UUW64

Wastewater (Quality - Overflows) Enhancement Case

October 2023

Chapter 8 supplementary document

This document sets out the service enhancement expenditure and activity that we will undertake, through our 2025-2030 business plan.

This case includes:

- Case 13: Storm Overflows
- Case 14: WINEP Flow and EDM

United Utilities

Water for the North West

1. Wastewater (Quality – Overflows) Enhancements

1.1 Structure

1.1.1 This document contains our Wastewater (Quality – Overflows) enhancement cases and is structured as below:

- Case 13: Storm Overflows
- Case 14: WINEP Flow and EDM

UUW64

Storm Overflows

October 2023

Enhancement Case 13

Water for the North West

Executive Summary

This document sets out the storm overflows enhancement case for the North West. There has been a significant shift in the regulatory regime for storm overflows that has results in the need for a step-change in investment. This investment will enable UUW to meet new and more onerous Environmental Permit requirements for intermittent discharges as a result of new statutory drivers.

The government's storm overflow discharge reduction plan (SODRP) sets out new, long-term ambitions for storm overflows. This 25-year plan requires all storm overflows to achieve 10 spills by 2050 or less where storm overflows are identified to cause harm or discharge to a designated bathing water. The investment has been programmed to at least meet the phasing and prioritisation requirements of the SODRP and strive to reduce spills as fast as possible where possible.

The scale of intervention required to meet new statutory drivers for storm overflows is related to current spill frequency and the initial starting position has been governed by past investment to comply with Urban Waste Water Treatment Regulations 1994, Bathing Water Regulations 2013, and Water Environment Regulations (also referred to as Water Framework Directive or WFD). The starting position for overflow discharges will differ by region depending on the environmental needs and future spill level required to comply with these statutory drivers.

To demonstrate how past investment and regional specific factors have influenced, and continue to influence differences in the closing AMP7 spill frequency between companies, we have undertaken a review of historic drivers for storm overflow investment and identified regional variations that impact current spill frequency levels. We have also described what we're doing to reduce spills to the environment ahead of the enhancement through our Better Rivers programme.

Our review identifies that in the North West it is reasonable to expect that we would have the highest number of storm overflow discharges. Whilst we are compliant with the current regulatory framework, we demonstrate that this arises as a result of applying historic and existing legislation to justifying past investment to meet environment outcomes (which have been focused on reductions in harm, not reductions in spill frequency) and the application of a cost-benefit assessment has driven investment to increase capacity of our wastewater network. This has prevented environmental harm from storm overflows but has not resulted in a significant reduction in total spill frequency. We also demonstrate why we would expect application of those same rules in different regions to yield the current differences in spill frequency between companies.

Our hydraulic network models suggest that our investment to date (including AMP7 enhancement programme) will result in a spill frequency starting position for AMP8 much higher than the current industry average. We consider that this is due to higher than average rainfall in the North West which has a significant impact on storm volume. This is further compounded by the North West having the largest proportion of combined sewers which convey both rainfall and wastewater.

We conclude that our current spill frequency level is a direct result of current regulatory framework and as such it is expected that UUW would have a significantly larger enhancement programme (comparative to the industry) to meet changing regulatory standards for spill frequency, in addition to addressing harm and protecting public health. Indeed this was also found to be the case in the independent work of the Storm Overflow Evidence Project.

This document sets out the enhancement case of £3089.431 million required to meet new, environmental standards at 437 storm overflows in AMP8.

To ensure that our investment programme reflects the best option for customers, our plan has been developed in line with regulatory guidance including WINEP options development guidance and WINEP options assessment guidance. Where possible we are making use of phasing and adaptive planning to ensure we meet

statutory requirements in a way that balances costs across the AMPs and prioritises delivery of low- or no-regret measures first.

Programme costs have been estimated using data collected over AMP3 to AMP7 and uplifted to represent the present market conditions under which we and the UK Water Industry are operating. In addition a third party estimating service was used which provided opportunity for external comparison and benchmarking from which addition assessments have been carried out to challenge these costs to ensure our programme is efficient.

Customers are protected from non-delivery of schemes through the AMP8 storm overflows performance commitment and price control deliverables. Additional measures are also in place through the Environment Agency (EA) that protect customer and the environment, including the EA's Environmental Performance Assessment (EPA) which tracks and reports WINEP delivery, potential prosecution and fines for non-compliance against environmental permits and reputational impacts if we fail to deliver against our environmental commitments.

Ofwat has proposed a new, common performance commitment for storm overflows in AMP8. Performance against this measure should be reviewed in light of past investment, exogenous factors affecting the North West and enhancement investment committing new performance improvements beyond the current baseline. UUW proposes a company-specific PCL that is reflective of our starting position (based on past investment), our enhancement programme and new measures that we are implementing now to reduce spill frequency.

Contents

1. Structure

1.1.1 This document is structured as follows:

- **Section 2** presents the Storm Overflows Enhancement Submission summary
- **Section 3** describes the historic drivers for storm overflow investment
  - Investment in storm overflows is primarily driven by statutory requirements and EU directives transposed into UK law. Specific requirements for storm overflows are set out in the following:
    - Urban Waste Water Treatment (England and Wales) Regulations 1994;
    - Bathing Water Regulations 2013; and
    - Water Environment Regulations (also referred to as Water Framework Directive or WFD).
  - Implementation of an improvement scheme under these drivers has been subject to a cost-benefit assessment to protect customers and to ensure that the benefit they receive is greater than or equal to the cost of the intervention.
  - Environmental improvements cannot be directly measured through spill frequency alone as this is not an indication of volume or impact of a discharge on the receiving environment. UUW has already made significant improvements at storm overflows to improve river water quality and we remain committed to going even further.
  - UUW has a robust process for assessing the impact of growth on our wastewater network and treatment systems. Our assessment looks at whether additional flow or load as a result of growth would result in customer impact, environmental impact or a breach of permit.
- **Section 4** describes the North West specific factors
  - The North West has the highest proportion of combined sewers in the industry. Combined sewers convey both foul and surface water flows, resulting in a reduced hydraulic capacity in periods of high rainfall. Normalised urban rainfall within the North West is 40% higher than the industry average across other regions. Companies with higher levels of both combined sewers and rainfall will be particularly affected by hydraulic overload resulting in sewers reaching capacity more frequently, resulting in more frequent storm overflow discharges.
- **Section 5** describes a case study - storm overflows regional variation due to rainfall
  - UUW has conducted a sensitivity analysis to test how rainfall alone influences storage volume required to address storm overflow spill frequency drivers.
  - Using an example catchment, hydraulic network models were run using ten times to determine the impact of regional rainfall on the modelled storage volume required to achieve the Government's Storm Overflow Discharge Reduction Plan (SODRP) ten spills driver. The analysis has shown significant regional variation across all spill analysis criteria assessed with UUW's average spill frequency shown to be 28% more than an equivalent 2021 national average.
  - To achieve the ten spills target for UUW this translates as an overall storage volume that is 70% above average and costs 51% above average, based on the example catchment analysis. This analysis demonstrates that long-term sustainable spill reduction will require significantly more investment in some regions based on rainfall alone. Delivery of any improvement should be considered in line with bill increases and deliverability of the programme.
- **Section 6** describes how we are investing in a stronger, greener, healthier North West
  - Major improvements are required to the wastewater system (network and treatment) in the North West to deliver a significant reductions in storm overflow spills. In 2023 UUW launched

Better Rivers: Better North West. This programme provides a roadmap for improvements in river heath and recreation in the North West including a reduction in spills from storm overflows.

  - We're not waiting to deliver spill improvements. We have deployed a new team and they are already delivering our accelerated infrastructure investment approved by Ofwat in April 2023. In addition we are developing short-term temporary solutions that we can deploy as quickly as possible, ahead of our AMP8 infrastructure enhancements which are still required. These short term operational solutions will provide a reduction in spills with the deployment of innovative equipment and additional operational support. They will act as interim measures to reduce spill frequency whilst permanent solutions are delivered.
  - The Storm Overflow Evidence Project identified that 35 per cent of the total investment required to meet the standard of 10 spills per annum, set out in the Storm Overflow Discharge Reduction Plan (SODRP), would fall in UUW's area. This is also reflected in the size of the UUW WINEP programme needed to deliver the long-term spill reduction requirements over the next 25 years.
- **Section 7** describes the WINEP overflows programme and Advanced WINEP
  - The WINEP sets out where the Environment Agency require us to enhance service standards in order to deliver environmental benefits under the following legislation:
    - The Water Environment (Water Framework Directive) Regulations 2017 (including shellfish requirements);
    - The Bathing Water Regulations 2013; and
    - Environment Act 2021.
  - We have undertaken a significant exercise to identify the most cost-effective programme, delivering the maximum benefit to customers. This enhancement programme reflects the step-change in legislation for storm overflows, and if agreed by regulators, will deliver the biggest enhancement programme since privatisation.
  - Our Advanced WINEP proposal has been endorsed by the Environment Agency. This innovative rainwater management programme will work in partnership to deliver sustainable drainage solutions across the North West.
  - The total cost of this enhancement case is £3,089.431m.
- **Section 8** describes defining spills
  - The methodology adopted by Ofwat in setting the storm overflows performance commitment diverges from that of the Environment Agency in the EDM annual return. This difference in reporting makes it difficult to use historic data to forecast future performance.
  - We acknowledge that delivery of a scheme to increase capacity and therefore reduce spill frequency will not necessarily be recognised within the recorded spill frequency in the same year as delivery. Enhancement solutions are designed using an average of ten years of rainfall and therefore the annual spill frequency will vary depending on whether rainfall within the catchment is above or below the average. In addition, EDM data is reported in calendar years and up to 12 months in arrears.
  - We observe that a common performance commitment for storm overflows would be insufficiently stretching for some companies and unachievable for others. Such an approach would be inconsistent with the performance commitment design principals.
- **Section 9** describes our proposed performance commitment level
  - We agree with a common performance commitment for storm overflows however we do not accept that a common target would be appropriate and so propose a company-specific target.

  - We propose an ambitious PCL to significantly reduce spills from our current baseline. This takes into account improvements from base and enhancement investment. Our proposal, if supported by Ofwat, will deliver a sustained, annual spill reduction of over 16,000 spills, increasing the capacity of our wastewater network by delivering improvements at 437 storm overflows. Our plan will deliver a sustainable average spill frequency of 19.6 by FY30 – a significant improvement from our current baseline of 49.73 (based on Ofwat methodology - FY23 data reported in OUT5.77)
  - More details on the measure can be found in the supplementary document UUW30 – Performance commitments technical document.
- **Section 8** describes customer protection
  - We agree that customers should be protected from non-delivery of enhancement projects. There are several mechanisms in place to ensure that we deliver our commitments to reducing storm overflow spills, including:
    - Environment Agency's Environmental Performance Assessment;
    - Prosecution and fines due to non-compliance with permits;
    - Reputational impact of reducing Environmental Performance;
    - Storm overflows performance commitment; and
    - Price Control deliverable (PCD).
  - UUW proposes a Price Control Deliverable (PCD) for storm overflows. The PCD will measure the number of modelled spills that have been reduced as a result of delivery of an enhancement scheme. The profile reflects our ambition to deliver our WINEP commitments early and aligns to our PR24 totex plan.

2. Storm Overflows Enhancement Submission

2.1 Enhancement case summary

Gate	Summary	Location reference
Need for enhancement investment	Our base expenditure only includes the cost for meeting current Environmental Permit requirements. The WINEP sets out where the Environment Agency require us to enhance service standards in order to deliver environmental benefits which they will enforce through varying our Environmental Permits. This enhancement investment is driven by the following statutory drivers to allow us to meet the future permit requirements for intermittent discharges: • The Water Environment (Water Framework Directive) Regulations 2017 (including shellfish requirements); • The Bathing Water Regulations 2013; and • Environment Act 2021.	Section 2 - 7
Best option for customers	We have undertaken a significant exercise to identify the most cost effective way of meeting the future permit requirements we are required to comply with.	Section 7
Cost efficiency	To ensure robust and efficient costs in our programme we have used an estimating approach based on data collected over AMP3 to AMP7 and updated to reflect the present market conditions under which we and the UK Water Industry are operating. Mott Macdonald provide us and other UK water and sewerage companies with an estimating service, which allows them to provide a benchmarked approach to our PR24 capital cost estimates. Following which cost assurance was carried out by UUW to promote further programme efficiencies where identified.	Section 7
Customer protection	Customers are protected from non-delivery through the following performance commitment: Storm overflows – the overflow spill reduction projects are built into the baseline of this performance commitment, therefore if they are not delivered the overflows will not meet the spill frequency requirements and we will incur an underperformance payment through this ODI. Additional consequences of non-delivery include: • Prosecution and fines due to non-compliance with permits; • Reputational impact of reducing Environmental Performance; • Loss of trust with customers and stakeholders; and • Loss of trust with the Environment Agency leading to less support for innovative approaches to delivering environmental improvement.	Section 8, 9 and 10
Price control deliverable	The following rice control deliverables have been developed for this enhancement case: • Storm tanks, storage and Storm overflow - sewer flow management and control; (WINEP/NEP) wastewater; and • Storm overflow - new / upgraded screens (WINEP/NEP) wastewater.	Section 10

2.2 Introduction

2.2.1 Storm overflows are emergency release points in the combined sewer network designed to prevent the sewer from backing up and causing flooding in customers' homes during extreme weather.

2.2.2 Storm overflows are a part of the combined sewerage system which conveys wastewater and rainwater from homes and public spaces to sewage treatment facilities to be treated before being returned to the environment. During periods of heavy or prolonged rainfall, large volumes of rainwater can result in sewers reaching their maximum capacity. When this occurs rainwater mixed with sewage can discharge to the environment though storm overflows. Sewers operate in this way to help prevent the flooding of streets, homes and businesses and, whilst storm overflow discharges are normally dilute compared to wastewater alone and only occur at times when flow in rivers is higher due to rainfall, they may still have an impact on the receiving water environment.

2.2.3 Wastewater networks for drainage and the disposal of sewage have been around for hundreds of years with storm overflows being an established feature of their design. Whilst the earliest regulation of sewerage was published in 1531 it was not until the middle of the 19th century that sewers were widely established alongside the rapid development of cities during the Industrial Revolution. These networks were the responsibility of local authorities, before The Water Act 1973 defined the boundaries of ten Water Authorities which later assumed the ownership and accountability for the sewerage network. These Authorities would later evolve into the Undertakers appointed under the Water Industry Act 1991.

2.2.4 The UK joined the European Community on 1 January 1973, with EU Directives relating to discharges to inland and coastal waters having immediate effect. The UK, like much of the EU, has included storm overflows within the design and construction of the combined sewage and rainwater networks and over 650,000 storm overflows are estimated to be in existence throughout Europe[1]. Storm overflows are legislated by several European Directives and have received major investment over the years and in line with the requirements of the time.

2.2.5 Past investment has been driven by legislation to protect the receiving water environment and move towards good ecological status under the Water Framework Directive (and its predecessors.) This has historically focused on identifying cost beneficial interventions that reduce environmental harm. Until relatively recently very limited measured data was available for storm overflows (since they were permitted based on what should be retained in the network, rather than what could be released from it) and so hydraulic network and integrated catchment models have been developed to inform the scope of work and the investment required to achieve the required water quality standards. Since 2016 UUW has delivered a large monitoring programme installing over 2,000 event duration monitors on storm overflows which tell us how often storm overflows discharge to the environment, regardless of whether or not this is causing environmental harm. It is this data that has led to the increased awareness and understanding of how the wastewater systems work and in recent years there has been a shift in the conversation around storm overflows.

2.2.6 Increased media coverage and public debate have raised the profile of storm overflows and as a result people are more informed about how the wastewater system works and are wanting change. We know from customers that compliance with current legal standards is not enough and that more needs to be done to reduce the use of overflows - regardless of harm. This need has also been recognised by Government with the introduction of new legislation that reflects these changing expectations.

2.2.7 The Environment Act 2021 and the government's Storm Overflow Discharge Reduction Plan (SODRP) set out new, tighter targets for storm overflows. The SODRP published in August 2022, will drive a step change in how overflows are regulated, driving investment to enable a significant reduction in their use, to address the legacy of storm overflows and the pressure from climate change.

[1] https://www.eureau.org/resources/position-papers/4955-position-paper-on-overflows-from-collecting-systems-1/file

2.2.8 This new legislation changes the way companies must approach improvements to storm overflows and moves away from the traditional assessment of harm and cost vs benefit analysis to a fixed spill frequency target in addition to removing harm. Improvements are no longer subject to a cost vs benefit assessment which will enable companies to intervene on more overflows to reduce storm overflow spills.

2.2.9 UUW welcomes the new requirements and the opportunity for change, and as part of our WINEP submission in January 2023, we undertook extensive analysis to categorise our storm overflows in line with the criteria in the SODRP and reviewed this with the Environment Agency and Natural England.

2.2.10 UUW has submitted to DEFRA its long-term storm overflow reduction plan for all storm overflows that we operate within the North West and this plan aligns to the regulatory framework and will achieve 10 spills or less at all storm overflows by 2050. In addition, we are actively exploring with regulators how we might accelerate the plan to achieve those outcomes earlier than 2050. This ambition is mirrored in our activities to reduce storm overflow spills as soon as possible through new and existing practices and is reflected within our storm overflow performance commitment. We believe this investment is right and needed to meet the new requirements.

3. Historic drivers for storm overflow investment

3.1 Summary

3.1.1 The water industry is a tightly regulated industry and duties on water companies have been set out in European and subsequently UK legislation. Contemporary legislation has set the requirements for storm overflows. Historically this has driven improvements where assets were identified as causing harm to the receiving watercourse with solutions designed to protect the environment. In addition, investment at sites impacting designated bathing waters has contributed to the protection of the public.

3.2 Legislative drivers

3.2.1 The Water Industry Act 1991 sets out the overarching duties of sewerage undertakers.

3.2.2 Prior to the Government's 2022 Storm Overflows Discharge Reduction Plan, the specific requirements of overflows and therefore the quality requirements for overflows were set through three main pieces of legislation, all of which were originally EU directives which are now transposed into UK law:

Urban Waste Water Treatment (England and Wales) Regulations 1994 ("UWWTR")

3.2.3 Supplements the duty imposed on every sewerage undertaker by section 94 of the Water Industry Act. Requires water companies to provide appropriate wastewater collection and treatment facilities that comply with regulatory requirements, for all agglomerations with a population of greater than 2000.

Bathing Water Regulations 2013

3.2.4 Establishes water quality objectives for bathing waters and requires permits to be set to meet these objectives.

Water Environment (Water Framework Directive) Regulations

3.2.5 Requires the Environment Agency to set environmental objectives and programmes to achieve "good" ecological and chemical status in all rivers.

Shellfish Water Regulation (later repealed by Water Framework Directive in 2013) was also catalyst for change in the North West. These requirements aimed to protect the growth of shellfish and promote high quality products that can be harvested for human consumption. When this legislation was repealed most requirements moved under WFD, however a cost benefit assessment was now applied.

3.3 Clarification of Urban Waste Water Treatment Regulation

3.3.1 Urban Waste Water Treatment Regulation (UWWTR) aims to protect the environment from the adverse effects of urban wastewater discharges. Unlike the Water Environment Regulation, UWWTR does not set numerical standards for storm overflows and therefore assessing compliance against this regulation is subject to interpretation by the relevant regulators. UWWTR recognises that it is not possible for combined networks to treat all wastewater in times of unusually heavy rainfall and that provisions should be put in place to prevent pollution from storm overflows. In relation to storm overflows UWWTR states:

"Collecting systems shall take into account wastewater treatment requirements.
The design, construction and maintenance of collecting systems shall be undertaken in accordance with the best technical knowledge not entailing excessive costs, notably regarding: Volume and characteristics of urban wastewater; Prevention of leaks; and Limitation of pollution of receiving waters due to storm water overflows."

3.3.2 In 2012, the UWWTR was clarified in the European Court of Justice following infraction proceeding against the UK. The Commission identified that that in regards to four examples, the UK had failed to comply with its obligations.

3.3.3 The proceedings identified that overflows should be designed and operate under all "normal climatic conditions" and that for overflows to operate under non-exceptional rainfall conditions would potentially be an example of sewage collections systems failing to deliver the required sufficient performance. This analysis was reinforced by Justice Holgate in the recent judicial review of the UWWTR (Case Nos: CO/4438/2022 and CO/4445/2022) where he held that the mere fact that a storm overflow discharges into a waterway in non-exceptional circumstances does not necessarily involve a breach of the UWWTR because it is also capable of being justified by cost-benefit analysis so as to satisfy the BTKNEEC test (Best Technical Knowledge Not Entailing Excessive Costs). The legislation does not provide a methodology for how to determine the exceptionality of rainfall or define a cost-benefit testing methodology, but the proceedings did suggest that frequently discharging overflows should be subject to an investigation to determine whether the operation of the overflow is delivering sufficient performance. It is for Member States to determine such a methodology. The proceedings also identified that:

- Sufficient performance should be interpreted in light of the objectives of UWWTR which is to protect the environment;
- Legislation does not set a numerical limit for spills. Therefore it is reasonable for Member States to set guidance about spill frequency. The Court of Justice for the EU would ultimately have final judgement on whether this is reasonable;
- Unusually heavy rainfall is not defined numerically by UWWTR and therefore must be assessed in light of the criteria and objectives of the regulations particularly taking into account best technical knowledge not entailing excessive costs (BTKNEEC); and
- Where spill frequency is high, and/or where spills are caused by non-exceptional rainfall, proposed improvements must be examined by weighting the best technology and costs against the benefits of a more effective wastewater network. The costs incurred cannot be disproportionate to the benefits obtained.

