract the highest value from the bugs we own, exploiting their knowledge of the technology to gain high quality results for us in 3 pilot DMAs.

These combine a cutting-edge Artificial Intelligence (AI) platform and in field device – which uses rapid machine-learning to 'listen' and interpret the unique data trail left by leaks. Then, it tracks them down to pinpoint the exact location of a leak. The trial includes incentivised reward for verified leaks found, the repairs still being managed and delivered through Portsmouth Water and partners. We have deployed these in predominantly plastic pipe DMAs so as not to duplicate effort with our fixed acoustic loggers on the metallic network.

We are continuously reviewing the performance of this trial for our AMP8 planning. We hope these devices provide additional detection points of interest and a level of accuracy above our existing acoustic loggers.

3.2.3 Smart network – Digital Twin

Portsmouth Water are committed to becoming a leading 21st century water company, underpinned by the digitalisation of our assets and the development of a smart network. At the core of this capability, we have undertaken to create a digital twin of our network. By modelling network behaviour in near-real-time, leakage management will move to a data centric approach which will improve the targeting of ALC activity.

During AMP7 we are already investing in the refresh and recalibration of all of our hydraulic models, new sensors will be used to calibrate them, with an optimised number remaining in the ground to provide real time updates for analysis and calibration. During AMP8 we expect the vast majority of our models will be refreshed and we will be transitioning to near-real time modelling, progressing from daily update start point onto higher frequencies up to hourly. This will provide Portsmouth with an unrivalled digital twin of its entire region, as well as increased pressure monitoring and transients analysis (new) through the additional sensorisation.

The hydraulic model will support burst avoidance through pressure and transient analysis, reduce leak run times and significantly improve the granular measurement of outcomes against actions. Creating efficiency through accurate data measurement, preventative maintenance, and raised confidence in intervention identification and prioritising actions.

3.2.4 Project Calm – network calming strategy

During AMP4 we installed 3 large PRVs to manage flow and pressure coming into the lowland and coastal urban areas. Since this time, we have increased the coverage further with a number of large scale and some local PRV's to the level where circa 70% of Portsmouth Water's network are receiving some level of pressure managed supply. Pressure management is proven to reduce network fatigue and extend asset life and is most beneficial when the range of pressure a network operates under is

as narrow and as stable as possible. Under these conditions burst frequencies will be reduced and, in turn it will reduce the NRR over time.

In AMP7 we began Project Calm, which sets out a plan to have all of our SMA/DMAs under some degree of pressure management by the end of AMP8 where it is practical and cost efficient to do so. Additionally, we will be undertaking a significant programme of local level pressure management to further reduce the range of pressures and overall level of pressure that our network is exposed to. Project Calm is split into three phases.

3.2.4.1 Phase 1 – refreshing and digitalising existing PRVs (AMP7)

The first phase, being completed in AMP7, is the refreshing and digitalisation of existing PRVs. The latest valves have digital connectivity, allowing them to connect and operate intelligently together or control through the digital twin. All existing large PRVs will be replaced with these by 2027with benefits being realised through AMP8 and beyond. The replacement will achieve a higher standard of pressure control and balance in the network. We will enable a closed loop control on all small and medium valves, currently operating with either flow modulation control or fixed head control, as this is the optimum control for a calm network.

3.2.3.2 Phase 2 – local pressure management (AMP7 – AMP8)

The aim of Phase 2 is to have PRVs installed at all locations during AMP7, to achieve a more effective identification and optimisation of solutions, which will be possible when the PRVs are coupled with the digital twin. In addition to this, we are exploring the implementation of Variable Speed Drives (VSD) for AMP8 which will add additional strength to the pressure management capability.

Phase 3 of this strategy will be implemented in AMP8, details of which are provided in section 5.6.1.12 as part of our ongoing leakage programme.

3.2.5 Mains Replacement

We have historically had a relatively high mains renewal rate compared to the other UK water companies, which has been crucial in keeping bursts and interruptions to customer supply among the lowest in the country.

We have always adopted a risk-based mains renewal strategy which includes burst frequency, impact to customers, age, and impact on water quality. This has seen a focus in previous years on key strategic mains that provide resilience, and PVC and ferrous mains which have a higher probability of bursting.

Our analysis has shown that due to previous high levels of mains renewal, we have replaced most at-risk mains and have the option to reduce renewal rates whilst maintaining our industry leading performance. We discussed this with our customers through our “Your Choices for Our Future” consultation in March 2023 and customers agreed that, considering the impacts of the cost-of-living crisis on affordability and other investment needs related to water quality and the environment, it was the right decision to maintain our current industry leading performance.

4 THE CHALLENGE AHEAD

In this section we describe the challenge we face on our supply demand balance and the important role leakage reduction is set to play in securing a sustainable water supply for our customers into the future.

4.1 The challenge

Our water resource planning aims to secure sustainable water resources for current and future customers. Our Water Resources Management Plan 2024 and our regional Water Resource South East (WRSE) plan outlines our understanding of the challenge within our region.

Our region is one of the driest in the country. In July 2021 Portsmouth Water was reclassified by the government as an area severely water stressed aligning it with the rest of the Southeast. With the pressures of a growing population and climate change, we are aware that if we do nothing, we may not have enough water to supply customers in the event of a drought. We have identified the amount of extra water required in Figure 2.

As a company, we are resilient to extreme weather events and changes in demand (as demonstrated in 2022 by a prolonged dry period classified in August 2022 as a drought by the Environment Agency). At Portsmouth Water we did not need to introduce temporary usage bans but, we know we have some challenges to overcome around our regional resilience in extreme dry weather events in the future. We also recognise the importance of delivering our remaining AMP7 reduction commitments to ensure a strong starting position for AMP8.

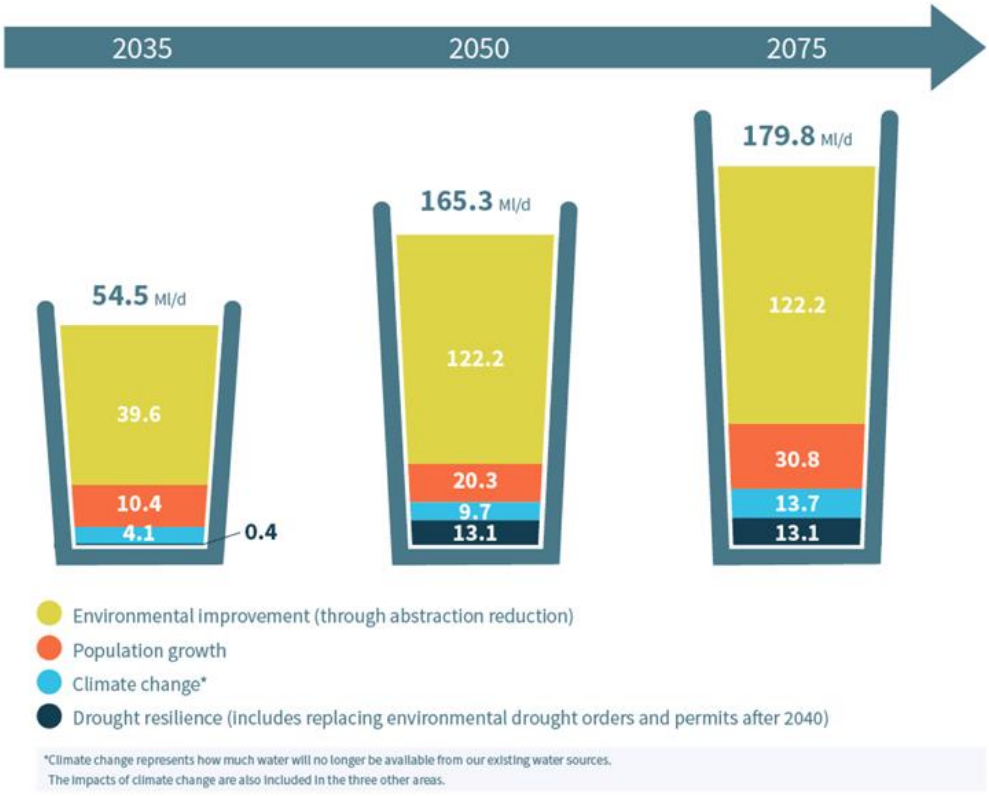


Figure 2 Extra water required in the Portsmouth Water supply area

4.2 Industry response and targets

In 2019 the English water companies made a Public Interest Commitment (PIC) to "triple the rate of sector-wide leakage reduction" by 2030. The water sector has also taken up the Public Infrastructure Commission (PIC) challenge, committing to halving leakage from 2017/18 levels by 2050. Published in 2022 by Water UK, the document details the actions for water companies to take, to meet both their 2030 leakage goal and the 2050 proposed reduction. These include the following:

- Improved quantification of background levels of leakage – that is leakage that cannot be detected with current technology. Portsmouth Water has taken a leading role in the industry Background Leakage working group that seek to close this gap.
- Improved quantification of leakage inside customers' properties through smart metering – Portsmouth Water's drive to become the first water supply only company with all properties on a smart meter will see us at the forefront of this valuable form of water saving.
- Development of a sector-wide code of practice on how to ensure that water mains are laid without leaks.
- Development of a strategy to tackle leaks on customers' water supply pipes (including the benefits of a common industry approach).

Building on the PALM model, the report recommends future adaptive pathways, to take account of a range of potentially variable factors. It also considers different leakage reduction scenarios, including increased active leakage control, smarter networks and improvements due to upgrading assets, such as pipes and control systems. The routemap calls on regulators to support the replacement of leaky pipes. Reducing leakage presents a significant technological challenge. With over 345,000 kilometres of water pipes, enough to go around the world eight and a half times, England's water companies are adopting some of the latest technology and innovation to reach every leak.

The 50% leakage reduction by 2050 has become the benchmark through the National Framework (Environment Agency, 2020). The framework endorses an approach of using regional plans to achieve the objectives. Portsmouth Water are within the Water Resource Southeast (WRSE) group and have actively participated in the creation of the regional plan to collectively meet these targets, joining up to make the best value overall decisions for the environment and our customers.

The Defra document "Environmental Improvement Plan 2023" confirmed the PIC 50% reduction by 2050 target and went on to include interim leakage targets of 20% by 31 March 2027, 30% by March 2032 and 37% by 31 March 2038.