3.3.4 Following the infraction proceedings, to address the lack of a methodology for investing in, and assessing overflows under the UWWTR, the Environment Agency developed the storm overflow assessment framework (SOAF). This guidance sets out a standard methodology for identifying, investigating, and implementing a solution at storm overflows where they have been identified as spilling frequently and having an adverse impact on the receiving water environment. The framework ensures that the water industry is proactively monitoring and managing the performance of its overflows in light of the pressures of growth, urban creep and changing rainfall patterns. It is explicitly intended to demonstrate that sewerage systems are compliant with relevant legislation such as the UWWTR and the BTKNEEC requirement.

3.4 Storm Overflow Assessment Framework

3.4.1 The Storm Overflow Assessment Framework (SOAF)[2] published in June 2018 provides a methodology for assessing the environmental impacts of high spilling storm overflows from wastewater treatment systems and provides a structured approach for identifying, quantifying, and mitigating these impacts. Justice Holgate (paragraph 84 - 86, Judicial Review case CO/4438/2022 and CO/4445/2022) observed that the Environment Agency introduced the SOAF expressly to address whether or not overflows and/or treatment works were in breach of regulation 4 of the UWWTR, and this extends to an assessment of whether or not potential solutions to address frequently spilling overflows are considered cost-beneficial.

3.4.2 The SOAF defines a high spilling storm overflow as any site that spills 40 times per annum on average (based on three years of data). The SOAF, in line with UWWTR, includes a cost-benefit analysis (CBA) as part of its methodology. The CBA reviews the cost to implement a spill reduction solution to below the threshold (<40 spills on average per annum) and the benefits of reducing environmental impacts. The

[2] water.org.uk/wp-content/uploads/2018/12/SOAF.pdf

results of the CBA can be used to inform decision-making about whether or not to implement mitigation measures. Where the cost is disproportionate to the benefit a solution is not progressed.

3.4.3 In addition to the CBA, the SOAF also considers other factors when assessing the environmental impacts of storm overflows, such as the potential impacts on human health, the environment, and the economy. The SOAF ultimately provides a decision framework for water utilities and regulators to use in making informed decisions about how to manage storm overflows.

3.4.4 If a frequently spilling overflow is found to be discharging outside of "exceptional" rainfall, and through the SOAF assessment is found to be hydraulic in nature (i.e., not due to maintenance), and where the solution is not cost-beneficial, the outcome under the SOAF guidance is "do nothing". In these cases, in relation the obligations in UWWTR, "do nothing" means there is no statutory driver to deliver the solution to reduce spill frequency.

3.4.5 Under similar circumstances, if the proposed solution is considered cost-beneficial, this leads to a statutory obligation, and a subsequent driver within the WINEP for the water company to deliver the scheme.

3.4.6 In AMP7 UUW is investigating over 300 high spilling overflows. The investigation will follow the SOAF guidance to identify whether these discharges are having an adverse environmental impact on any of our inland or coastal waters in the North West. The investigations will be completed throughout 2020 to 2025 and will help us to identify overflows where there is a priority need for investment to reduce harm, based on the Storm Overflow Assessment Framework definitions.

3.4.7 To date, of 119 storm overflows identified as requiring some form of solution at stage 3a of the SOAF, none have been deemed to be cost beneficial following detailed design and engineering estimates. In SOAF terms, in relation to UWWTR, these overflows are "do nothing". Thus, based on a traditional model of statutory obligations arising only where cost-beneficial schemes to address harm exist, the SOAF, as per previous legislation and guidance, does not lead to a statutory obligation or driver for WaSCs to invest in reducing storm overflow spill frequency. In this respect, the Storm Overflow Discharge Reduction Plan, SODRP, is a significant step-change for the requirements on storm overflows spill frequency. In the case described earlier, Justice Holgate agreed (paragraph 105), reflecting the witness statement from the Deputy Director of Defra, who said "... the targets in the Plan SODRP seek to go beyond those requirements UWWTR". In paragraph 169 Justice Holgate goes further: "The Plan SODRP goes further than the 1994 Regulations UWWTR. None of the policy targets or statements in the Plan is qualified by any cost benefit test."

3.4.8 In November 2021 the Environment Act was published which was later followed by Government's Storm Overflow Discharge Reduction Plan (SODRP) in August 2022, as required under the Act. These documents set out new, tighter targets for storm overflows that go beyond current legal requirements of UWWTR, Bathing Water Regulations and Water Environment (Water Framework Directive) Regulations. The Act will drive a step change in performance across the water industry to address the legacy of storm overflows and the pressure from climate change. Crucially, the requirements of the SODRP are not subject to any form of cost benefit test.

3.4.9 As SOAF investigations are still underway in AMP7, the EA clarified that water companies should continue with the investigations but should align to newest guidance and therefore should target a spill reduction of 10 per annum on average in line with SODRP (and therefore irrespective of environmental harm or costs) and a benefits assessment was no longer required. The outputs of these investigations are still valuable as they can be used in future AMPs to aid solution development and implementation. SOAF investigations that have already completed ahead of this clarification from the EA will not be re-visited in AMP7 as they reflect the guidance at the time.

3.4.10 Future SOAF investigations delivered in AMP8 under PR24 WINEP driver EnvAct_INV4 will identify whether storm overflows that spill 10 times per annum on average have an adverse impact on the environment and therefore may need to reduce spill frequency below the average spill target of 10 spills per annum identified within Government's SODRP.

3.5 Implementation of statutory requirements by AMP

3.5.1 To date, investment at storm overflows has been driven by an evolving set of statutory drivers and guidelines focussed on reducing the environmental impacts of storm overflows to meet the requirement of Bathing Waters regulation and Water Environment Regulations. Implementation of a scheme under any of these statutory drivers prior to the Environment Act 2022 has been subject to cost benefit analysis to protect customers and to ensure that the benefit they receive is greater than or equal to the cost of the intervention as defined below in Figure 1.

Figure 1: Implementation of statutory requirements by AMP, the driver for investment and whether a cost vs benefit assessment was applied

Source: UUW infographic

3.5.2 Environmental improvement (or harm) cannot be directly measured through storm overflow spills as spill frequency alone does not indicate the volume or environmental impact that a discharge may have on the receiving watercourse. A single annual large-volume discharge into a small brook may be many times more harmful than daily small discharges into a large estuarine river, for example. This is reflected within the current permitting regime where to date, rather than directly permitting the number of spills from a discharge, the EA sets permits to the scale of mitigation required to meet the expected reduction in harm. For example, even for discharges to bathing waters and shellfish waters where the driver requires solutions to meet 3 spills per bathing water and/or 10 spills per year (as an average), permits contain only the volume of storage necessary to meet the design spill frequency based on modelled data. Storage volumes were agreed with the EA and projects that delivered the minimum storage requirement were deemed complete and signed-off by the EA. So long as the permitted storage volume remains available, the site is deemed compliant. There is no current permit requirement for companies to investigate or intervene where annual spill frequency exceeds that indicated by the original driver (for example where actual annual rainfall is significantly different to the modelled rainfall assumptions).

3.5.3 In AMP8, under the Environment Act, UUW will install monitors in rivers to measure key parameters of river health These will help calibrate models and potentially identify rivers that are not meeting good ecological status and help UUW and other local stakeholders to target and prioritise improvements where they are required. Conversely, it is possible that the new data may allow the Reasons for Not Achieving Good (RNAG), which currently attribute overflows as the main reason, to be updated to exclude overflows as the main barrier to good ecological potential.

3.6 AMP7 Storm Overflow Water Quality Schemes

3.6.1 In AMP7, against Water Environment Regulation (WFD) water quality targets (the same standard for the SODRP ecological harm test), UUW is delivering 23 storm overflow improvement schemes, listed in Table 1. Integrated catchment models have been used to identify the impact of storm overflows on the receiving water environment and consequently which overflows require addressing in order to address environmental harm in a particular waterbody. It is important to note that not all overflows contributing to a particular watercourse will require a spill reduction in order for the overall watercourse to achieve WFD good status and thus only those overflows assessed as being the main contributing factors to environmental harm will have had solutions identified. Even for those overflows identified as requiring a solution to address harm, in accordance with the cost-benefit requirement in the contemporaneous legislation, the solution is limited to the volume of storage required to address environmental harm rather than a particular spill frequency target. As no additional environmental benefit is obtained by installing solutions which deliver spill frequencies beyond that required to address environmental harm, these solutions (or at least the part of the solution going beyond addressing harm) will not be considered cost-beneficial and so would not create a statutory driver to go beyond the removal of harm.

3.6.2 This is borne out in Table 1 and Figure 2 below where the average spill frequency that is expected following our interventions, in order to achieve the expected reduction in harm, is 46 spills per annum. Consequently, the post-scheme solution spill frequencies are frequently greater than 10, 20 or even 40 times per annum.

Table 1: UUW AMP7 storm overflow water quality schemes

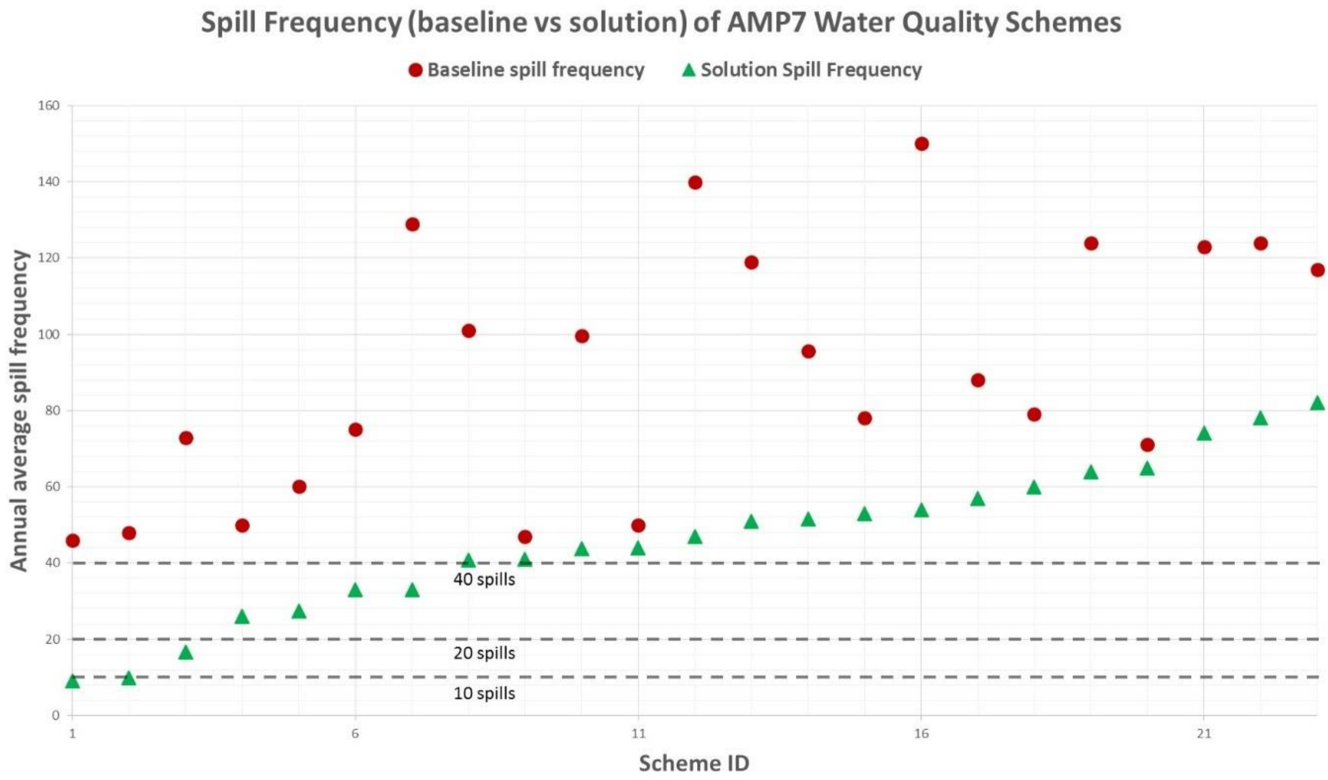
Discharge Reference	Baseline Annual Average Spill Frequency	WQ Solution Annual Average Spill Frequency	Meets 40 Spills	Meets 20 spills	Meets 10 spills
017670049SO	46	9	Yes	Yes	Yes
017160024ST	48	10	Yes	Yes	Yes
017050012ST	73	17	Yes	Yes	No
VRY0063SO	50	26	Yes	No	No
017050012SO	60	27	Yes	No	No
016950034ST	75	33	Yes	No	No
016940089ST	129	33	Yes	No	No
CON0012SO	101	41	No	No	No
BBN0169ST	47	41	No	No	No
016940139ST	100	44	No	No	No
016810084ST	50	44	No	No	No
CHR0021SO	140	47	No	No	No
017160005ST	119	51	No	No	No
WIG0207SO	96	52	No	No	No
016950042ST	78	53	No	No	No
BOL0129SO	150	54	No	No	No
PEN0056SO	88	57	No	No	No
016940089SO	79	60	No	No	No

Discharge Reference	Baseline Annual Average Spill Frequency	WQ Solution Annual Average Spill Frequency	Meets 40 Spills	Meets 20 spills	Meets 10 spills
BOL0153SO	124	64	No	No	No
017160008ST	71	65	No	No	No
BUR0026SO	123	74	No	No	No
BOL0056SO	124	78	No	No	No
BOL0176SO	117	82	No	No	No

Source: PR19 business plan and supporting data from UUW models.

3.6.3 Figure 2 below demonstrates the baseline and solution annual average spill frequencies of all capital schemes being undertaken in AMP7 by UUW to address harm rather than a specific spill frequency target. The solution spill frequency to address harm is generally above 40 spills per annum (SOAF) and rarely as low as the SODRP target of 10 spills per annum.

Figure 2: Spill frequencies of AMP7 water quality schemes



Source: UUW modelled data.

3.6.4 Figure 3 demonstrates the difference in scale of modelled storage volume for a WFD solution versus achieving 10 spills per annum for an example overflow from Table 1 (highlighted). This scheme is identified in the AMP7 WINEP with reference '7UU200769 Royal Oak CSO BOL0129' and was included at PR19 within enhancement submission 'S6028 Enhancement expenditure: Wastewater Network Plus – Water Industry WINEP – Storage / Flow to full treatment (FTFT)'.

3.6.5 The graph plots the modelled storage volumes required to meet particular spill frequencies. For example:

- In the baseline situation, with no storage, the overflow spills 150 times per annum on average;
- 2,200m^3 of storage will reduce the spill frequency to 54 times per annum, enough to achieve a WFD compliant solution in the watercourse (consistent with current legislation); and

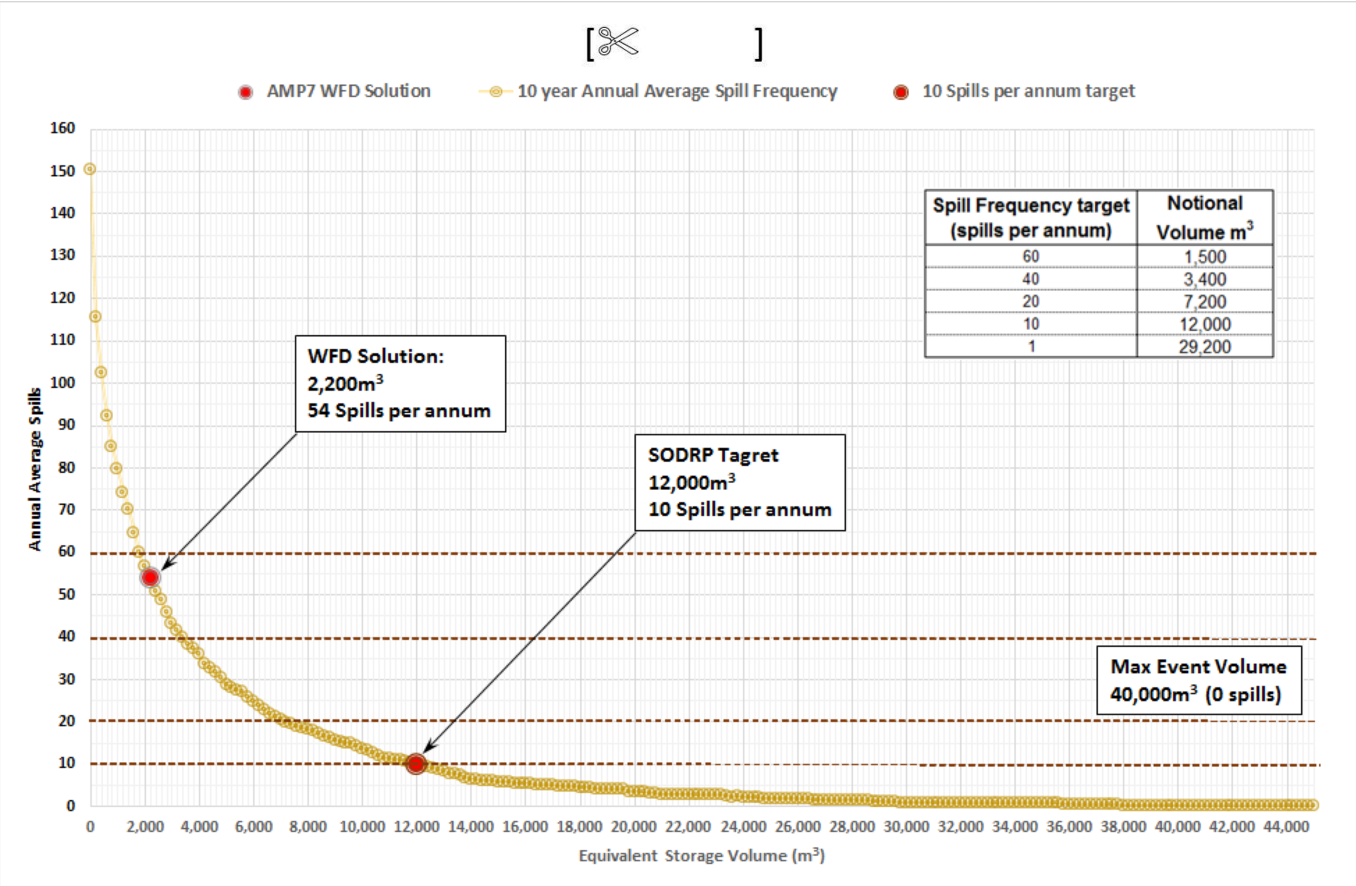
- In order to achieve a 10 spills per annum solution, a further 10,000m^3 of storage is required – five and a half times larger than the approved WFD solution.

3.6.6 In this example, targeting environmental harm results in a spill frequency of 54 times per annum and a solution nearly six times smaller than the equivalent to achieve a ten spills outcome. Indeed, the graph demonstrates that the relationship between solution size and spill frequency is exponential when trying to achieve spill frequencies trending towards zero. Unsurprisingly, this has an equivalent knock-on to the associated cost of solution.

3.6.7 Delivering storm overflow solutions with lower spill frequencies than are required to address environmental harm have been non-cost beneficial under the WFD and consequently have not been delivered in this or previous investment cycles.

3.6.8 Clearly, each overflow has its own unique exponential curve identifying both the storage (or equivalent volume) required to address environmental harm and the storage (or equivalent) to achieve a maximum 10 spills. Even though it is true for 100% of the UUW AMP7 statutory obligations, it is not always the case that the storage required to get to 10 spills will be greater than the storage required to eliminate harm. In fact, in circumstances where rainfall levels are lower and/or where dilution in the receiving water course is higher, then it is possible that historical cost-beneficial statutory drivers will have already reduced spills to 10 per annum, or fewer.

Figure 3: Modelled storage volume required to address environmental harm versus specific spill frequency targets (based on a 10 year time series of rainfall)



Source: UUW modelled data.

3.7 Conclusion

3.7.1 The data presented within this section demonstrates that storm overflow annual spill frequency is not a measure of environmental harm. Given that the approach to assessing efficient investment to date has been based on addressing harm and a cost benefit approach, it is therefore to be expected that past investment has resulted in solutions with greater spill frequency than the newer, more stringent SODRP targets and that SODRP compliant solutions would, at least in the North West, likely be considered non-cost beneficial under the WFD or UWWTR approach.