4.3 Our final WRMP24 approach to leakage reduction

At Portsmouth Water we have made the decision to reduce leakage by 50% by 2040, 10 years ahead of the national target. We have constructed a programme of work that builds on our success and investments whilst driving forward with new and exciting innovations and improvements.

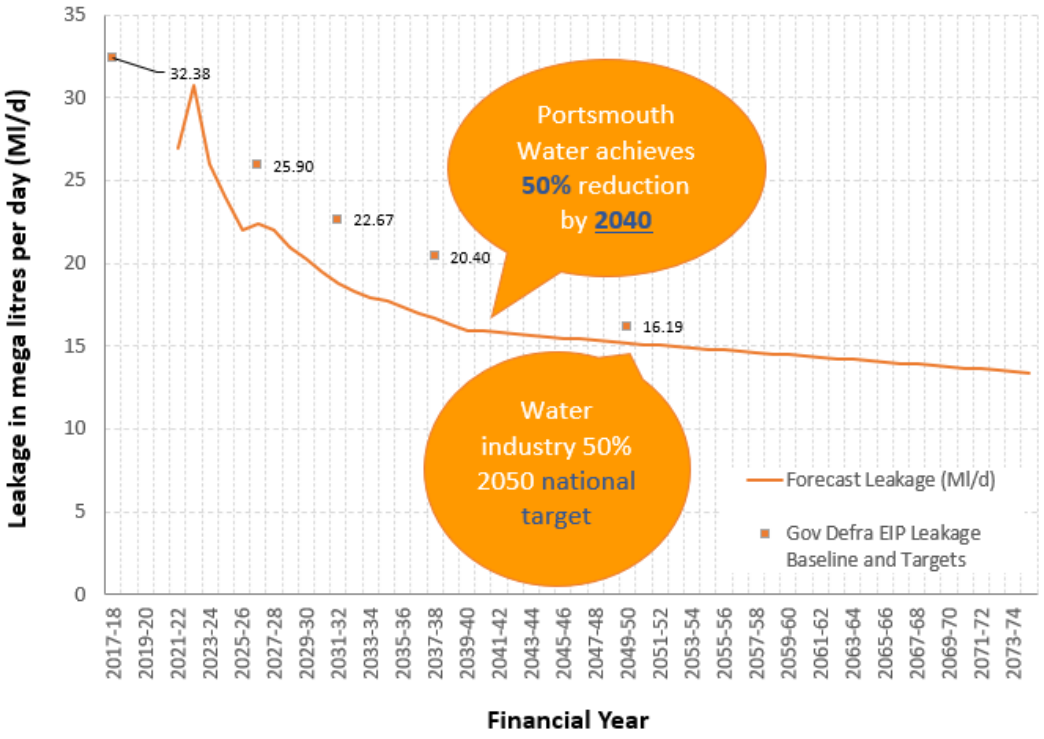


Figure 3 Final WRMP24 forecast leakage and comparison with targets

There are 3 key drivers that have led us to push for the 50% reduction in leakage by 2040 in Portsmouth Water, 10 years ahead of the industry commitment:

- **Maintaining/enhancing the environment** – in the face of climate change (the impacts on water resources as well as the impact through unnecessary CO2 generation) and the environmental pressure to maintain our own internationally important chalk streams, we must continue to maintain the supply/demand balance. Leakage, even at our lower levels, contributes more than it should to the overall demand for water.
- **Leading by example** – our customers will be asked to do more over the AMP8 period and beyond to manage their own relationship with water usage, it is important that as the company asking them to do that, we have the credibility of managing our own water stewardship. Leakage will always be at the forefront of the debate to why we should do more as individuals.
- **Doing the right thing** – The PIC commitment was a national challenge, but we feel we have set ourselves up in the right place to achieve it sooner, so why delay when it's the right thing to do, it's absolutely what our customers are telling us they want (via the Plan Choices and WRMP24 consultations) and it's what the environment at a macro and local level deserves. Our review of existing evidence reaffirmed our understanding that customer's top two priorities for their water supply are; ensuring a reliable water supply and fixing leaks. When presented with more information about water resources and options to improve the balance between supply and demand, customers tell us their top three option types to achieve these are, in order of preference, reducing and fixing leaks, using less water, and increasing supply.

We believe that the low levels of leakage that we are targeting to achieve at the end of AMP7 could slow down the rapid rate of progress in overall leakage reduction given diminishing returns on effort that is likely to characterise a status-quo, no change strategy. We believe that the next significant step benefit in overall leakage reduction will be in the reduction of customer side leakage; this is included in our overall reported numbers, and we believe that this may make up as much as 50% of the remaining leakage as we move forward into AMP8. It is therefore hugely important for us that our universal smart metering programme is fully funded for our AMP8/9 submissions as the inroads

into this area of relatively untouched leakage will be significant as our installation and follow up customer hyper-care programme roll out.

Through recent collaborative Club Projects, such as the Background Leakage project, we estimate that background leakage sits at 16.7 Ml/d. Background leakage is the accumulation of weeps, seeps and leaks that are undetectable with current technology. Smart metering will be able to reduce background leakage along with mains replacement, however existing technologies that are mainly reliant on acoustic technology find background leakage extremely difficult to detect. We have been looking at non-acoustic techniques on top of those we already deploy, in order to help reduce background leakage.

The rollout of smart metering influences the rate at which we can deliver the 50% leakage reduction and therefore 2040 is considered to be the earliest date this can be achieved. We are forecasting to meet the background level of leakage in 2037/38, with further reductions to 2040 and beyond.

5 DEVELOPING OUR LEAKAGE PROGRAMME

In this section we describe the high-level process we followed to ensure we have a robust delivery programme that presents good value to customers.

5.1 The approach

To deliver a cost efficient and effective programme of options to tackle leakage we followed a simple process identifying every option available to us, identifying the most cost beneficial options, assessing the impact of our efficiency in the face of reducing leakage and finally collating a final programme of options.

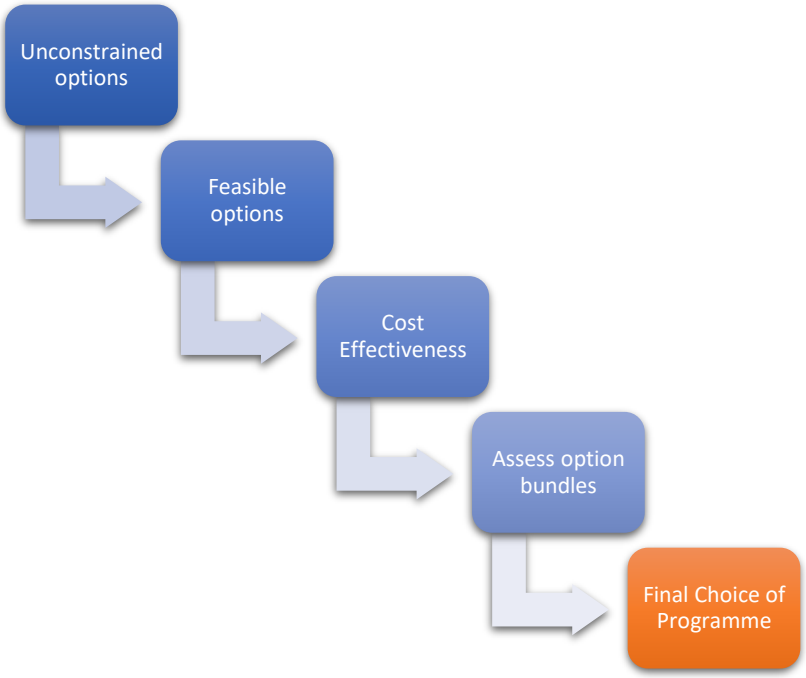


Figure 4 Portsmouth Water approach to developing the WRMP24 leakage programme

5.2 Unconstrained options

In this section we outline all the unconstrained options that could potentially help Portsmouth Water meet leakage objectives.

In order for us to be able to review all of the possible options for demand management, we undertook a rigorous assessment that included:

- Current Portsmouth Water strategy and initiative review;
  - All current demand management activities were reviewed for their effectiveness, value, and scalability.
  - All current trial and innovation pathfinders were assessed for their current effectiveness and readiness for affordable and practical deployment at scale.
  - Supply chain capacity.
- Best practice industry scan;
  - Proven technologies, approaches and innovations that have been delivered through AMP7.
  - Partnering with industry experts for internal / external strategy review.
  - Government / regulatory led initiatives and standards.
- Portsmouth Water strategic plans:
  - Initiatives where demand benefits or impacts could be harnessed, such as smart metering.

The options are listed below in Table 2, with greater detail provided later in the document where the intervention was adopted in the plan.

Table 2 Portsmouth Water leakage reduction: unconstrained options

Intervention	Potential Benefit Area	Potential benefits to leakage management
Find and Fix (ALC)	Locate and Mend	This is the process in which a water company identifies, prioritises, and fixes leakage in order to mitigate a natural rate of rise (NRR).
Find and Fix – DMA Integrity Hyper Care (ALC)	Locate and Mend	Enhancement to the above whereby the quality of data and physical integrity of the network is rigorously validated to improve certainty of actions required from the data that drives leakage measurement and identification. This can also include the focused attention within a DMA to follow up data accuracy with a concerted effort on the ground to drive down all leakage within the area to below average levels.
Trunk and rural mains strategy	Prevent, Aware and Locate	By harnessing the use of innovative survey methods, including satellite imagery, lidar and in-pipe inspections, a water company can detect previously unknown leakage on its rural and trunk mains where access and data accuracy may have prevented their ability to detect leaks. The focus on best practice asset management, including the inspection and exercising of key valves and air valves will also reduce the strain on the network and prevent future bursts.
Project calm – network calming strategy	Prevent	By optimising and controlling pressures and transients across a network a water company can expect to reduce the stress and strain on the network components and extend overall asset life as well as preventing bursts caused by pressure spikes.