3.7.2 Consequently, storm overflow investment in this and previous AMPs to address WFD or UWWTR standards will yield different solution spill frequencies based upon what is required at a particular site, or in a particular waterbody, catchment or region to address environmental harm. Indeed, it is clear that all but two of the 23 overflow reduction schemes in AMP7 will require additional investment in order to meet the new SODRP spill frequency requirements.

3.7.3 Required solution sizes at storm overflows to address harm will have been driven by the characteristics of the underlying contributing rural and urban catchments, rainfall and watercourse hydrology. That is; drier regions will have consequently lower peak river flows and more concentrated storm overflow spill effluent, driving fundamentally lower spill frequency solutions to achieve WFD standards than wetter regions with higher peak river flows and consequently more dilute spill effluent and in-river dilution. Thus, as a direct consequence of past cost-benefit driven enhancement investment to address harm, lower spill frequencies post-solution have been observed in drier regions than in wetter regions such as the North West.

3.7.4 In comparison to other companies we would expect UUW to have a higher baseline level of spills, and hence a need for a greater level of investment to meet the 10 spills target set out in the SODRP:

- Higher levels of rainfall in the North West lead to a higher natural underlying / unmitigated spill frequency; and
- Fast / flashy rivers, which when coupled with high rainfall entering sewers, means that the spills are often relatively dilute. This has previously presented a significant challenge to demonstrating that schemes are cost beneficial, as the as the reduction in harm is relatively low compared to the storage volume required (and hence the cost). This is in contrast to regions with slower moving meandering rivers, and lower levels of rainfall – in this case, the lack of dilution enables cost benefit tests to observe a more significant reduction in harm (and hence benefit) to compare with the cost of a scheme.

3.7.5 This means that, whilst UUW has many overflows, the historic approach to justifying investment under WFD or UWWTR has led to many overflows in the North West not receiving investment in spill reduction, or for that investment to only have had a moderate spill reduction from the prior baseline. For the reasons outlined above, it is therefore expected that our current spill frequency is (naturally) higher than other companies.

3.7.6 Therefore, it cannot be assumed that all water companies have been funded previously to achieve a particular standard spill frequency and all companies will thus have varying storm overflow spill levels, despite following consistent statutory requirements. A common target is not appropriate as it does not reflect the differing (implicit) spill level that each company has been funded to achieve nor the cost to achieve a common target that would be incurred by different companies.

3.8 Investment in growth

3.8.1 An increase in growth can occur as a result of increased domestic population or an increase in trade effluent discharge. The Water Industry Act 1991 and the Urban Waste Water Treatment Regulations require companies to accommodate growth to maintain effectual drainage systems and environmental compliance. UUW has over 500 discrete drainage areas, all with different capacities to manage increases in flow and load as a result of growth.

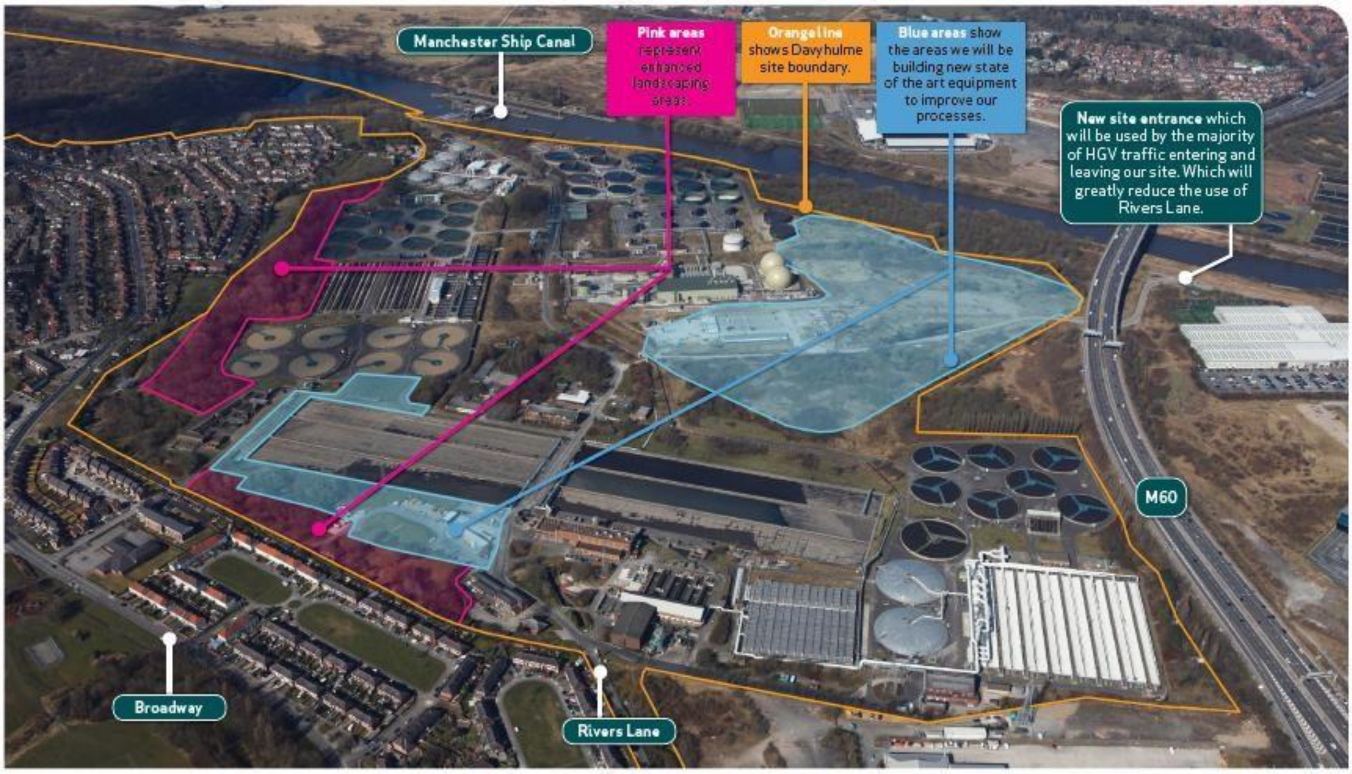
3.8.2 Growth forecasts are completed in line with the WRMP and DWMP methodologies using local authority planning information where available and trend-based models where not (issued by an independent expert in defensible demographic forecasting).

3.8.3 Growth is not evenly distributed across the region and the levels of certainty on where it will occur can also vary significantly based on the maturity of local authority plans and data forecasts. Local authority plans usually forecast new development for up to fifteen years, with the maturity of the plan based on the allocation of land for development, planning stages and delivery within the designated areas. Investment within our sewage system and wastewater treatment facilities are managed through a risk-based approach using best available data and refreshed as better information is made available. This identification of the risk follows the framework outlined in the UK Water Industry Research (UKWIR) report No. 07/RG/08/2 'Long term/least cost planning for wastewater supply-demand' and updated report 'Wastewater Supply-Demand Framework' report no. 14/RG/08/6. The approach represents national best practice and is consistent with our historic approach and has been used within our long-term DWMP.

3.8.4 For wastewater treatment works, UUW's capacity assessment identifies where forecast growth may result in a breach of the current permit conditions for flow or load (measured via dry weather flow assessment and final effluent parameters). Simulated catchment (SIMCAT) models are run to identify potential deterioration to the receiving water course as a result of the growth. Using SIMCAT we can identify if tighter permits are required in order to accommodate new growth within an area and prevent adverse impacts on the receiving water environment.

3.8.5 Davyhulme WwTW is the largest WwTW in the North West and is a good example where rapid expansion of an area has led to significant interventions to prevent any adverse environmental impacts as a result of the growth. This site had been identified for improvements under WFD Regulations, the solution for which would have resulted in the refurbishment of existing treatment assets and additional treatment of liquors. Significant growth in this catchment of circa 125,000 PE, stimulated by a surge in economic development in and around Manchester City centre, meant that a strategic approach was required to meet future demand. The new solution included a new inlet works, a new additional activated sludge process, SAS thickening, odour control and enhancements to existing processes. This was a major modernisation project triggered by the rapid expansion of Manchester city centre and the surrounding catchment areas, the project ensured the future protection of the Manchester Ship Canal from population growth in the area. Figure 4 and Figure 5 show the additional capacities built at Davyhulme WwTW to accommodate growth.

Figure 4: Davyhulme WwTW prior to major modernisation project



Source: Aerial image of Davyhulme WwTW before *modernisation project.*

Figure 5: Davyhulme WwTW post major modernisation project to protect receiving water from the impact of rapid growth within the catchment ahead of the development happening

Source: Aerial image of Davyhulme WwTW after *modernisation project.*

3.8.6 From 1st April 2018 Water Companies were required to report on network reinforcement expenditure. Network Reinforcement captures work that needs to be carried out in consequence of development-related growth, it does not include wastewater treatment assets. Such work will typically be needed to ensure that the new development does not result in any degradation of service. The cost of providing network reinforcement is recovered from all new properties connecting to the network for the first time. Network reinforcement may include:

- Enlarging existing or proposed pipes to increase capacity for a specific development, or growth more generally;
- Upsizing existing or proposed pumping stations;
- Providing new cross-connections to improve network capacity under differing network conditions; and
- Other infrastructure required to provide network capacity for growth resulting from new development.

3.8.7 In the charges scheme rules in relation to infrastructure charges, Rule 30 is clear that infrastructure charges must not relate to the costs of reinforcing, upgrading or otherwise modifying existing network infrastructure in order to address pre-existing deficiencies in capacity or in capability.

3.8.8 To identify the impact of growth within an area, a development impact assessment is completed. This uses modelled data to assess the impact of additional flows from new developments on storm overflow spills and flooding locations within a drainage area. This could be on a development-by-development basis or looking more strategically at the impact of all developments over a given catchment area. A Development Impact Assessment provides a scoring matrix to assess impacts and score them high, medium and low based on a set of parameters including but not limited to; proximity to existing flooding properties, increased risk of overland flooding, new flooding predicted and impact on storm overflow spill volume. When set at PR19, protecting properties from sewer flooding was given a higher weighting in the matrix in reflection of customer feedback and priorities.

3.8.9 The scoring matrix has recently been reviewed in light of the public interest in environmental pollution and UUW recognises this will have a greater influence on prioritising future projects. Increase in spill frequency is now also modelled, where previously only increase in spill volume was assessed. However, this has to be weighed against the baseline position. For example if a CSO currently spills 40 times a year without growth, and the modelled additional properties increased the spill count to 42, infrastructure charges can only be used to resolve the additional 2 spills and cannot be used to resolve existing issues. This is clear from the new connections charges scheme rules, which makes clear that infrastructure charges should not be used to recover costs of additional work, beyond that required to offset the impact of the new development. It is therefore not feasible for spill frequency to have been naturally reduced from the impact of growth related investment.

3.8.10 In summary, increasing the capacity of our existing network as a consequence of new development is funded through infrastructure charges. But infrastructure charges can only be used to return to baseline conditions and cannot be used to recover the cost of improving service levels (e.g. reducing existing spill frequency) beyond the pre-existing baseline. It is therefore not reasonable to assume that historic growth investment should have any beneficial impact on spill frequency.

4. North West specific factors

4.1 Summary

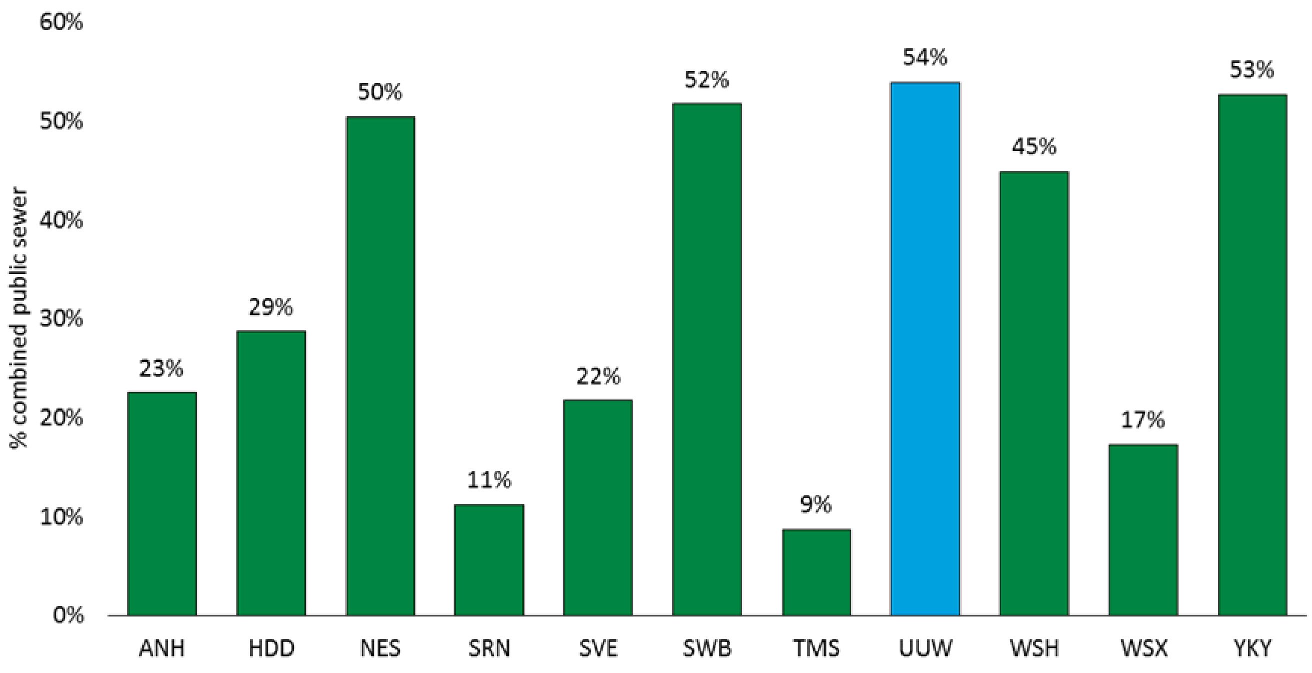
4.1.1 The North West has the highest proportion of combined sewers in the industry. Combined sewers convey both foul and surface water flows, resulting in a reduced hydraulic capacity in periods of high rainfall. Normalised urban rainfall within the North West is 40% higher than the industry average across other regions. Companies with higher levels of both combined sewers and rainfall will be particularly affected by hydraulic overload resulting in sewers reaching capacity more frequently resulting in more frequent storm overflow discharges.

4.2 Proportion of combined sewers

4.2.1 A significant proportion (54% versus an industry average of 33%, see Figure 6 below) of the North West sewer network is combined, consequently sewage and surface water (i.e. rainfall from gutters and roads) are drained in shared, combined, sewer networks. This characteristic means that drainage systems in the North West are more vulnerable (responsive) to climate change impacts than areas with lower proportions of combined systems and lower rainfall.

4.2.2 Storm overflows have historically been constructed and permitted to act as hydraulic relief points within the combined sewer network and discharge when storm water runoff results in the hydraulic capacity of the sewer being exceeded. These storm discharges allow water to leave the sewer in a controlled location to prevent localised flooding of properties through surcharge of the hydraulic sewer network.

Figure 6: UUW has the highest per cent of combined public sewers in the industry.



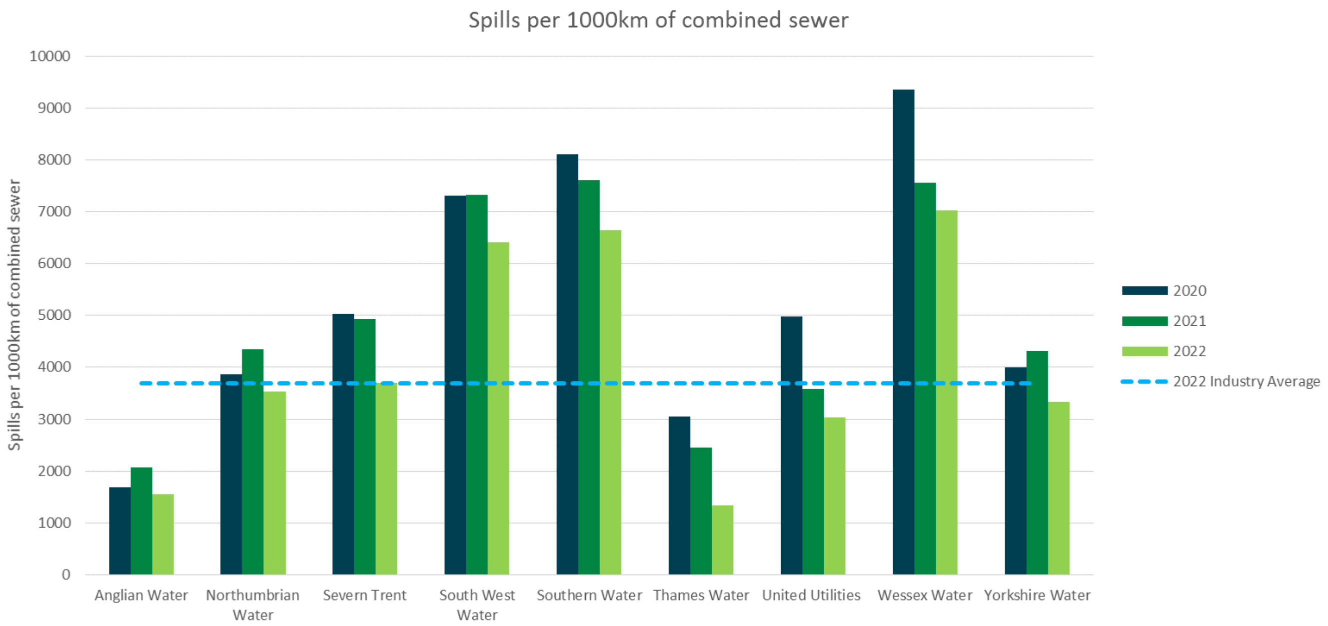
Source: Ofwat, PR24 wastewater cost assessment master dataset[3]

4.2.3 The proposed storm overflow performance commitment methodology normalises total spills by the number of storm overflows which does not take into consideration the size or volume discharges from storm overflows and so provides an inappropriate comparison between companies. Sewer length is already used as the normalising factor for other environmental measures such as total pollution and

[3] https://www.ofwat.gov.uk/wp-content/uploads/2023/04/PR24-Cost-Assessment-Master-Dataset-Wholesale-Wastewater-Base-Costs-v4.xlsx

internal flooding. It reflects the length of sewers being operated and a proxy for the load placed on the overflow system and unlike overflows is a more static number. Figure 7 shows the number of storm overflow spills normalised per 1000km of combined sewer, based on this normalisation UUW are below the 2022 industry average for storm overflows. Comparatively when normalised by the number of storm overflows UUW has the highest average spill frequency. Figure 8 below, shows that the factor used for normalisation affects the positioning of performance and the targets reasonably achievable by each company.

Figure 7: The number of storm discharges reported in 2020, 2021 and 2022 per 1,000km of combined sewer

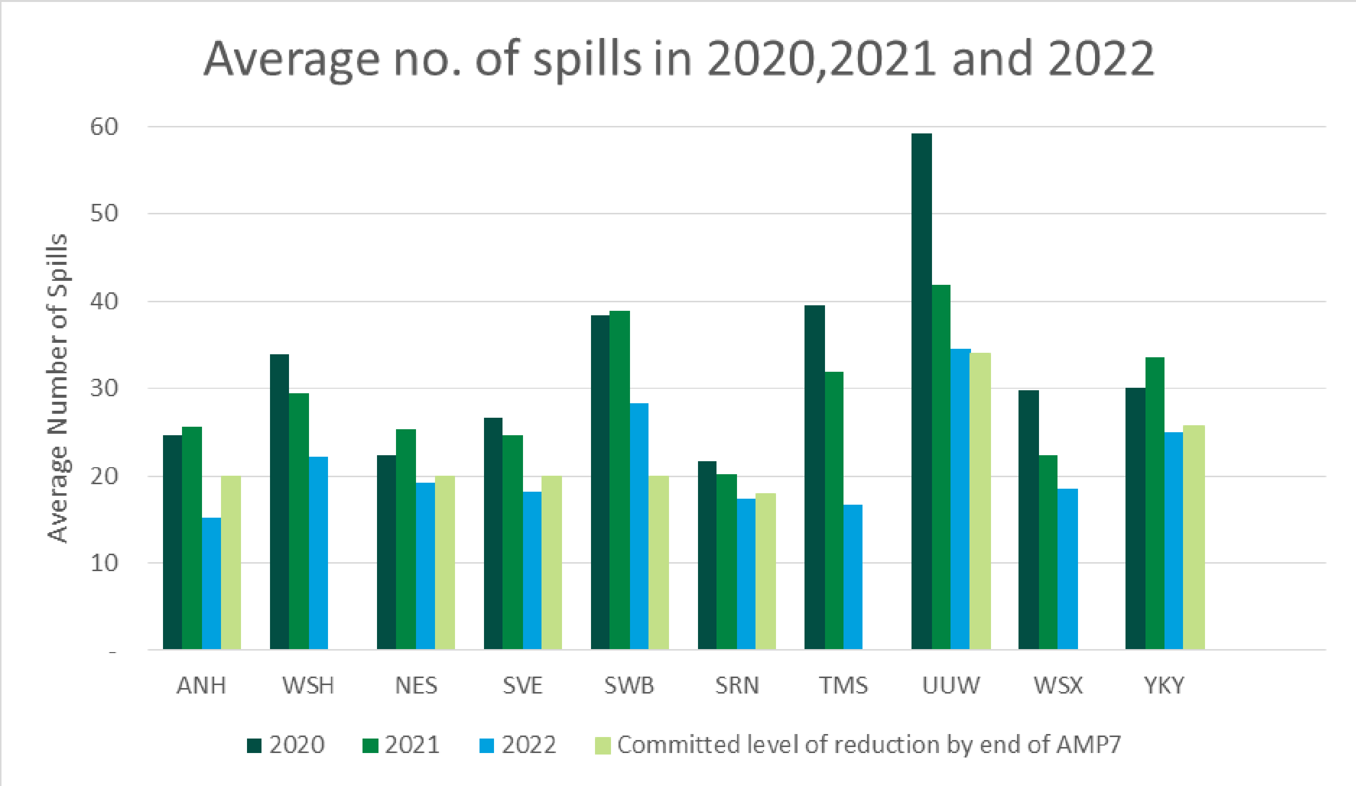


Source: UUW analysis of industry EDM data[4]normalised by APR datashare

4.2.4 Figure 8 highlights that a common performance commitment level would almost certainly be easily met by some companies and impossible for others, without significant additional investment. It is important to recognise that existing spill frequency levels reflect a combination of regional environmental conditions (such as urban rainfall), asset inheritance (such as the proportion of combined sewers) and historic opportunities to invest in improvement that could have reduced spill frequency. On the latter point, the previous section explained how historic interventions needed to be demonstrably cost beneficial in reducing harm, and that it was more difficult in the North West to justify significant interventions to reduce spill frequency.

[4] https://www.data.gov.uk/dataset/19f6064d-7356-466f-844e-d20ea10ae9fd/event-duration-monitoring-storm-overflows-annual-returns

Figure 8: Industry average number of spills 2020-22



Source: *UUW analysis of industry EDM data*[5]

4.2.5 UUW's position to the west of the UK results in a high exposure to prevailing winds from the south west bringing warm air that is laden with moisture from the Atlantic Ocean (Figure 9). This air cools as it is forced to rise over the west Pennines high ground resulting in large totals for orographic rainfall[6]. Indeed, as acknowledged by Ofwat at PR19[7], ranked by average annual rainfall, 17 out of the top 26 wettest cities in England and Wales fall within UUW's operating area.

4.2.6 Furthermore, Ofwat's urban rainfall calculations (October 2022) dataset[8] (BN4505) demonstrates that, when normalised per 10,000 sewer connections, UUW's urban rainfall is 40% higher than the industry average (Figure 3). Therefore, as high rainfall coincides with the main urban conurbations of the North West, more rainwater falls onto hard, impermeable urban surfaces and so enters the wastewater system relative to in other companies' areas. High rainfall results in higher flooding risk and drives increased overflows spills to alleviate such risk.

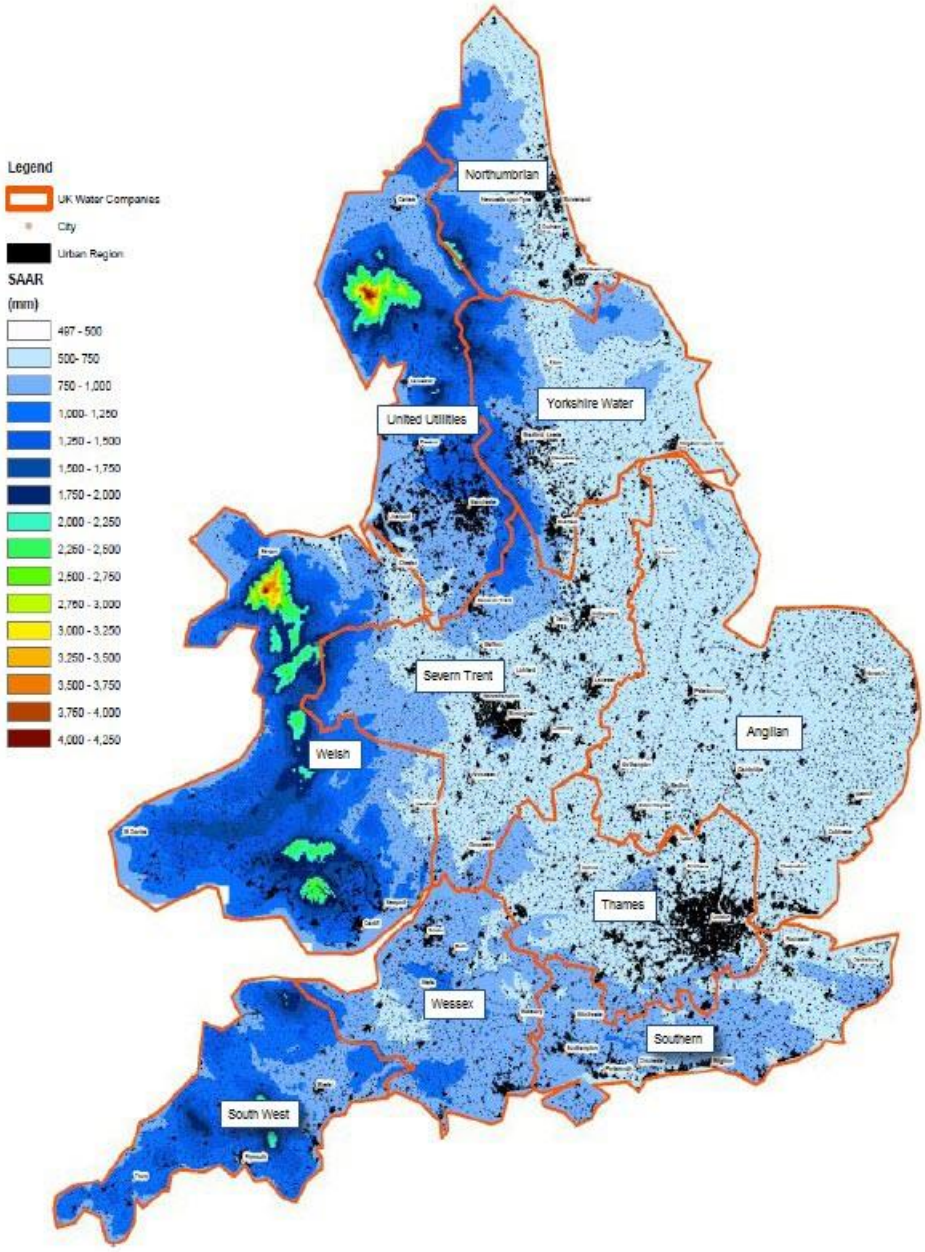
[5] https://www.data.gov.uk/dataset/19f6064d-7356-466f-844e-d20ea10ae9fd/event-duration-monitoring-storm-overflows-annual-returns

[6] Orographic rainfall is formed when air is forced to cool when it rises over hills or mountains

[7] https://www.ofwat.gov.uk/wp-content/uploads/2019/12/PR19-final-determinations-United-Utilities-Cost-efficiency-additional-information-appendix.pdf

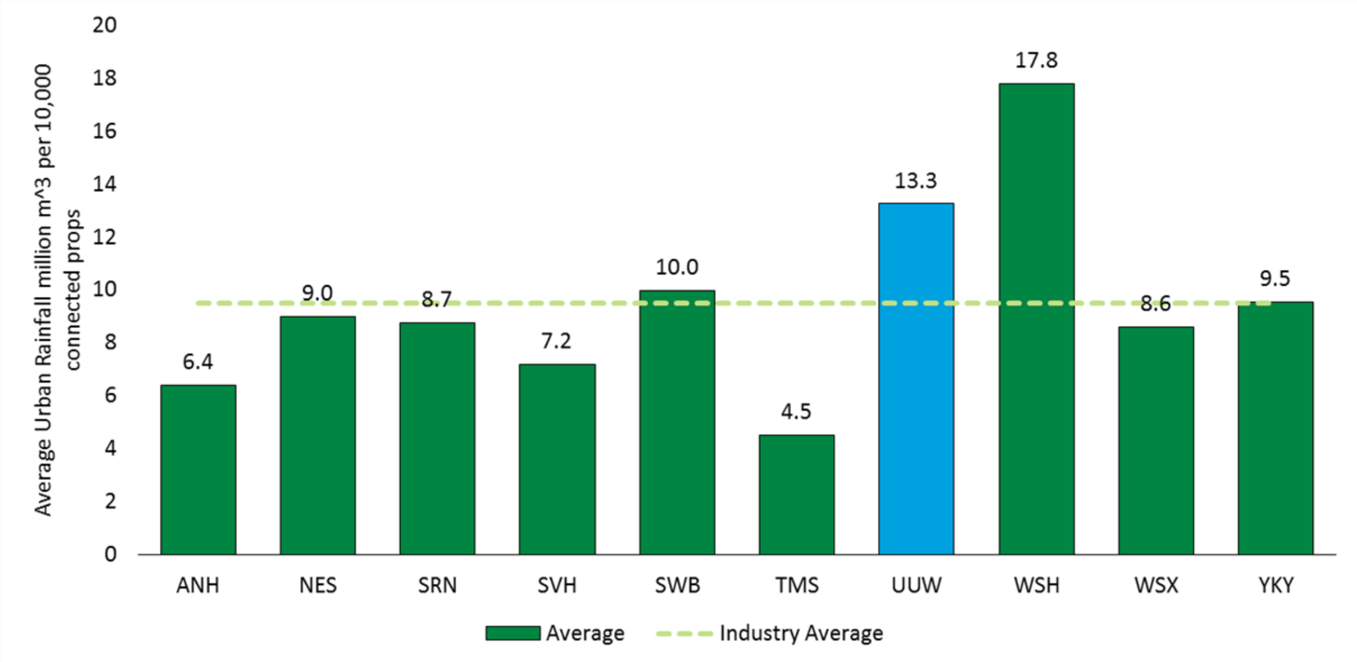
[8] https://www.ofwat.gov.uk/publication/urban-rainfall-calculations/

Figure 9: Map reflecting the Standard Average Annual Rainfall (SAAR) across England and Wales. Greater volumes of rainfall are see on the west of the country in the areas of UUW, South West Water and Welsh Water



Source: Centre for Ecology and Hydrology_GEAR

Figure 10: Urban rainfall (million m^3) (wastewater - LAD) per 10,000connected properties[9].



Source: Ofwat's urban rainfall calculations. Available here.

4.2.7 The following case study demonstrates the impact on storm overflow spill frequency of a typical UUW drainage catchment when rainfall from different regions of England and Wales is simulated.

[9] https://www.ofwat.gov.uk/publication/urban-rainfall-calculations/

5. Case Study - storm overflows regional variation due to rainfall

5.1 Summary

5.1.1 UUW has conducted a sensitivity analysis to test how regional rainfall alone influences the modelled storage volume required to address storm overflow spill frequency drivers.

5.1.2 An example catchment within the UUW region was assessed against nine other regional rainfall data sets to determine whether the scale of investment required to achieve the Government's Storm Overflow Discharge Reduction Plan (SODRP) ten spills driver was impacted.

5.1.3 The analysis has shown significant regional variation across all spill analysis criteria assessed with UUW's average spill frequency shown to be 28% more than an equivalent 2021 national average.

5.1.4 For UUW this translates to an overall storage volume to achieve the ten spills target 70% above average and a 51% above average cost based on the example catchment analysis.

5.2 Approach

5.2.1 UUW has undertaken an analysis to:

- Understand the scale of regional variations in overflow spills; and
- Highlight if the challenge to meet the Defra Storm Overflow Discharge Reduction Plan (SODRP) is significantly variable between water companies and therefore more onerous on customer bills for some water companies.

5.3 Catchment

5.3.1 A moderate sized urban catchment was selected within the UUW region. Its wastewater network is primarily combined, with 34 modelled permitted overflows and a population equivalent of approximately 160,000.

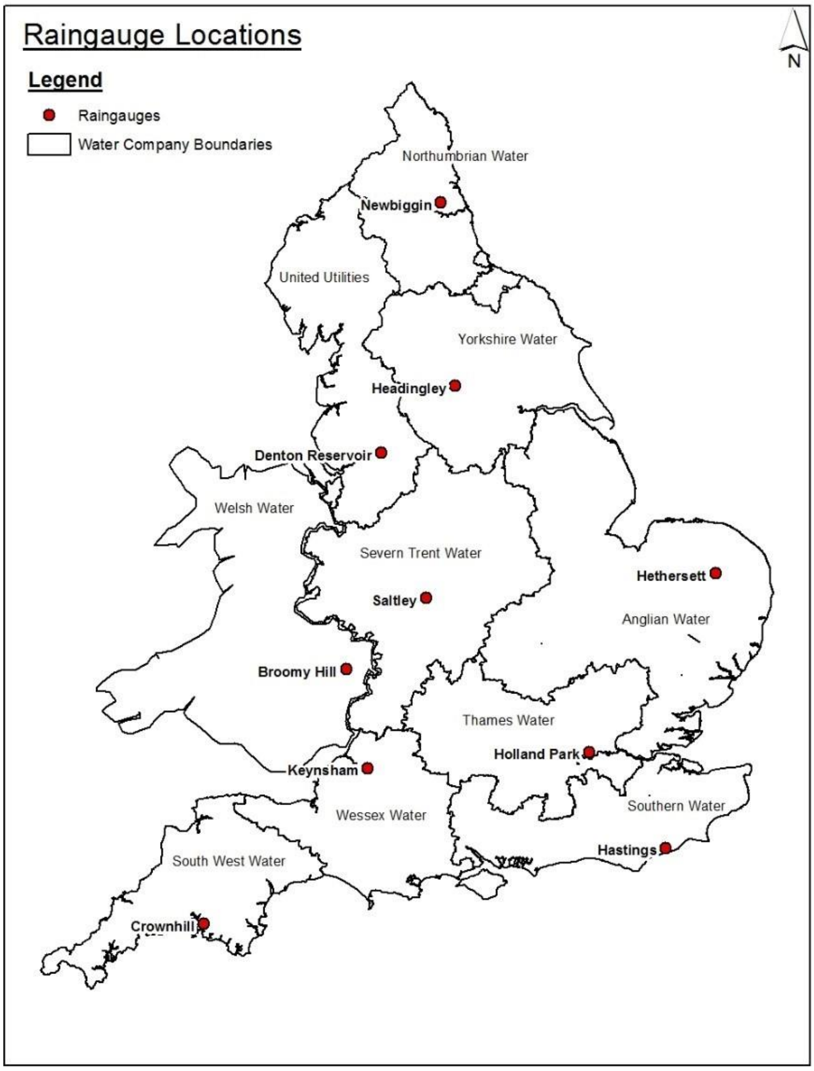
5.3.2 The analysis looked at the impact on storm overflow spills in the same catchment if rainfall from different regions within England and Wales was used.

5.4 Rainfall

5.4.1 The locations selected for the analysis were the same EA rain gauges used by the recent UKWIR research project on Climate Change (see Figure 11 below).

5.4.2 Rainfall for the year 2021 was used – this is a recent year with typical average rainfall. The data was assessed for quality and ten locations were used.

Figure 11: Rain gauge locations used for analysis



5.4.3 The names and locations of the rain gauges used in the assessment are detailed in Table 2 below.

Table 2: Locations used in rainfall analysis

Rain gauge name	Rain gauge location
Broomy Hill	Hereford
Crownhill	Plymouth
Denton Reservoir	Stockport
Hastings	Hastings
Headingley	Leeds
Hethersett	Norwich
Holland Park	London
Keynsham	Bristol
Newbiggin	Newcastle
Saltley	Birmingham

5.5 Modelling Approach

5.5.1 The 2021 rainfall data for each regional rain gauge was simulated in the catchment network model to represent the expected storm overflow spill levels if located in that region. The storm overflow spill data was extracted and spill frequency, volume and duration were calculated for all overflows and indicative solutions were developed to meet 10 spills per annum. This included a calculation of required storage volume and the associated costs. For consistency and comparability, the storage volume in all cases was calculated using the 10 spill storage curve derived for UUW's DWMP with costs based on Price Review 24 cost curves.

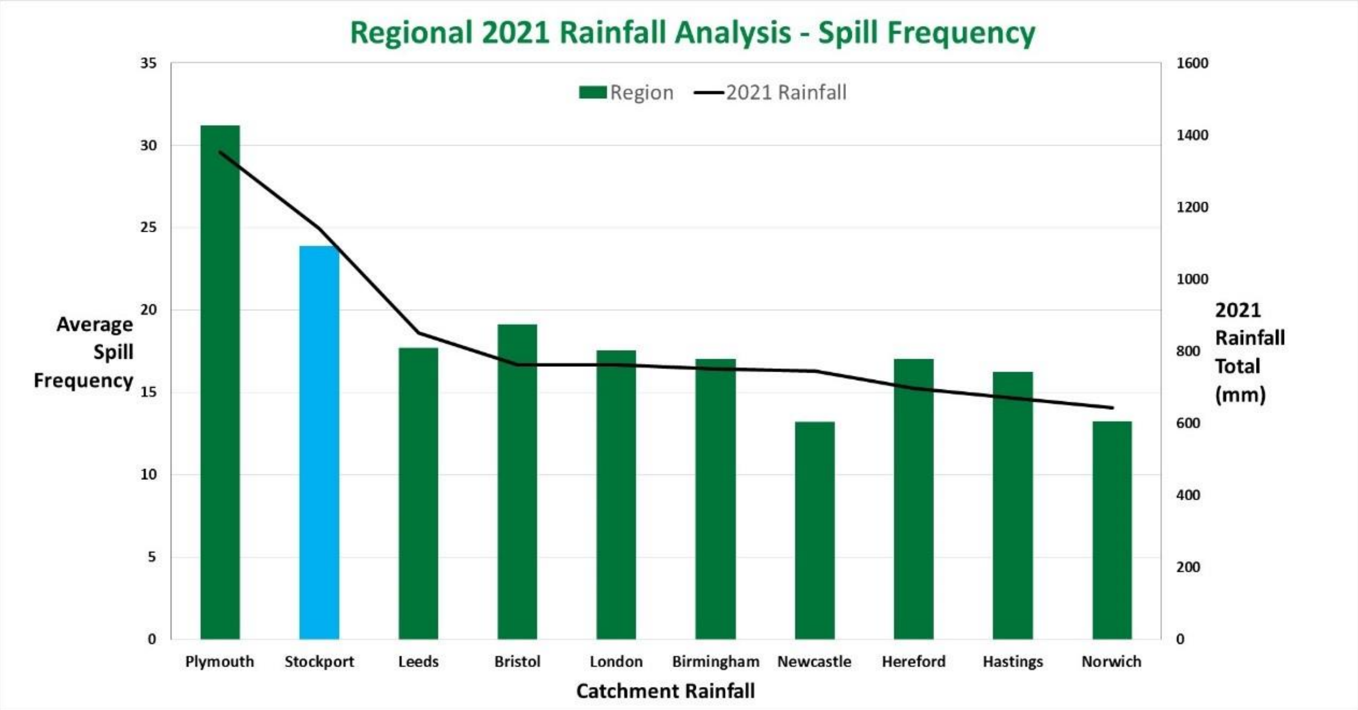
5.6 Results

5.6.1 The following figures demonstrate, for the same example catchment when modelled with different regional rainfall, the impact on:

- Average spill frequency of all storm overflows (Figure 12 below);
- Average spill volume (Figure 13 below);
- Average spill duration for each region assessed (Figure 14 below);
- Total storage volume to achieve 10 spills per annum (Figure 15 below); and
- Total storage cost to achieve 10 spills per annum (Figure 16 below).