Intervention	Potential Benefit Area	Potential benefits to leakage management
Improved Repair Techniques	Mend	Innovations and/or existing best practice that may improve speed and quality of repair.
Universal Smart Metering	Aware, Locate and Mend	Smart metering can benefit leakage in a number of ways, including: • Identifying customer side leakage including supply pipe • Validating overall water demand within a DMA and therefore assumptions around leakage • The water company electing to repair supply pipe leakage as part of their smart metering roll-out and therefore reduce reported leakage in the area
Smart network – digital twin	Prevent, Aware and Locate	The introduction of a digital twin and the extension of sensors across the network can allow a water company to better understand the performance in operation of its network. This will create new opportunities to optimise the configurations and controls in the network that prevents future bursts, it will provide alerts and points of interest that suggest imminent or current failures with increased confidence on the location of that burst in order to direct the locate and mend teams into resolving the problem. Future enhancement would integrate smart metering data as well as network sensors to create an even more complete understanding of network performance.
Mains replacement	Prevent and Mend	Replacement of failing assets in the network to stabilise the NRR in those areas. By replacing deteriorating mains, a water company will prevent future leakage and bursts as well as removing sections that may be contributing to current leakage.
Communication pipe replacement	Prevent and Mend	Communication (comms) pipe repairs commonly are a high element of the repair basket and where the material is prone to further failures, such as galvanised iron or black alkathene then a water company may choose to proactively replace on finding individually or look to cluster programmes of replacement in a geography to prevent future leakage.
Supply pipe adoption	Mend	The adoption of customer supply pipes would introduce a significant uplift in asset liability and is under review at an industry level.
Non-Household (NHH) Approach	Prevent, Aware, Locate and Mend	By working with retailers and larger NHH consumers a water company can help manage demand and leakage through bringing to the attention of the company best water management practices (that can help prevent network leakage), detect leakage within the boundary of the premises and help the company understand how they can use their consumption data to identify future issues.
In pipe robotics	Aware, Locate, Mend	Not yet developed in the water industry, in the gas sector these have been used to detect and mend leaks and issues.
Root cause analysis	Prevent	By analysing the cut outs and ground composition of all burst and leak repairs it may be possible to create a future predictive model that can forecast failures on specific mains, or categories of mains within a common classification (material, age, soil type, depth, climatic events etc) that could predict the likely location of leaks with climatic events and help future mains laying operations safeguard against common risks. This is currently an academic hypothesis, not common practice in the UK.

Intervention	Potential Benefit Area	Potential benefits to leakage management
Repair time innovations	Mend	Technologies such as vacuum excavation (Vac-Ex) can increase the efficiency of repair gangs and therefore the utilisation and productivity. These are typically more expensive to operate but provide greater yield on resources where resource availability is impacting leakage run times and volumes.

5.3 Feasible Options

In this section we discuss the options taken forward as feasible into our programme design stage

Our approach to leakage reduction has been multi-faceted. Our exploration of unconstrained options included an assessment of effectiveness, affordability, and value/benefit for investment. Following a cost benefit review of the effectiveness of several interventions we have selected a suite of activity we feel represents our most influential mix of activity, whist also providing value for our customers.

We took the unconstrained options to the next layer of development and added a Portsmouth Water application and lens to the possible options, using a feasibility approach to determine which elements could be taken forward to the preferred plan (see Table 3 and Table 4).

5.3.1 Accepted at feasibility stage

Table 3 Portsmouth Water leakage reduction: options accepted at feasibility stage

Intervention	Potential Benefit Area	Relevance to Portsmouth Water	Adopted in Plan
Find and Fix (ALC)	Locate and Mend	There is an evidenced link between leakage improving with an increase in the repair basket. Currently more leak repairs are reactive, only one third of the repairs are proactively raised and this trend needs to reverse in AMP8 to improve the leakage outcome. This includes the fixed acoustic sensors in the network and locate tooling available to teams.	Yes
Find and Fix – DMA Integrity Hyper Care (ALC)	Locate and Mend	By focussing on the data and physical integrity of a DMA we will characterise and prioritise leakage reduction activities in those areas that have deviated most from the norm for their category.	Yes
Trunk and rural mains strategy	Prevent, Aware and Locate	The rural transmission mains sitting within the SMA boundaries contribute to leakage performance but are not as regularly surveyed due to their remote nature and limited availability of fittings for leak sounding. Therefore, an aerial imaging solution has the potential to contribute to improving the effectiveness of ALC by creating points of interest for follow up by ground teams. New correlation and in pipe inspections could contribute towards leakage detection and reduction.	Yes
Project calm – network calming strategy	Prevent	70% of customers are already fed from a pressure managed system but the majority are fed through upstream TM pressure control which leave significant opportunity for local pressure control.	Yes
Universal Smart Metering	Aware, Locate and Mend	Smart metering is a key initiative at Portsmouth Water in AMP8 and AMP9. The leakage opportunity is to greatly improve visibility customer side leakage, plumbing losses and demand variance.	Yes

Intervention	Potential Benefit Area	Relevance to Portsmouth Water	Adopted in Plan
Smart networks – digital twin	Prevent, Aware and Locate	Introduction of a digital twin model in AMP7 and the extension of sensors across the network will significantly improve the visibility of network behaviour, optimisation and exploitation in AMP8 and beyond.	Yes
Mains replacement	Prevent and Mend	Replacement of failing asset in the network to stabilise the NRR in those areas. Achieving a net zero leakage benefit.	Yes

5.3.2 Rejected at feasibility stage

Table 4 Portsmouth Water leakage reduction: options rejected at feasibility stage

Intervention	Potential Benefit Area	Relevance to Portsmouth Water	Adopted in Plan
Improved Repair Techniques	Mend	Repair data does not suggest that there is an issue with repair quality. This is probably due in part to size of the R&M teams creating a sense of ownership. Whilst negotiating the AMP8 relet of R&M we will challenge potential delivery partners to bring innovation to the process.	No
Data analytics Prioritised repair basket	Mend	Our repair basket prioritisation model and analysis are already delivering successful outcomes in this area and does not require fundamental change.	No
Communication pipe replacement	Prevent and Mend	We will continue to replace comms pipes that are found to have deteriorated to the point their condition is beyond the economic state of repair but have no evidence that a systematic proactive programme would be beneficial for Portsmouth Water customers.	No
Supply pipe adoption	Mend	Portsmouth Water will contribute to and accept the findings of the industry review into this approach. Rejected at this stage.	No
Non-Household (NHH) Approach	Prevent, Aware, Locate and Mend	NHH leakage beyond the meter is classified as consumption but is a burden on overall demand management. This does not fall under the typical leakage responsibilities of an undertaker, however as part of our demand management response we will be working with 20 NHH customers per annum to reduce consumption and include leakage detection as part of that offering. We will be smart metering all NHH properties (with smart meter or smart adjustment to existing meter), bringing self-leakage management for customers into scope.	No
In Pipe robotics	Aware, Locate, Mend	Technology is only at proof of concept and academic research level. Portsmouth Water will be open to allowing our network to be used for trials if approached and all quality and safety requirements can be met, but at this stage are unable to attribute any benefits to a technology in its infancy.	No
Root cause analysis	Prevent	We do not believe that the benefits from root cause analytics provide a short to medium term benefit that provides value for money for Portsmouth Water customers. We will participate in industry wide studies in this area that are more likely to have the representative volumes and shared funding to make this viable.	No
Repair time innovations	Mend	Due to the small geography of the Portsmouth Water region, we have good utilisation and productivity from our repair gangs. However, we have committed to including repair innovations into the re-letting	No

Intervention	Potential Benefit Area	Relevance to Portsmouth Water	Adopted in Plan
		process of our Repair and Maintenance (R&M) framework, due in 2024 and so we have not discounted these innovations being driven through our supply chain.	

5.4 Optimising and prioritising options

In this section we outline how we created the feasible options list and took it forward into a programme of work that delivered benefit and value for our customers, region and environment.

We have independently created an optioneering model for leakage that has been in use during AMP6 to reduce leakage, AMP7 to develop PR19 plans, and enhanced for WRMP24 and AMP8. The model balances unit cost and benefit for the array of approaches that are feasible for the business and how they could meet the target outcomes based on the validated NRR.

We have carefully assessed the outputs of that model which provides the first pass of options for consideration. These were normalised/calibrated with expert opinion within Portsmouth Water and through our independent partners to ensure that we have a realistic and well-balanced set of options for WRMP24; a necessary step due to the model maturity to ensure a deliverable programme.

Leakage is a key short-term lever in resolving the overall supply demand balance challenges for WRMP24.

5.5 Our choice of preferred plan

In this section we confirm the planning assumptions we have made and the final compilation of options we have included in our preferred programme to reduce leakage as required by the WRMP. This is the leakage element of the Portsmouth Water 'High-Plus' demand management basket for WRMP24.

When compiling this programme of options, we have made a number of planning assumptions covering weather, leak detection efficiency under various circumstances and the NRR for our network.

5.5.1 Weather

Due to climate change and the increase in adverse weather conditions that have hit the performance of leakage in the industry at increasing intervals over the course of AMP6 and AMP7, we have built up our assumptions based on recent experience that we will be faced with severe adverse conditions once in every three years. The remaining 2 years being classified as normal, which encompasses benign conditions. This reflects the effort we believe we will have to make in order to stay on course for our Portsmouth Water 2040 and national 2050 leakage targets. This has been forecast in a pattern of 1:3 years on the plan to represent effort and cost, although the reality will be irregular and random.

5.5.2 Efficiency

We have applied a depreciation on efficiency of our methodologies through the course of AMP8 and WRMP24 that reflects the reality of overall diminishing returns on effort as leakage reduces and there are less leaks on our network to find. This in turn has been mitigated by the capital investment in new approaches and technologies that we believe will in part offset the reduction in efficiency we will observe as we reach record low levels of leakage. These are covered in detail later in the document, but are Digital Twin, Analyst Resource, New DMAs and Fixed Sensor network for plastic mains.

5.5.3 Natural Rate of Rise (NRR)

The natural rate of rise of 7.2Ml/d was validated as part of our leakage programme development. The calculation assesses the impact that leakage repairs have had on DMA nightlines (used as the starting point for the leakage calculation), what has happened to the nightline values in the period between leakage repairs and whether the repairs are proactive leaks (not visible) or reactive bursts (visible) to calculate the underlying rise in the nightline that would have occurred had repairs not been completed. We have considered only the rise that would occur if proactive repairs are undertaken for the purposes of developing the leakage programme on the assumption that any visible leaks would be repaired as a matter of course and that this type of leak tends to be short in duration and does not significantly impact annual average leakage. There are complicating factors such as DMA integrity, flushing and other activities that needed to be understood and factored into the outcomes. The calculation followed the industry best practice methodology.

5.6 Our programme

In this section we describe how our programme of work in relation to the PALM and Data model will deliver benefits to our customers, region, and the environment. A summary of our programme is shown below in Table 5.