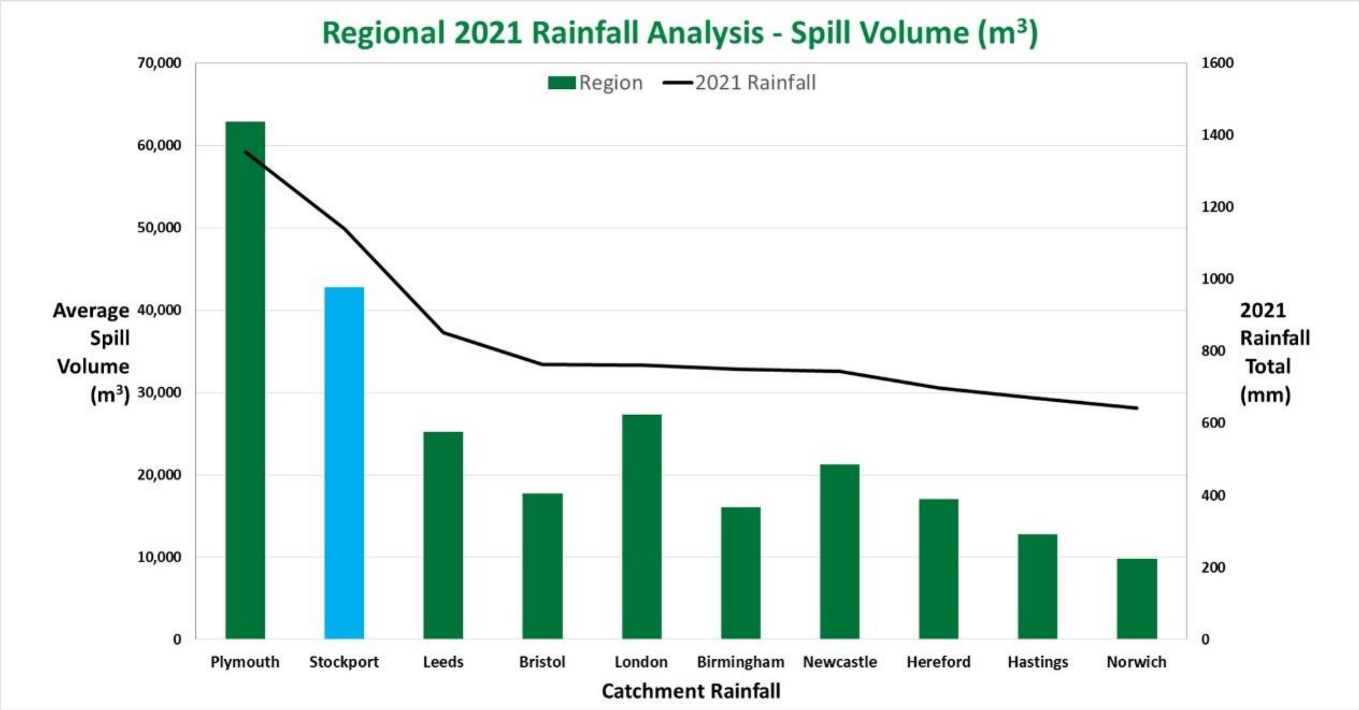
Stockport, the UUW rain gauge location, is highlighted in all graphs for ease of comparison against other regions.

Figure 12: Average spill frequency of all storm overflows by regional rainfall



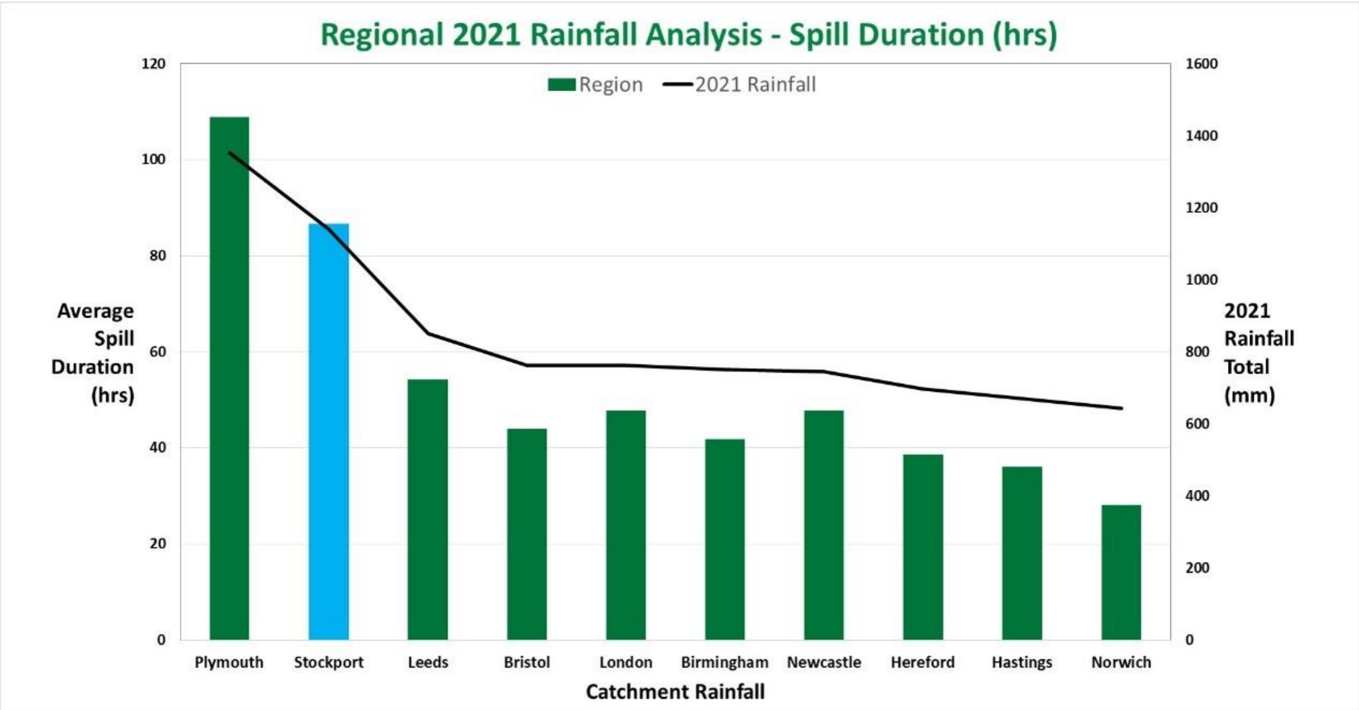
Source: UUW analysis of rainfall and modelled data.

Figure 13: Average spill volume of all storm overflows by regional rainfall



Source: UUW analysis of rainfall and modelled data.

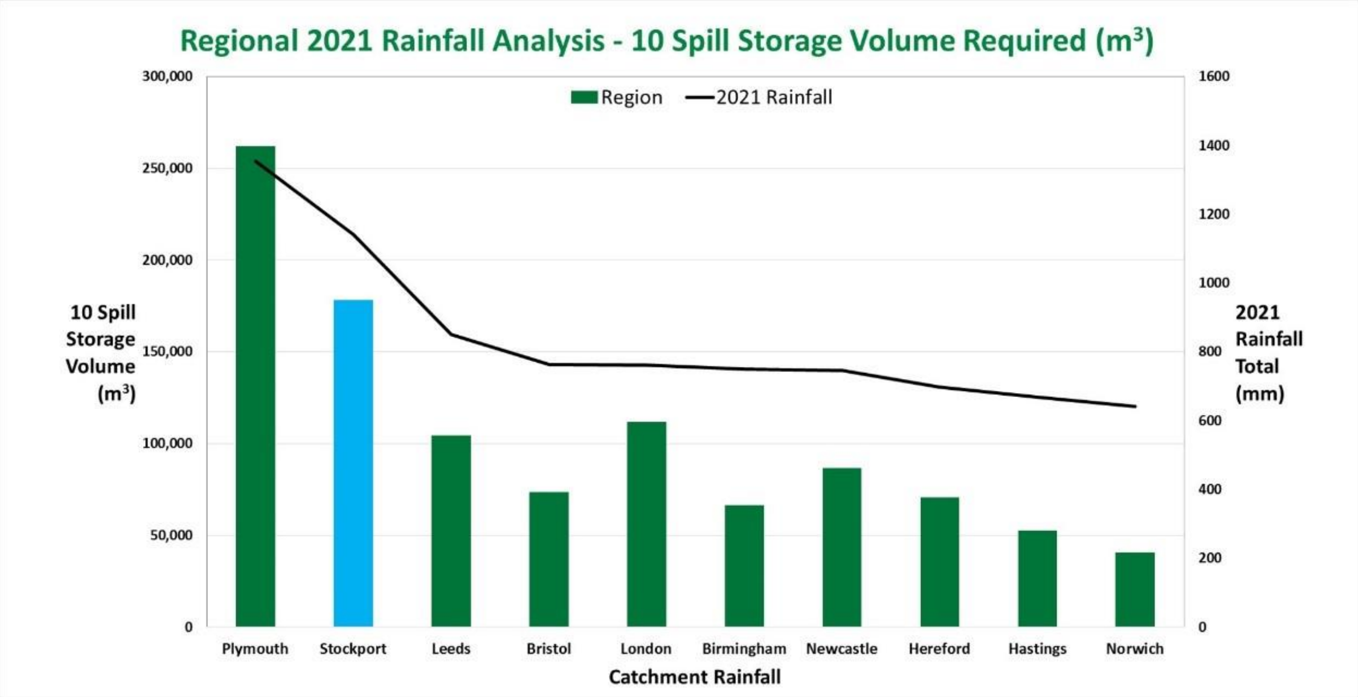
Figure 14: Average spill duration of all storm overflows by regional rainfall



Source: UUW analysis of rainfall and modelled data.

5.6.2 The findings demonstrate that the average spill duration and volume of all storm overflows within the test catchment correlates strongly to the amount of rainfall recorded at the individual regional rain gauges. The greater rainfall totals recorded in Stockport and Plymouth clearly result in the same catchment having a considerably greater average spill volume (Figure 13 above) and duration (Figure 14 above) than those locations with less annual rainfall, with this being significant given that Ofwat's methodology for measuring spills will count long duration spills as multiple spills.

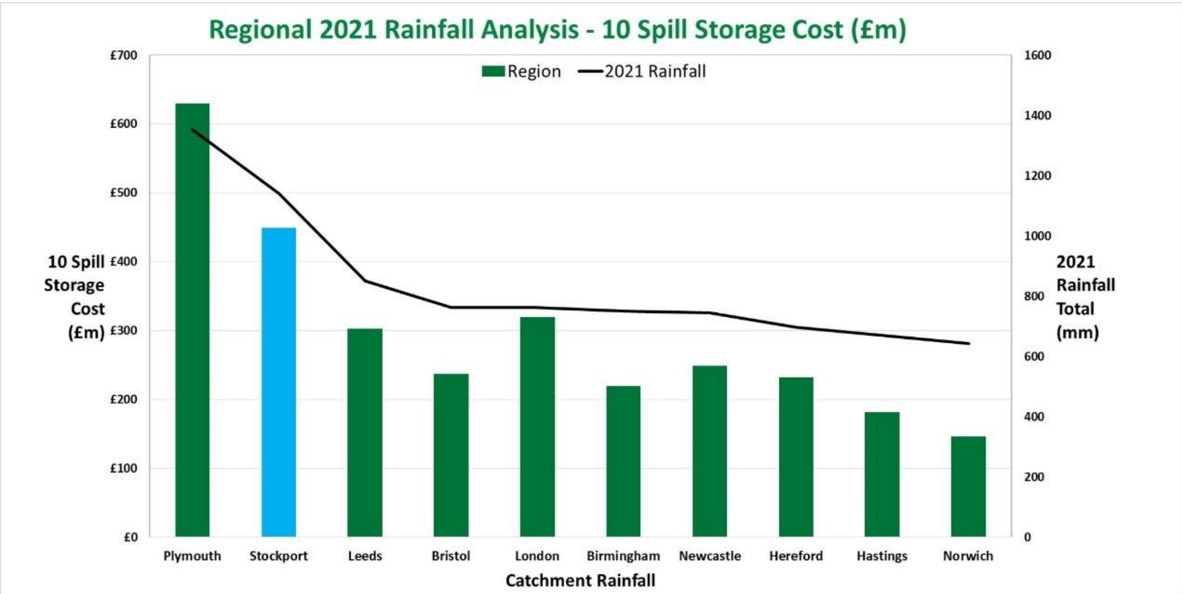
Figure 15: Total storage volume (m^3) to achieve 10 spills by regional rainfall



Source: UUW analysis of rainfall and modelled data.

5.6.3 The compounded result of the findings observed in Figure 12, Figure 13 and Figure 14 is that to achieve an average spill frequency of ten times per annum at storm overflows in the UUW region (Stockport rain gauge, highlighted), the total volume of storage required to be built (or avoided) is significantly greater than most regions in England and Wales as shown in Figure 15 above. The further consequence of this greater storage volume is that a far greater requirement of financial investment to meet the same outcome, purely driven by different rainfall (see Figure 16). This is also supported by the independent findings of the Storm Overflow Evidence Project which concluded that 35 per cent of the investment required to meet the standard of 10 spills per annum set out in the SODRP would fall in UUW's area.

Figure 16: Total cost (£m to achieve 10 spills by regional rainfall



Source: UUW analysis of rainfall, modelled data and forecast costs to build storm storage.

5.6.4 Table 3 summarises the percentage variation for each analysis type and region relative to the average of the ten regional results.

Table 3: Comparative spill frequency and SODPR requirement analysis

	2021 - Relative difference (%) to the average of all results									
	Plymouth	Stockport	Leeds	Bristol	London	Birmingham	Newcastle	Hereford	Hastings	Norwich
Rainfall total	62%	36%	2%	-9%	-9%	-10%	-11%	-17%	-20%	-23%
Spill frequency	68%	28%	-5%	3%	-6%	-9%	-29%	-8%	-13%	-29%
Spill volume	149%	69%	0%	-30%	8%	-37%	-16%	-33%	-50%	-61%
Spill duration	104%	62%	2%	-18%	-11%	-22%	-11%	-28%	-32%	-47%
10 Spills	150%	70%	0%	-30%	7%	-37%	-17%	-33%	-50%	-61%
Storage Volume	112%	51%[10]	2%	-20%	8%	-26%	-16%	-22%	-39%	-51%

Source: UUW analysis of rainfall and modelled data.

[10] i.e. the cost to deliver the SODRP 10 spills per annum spill target in the test catchment is **51%** more expensive than an equivalent national average if the same catchment was located elsewhere in England or Wales

5.7 Conclusion

5.7.1 The analysis has shown significant regional variation across all spill analysis criteria assessed.

5.7.2 A simple consequence of more regional rainfall (and regional rainfall patterns) means UUW's average spill frequency is shown to be 28% more than an equivalent 2021 national average with comparison to some regions being more than 50% higher. The impact of the greater rainfall also generates an even larger overall spill volume and duration when compared to the 2021 national average.

5.7.3 Considering the SODRP 10 spills per annum target, the greater spill frequency, volume and duration translates into significant variation in the scale of solutions and costs. For UUW this translates to an overall storage volume, to achieve the 10 spills target, 70% above average and costs which are 51% above average based on the example catchment analysis. Whilst not the largest variation, the analysis still demonstrates the impact on the challenge faced within the North West compared to most regions in England and Wales, purely down to rainfall variation.

5.7.4 Regional variation follows a very similar pattern to the average spills reported in the 2021 EDM return. This reinforces the message that until companies start to invest on overflow spill reduction programmes (AMP8 onwards) to get a level playing field, any overall company spill levels is very much regionally biased and should be considered in any future ODI. UUW consequently has a much bigger challenge (size and cost) to meet the SODRP targets.

5.7.5 In the UUW region, we already have a large average spill variation, +/-40 spills per annum average between Cheshire and Cumbria. The test catchment used in this analysis represents an area with average rainfall within the UUW region. We can expect regional variation to the cost percentage in this analysis but it is safe to conclude that there is a significant cost premium to deliver the SODRP outcome for UUW when compared to other water companies. Please note the WINEP costs for overflows are derived from modelled and costed solutions and not based on the regional comparative analysis undertaken here.

6. Investing in a stronger, greener, healthier North West

6.1 Summary

6.1.1 Our AMP7 enhancement programme for storm overflows has largely been focused on reducing environmental harm from discharges, primarily through the provision of additional network capacity. However, customers have told us that they want to see major improvements to reduce the number of storm overflow spills no matter how diluted by rainfall they may be. This has also been reflected in the new SODRP requirements. UUW has therefore submitted an ambitious plan to Defra to tackle storm overflows and meet these new requirements. If agreed by our regulators, our plan will deliver the largest investment in storm overflows since privatisation of the water industry. We will target 437 sites in the next 5 year planning period and circa 1,500 in our long-term plan, in total reducing spills by over 56,000 per year and improving water quality. To get a head start on this programme, we have agreed an early start programme with our regulators and are implementing short-term operational interventions to deliver immediate spill benefits through our Better Rivers programme.

6.2 Better Rivers

6.2.1 UUW has proposed an ambitious enhancement programme for overflows to meet new requirements, and we have started early on that work. Additionally we have launched our Better Rivers Better North West programme that puts customers and the environment at the heart of what we do. As a direct result of our operational activity, we are also reducing spill frequency from storm overflows in the short term whilst permanent solutions are delivered.

6.2.2 In addition to our enhancement plan we are making changes on the ground today endeavouring to deliver spill reduction and other benefits as soon as possible. This includes an early start programme on overflow enhancements, which was agreed with the regulators and is underway, and work under our 'Better Rivers Better North West' programme. Launched in 2022 our Better Rivers programme includes our roadmap to improve accessibility and river health in our region. Our pledges are summarised in our published document[11].

6.2.3 As part of our Better Rivers plan, UUW has hired a new team of six River Rangers to patrol the river banks of the North West, engaging with local communities, checking on company assets and prioritising maintenance and the clean-up of litter and debris. They will also be carrying out sampling to allow the company to better understand river water quality across the region. Our River Rangers have been promoting the importance of river health and what UUW is doing to play our part.This has captured the interest of local radio stations and national news outlets which in turn raises awareness. This is just a part of our wider plan; in addition we are:

- Using specially trained dogs to identify surface water that has been contaminated with additional drainage, for example where washing machines have been connected to the wrong drainage system (Figure 17);
- Working in partnership with local community groups to organise local volunteering events including litter picking, balsam bashing and Pennywort removal;
- We have planted 500 new trees;
- Working with farms and agriculture to reduce over-land run off to help protect river health;
- Trialling new innovative measures at WwTW to target spill reduction. If successful these intervention types could be used as part of future mainstream enhancement solutions; and

[11] https://www.unitedutilities.com/corporate/newsroom/latest-news/united-utilities-publishes-road-map-to-better-river-health/

- Increasing transparency of data through development of a new EDM portal to view discharges from storm overflows in near real time and hosting our first Environmental AGM in 2022.

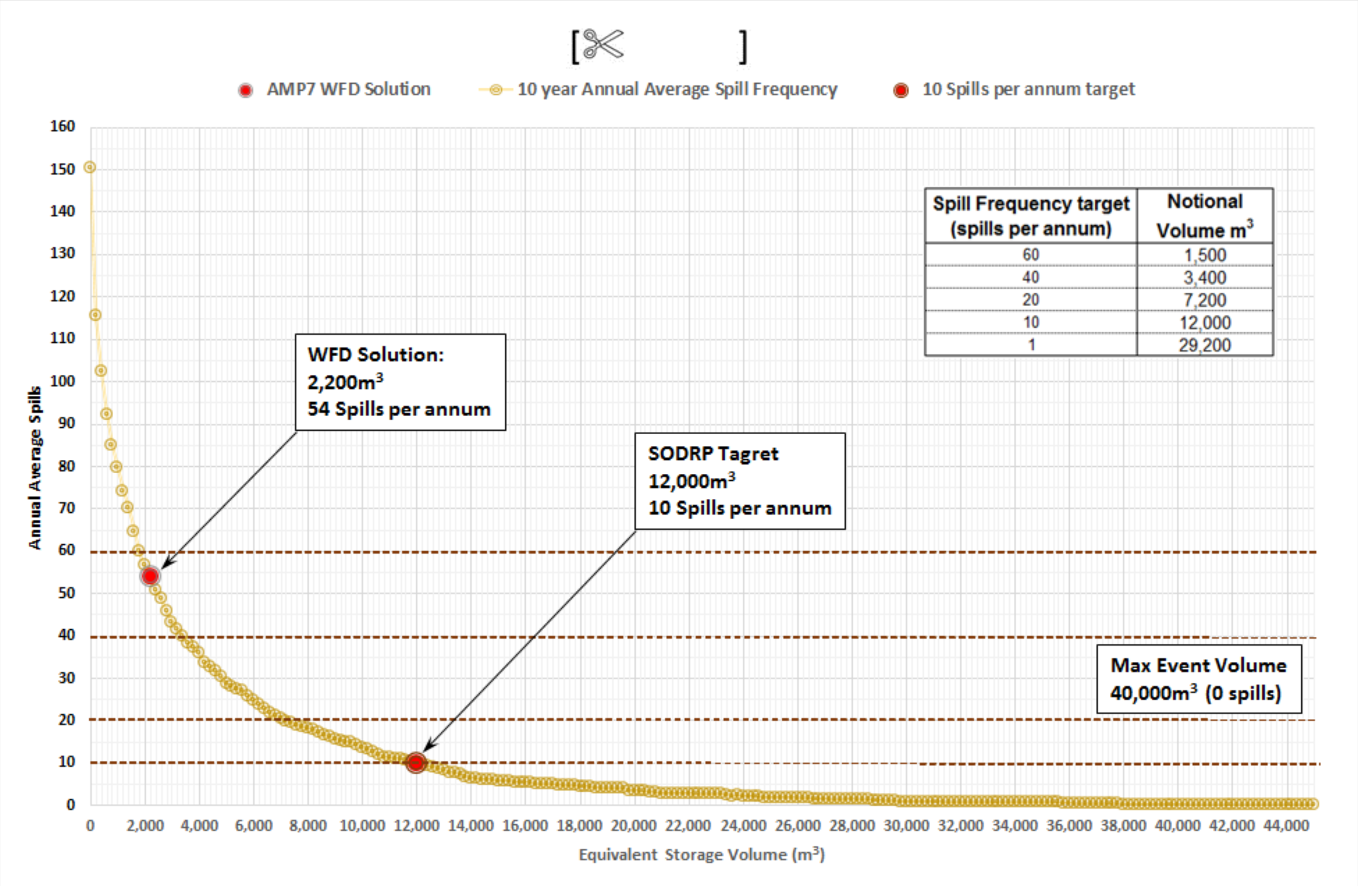
Figure 17: Activities carried out as part of Better Rivers Better North West programme

6.3 Our delivery plan

6.3.1 Past enhancement investment has been targeted at reducing the impact of storm overflow discharges on the environment (rather than spill numbers as a target). The past investment has resulted in additional sewer capacity usually through the addition of a storm water storage, but the level of storage required to meet water quality targets is much less onerous than the volume of storage required to meet future spill frequency requirements. For example, Figure 18 demonstrates the volume of storage that would be required to meet the requirements of the WFD (2,200 m^3) versus the volume of storage required to meet a 10 spills per annum target (12,000 m^3) –more than five times more storage must be constructed to meet the spill frequency target than to satisfy current environmental harm drivers.