Table 5 Portsmouth Water's programme of leakage reduction work

Option	Description
Prevent	Expansion of digital twin capability
Prevent	Expansion of localised pressure-controlled areas
Aware	Expansion of sensing fixed network to plastics
Aware	Fixed acoustic Permanent/Zonescan networks
Aware	Enigma Sweeps
Aware	New DMAs/DMA Integrity
Aware	Universal Smart Metering
Aware	Satellite Imagery
Locate	Digital sounding sticks (e.g., Iquarius/LS1)
Locate	AI enabled sensors
Locate	New Sounding Techniques
Locate	Enigma/HyQ Sweeps
Mend	Smart Metering Hypercare
Data	Increase in analytical resources
Data	DMA Playbook
Data	Smart Network

5.6.1 Description of activities and benefits

5.6.1.1 Data on activities and benefits

All tables in this section show megalitres per day (Ml/d) leakage reductions for selected years of WRMP24. The Ml/d savings are the reductions required to overcome the natural rate of rise and achieve the target leakage profile in our WRMP24.

5.6.1.2 Find and Fix/ALC -Active Leakage Control

We can demonstrate that the time to repair leaks in our network has significantly reduced over AMP6 and AMP7, with technologies such as acoustic noise loggers on our ferrous mains reducing time to find and fix from what was up to 6 months in some areas to as little as 3 days to a week where acoustic sensors are most effective. The reduction in leakage volumes (by reduction in time leaking)

as a result is not a benefit that can be repeated once these new find and fix rates become the norm for our region. Faster detection rates will be reducing from a 1-week baseline and therefore the gains made will be smaller than seen in recent years where the find and fix time was as much as 6 months. Improvements in leakage detection technology will therefore have a lower volumetric gain in future years for the "typical leakage" classification on leaks. The proportion of harder to detect leaks in the "Atypical Leakage" and "Known unknown" leakage baskets will become high proportions of the overall workload, meaning that the repair basket is shallower and more complex, with time to locate and fix both increasing.

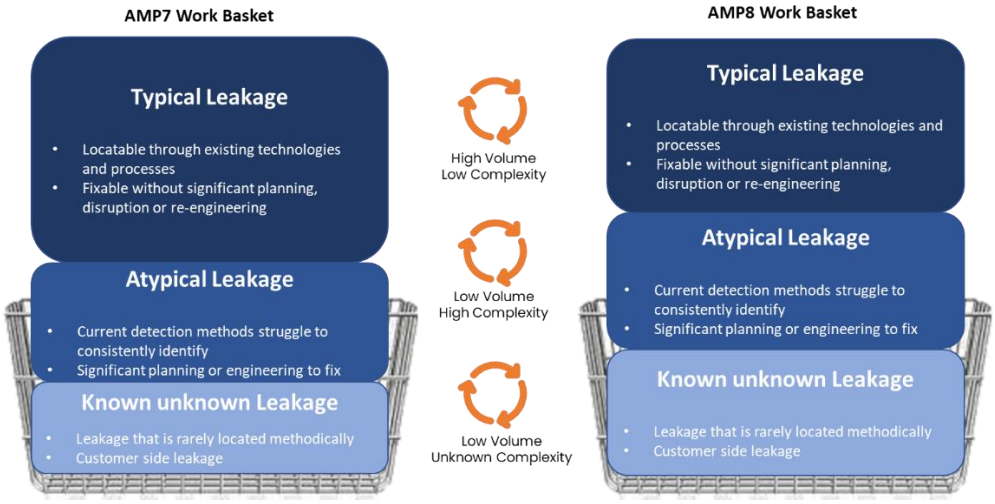


Figure 5 Portsmouth Water Find and Fix – Active Leakage Control AMP7 and AMP8 work baskets

Detecting increasingly complex and hard to find network leaks will characterise the workbasket as we drop below the record levels of low leakage planned in AMP7. The efficiency in these more challenging aspects of leakage detection and repair will in part be enabled through the creation of points of interest via our digitalised network (digital twin) and the planning and scenario testing that this will enable for complex work.

5.6.1.3 New Sounding Techniques

Technology in leakage detection is moving forwards at a fast pace, which is outlined in other options below. Traditional sounding technicians will be equipped with the benefit of these technical advancements and benefits are therefore stated in other option lines for AMP8 and AMP9. From 2037 onwards, the benefit of the current new technology has been maximised. We expect further leakage detection techniques to be developed and have assigned benefit to these future options in this section. We are working with the industry and universities to advance leakage detection capabilities. These benefits are provided in Table 6 in financial years i.e., 2026 is 2025-26.

5.6.1.4 Comm PermaNet/Comm ZoneScan fixed networks

The fixed acoustic network on our metallic mains remains a mainstay of the strategy throughout WRMP24/PR24. We have overcome the battery life issues that caused problems in AMP7 and are in the process of updating the communications software and protocols to ensure currency of technology in use. We are confident that with the maintenance of these technologies we will continue to yield more effective results and few false positives. Benefits are provided in Table 6 in financial years i.e., 2026 is 2025-26.

5.6.1.5 Enigma Sweeps

We will continue to effectively utilise our Enigma correlating noise logger sets to carry out sweeps on the metallic network. These are used to add increased confidence in points of interest where fixed

loggers are providing inconsistent results or in the areas of the network that remain uncovered by our extensive range of fixed loggers. Over 90% of metallic mains are covered, the remaining 10% are in areas where fixed logger deployment makes little financial or practical sense due to mix of materials and fittings in the SMA/DMA. Benefits are provided in Table 6 in financial years i.e., 2026 is 2025-26.

5.6.1.6 Fixed Sensor Plastic Network

Approximately 45-50% of our network is covered by fixed acoustic loggers but only on metallic mains. Our trials on plastic pipes during AMP7 delivered disappointing results, we installed 225, but with too many false positives to make the technology viable and will not renew that contract. We will continue to explore innovation in this area as over 50% of our network is currently made up of plastic pipes and this proportion will grow over time with renewals and new build.

HyQ Sweeps: A similar technology to the Enigma devices for metallic pipes, the HyQ Hydrophones are lift and shift correlators that have been very effective in Portsmouth Water. Whilst our fixed hydrophone network created too many false positives, the mobile option has been a key tool in locating leakage on our plastic network. We will continue to exploit this technology in WRMP24.

Fixed Plastic Network: We have seen great advances in fixed sensors for plastic mains, with trial deployments in peer water companies reporting good results. Our own deployment of such devices using these trial outcomes was disappointing, however, we believe that there is sufficient energy in the industry and supply chain to overcome these challenges and forecast that technologies will be available for us to deploy at pace in the first few years of WRMP24. We have been developing improved acoustic capabilities on plastic pipes through active involvement in UKWIR research programmes and will benefit as an early adopter of technology when it is ready for deployment. It is our intention to invest capital expenditure in these capabilities as soon as practicable given the opportunities in our region.

As stated in the assumptions, this is also a countermeasure to the diminishing return on effort through existing technologies and approaches, providing additional points of interest for leakage resources. Benefits are provided in Table 6 in financial years i.e., 2026 is 2025-26.

5.6.1.7 New DMAs/DMA Integrity (inc. DMA Playbook)

We plan to characterise all SMA/DMAs and develop the analytics and reporting that enables us to surface SMA/ DMAs that are behaving significantly out of expected performance and operating standards when compared to those of a similar composition. We believe that this greater understanding of our SMA/DMAs and the ability to use relative performance as a trigger for deep dive investigation will transform detection rates in AMP8/WRMP24.

We intend to set up DMA Hyper-Care projects to investigate the worst performing DMAs. Rigorous desktop analytics and modelling using our digital twin will detect anomalies in performance or anticipated operating outcomes, targeted additional logging and sensorisation will be installed at key locations to generate the highest possible quality of DMA intelligence. The DMA integrity will be assured and where appropriate corrective actions put in place before leakage detection specialists will then saturate the area investigating points of interest and intelligence generated by the hyper-care, moving all leaks detected to work for rapid repair.

The development of the hyper-care approach will be complemented by our DMA Playbook, this will form the knowledge bank for any given SMA/DMA to support and help leakage management across the Aware, Detect and Mend stages of PALM. The Playbook will capture the qualitative tacit knowledge of our current leakage teams to highlight known weak spots, best methods for detection in an area, challenging repair locations, current configurations and pressure management activities as well as quantitative data including numbers of leaks, previous repair data and investment due. We believe that this playbook will drive down the time we spend locating a leak after anomalies are detected.

We recognise that our network has relatively large SMA/DMAs and will work to create the optimal balance for leakage control and water quality over the course of WRMP24. Smaller defined areas can increase detection accuracy and efficiency, so we regard this as a countermeasure to the diminishing return on effort as we reach new leakage low levels. It has no direct reduction benefit associated with investment but influences the return in effort for all approaches.

5.6.1.8 Smart Network – Digital Twin

Digital twin capability in AMP8 will enable more effective identification and optimised solutions and is a key enabler of effective deployment of the ALC system. In addition to our current approach as outlined in section 3.2.3, during Phase 3 the digital twin will be used to expose the variance in AMP8 and beyond. Significant improvements in their ability to calm overall DMAs, whilst ensuring no customers are adversely affected by change, will be achieved with increased sensorisation and accurate, calibrated hydraulic models to proceed at pace in identifying viable sites for pressure reduction.

5.6.1.9 AI Enabled sound loggers (e.g., FIDO bugs)

We purchased 500 FIDO bugs in AMP7 as described in our current approach (section 3.2.2) and plan to continue to deploy these throughout our network to surface new and challenging leaks. Our new analyst capability will support in the exploration of the technology and increase the level of accuracy in our findings. We believe that such devices will continue to evolve and remain useful through WRMP24.

We have found that these devices also help mains repairs gangs home in on difficult to locate bursts, reducing the mend time in such circumstances. Benefits are provided in Table 6 in financial years i.e., 2026 is 2025-26.

5.6.1.10 Digital Sounding Sticks (e.g., Iquarius/LS1)

We have explored the use of Iquarius and LS1 listening sticks in AMP7/WRMP19. Whilst we have not yet committed to a specific provider, we are certain that there is significant value in the investment in these tools for breakout management and overall leakage detection. This benefit to our breakout management plans is that additional non-leakage resources can be mobilised quickly due to the simplicity of use of the product whilst retaining point of interest results. These tools will enable us to widen our pool of leakage detection resources during events or as we move into hyper-care DMA activity.