6.3.2 In AMP7 the modelled spill frequency reduction as a result of our AMP7 enhancement programme provides a regional average spill reduction of 0.7 per annum by the end of the AMP. All solutions within our AMP7 programme were subject to a cost-benefit assessment to ensure that we are delivering the best value for customer. The level of spill reduction is reflective of our programme that is not being driven by spill frequency reduction but by the ambition to eliminate harm. The AMP7 modelled baseline (encompassing of AMP7 enhancement improvements) shows a ten-year average spill frequency of 75,060 annual spills, equivalent to 32.9 average spills per storm overflow.

Figure 18: Demonstration that the removal of high frequency, low volume spill doesn't change the quantum of costs to meet SODRP

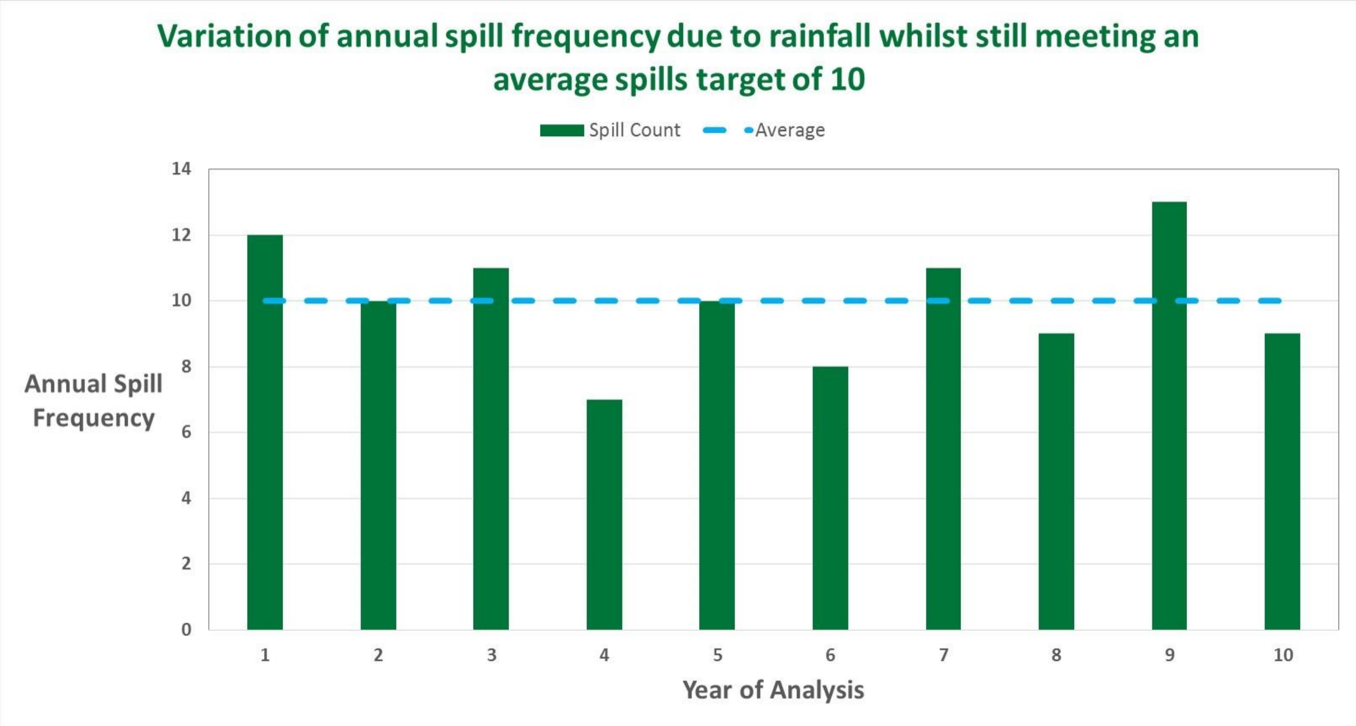


Source: UUW modelled data.

6.3.3 The AMP8 enhancement programme is targeting spill reductions at 437 storm overflows in AMP8 at a cost of £3089.43 m. It is anticipated to deliver over 600,000m3 of new storage capacity, an increase in treatment capacity at 37 WwTWs, and implementation of over 170 sustainable drainage solutions (SuDs). To design and deliver a programme of this size and scale will take a huge amount of resource and time.

6.3.4 We have used hydraulic network model outputs to design and forecast the modelled spill reduction of our AMP8 programme. This approach is based on the annual average spill frequency (using ten-year' time series rainfall) and therefore the annual observed spill frequency will vary according to actual rainfall year-on-year – see Figure 19 below.

Figure 19: Illustrative example showing the variation of annual spill frequency due to rainfall whilst still meeting the average spill target



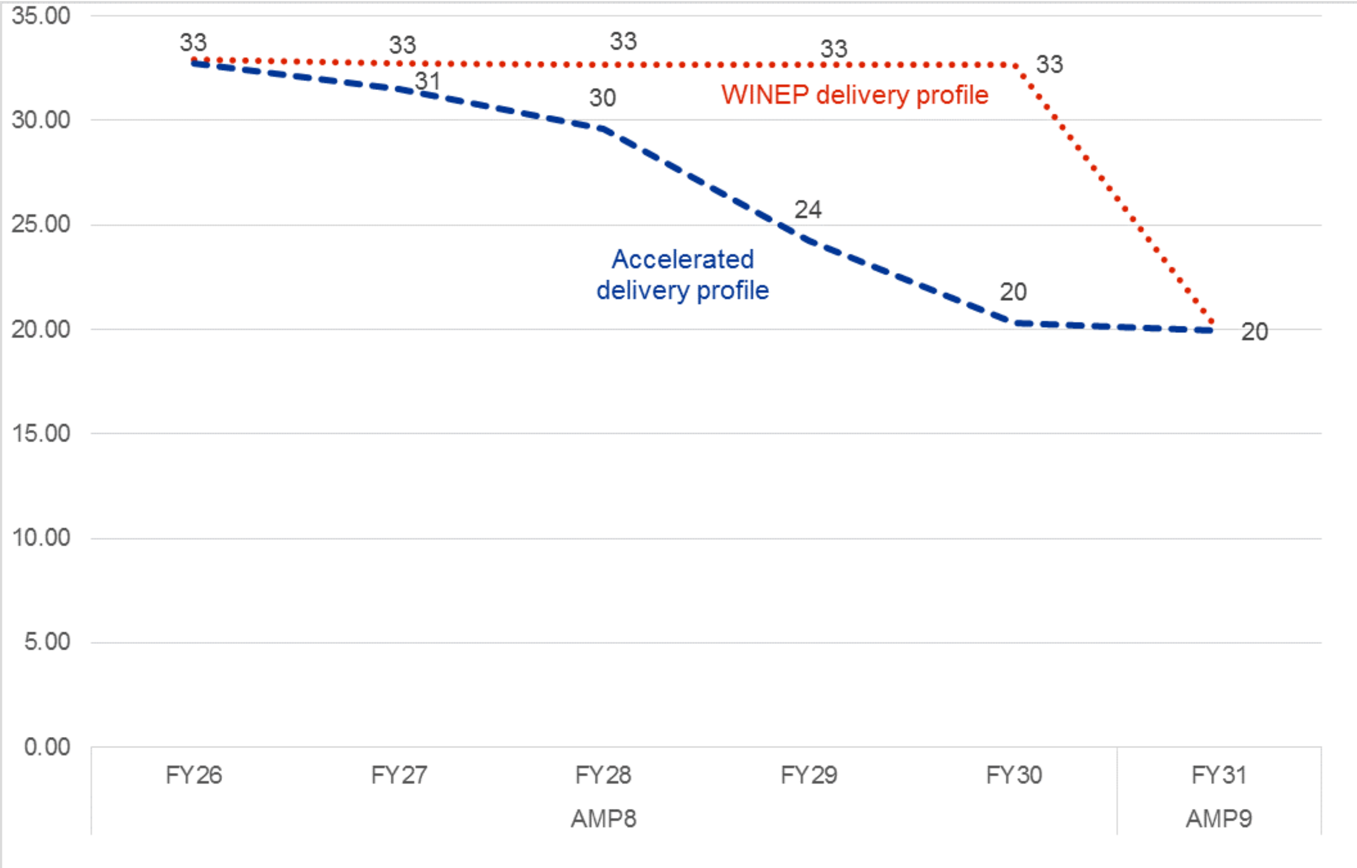
Source: Illustrative example only.

6.3.5 In addition, the year in which a project completes will only deliver a proportion of the total spill reduction benefit for the project. The full benefit will be realised in the next full calendar year following implementation. As spill reporting is a calendar year measure, the reporting will cover years 2025 to 2029. The majority of WINEP schemes have a regulatory date of 2030 and so fall outside of the AMP8 reporting window with the vast majority of the spill benefit being reported in AMP9. UUW recognises the importance of reducing discharges from storm overflows as soon as possible and so have challenged our delivery teams to put in place new streamlined processes that will enable more efficient delivery of our AMP8 programme. This includes:

- Early investment through the accelerated programme which will help to bring forward project delivery of 154 sites;
- Starting detailed project design in AMP7 (2023) to ensure rapid deployment of assets, teams and contracts in AMP8; and
- Maximising design standardisation and modularisation and the use of global markets for an enhanced delivery model.

6.3.6 Our plan accelerates our AMP8 programme ahead of the WINEP delivery dates to bring forward over 28,000 spill reductions into AMP8. Figure 20 below represents the difference between the WINEP delivery profile and the accelerated profile included within our business plan.

Figure 20: AMP8 spill reduction delivery profile based on modelled spill reduction in the year of delivery

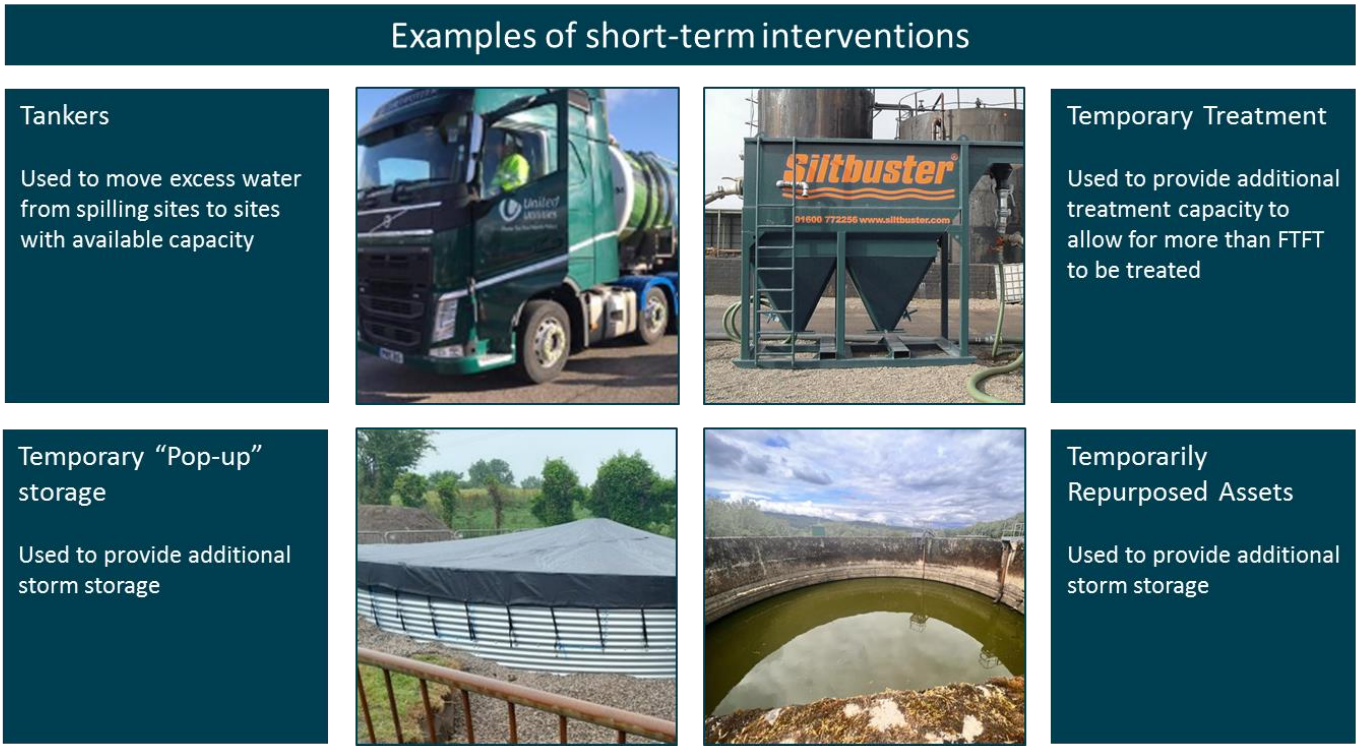


Source: AM8 WINEP and PR24 Data Tables.

6.3.7 With our accelerated delivery profile, UUW will deliver a steady spill reduction throughout AMP8 to achieve a modelled spill frequency of 20 spills per overflow, using Ofwat's measure of spills, by the end of FY30. This is a significant improvement from the WINEP programme that would deliver an average modelled spill frequency of 33 in the same period. However, alongside the accelerated delivery of additional capacity through the WINEP, we have also mobilised a team within our Better Rivers programme to develop short-term mitigation measures to deliver immediate reductions to spills frequency, ahead of our AMP8 infrastructure enhancements (which are still required). Whilst these are short-term mitigations measures, they can provide a reduction in spills through the deployment of innovative equipment and additional operational support. These measures are often operationally intensive and whilst they would not meet our new long term regulatory requirements we acknowledge the need to restore customer confidence in water companies and to deliver immediate environmental improvements. These short-term mitigation measures are being delivered from our base capital.

6.3.8 Delivery of these short-term mitigation measures is progressing at pace with accelerated approvals on design and early contractor involvement (where needed) to enable orders to be placed as quickly as possible. Orders have been and are placed within the supply chain early to ensure short-term mitigation measures can be implemented as quickly as possible once identified. See Figure 20 below for examples.

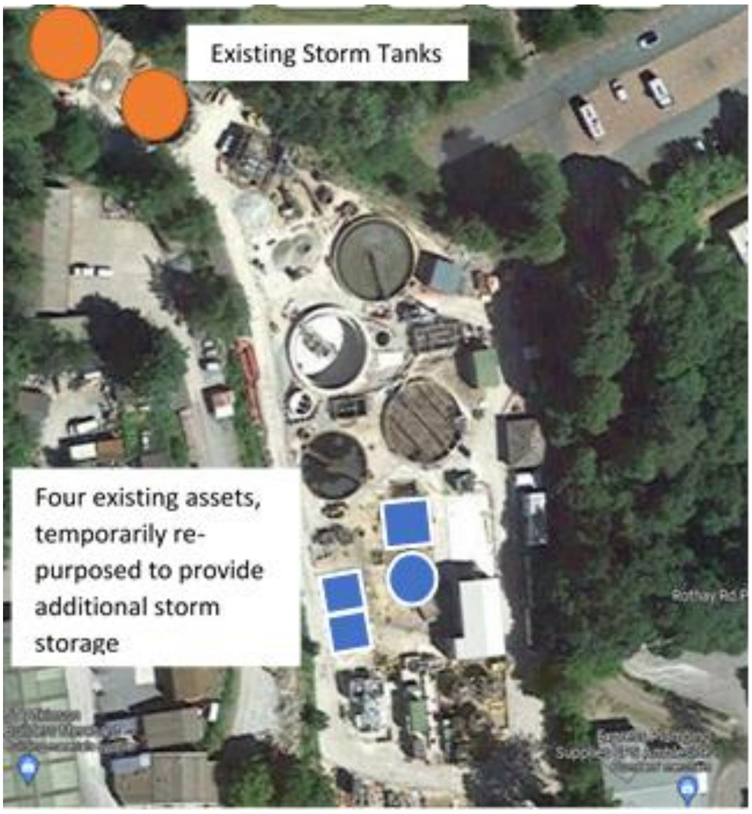
Figure 21: Example of short-term temporary interventions



6.3.9 These measures have short life spans and are only suitable for some sites. The deployment of short-term mitigation measures doesn't change the scale of enhancement needs required for the permanent solutions as these provide a long term, resilient and reliable solution that replaces and exceeds the short-term measures. Due to physical size and/or storage capacities in question, the deployability of these types of short-term mitigation measures is limited to sites with very high frequency, but low volume spills.They are not a replacement for large-scale infrastructure solutions (either blue-green or conventional grey solutions). However, they have an important role to play in our commitment to reduce spills as quickly as possible.

Site specific example

Figure 22: Ambleside WwTW



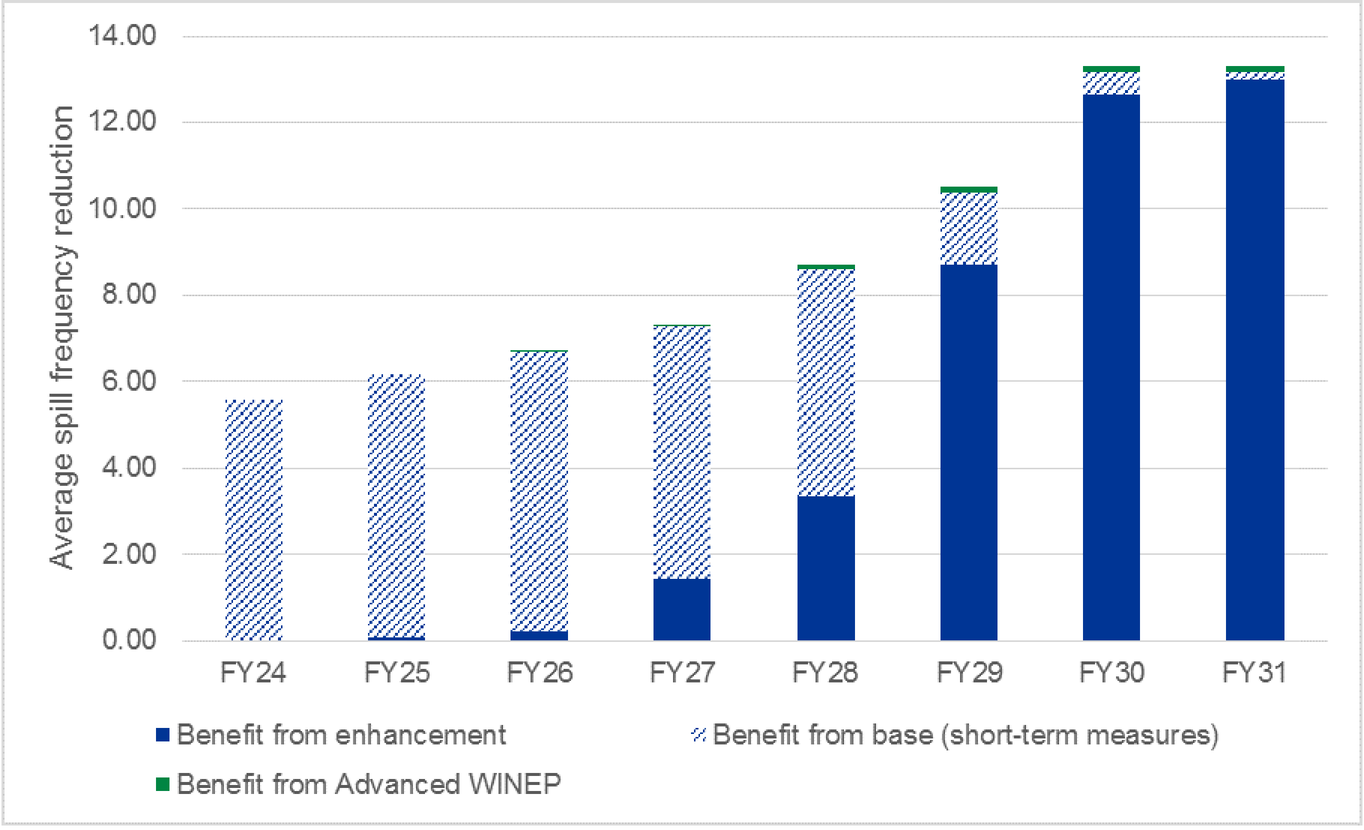
Source: Aerial image of Ambleside WwTW, Google Maps, with UUW annotation.