The ability to mobilise additional leakage detection resources early in a breakout event is vital for us to be able to minimise the total volume of leakage such events can inflict on us. We have committed to ensuring we have sufficient devices to mobilise and control breakouts in rapid time, saving significantly on event volumes. We expect the need for this benefit to be in AMP9, however we are ready to deploy in AMP8 should we experience greater breakout than expected. Benefits are provided in Table 6 in financial years i.e., 2026 is 2025-26.

5.6.1.11 Universal Smart Metering

We have identified universal smart metering as a leading initiative for leakage reduction within the immediate AMP8 period, but also on the route to achieving the national 50% 2050 target, and the internal 2040 target that we have boldly set to meet the needs of the region. Based on existing evidence and our knowledge of our supply area we propose to deliver universal smart metering over 8 years starting in 2025–26 until 94 per cent of the homes in our area are metered in 2033-34.

Universal Smart Metering will provide additional insight and understanding of our DMAs and certainty around the consumption of our customers when calculating the water balance and therefore finding and locating network leaks with greater certainty and accuracy. Additionally, we will expect to identify customer side leakage at scale for the first time in our history. This immediate insight will enable us to

provide hyper-care service to our customers in the period after installation, identifying issues and helping them fix them. We anticipate that this will include the repairs of a significant number of supply pipes over the 8 year roll out, contributing to leakage benefits as well as demand reduction and reducing the bills of customers. Ongoing into WRMP24 we expect to continue to surface new leaks on supply pipes that can be fixed as they emerge.

We believe that smart metering with a hyper-care service will heighten levels of awareness within our communities and provide sustainable reductions in customer side leakage. We expect this benefit to be significant as for many of our customers, metering and internal leakage awareness has historically been low. We estimate this will reduce customer side leakage by 50%, this is based on 1:5 homes visited as part of hyper-care having a leakage issue of a relatively significant size, a value that is consistent with other water company estimates and findings. We estimate that a high percentage of our future leakage will be customer side as it falls in the "Known unknown" basket that previously had not been locatable, through smart meters and hyper-care we anticipate high volumes of repairs during the roll out programme and a steady workload of detectable new sources of leaks for the remainder of WRMP24. Smart metering enabled customer side leakage is a crucial new area of opportunity that will help us realise our 2040 ambitions.

In 2022 we gave away over 1000 'Leakbots' to customers using above average volumes of water. These devices provide insight to the customer allowing them to adjust their water use habits and provide assurance against household leakage being a factor in their high levels of consumption. We found that 24% of properties had a high nightline indicating a leak within the property boundary, giving us valuable insight into likely future benefits.

Anglian Water, a company with widespread dumb meters before its smart meter roll out were able to detect that 8.5% of properties with a smart meter installed had a leak at the point of install. They also found that a further 10% of properties later developed a leak which the smart meter could detect quickly. Prior to installing smart meters Anglian advised that it took on average 210 days for a leak to be detected by dumb meters and 110 days for detection using automatic meter reading (AMR) technology. The impact to Portsmouth's largely unmetered population can reasonably be expected to be higher.

Once all of our SMA/DMAs become fully smart metered we will be able to integrate data into our digital twin, creating an enriched digital network and enabling high accuracy network oversight that will enhance our leakage analytics of the network further still.

The initial roll out of smart meters will focus on providing a stable product and service for our customers. It is essential that the programme delivers the core benefits, the leakage ones covered above. Portsmouth Water are committed to driving all innovation that can efficiently reduce leakage in our network and recognise that there is potential for smart meters to provide "backward" sensing of the connected network (including acoustics, pressure, and temperature) that could enhance our identification and location of network leaks. We will work with the supply chain to explore how this can fit into our smart water network and 21st century Portsmouth Water vision.

The principal savings we have accounted for in our WRMP24 plan have been in the identification and fixing of customer supply pipe leakage. The savings reflect the profile of the smart metering roll out and hyper-care after service where we expect to surface and repair the majority of leaks. The costs are included in smart metering.

We are committed to working with other companies and Water UK on a common industry approach to supply pipe leaks. We would welcome the sharing of data over the industry for best practice, whilst ensuring vulnerable customers are protected. These approaches would develop as we develop our plans for PR24 further. Benefits are provided in Table 6 in financial years i.e., 2026 is 2025-26.

5.6.1.12 Project Calm – Network Calming Strategy

Pressure management remains a core element of Portsmouth Water's leakage management plan. In AMP7 we began Project Calm, a programme to stabilise, enhance and expand our existing pressure management capability where 70% of the network was under some level of pressure management. In AMP7 we will have completed the refreshment and digitalisation of existing infrastructure in phase 1 of Project Calm (described in section 3.2.4.1). Phase 2 will be already underway, and Phase 3 will be delivered in the first 5 years of WRMP24.

Phase 2 – local pressure management (AMP7 – AMP9)

During AMP7 we have already begun the process of creating localised pressure managed areas using temporary loggers and the historic hydraulic model set to identify areas with high zonal night pressure. Digital twin capability in AMP8 will enable us to more effectively identify and optimise solutions. In AMP9 we aim to have installed PRVs at all locations where the digital twin demonstrates benefit and value.

Intelligent pump controls add additional strength to our pressure management capability, managing pressure variance and reducing transients from our source works and boosters. During AMP7/8/9 we are exploring the installation of VSD (variable speed drives) and intelligent motor controls/pumps at critical points in the network.

Phase 3 – Digital twin optioneering and critical point management

Using our digital twin, we will target the areas that are most exposed to variance in AMP8 and beyond, with increased sensorisation (approximately 8 per DMA) and accurate, calibrated hydraulic models we will be able to proceed at pace in identifying viable sites for pressure reduction. With the extra confidence in our data and information we will look to identify and manage critical point pressures, this will include the reduction in mean zonal pressure with additional booster pumping to manage the critical points. This will allow significant improvements in our ability to calm overall DMAs whilst ensuring that no customers are adversely impacted by the change.

As part of our investment in a digital twin, we estimate that on average 8 loggers will be sited in each DMA in order for us to manage pressure and operate a near real time model. These loggers come with the additional capability to monitor and alert for transients. Transients are pressure and flow episodes triggered by sudden changes in network operation, such as valve changes, pump starts with no active controls or offtakes suddenly drawing off significantly higher volumes of water. Transients create significant strain on the network, water hammer being a common impact, but overall stress to the system is high. It has been proven that the active management of transients risk will reduce burst volumes and reduce NRR over time as asset life is extended and weak points in the network are exposed to less stress.

In WRMP24/AMP8 we will actively increase our capability in transients identification and where analysis reveals value and root cause we will invest in the remediation of transients risk and work with any customers that are triggering such events, to help them smooth their operations.

5.6.1.13 Trunk and rural mains strategy

Bursts in rural areas and on trunk mains have historically been reported in lower numbers due to the lack of human interaction with the areas of uninhabited land they run below. Portsmouth Water walk these mains on a planned cycle to proactively find leaks and issues, or in response reactively to points of interest generated by our network monitoring. This has proven benefit but can be optimised through innovation and digital capabilities.

Air is present in all water supply pipes, in our rural and expansive mains network it is particularly important that we construct and maintain the infrastructure that prevents the formation of pockets of air that can cause flow stoppage, pipe bursts, corrosion and water hammer/noise. Trunk mains

walks and asset inspections will recommence in AMP8 following a temporary halt initially prompted by Covid 19 restrictions.

We will resume the correlation activity (leapfrog methodology) on our trunk mains in WRMP24 as well as continuing to explore and partner with innovative products that are exploiting such technologies as sonar, in pipe camera (under pressure) and AI sensors. We are already exploring in AMP7 and anticipate significant improvements in trunk main detection. With trunk main leaks, the number of leaks is low, but each leak found is volumetrically more significant than a typical burst due to the size of the main and the quantity of water being moved. Benefits are provided in Table 6 in financial years i.e., 2026 is 2025-26.

5.6.1.14 Satellite Imagery

We have committed to the acquisition of satellite reporting via a third-party supplier on a minimum annual basis. Providers offer a points of interest service that detects changes in vegetation densities and composition and also exposure to chlorinated water. This is most effective after both a winter leakage breakout and then after a long dry spell. Our AMP8 plan is to purchase this data from September imagery in the year after a harsh winter. The imaging we purchase will be for the whole region and will benefit leakage detection on both trunk and distribution mains. Benefits are provided in Table 6 in financial years i.e., 2026 is 2025-26.

5.6.1.15 Mains Replacement

As described in section 3.2.5, our customers agreed that maintaining our current industry leading performance in leakage is the right decision and our historically high mains renewal rate compared to other UK water companies has been crucial in achieving this, we will therefore be planning to continue our mains replacement activity between 2025 and 2030. Our mains replacement programme aims to stabilise the NRR in the areas of the network where assets are failing. By replacing deteriorating mains, we will prevent future leakage and bursts, as well as removing sections that are contributing to current leakage. By replacing these mains, we will achieve a leakage benefit of 1.0 Ml/d. We assessed additional mains renewals to further reduce leakage, however most the most cost-effective options to achieve the same outcomes are available through innovative find and fix methods, network calming and pressure optimisation.

The replacement programme is managed through our capital delivery processes and prioritisation will take place in PR24 through our Copperleaf investment engine. We plan to increase the robustness of our assurance processes, systemising the audit of photographed quality checks through our delivery partners as well as reviewing our approach to self-lay commissioning and sign off to ensure that new mains and fitting that are delivered through Portsmouth Water or to be connected to our network meet the highest standards and ensure full asset life. Benefits are provided in Table 6 in financial years i.e., 2026 is 2025-26.

5.6.1.16 Analytics

We recognise the increase in the complexity of leakage technologies and analytics and the increasingly specialised nature of the analysis associated with the discipline. We intend to increase our analytics capability to reflect our ambition in this area and stay focussed on delivering a leading 21st century water company. The analytics capability adds a positive efficiency ratio to all approaches, countering the decreasing efficiency forecast as we reach record low leakage levels. There is no specific Ml/d saving associated with the investment as a result.

6 BENEFITS AND COSTS

6.1 Summary of benefits and costs

We believe that our blend of tried and tested, and industry leading processes, assets and tools merged with innovative and 21st century solutions such as our digital twin and universal smart metering will continue to drive value and benefit for our customers, region and the environment. We know that as we quickly reach record low leakage in our region the challenge will become harder, but we have the programme of work to offset the risk and take Portsmouth to record lows and an industry target beating 50% reduction in leakage by 2040.

A summary of benefits associated with our programme is provided in Table 6. The activities in Table 6 show megalitres per day (Ml/d) leakage reductions for selected years of WRMP24; these are financial years i.e., 2026 is 2025-26. The Ml/d savings are the reductions required to overcome the natural rate of rise and achieve the target leakage profile in our WRMP24.

The majority of the activities shown in Table 6 are rolled up and the combined enhancement they provide is included within the higher level WRMP24 option '**Leakage reduction - Active Leakage Control - Company - High+**'. These are the activities that will reduce leakage within our network.

Customer-side leakage reductions achieved through smart metering of households are included within WRMP24 option '**Metering CSL - Company - High+**'. Leakage reductions in non-households are represented within option '**Leakage reduction - Customer engagement / education / incentives - Non-Household - Company - High+**'.

The capital cost and operational cost profiles associated with the WRMP24 options are shown in Figure 6. Cost data for the options is provided within the WRMP24 tables that are published alongside the WRMP24 document. Further detail on costs and benefits is provided in the sections below.

Table 6 Cumulative benefits in Ml/d associated with leakage reduction activities

WRMP24 option	Activity (Ml/d)	2026	2027	2028	2029	2030	2035	2045	2055	2065	2075
Leakage reduction - Active Leakage Control - Company - High+	New Sounding Techniques	0.00	0.00	0.00	0.00	0.00	0.00	5.62	13.16	20.77	33.73
	Comm PermaNet	3.06	5.83	8.79	11.56	14.17	26.70	49.50	71.28	93.26	115.44
	Comm ZoneScan	2.86	5.44	8.21	10.79	13.23	24.92	46.20	66.53	87.04	107.74
	Enigma Sweeps	0.88	1.68	2.53	3.32	4.07	7.67	5.62	20.48	26.80	33.17
	HyQ Sweeps	0.55	1.05	1.58	2.08	2.55	4.79	8.89	12.80	16.75	20.73
	Fixed sensor plastic network	0.00	0.55	1.14	1.69	2.73	7.71	16.78	25.44	34.19	43.01
	AI Enabled sound loggers	0.55	1.04	1.04	1.04	1.51	1.95	5.62	9.52	13.45	17.42
	Digital sounding sticks	0.00	0.00	0.00	0.00	0.00	0.31	2.64	4.85	8.48	12.99
	trunk main correlations	0.66	1.25	1.88	2.48	3.04	5.72	10.61	15.28	19.99	24.75
	satellite imagery	1.17	2.33	2.33	2.33	2.33	3.50	14.00	25.66	37.32	48.99
	Mains replacement	0.20	0.40	0.60	0.80	1.00	1.00	1.00	1.00	1.00	1.00
Metering CSL - Company - High+	Smart metering households	0.00	0.04	0.30	0.75	1.38	4.03	4.03	4.03	4.03	4.03
Leakage reduction - Customer engagement / education / incentives - Non-Household - Company - High+	Non-households	0.00	0.00	0.00	0.00	0.00	0.06	0.19	0.30	0.30	0.30
	TOTAL	9.93	19.61	28.40	36.84	46.01	88.36	170.70	270.33	363.38	463.00

Table 7 Estimated total cost per Ml/d for activities

Activity	Thousands £ per Ml/d saving
Enigma Sweeps	95.14
Fixed sensor plastic network	103.34
Comm PermaNet	108.27
HyQ Sweeps	113.90
Trunk main correlations	114.47
Comm ZoneScan	125.99
AI Enabled sound loggers	168.01
Satellite imagery	185.96
Digital sounding sticks	196.26
Sounding	202.13
Mains replacement	224.90

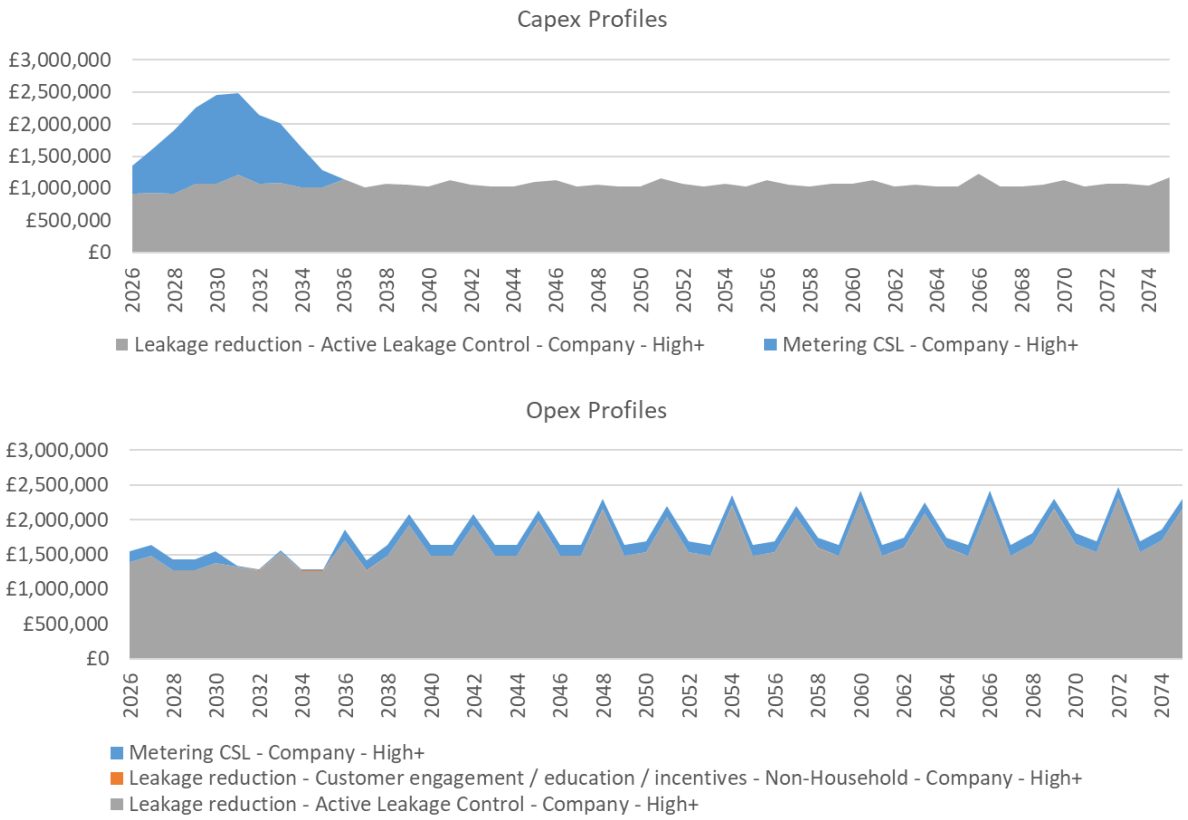


Figure 6 Opex and Capex for WRMP24 options that reduce the amount of leakage

6.2 Breakdown of Active Leakage Control options and associated benefits

The cumulative benefits in Mega Litres per Day (Ml/d) of the WRMP24 leakage strategy are provided in Table 6. The benefits are the reductions required to overcome the natural rate of rise and achieve the target leakage profile in our WRMP24. Therefore, the benefits within Table 6 are not directly comparable to the benefits stated within the WRMP24 tables for the '**Leakage reduction - Active Leakage Control - Company - High+**' option.

Our leakage model uses the following equation to calculate the net benefit level our ALC activities are required to achieve in any given year:

> ('Start of Year Leakage' – 'WRMP Target for In Year Leakage') + 'Weather Impact' + 'Natural Rate of Rise' + 'Benefits from mains renewal and customer supply pipe renewals / repairs'

The weather impact assumes a repeating pattern of two benign years with zero impact, followed by an adverse year with a 3 Ml/d impact. We have calculated that our Natural Rate of Rise is 7.2 Ml/d. The customer supply pipe renewals / repairs element reflects the benefits we expect to realise through the delivery of our Smart metering programme of households and non-households.

We have presented the net ALC activity requirement alongside the planned level of ALC activity in Figure 7. The planned activity is always higher than the net requirement, which is explained further below.

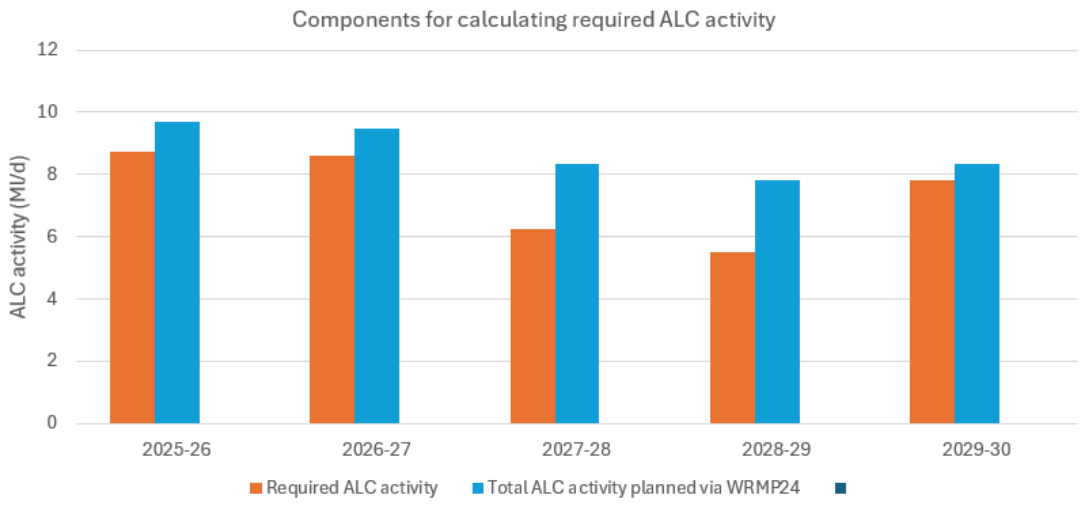


Figure 7 Net Active Leakage Control activity requirement and planned level of activity.

In Figure 8 below we have presented an illustration of how our planned ALC activity overcomes the natural rate of rise and weather impact to meet the target level of leakage within our WRMP24 tables. This illustration uses 2025-26, the first year of WRMP24.