6.3.10 Ambleside WwTW, Figure 22 above, is located with the Lake District National Park and discharges to a tributary of Lake Windermere. This site has an AMP8 EnvAct_IMP4 driver in WINEP to reduce spill frequency to 10 spills on average with anticipated delivery in 2027.

6.3.11 In advance of the WINEP solution, UUW has identified opportunities to utilise existing redundant tanks to store more storm water. Temporary pumps and control panels have been hired to fill and drain these tanks which has enabled a temporary increase in capacity estimated to reduce spill frequency by 7-9 spills per annum.

6.3.12 This mitigation measure does not deliver the environmental outcome required by WINEP, and the temporary pumps and pipes do not have the resilience, telemetry or protections that would be required in a permanent solution, but the measures will contribute to some spill reduction during the design and construction of a new, larger and permanent storm tank at this site.

Figure 23: Spill frequency improvement from modelled baseline over time as a result of base and enhancement investment



Source: UUW analysis of rainfall and modelled data.

6.3.13 Figure 23 above illustrates the relationship between the short-term mitigation measures and the permanent enhancement solutions. In AMP7 the vast majority of the spill reduction benefit is from short-term mitigation measure, whilst in AMP8 the benefit from the short-term mitigation measures reduces as the permanent enhancement investment is delivered.

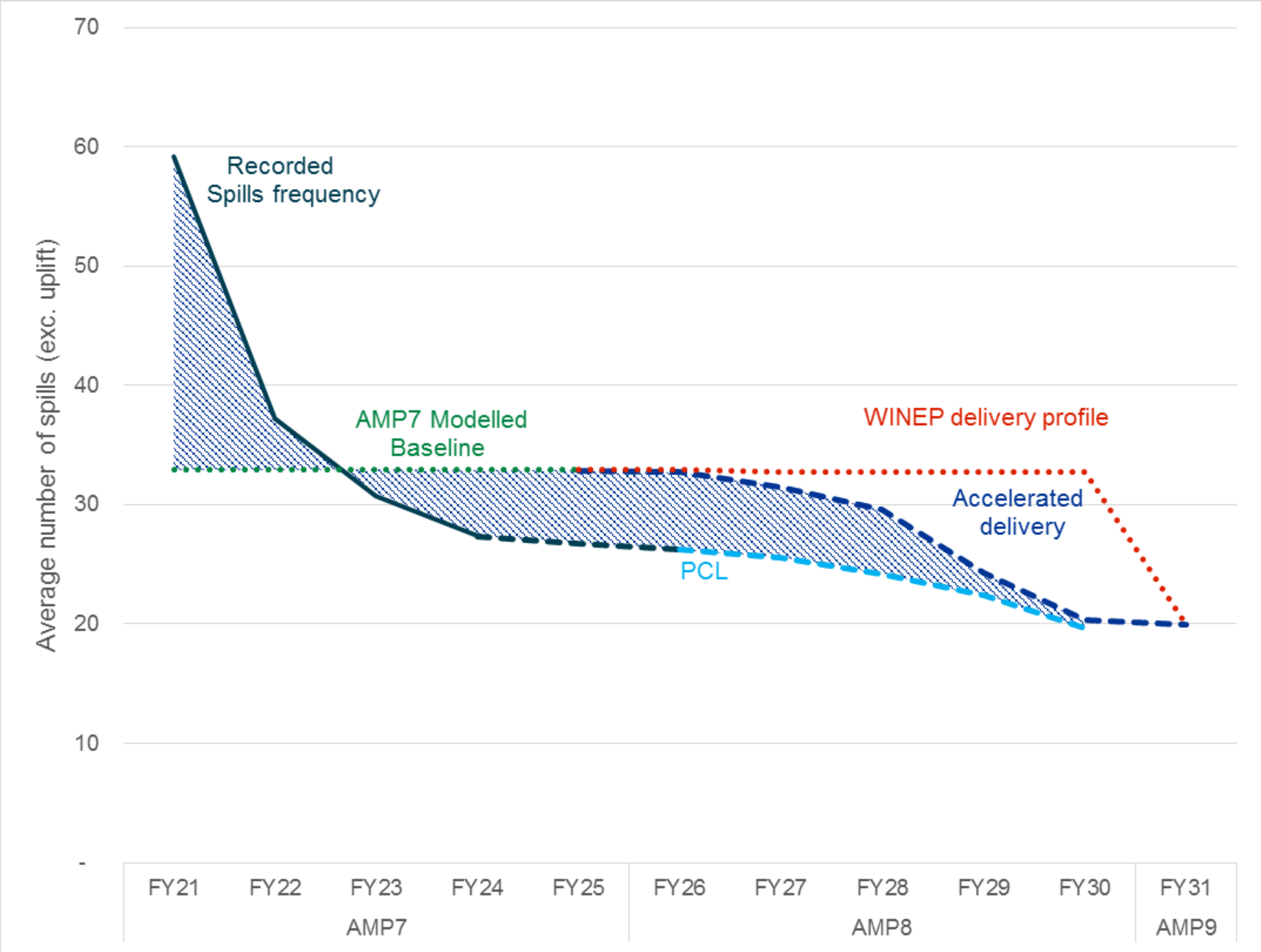
6.3.14 Additional capacity will be delivered progressively throughout AMP8 as a result of our enhancement programme. This will replace and exceed the short-term measures and will deliver the long term spill reduction requirement. The short-term mitigation measures and permanent enhancement solutions both contribute towards the same annual spill frequency improvement, the benefits are not compounding.

6.3.15 Ofwat has specified that companies should stretch themselves on what can be delivered from base but that companies should not show a deterioration in base performance[12]. To ensure that the spill reduction is not double counted, the majority of spill reduction benefit in AMP7 has been allocated to base enhancement, whilst all spill frequency improvement in AMP8 has been allocated to enhancement expenditure in the PR24 data tables (OUT2 and OUT3). In reality the benefit from short-term mitigation measures will be present in AMP7 and continue into AMP8, but will be superseded by the permanent capacity enhancement solution as shown in Figure 23 above.

6.3.16 UUW has reflected the additional/immediate environmental benefit from short-term mitigation measures within the AMP8 performance commitment level, providing a more stretching target than would otherwise be possible though the enhancement programme alone, see Figure 24 below.

[12] https://www.ofwat.gov.uk/wp-content/uploads/2023/08/PR24-BP-table-guidance-part-1-OutcomesV5.pdf

Figure 24: Performance improvement identified for short-term measures



Source: PR24 Data Tables and supporting calculations.

6.3.17 The historic and AMP7 forecast spill levels presented above do not include an uplift for unmonitored storm overflows or operability (where operability is less than 100%).

6.3.18 UUW will continue to look for additional opportunities for spill reduction outside of the enhancement programme delivering incremental reductions in spill frequency and where possible we will endeavour to take the same approach, on short-term mitigation measures ahead of enhancement, in AMP9.

Past performance

6.3.19 FY21 was the first year of reporting following the major AMP6 programme to install event duration monitors (EDM) on the majority of storm overflows. This programme required over 2000 monitors to be installed on our assets and was the first time that we had data to show the number of times our storm overflows discharged to the environment. FY21 was also the first year in which most water companies published their EDM data.

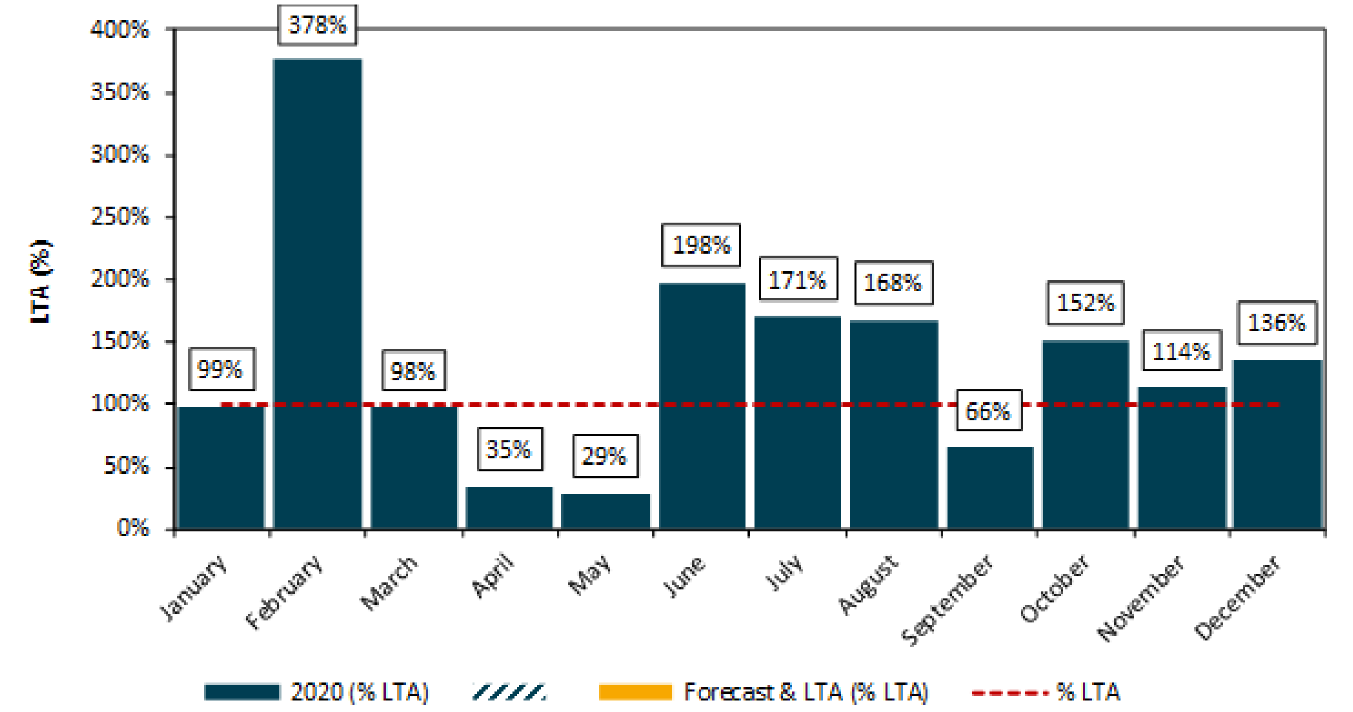
6.3.20 The total number of historic spills recorded by UUW's EDMs are reported in the Environment Agency's EDM annual return and published on our website: here.

6.3.21 The green line in Figure 24 above shows the modelled baseline expected ten-year average spill frequency for AMP7 and takes into account improvements as a result of the AMP7 WINEP enhancement programme. The modelled spill frequency presents the number of spills that we would expect in our region based on our wastewater system and other factors such as rainfall. Modelling data is based on the best available information and will improve over time as data is refined.

6.3.22 In 2020/21, the number of spills reported is significantly above the modelled baseline, we have observed that this is mainly due to a) above average rainfall in 2020, and b) project and data infancy.

6.3.23 Figure 25 below compares the rainfall in 2020 against the long-term average. This shows that 6 out of 12 months were significantly above average rainfall, with February being particularly wet. This is also reflected within long term rainfall data which shows calendar year 2020 as being one of the wettest in the last 20 years.

Figure 25: Monthly rainfall observed in 2020 as a percentage of the Long Term Average (LTA)



Source: UUW analysis of Met office rainfall data.

6.3.24 UUW has taken a systematic approach to improvements. We developed a new digital platform to improve efficiency of data reporting and to enable some system analytics to identify potential data errors from the millions of data points that we receive.

6.3.25 In addition to the investment in our digital infrastructure, we have also recruited additional subject matter experts to increase our capability to identify, investigate and validate spill data. In addition to our ongoing WINEP investigations (SOAF), we have undertaken root-cause analysis at our highest spilling overflows and where possible have implemented measures to reduce spill frequency. These include enhancements in our analytical capabilities, operational optimisations, and the initial implementation of short-term spill mitigation schemes. This is evident in our 2021/22 EDM return where we report a significant reduction in spill frequency as a direct result of the improvements that have been made.

6.3.26 In 2022/23 we observe that the modelled baseline is higher than the 2022 recorded data. This is due to a combination of the continuing deployment of short-term mitigations, alongside lower than average rainfall. In 2022/23 we also continued to expand our implementation of spill reduction measures beyond our AMP7 enhancement programme, such as optimisation of assets to increase site performance e.g. implementation of automatic returns on storm tanks at remote unmanned sites. Previously we would have relied on staff to manual return storm tanks.

6.3.27 The nature of the assets used to implement short term mitigation measures means that they are not suitable for all sites. For example, in the case of using a vehicular tanker to capture storm flows, for UUW the typical maximum volume allowed to be carried by road is 28m^3 of water, so sites which have a daily spill volume of greater than 28m^3 are not suitable for this solution. Other deployable assets are similarly constrained so the volume of sewage to be captured (which would otherwise have been discharged via an overflow) limits the use of these measures to small-volume, high-frequency spilling sites. For this reason, there is a finite limit to the extent to which short-term mitigations can be used. We anticipate having deployed measures to most suitable sites before the end of AMP7 and therefore do not expect significant further annual reductions in FY25. Even though the number of spills will still be volatile in response to annual rainfall volumes and patterns, we have ambitious plans to offset the impact of rainfall by maintaining the short-term measures in place throughout AMP8, until the additional infrastructure is permanently installed. In parallel, as described earlier in Section 6, we will be accelerating the delivery of our storm overflow WINEP programme to secure permanent spill reductions as early within the AMP as possible. As such, our performance commitment levels reflect a lower, and more ambitious spill reduction than models suggest our network is capable of. This reflects the additional performance we are delivering early through our use of short-term spill mitigation, and an accelerated delivery of our WINEP programme.

6.4 Storm overflow reduction plan

6.4.1 The analysis carried out by Stantec for the Storm Overflow Evidence Project identified that 35 per cent of the investment required to meet the standard of 10 spills per annum set out in the Storm Overflow Discharge Reduction Plan (SODRP) would fall in UUW's area. This broadly aligns with the scale of investment need we have identified following the WINEP guidance and means we have a sizeable programme of work to deliver in the next 25 years.

6.4.2 We have categorised all storm overflows in line with the criteria in the SODRP and reviewed this with the Environment Agency and Natural England. In doing this we have been able to rely on our extensive integrated catchment modelling capability along with our full coastal modelling capability.

6.4.3 In our AMP8 WINEP submission, we developed a plan that:

- Delivers the trajectory set out in the SODRP by improving more than 38 per cent of high priority overflows;
- Improves 437 storm overflows to achieve a reduction in spill frequency across UUW to an average of 20 spills per annum by 2030;
- Proposes an Advanced WINEP that will enable us to work more flexibly to deliver the rainwater management solutions and partnerships required as part of the long-term adaptive plans required for our sewerage systems, as well as advancing the techniques, relationships and approaches to mainstream these solutions and sharing knowledge gained;
- Includes screens and chambers for all overflows in the programme that require one, irrespective of whether the solution is blue/green only (SuDS), hybrid or grey only; and
- Starting early on our plan following the submission and acceptance of an accelerated programme that enables us to commence delivery of this substantial programme ahead of AMP8, as well as delivering earlier benefits and economic activity.

6.4.4 UUW has a history of investing in storm overflow improvements where impacts had been identified; however, these have been to meet Water Framework Directive standards, which can still leave an overflow spilling more than 40 times a year, and thus a new requirement to get to 10 spills per annum on average at each overflow represents a very substantial additional change in the compliance standard.

6.4.5 The proposal plans to meet the Defra trajectory targets of 14% of overflows improved and 38% of high priority overflows improved as shown in Table 4. The programme is appropriate in the context of the overall targets we need to meet over the next 25 years and the drive for a substantial reduction in spill frequency as soon as possible. The programme has been designed to offer customers the best blend of costs and benefits by meeting the Defra trajectory targets, addressing proven harm where we have been able to identify the best value solution and achieving a reduction in spill frequency to below 20 spills per annum in the most cost-effective way possible.

6.4.6 As we move through the 25 year programme we will have to intervene with some very challenging trunk sewer overflows which will require multi-AMP programmes to address them and the unit cost per spill reduction is going to increase as we tackle these overflows. Future AMPs will therefore contain fewer overflows but still require similar, if not greater levels, of expenditure to AMP8. We will be using AMP8 to plan for some of this major investment.

Table 4: UUW proposed storm overflow programme for AMP8 compared with SODRP targets

Overflow category	No of overflows requiring upgrade by 2050	Minimum AMP8 target no of overflows	UUW WINEP no of overflows	Minimum AMP8%
EnvAct_IMP2 high priority	450	171	198	38%
EnvAct_IMP4 other	1462	205	404	14%

Source: UUW data

6.4.7 Building on the analysis undertaken to create our AMP8 WINEP, we have additionally produced a full 25 year storm overflow phased plan that meets all targets within the SODRP. The plan has been derived to meet the Environment Act targets on High Priority sites (EnvAct_IMP2[13]) and meeting the 10 spills per annum target (EnvAct_IMP4), prioritising addressing known harm. Table 5 details the targets to be met within each investment period.

Table 5: SODRP targets by investment period

AMP9	AMP10	AMP11	AMP12
Ensure 100% of EnvAct_IMP3 addressed	Ensure 87% of high priority overflows are addressed	Ensure 100% of high priority overflows are addressed	All standalone EnvAct_IMP5
Ensure at least 75% of high priority overflows are addressed	Ensure 52% of all overflows requiring improvement are addressed	Ensure 76% of all overflows requiring improvement are addressed	Ensure 100% of all overflows requiring improvement have been addressed
Ensure 28% of all overflows requiring improvement are addressed – (AMP8 achieves 28%)			

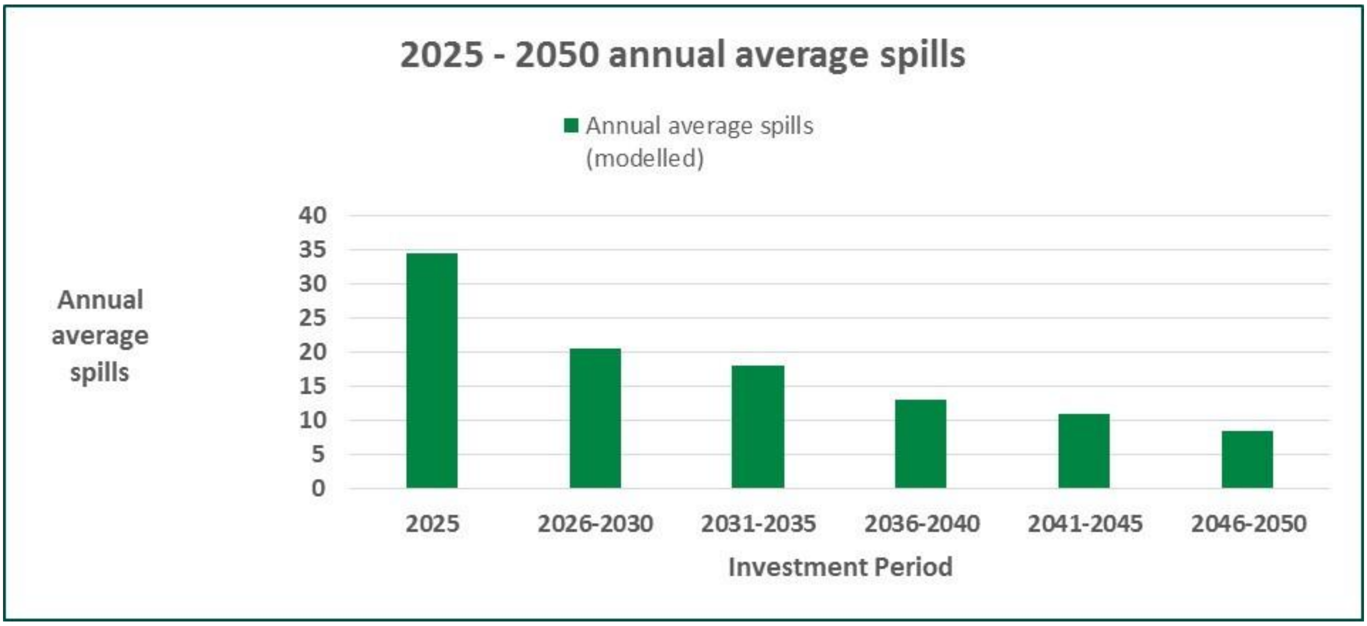
Source: Storm Overflow Discharge Reduction Plan (SODRP)[14]

6.4.8 This ambitious plan targets 10 spills or less per annum at all overflows by 2050 (Figure 26 below) and a reduction of over 56,000 storm overflow spills per year (Figure 27 below) by 2050.