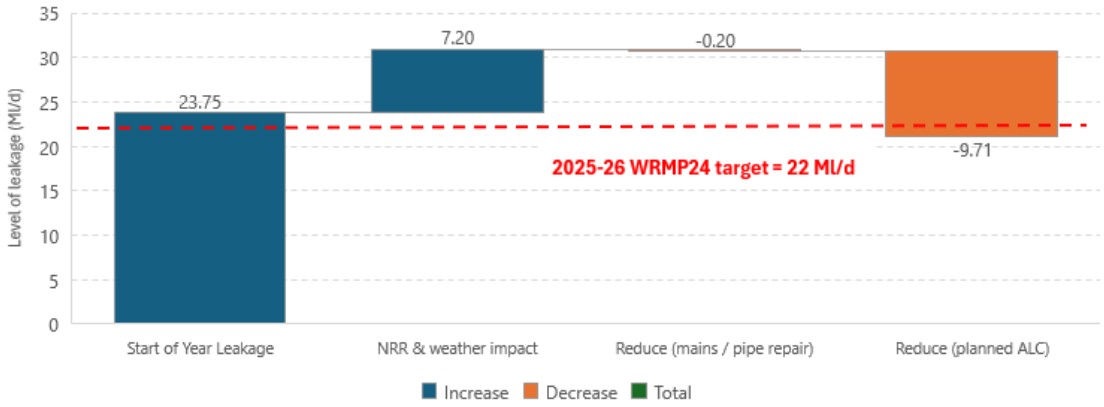


Figure 8 Illustration of how ALC activity overcomes NRR to meet the WRMP24 target

A full breakdown of AMP8 year by activity is set out below in Table 8 to Table 12, showing the variability of Active Leakage Control to mitigate against adverse winters and the ranking of activity by cost per Ml/d. The cost per Ml/d is based on an assessment when leakage is at 28 Ml/d.

In each of the tables below the following applies:

- The top green row provides the target annual average leakage Ml/d stated within our WRMP24 tables.
- The yellow set of rows identify the starting level of leakage, the impact of the natural rate of rise and the adverse weather impacts that we must overcome.
- Non-ALC benefits associated with mains replacement and smart metering are in white rows.
- The set of purple rows gives the benefits from activities associated with the ALC option.
- The resulting modelled in-year leakage value is provided below these rows, and it should always be compliant (lower) than the WRMP24 target in the top green row.
- The final dark green rows provide the assumed benefit of the ALC option within the WRMP24 tables and the additional calculated benefit of the ALC activities from the leakage model.

The modelled ALC activities always provide an additional benefit relative to that stated for the ALC option in the WRMP24 due to the 'blocky' nature of some of the activity benefits e.g. where we need to ensure steady levels of skilled leakage resources are retained across multiple years. A benefit of this is slight mitigation it provides in the case that the natural rate of rise varies from the assumption in the leakage model.

It is important that the planned level of activity can achieve the WRMP24 target leakage profile, to maintain the balance of supply and demand and reduce the risk of supply interruptions for our customers.

Table 8 Breakdown of leakage activity in 2025/26

Leakage Activity 2025/26	Cost / Benefit (£ / Ml/d)	Leakage Increase / Reduction (Ml/d)	Leakage Value (Ml/d)	Notes
WRMP24 in-year target	-	-	**22.00**	The target identified in our WRMP24 tables for 2025/26.
Start of Year Leakage	-	-	23.75	This matches the modelled final leakage from the previous year (2024/25)
Natural Rate of Rise	-	+7.20	30.95	Based on most recent assessment of NRR, as set out in Appendix 10C.
Adverse Weather Impact	-	+0.00	30.95	Adverse weather impacts in one of every 3 years, as set out in Appendix 10C.
Mains Renewal	0	-0.20	30.75	Mains renewal programme based on stable bursts. Results in 1 Ml/d of leakage reduction benefit over 5 years without additional cost. Further mains renewal for leakage benefit included in activity assessment but deemed to not be as cost effective as ALC solutions chosen at £224.9k / Ml/d
Enigma Sweeps	95.14	-0.88	29.87	Enigma sweeps are assessed as most cost effective ALC method. Based on Table 7 of Appendix 10C.
Comm PermaNet	108.27	-3.06	26.81	
HyQ Sweeps	113.90	-0.55	26.26	
Trunk Main Correlations	114.47	-0.66	25.60	
Comm ZoneScan	125.99	-2.86	22.74	
AI Enabled Sound Loggers	168.01	-0.55	22.19	
Satellite Imagery	185.96	-1.17	21.02	Cannot scale down. Therefore, results in overachievement in year compared to WRMP target of 22 Ml/d.
Final modelled Leakage in Year	-	-	**21.04**	Difference due to benefits rounded to 2 decimal places across activities. The final leakage is lower than the WRMP24 target.
WRMP24 assumed reduction from ALC	-	**-2.00**	-	From the WRMP24 tables (tab 5. option benefits)
Additional Leakage model benefit from ALC	-	**-0.98**	-	(Start of year leakage – WRMP24 in-year target) + ALC (purple rows) + NRR & adverse weather impact (yellow rows) + other leakage options (white rows)

Table 9 Breakdown of leakage activity in 2026/27

Leakage Activity 2026/27	Cost / Benefit (£ / Ml/d)	Leakage Increase / Reduction (Ml/d)	Leakage Value (Ml/d)	Notes
WRMP24 target	-	-	**22.40**	The target identified in our WRMP24 tables for 2026/27.
Start of Year Leakage	-	-	21.04	This matches the modelled final leakage from the previous year (2025/26)
Natural Rate of Rise	-	+7.20	28.24	
Adverse Weather Impact	-	+3.00	31.24	Adverse weather impacts in one of every 3 years, as set out in Appendix 10C.
Mains Renewal	0	-0.20	31.04	
Customer Side Leakage	0	-0.04	31.00	Benefit from smart metering programme. Costs included within the smart metering enhancement case for PR24 and therefore not included in leakage.
Enigma Sweeps	95.14	-0.80	30.20	Lower leakage detected on ALC due to lower starting leakage levels.
Fixed Sensor Plastic Network	103.34	-0.55	29.65	New innovative technology expected to be ready for deployment in 2026-27.
Comm PermaNet	108.27	-2.77	26.88	

HyQ Sweeps	113.90	-0.50	26.38	
Trunk Main Correlations	114.47	-0.59	25.79	
Comm ZoneScan	125.99	-2.59	23.20	
AI Enabled Sound Loggers	168.01	-0.50	22.70	
Satellite Imagery	185.96	-1.17	21.53	
Final modelled Leakage in Year	-	-	**21.54**	Difference due to benefits rounded to 2 decimal places across activities. The final leakage is lower than the WRMP24 target.
WRMP24 assumed reduction from ALC	-	**-1.57**	-	From the WRMP24 tables (tab 5. option benefits)
Additional Leakage model benefit from ALC	-	**-0.87**	-	(Start of year leakage – WRMP24 in-year target) + ALC (purple rows) + NRR & adverse weather impact (yellow rows) + other leakage options (white rows)

Table 10 Breakdown of leakage activity in 2027/28

Leakage Activity 2027/28	Cost / Benefit (£ / Ml/d)	Leakage Increase / Reduction (Ml/d)	Leakage Value (Ml/d)	Notes
WRMP24 target	-	-	**22.04**	The target identified in our WRMP24 tables for 2027/28.
Start of Year Leakage	-	-	21.54	This matches the modelled final leakage from the previous year (2026/27)
Natural Rate of Rise	-	+7.20	28.74	
Adverse Weather Impact	-	+0.00	28.74	
Mains Renewal	0	-0.20	28.54	
Customer Side Leakage	0	-0.26	28.28	
Enigma Sweeps	95.14	-0.85	27.43	
Fixed Sensor Plastic Network	103.34	-0.59	26.84	
Comm PermaNet	108.27	-2.96	23.88	
HyQ Sweeps	113.90	-0.53	23.35	
Trunk Main Correlations	114.47	-0.63	22.72	
Comm ZoneScan	125.99	-2.76	19.96	
Final modelled Leakage in Year	-	-	**19.95**	Difference due to benefits rounded to 2 decimal places across activities. The final leakage is lower than the WRMP24 target.
WRMP24 assumed reduction from ALC	-	**-1.66**	-	From the WRMP24 tables (tab 5. option benefits)
Additional Leakage model benefit from ALC	-	**-2.08**	-	(Start of year leakage – WRMP24 in-year target) + ALC (purple rows) + NRR & adverse weather impact (yellow rows) + other leakage options (white rows)

Table 11 Breakdown of leakage activity in 2028/29

Leakage Activity 2028/29	Cost / Benefit (£ / Ml/d)	Leakage Increase / Reduction (Ml/d)	Leakage Value (Ml/d)	Notes
WRMP24 target	-	-	**21.00**	The target identified in our WRMP24 tables for 2028/29.
Start of Year Leakage	-	-	19.95	This matches the modelled final leakage from the previous year (2027/28)
Natural Rate of Rise	-	+7.20	27.15	
Adverse Weather Impact	-	+0.00	27.15	
Mains Renewal	0	-0.20	26.95	
Customer Side Leakage	0	-0.45	26.50	
Enigma Sweeps	95.14	-0.80	25.70	
Fixed Sensor Plastic Network	103.34	-0.55	25.15	
Comm PermaNet	108.27	-2.77	22.38	
HyQ Sweeps	113.90	-0.50	21.88	

Trunk Main Correlations	114.47	-0.59	21.29	
Comm ZoneScan	125.99	-2.59	18.70	Maintaining activity to reduce leakage ahead of expected adverse winter in following year.
Final modelled Leakage in Year	-	-	**18.70**	The final leakage is lower than the WRMP24 target.
WRMP24 assumed reduction from ALC	-	**-2.25**	-	From the WRMP24 tables (tab 5. option benefits)
Additional Leakage model benefit from ALC	-	**-2.30**	-	(Start of year leakage – WRMP24 in-year target) + ALC (purple rows) + NRR & adverse weather impact (yellow rows) + other leakage options (white rows)

Table 12 Breakdown of leakage activity in 2029/30

Leakage Activity	Cost / Benefit (£ / Ml/d)	Leakage Increase / Reduction (Ml/d)	Leakage Value (Ml/d)	Notes
WRMP24 target	-	-	**20.25**	The target identified in our WRMP24 tables for 2029/30.
Start of Year Leakage	-	-	18.70	This matches the modelled final leakage from the previous year (2028/29)
Natural Rate of Rise	-	+7.20	25.90	
Adverse Weather Impact	-	+3.00	28.90	
Mains Renewal	0	-0.20	28.70	
Customer Side Leakage	0	-0.63	28.07	
Enigma Sweeps	95.14	-0.75	27.32	Lower leakage detected on ALC due to lower starting leakage levels.
Fixed Sensor Plastic Network	103.34	-1.04	26.28	Increase in reduction as new innovative technology rolled out to additional areas after comm improvements expected to be made.
Comm PermaNet	108.27	-2.61	23.67	
HyQ Sweeps	113.90	-0.47	23.20	
Trunk Main Correlations	114.47	-0.56	22.64	
Comm ZoneScan	125.99	-2.44	20.20	
AI Enabled Sound Loggers	168.01	-0.47	19.73	Restarted due to adverse winter.
Final modelled Leakage in Year	-	-	**19.74**	Difference due to benefits rounded to 2 d.p across activities. Increase on previous year but still below WRMP target.
WRMP24 assumed reduction from ALC	-	**-2.37**	-	From the WRMP24 tables (tab 5. option benefits)
Additional Leakage model benefit from ALC	-	**-0.52**	-	(Start of year leakage – WRMP24 in-year target) + ALC (purple rows) + NRR & adverse weather impact (yellow rows) + other leakage options (white rows)

6.3 Breakdown of Active Leakage Control options and associated costs

Ofwat has asked us how the WRMP24 ALC option translates into our business plan e.g. the costs within tables CW.3.49 and CW19. Further information is provided below.

The costs of the ALC option '**Leakage reduction - Active Leakage Control - Company - High+**' used to inform our WRMP24 tables is provided in Table 13.

The costs of ALC are presented in the business plan tables (CW19.1 and CW19.2) and these are reproduced in Table 14, split into costs associated with 'maintaining' the level of leakage and costs associated with 'reducing' the level of leakage.

Costs related to existing ALC activities are classified as 'maintain', whilst costs associated with new innovative ALC activities are classified as 'reduce'. This includes enabling work to improve efficiency, such as the creation of a Digital Twin and the installation of new DMAs.

ALC costs are broken down by ALC activity in Table 15 and align back to Table 8 to Table 12.

The sum of the costs in the business plan (CW19) and WRMP24 are compared in Table 14 and this demonstrates a discrepancy of around £3m per year. Table 9 shows the breakdown of costs included in CW19, with the mains renewal and repairs adding up to this discrepancy.

The mains renewal costs were not included in the WRMP24 costs, as leakage reduction was not the primary driver for the expenditure, but a secondary benefit. As stated in Table 8, as an option on its own, it would not be cost beneficial compared to ALC activities.

ALC repair costs were also not included in the WRMP24. They were still being revised at the time of the rdWRMP24 data freeze and therefore only feature in the business plan tables. However, we confirm the exclusion of these costs has not impacted option selection within the WRSE investment model and therefore has not influenced the Best Value Plan and our WRMP24.

All ALC costs represent 'base' expenditure rather than 'enhancement' expenditure and for this reason there are no ALC costs within our business plan table row CW3.49. Costs associated with supply pipe repairs from installing smart meters are included within the smart metering enhancement business case, with just the leakage reduction benefit recorded in the WRMP and business plan tables to ensure no double counting.

Table 13 Active Leakage Control Capex and Opex costs assumed for the WRMP24 (2022-23 cost base)

Option ID	Cost	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
PRT_PRT_EF-LKR_ALL_ALL_leakage_alc high+	Capex (£m)	0.921	0.926	0.914	1.066	1.075	1.216	1.066	1.082	1.012	1.012
	Opex (£m)	1.389	1.480	1.266	1.266	1.380	1.322	1.264	1.534	1.264	1.264
	Total (£m)	**2.310**	**2.407**	**2.180**	**2.332**	**2.456**	**2.538**	**2.330**	**2.617**	**2.276**	**2.276**

Table 14 'Maintain' and 'Reduce' costs in business plan table CW19.1 and CW19.2

Expenditure Type	2025-26	2026-27	2027-28	2028-29	2029-30
Maintain (£m)	3.741	3.912	3.713	3.787	3.909
Reduce (£m)	1.717	1.698	1.549	1.495	1.541
Total (£m)	**5.458**	**5.610**	**5.262**	**5.282**	**5.450**
Difference from WRMP (£m) *	**3.148**	**3.203**	**3.082**	**2.950**	**2.994**

* Difference between the Total rows in Table 13 and Table 14, which aligns to mains renewals + leak repairs in Table 16..

Table 15 Cost breakdown for ALC options by year (detection costs only)

Expenditure Type	2025-26	2026-27	2027-28	2028-29	2029-30	
Enigma Sweeps	£0.053m	£0.053m	£0.053m	£0.053m	£0.053m	Maintain
Fixed Sensor Plastic Network	£0.000m	£0.081m	£0.081m	£0.081m	£0.127m	Reduce
Fixed Sensor Plastic Network	£0.000m	£0.206m	£0.206m	£0.412m	£0.412m	Maintain
Comm PermaNet	£0.311m	£0.311m	£0.311m	£0.311m	£0.311m	Maintain
HyQ Sweeps	£0.050m	£0.050m	£0.050m	£0.050m	£0.050m	Maintain
Trunk Main Correlations	£0.054m	£0.054m	£0.054m	£0.054m	£0.054m	Maintain
Comm ZoneScan	£0.385m	£0.385m	£0.385m	£0.385m	£0.385m	Maintain
AI Enabled Sound Loggers	£0.058m	£0.058m	£0.000m	£0.000m	£0.058m	Maintain
Satellite Imagery	£0.149m	£0.149m	£0.000m	£0.000m	£0.000m	Reduce
TOTAL ALC costs (detection only)	**£1.060m**	**£1.347m**	**£1.140m**	**£1.346m**	**£1.454m**	

Table 16 Cost breakdown for leakage options by year

Expenditure Type	2025-26	2026-27	2027-28	2028-29	2029-30	
ALC Detection Costs	£0.911m	£1.117m	£1.059m	£1.265m	£1.323m	Maintain - Locate
ALC Detection Costs	£0.149m	£0.230m	£0.081m	£0.081m	£0.127m	Reduce - Locate
Additional Costs (Management, Analysis, Consultancy, Reporting, Software, Training, Vehicles, Data Logging, Misc)	£0.471m	£0.471m	£0.471m	£0.471m	£0.471m	Maintain - Locate
Additional Costs (New Loggers)	£0.108m	£0.008m	£0.008m	£0.008m	£0.008m	Maintain - Aware
Additional Costs (Innovation)	£0.020m	£0.020m	£0.020m	£0.020m	£0.020m	Reduce - Locate
Leak Repairs (both ALC and Reactive)	£2.130m	£2.185m	£2.064m	£1.932m	£1.976m	Maintain - Mend
New and Upgrade of Existing DMAs	£0.296m	£0.296m	£0.296m	£0.242m	£0.242m	Reduce – Aware
Digital Twin	£0.234m	£0.134m	£0.134m	£0.134m	£0.134m	Reduce - Prevent (Calm Networks)
Mains Renewals	£1.018m	£1.018m	£1.018m	£1.018m	£1.018m	Reduce – Prevent (Rehab)
Contingency	£0.121m	£0.131m	£0.111m	£0.111m	£0.131m	Maintain - Locate
TOTAL Leakage Costs – CW19.3	**£5.458m**	**£5.610m**	**£5.262m**	**£5.282m**	**£5.450m**	

7 TRACKING AND SENSITIVITY

In this section we describe how we will ensure that the key elements of our programme delivers the benefits described and how we will measure and manage performance and how we may adapt if our aspects of our plan cannot deliver against expectations. Our approach is shown in Table 17 below.

Table 17 Measuring and managing performance and adapting to challenges

Approach	Lead Measure(s)	Lag Measure(s)	Trigger point(s)	Countermeasure(s) *Actions escalate*
Detection resource	Availability and productivity of leakage technicians Availability of analysts and modellers	Glidepath target leakage (annual targets)	3 consecutive weeks under target resource or any single week where resource less than 60%	Additional detection resources brought into team; additional repair gangs mobilised from main laying gangs. Troubleshooting and root cause team identify reason for deviation and recovery plan. Review and optimise leakage model if logic failed to deliver
Repair resource	Points value of work in basket Repair gang availability/productivity Average time from detection to fix % Hidden leaks	Glidepath target leakage (annual targets)	3 consecutive weeks where work basket value is greater than target.	Work to improve productivity/availability with R&M partner Additional detection resources brought into team; additional repair gangs mobilised from main laying gangs. Breakout plan enacted. Troubleshooting and root cause team identify reason for deviation and recovery plan. Review and optimise leakage model if logic failed to deliver
Satellite Imagery	No of leaks found Points of Interest (PoI) ratio (false:positive)	Glidepath target leakage (annual targets) £/Ml saved	End of season review £/Ml ratio falls below or above target	If below target, move investment into other trunk main innovation activities. If above target, consider increasing frequency of imagery purchases if cost/benefit allows

Pressure Management	Forecast assets installed/ upgraded vs plan % SMA/DMA/PMA within target limits % maintenance vs plan	Glidepath target leakage (annual targets)	<80% of programme on target <95% of areas within target pressure control <85% maintenance completed to plan	Work with partners to understand productivity/delivery issues Increase resources to install/upgrade programme Route cause for pressure deviation, target priority resolutions Increase resourcing for maintenance activities
AI Sensors (e.g., FIDO)	No of leaks found PoI ratio (false:positive)	Glidepath target leakage (annual targets) £/Ml saved	Less than 50% accuracy on PoI £/Ml	Supply chain approached for improved AI optimisation to support internal analytics teams
Fixed sensors	Availability and quality of sensor data PoI ratio (false:positive)	Glidepath target leakage (annual targets)	Less than 50% accuracy on PoI	Supply chain warranties on quality of service enacted, working with partners to re-calibrate and improve sensitivity. If technology cannot be optimised, increase investment in field leakage technicians and Enigma/HyQ equipment for ground level leakage detection increase.
Smart metering roll out	Forecast meters installed vs plan	Actual meters installed vs plan	10% negative deviation from plan	Work with partners to understand and resolve productivity/delivery issues Route cause for under-delivery, target priority resolutions Increase resources for programme
Customer side leakage	Customer side leakage estimates/measures Average time from detection to fix	Glidepath target leakage (annual targets)	Ave time to repair exceeds LoS by 10%	Work with partners to understand and resolve productivity/delivery issues Route cause for under-delivery, target priority resolutions

				Increase hyper-care repair resources.