[13] EnvAct_IMP2 are requirements of the Storm Overflows Discharge Reduction Plan (https://www.gov.uk/government/publications/storm-overflows-discharge-reduction-plan)

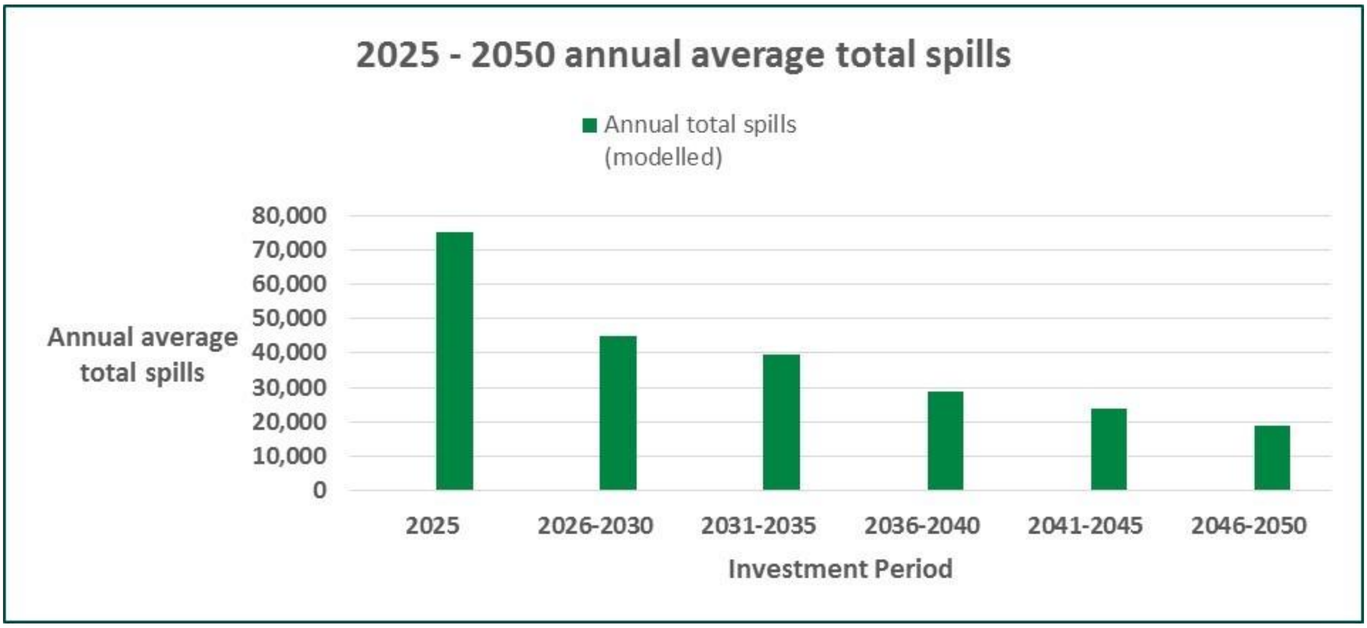
[14] *Available: https://www.gov.uk/government/publications/storm-overflows-discharge-reduction-plan*

Figure 26: Reduction in annual average spills of all storm overflows



Source: PR24 Data Tables (LS1).

Figure 27: Reduction in total spills across all storm overflows



Source: PR24 Data Tables (LS1) and supporting calculations.

6.5 Enhancement rather than maintenance

Ensuring our storm overflow programme is addressing hydraulic constraints (rather than existing or additional maintenance)

6.5.1 Extensive sewer network modelling was undertaken to develop our DWMP and WINEP storm overflow programmes. We have extensive model coverage and our modelling approach follows industry code of practice which is accepted and specified by the EA and allows us to identify where new additional capacity is needed to meet new design performance requirements. The models assume the network is operating at its' optimum and make no allowance for deteriorated performance that might result from a lack of maintenance. This means that solutions developed to address new tighter regulatory standards are built upon existing assets which are assumed to be operating at their full capacity. Therefore, no additional operating or maintenance expenditure, to meet existing obligations, are included in the proposed enhancement investments for 2025-2050. Given that the baseline for our modelling ensures that maintenance requirements are excluded, this provides confidence that the need for enhancement expenditure is certain, incremental and is driven by the new compliance standard required rather than “double counting” existing obligations that should be met through base cost allowances.

6.5.2 We ensure this approach is embedded into our ways of working through our company model guidance and the industry code of practice, where there is a requirement for historic verification of actual performance versus the model prediction. This now includes a check of the spill frequency levels measured through Event Duration Monitoring (EDM) against the forecast from the hydraulic model and is indirectly equivalent to a Stage 1 of a SOAF investigation (which aims to confirm where a high frequency of spill measured by EDM is due to hydraulic capacity issues). This provides reassurance that the need for enhancement expenditure is genuine and not a double count with base cost allowances. We have used this process to screen overflows before inclusion in the AMP8 WINEP to ensure we only include overflows that require additional hydraulic capacity. We therefore have confidence that base costs and enhancement costs will each be appropriately allocated in our submitted business plan.

6.5.3 To provide additional assurance, in our regulatory return to the Environment Agency for EDMs, we are required to identify the “Primary Reason” for any overflow that is identified as a frequently activating overflow (greater than 40 spills per year). In our regulatory return for 2021 we were a sector leader in complying with this request and our analysis showed that 70 frequently spilling overflows were attributable to “Performance” issues, which includes operational or maintenance matters, some three per cent of the total number of overflows we have. Clearly, there are occasions when operational issues do occur (for example due to power failure, lost telecom connections or asset failures) but we respond urgently to ensure repairs or mitigation works are in place quickly to prevent spills occurring or to at least minimise the number or duration of spills that result from the issues – this prevents them from becoming high-frequency spilling overflows.

6.5.4 This provides further supporting evidence that the majority of reasons for high-spilling overflows in the North West are not due to maintenance or operational issues. High spill frequency overflows that are attributed to operations or maintenance issues are expected to be resolved urgently through our base expenditure, and we have robust processes in place to identify and resolve such issues.

7. WINEP overflows programme and Advanced WINEP

<table>
<tr><th colspan="2">Enhancement submission</th></tr>
<tr><td>Title:</td><td>Storm overflows</td></tr>
<tr><td>Price Control:</td><td>Water Network Plus</td></tr>
<tr><td>Enhancement headline:</td><td>Enhancement expenditure to meet the needs of the AMP8 WINEP for overflow enhancement requirements. This document sets out where the Environment Agency require us to enhance service standards in order to deliver environmental benefits which they will enforce through by varying our Environmental Permits.
This enhancement investment is driven by the following statutory drivers:
• The Water Environment (Water Framework Directive) Regulations 2017 (including shellfish requirements);
• The Bathing Water Regulations 2013; and,
• Environment Act 2021.</td></tr>
<tr><td>Enhancement expenditure
(FY23 prices)</td><td>
<table>
<tr><th></th><th>AMP8 Capex inc TI (£m)</th><th>AMP8 Opex (£m)</th><th>AMP8 Totex (£m)</th></tr>
<tr><td>Pre RPE and Frontier Shift</td><td>3112.171</td><td>44.468</td><td>3156.639</td></tr>
<tr><td>Post RPE and Frontier Shift</td><td>3046.240</td><td>43.191</td><td>3089.431</td></tr>
</table>
The table above shows the total expenditure, inclusive of accelerated programme and transitional investment, on both a pre-efficiency (i.e. pre frontier shift and real price effects basis, consistent with the cost data tables), and a post efficiency and RPE basis (i.e. consistent with the value we propose to be recovered from price controls). All numbers referenced hereafter in this enhancement case are on a post efficiency and RPE basis.</td></tr>
<tr><td>This case aligns to :</td><td>Ww WINEP submissions and data tables CWW3, CWW9, CWW20. For full reconciliation between enhancement costs and data table lines, see enhancement mapping tabs in UUW117 – Project allocations CW3 and CWW3.</td></tr>
<tr><td>PCD</td><td>Yes</td></tr>
</table>

7.1 Introduction

7.1.1 This section sets out the enhancement case of £3089.431m to allow UUW to meet new and more onerous Environmental Permit requirements for intermittent discharges as a result of statutory drivers in the AMP8 WINEP.

7.1.2 It also covers why the need for these requirements is outside of management control, our approach to solution development and how we have ensured that costs are robust. A total of 437 intermittent discharges require upgrade to meet environmental and/or spill frequency requirements as outlined in The Water Environment (Water Framework Directive) Regulations 2017, The Bathing Water Regulations 2013 and the Environment Act 2021. Our cost estimate for this programme in AMP8 is a totex value of £3,089.431m. This includes overflows within the UUW accelerated infrastructure delivery project and Advanced WINEP programme.

7.1.3 The development of the WINEP has been informed by the key regulatory guidance including; the WINEP methodology, WINEP options development guidance, WINEP options assessment guidance, WINEP driver and supporting guidance.

7.1.4 Where possible we are making use of phasing and adaptive planning to ensure we meet statutory requirements in a way that balances costs across the AMPs and prioritises delivery of low- or no-regret measures first. This ensures we capture new statutory requirements and that we continue to meet existing ones despite changes in demand and climate change. Where there is uncertainty we are proposing investigations ahead of action so subsequent investment can be best value. This is particularly relevant in the case of investment in overflow reduction. We are proposing 11 drainage area catchment investigations under the driver code EnvAct_Inv4 the outcome of these investigations will ensure that the most appropriate solutions for the drainage areas are planned to achieve the Environment Act targets. Further detail on wastewater investigations is available in enhancement case Ww3 Investigations. We are also actively seeking partnerships to help spread costs across responsible and/or benefitting parties and have successfully developed an Advanced WINEP proposal for Rainwater Management that includes for significant partnership contributions.

7.1.5 Drivers in this enhancement case include the requirements of the Water Environment (Water Framework Directive) Regulations 2017 to meet fair share contribution to the receiving waters, the Bathing Water Regulations 2013 and shellfish requirements of the WFD to achieve 3 spills per bathing season (Bathing waters) and /or 10 spills per year, and or the Environment Act requirements of 10 spills on average per annum. Sites within the WINEP can have multiple drivers and therefore it is not possible to allocate spend to individual drivers. Table 6 gives an overview of the investment requirement based on solution types as shown in PR24 data table CWW3. This enhancement case sets out how we have determined the efficient cost of meeting these new requirements. This case includes costs of schemes primarily driven by intermittent discharge enhancement requirements. For a small number of schemes the requirements for both final effluent enhancement and storm overflow discharge reduction are within one project. To aid clarity on these projects they have been included in the enhancement case of the lead driver. Within the data tables the cost is split between drivers, therefore the scheme counted twice. Further detail of this approach is available in the CWW20 data table commentary.

Table 6: Overview of solution types identified in CWW3 and associate totex included in this enhancement case

	Number of schemes	Capex (£m)	Opex (£m)	Totex (£m)
Increase storm tank capacity at STWs - grey solution; (WINEP/NEP) wastewater	72	806.069	10.986	817.056
Increase storm system attenuation / treatment on a STW - green solution; (WINEP/NEP) wastewater	1	1.233	0.057	1.290
Storage schemes to reduce spill frequency at CSOs etc - grey solution; (WINEP/NEP) wastewater	358	1,410.026	23.789	1,433.814
Storage to reduce spill frequency at CSOs etc - green solution; (WINEP/NEP) wastewater	11	207.861	1.466	209.328
Storm overflow - discharge relocation (WINEP/NEP) wastewater	0	0.000	0.000	0.000
Storm overflow - increase in combined sewer / trunk sewer capacity; (WINEP/NEP) wastewater	0	0.000	0.000	0.000
Storm overflow - sustainable drainage / attenuation in the network; (WINEP/NEP) wastewater	171	142.635	1.117	143.753
Storm overflow - source surface water separation; (WINEP/NEP) wastewater	0	0.000	0.000	0.000
Storm overflow - infiltration management: (WINEP/NEP) wastewater	0	0.000	0.000	0.000

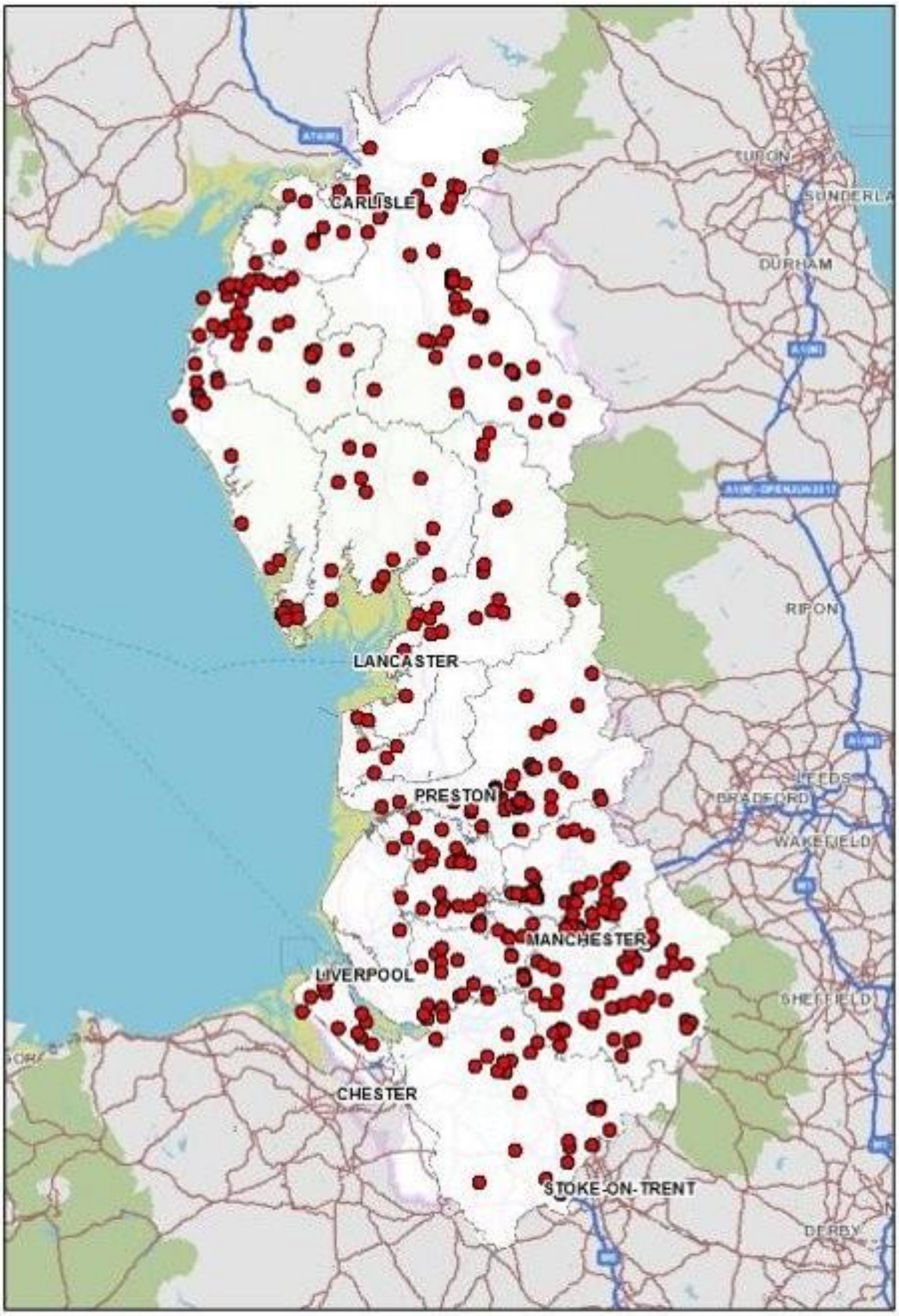
	Number of schemes	Capex (£m)	Opex (£m)	Totex (£m)
Storm overflow - sewer flow management and control; (WINEP/NEP) wastewater	0	0.000	0.000	0.000
Storm overflow - new / upgraded screens (WINEP/NEP) wastewater	326	478.415	5.775	484.191
Total	**766***	**3,046.240**	**43.191**	**3,089.431**

7.1.6 *Note that a scheme may appear in multiple lines where the solution delivers multiple intervention types, for example a spill reduction scheme may deliver a conventional storm tank alongside a sustainable drainage solution – both will contribute to the final outcome being delivered. The Totex includes TI, AMP8 schemes with spend in AMP9, and investment identified for our Advanced WINEP.

7.1.7 [✄]

7.1.8 The 437 overflows which are being addressed as part of the AMP8 wastewater WINEP programme are located all across the North West. Figure 28 below shows the geographic distribution of these overflows. The AMP8 storm overflow reduction element of the WINEP is anticipated to reduce spills from overflows in line with the storm overflow performance commitment. The measurement of this is captured again for the Storm Overflows Performance Commitment Level in our supporting technical document in Chapter 5 and is reflected as enhancement benefit in the OUT tables. This reduction in spills will help to enhance and protect the environment and move towards the target of 10 spills per overflow by 2050 as detailed in the Environment Act 2021.

Figure 28: Location of storm overflows within the AMP8 programme



7.2 Need for enhancement investment

7.2.1 This section details the environmental drivers and legislation which supports the need for investment and our approach to addressing these requirements.

7.2.2 We have followed the Environment Agency driver guidance to identify needs for enhancement investment at storm overflows within the UUW area. We have specifically factored the impact of climate change into the development of our WINEP and we account for climate change in our hydraulic models when identifying the need for storm overflow improvement schemes and developing options to address the drivers.

7.2.3 We have developed the AMP8 WINEP proposal within the long-term context to ensure that our plan is balancing investment across the AMPs and intervening at the most appropriate time. Where appropriate, we have made use of long-term adaptive planning approaches to plan a low regrets route to meet long-term targets whilst also meeting our statutory obligations and deadlines.

7.2.4 The three key pieces of legislation which are driving the enhancement expenditure to reduce storm overflow spills are:

- The Bathing Water Regulations 2013;
- The Water Environment (Water Framework Directive) Regulations 2017 (including shellfish waters); and
- Environment Act 2021.

7.2.5 These legislative drivers result in different design standards for overflows. Numerous overflows within the programme have multiple drivers. In these instances the design and solution has been developed to address the most onerous requirement. Multiple factors impact the design of solutions. Where it has been possible to design the scheme to address future known drivers we have taken this opportunity. In certain cases additional work is required in the catchment (such as surface water removal) for a viable long term solution for an overflow to be developed. In these cases we are addressing the Water Environment (Water Framework Directive) Regulations driver initially, with the intention of reviewing the performance of the overflow in the future to address the more onerous Environment Act requirement. Detail of these design requirements are in below in Table 7. There is also an Environment Act requirement for appropriate, 6mm in two dimensions, screening on overflow discharges. We have included 351 screens in our plan.

Table 7: Overflows requirements for the different drivers

Legislative driver	Design requirement
The Bathing Water Regulations 2013	3 spills per bathing season for coastal discharges 1 spill per bathing season for inland bathing waters
The Water Environment (Water Framework Directive) Regulations 2017	Appropriate spill frequency/duration/volume reduction to meet the WFD target in the receiving waters
The Water Environment (Water Framework Directive) Regulations 2017 (Shellfish waters)	10 spills per annum
Environment Act 2021	10 spills per annum
Environment Act 2021	Screening of spills to 6mm in two dimensions

7.2.6 There are three factors which together mean that the scale of work UUW must deliver to meet the standards set out in the Storm Overflow Discharge Reduction Pan (SODRP) is significantly larger than other water companies and thus our programme is likely to represent the largest in the sector:

- The extent of the existing combined sewer system (legacy assets) in the North West with 54 per cent of it being combined compared to the England average of 33 per cent;
- High levels of rainfall in key urban areas such as Greater Manchester and East Lancashire; and
- Poor soil permeability in much of the region which leads to increased run off into the combined sewer system.

7.2.7 To enable the delivery of Environment Act 2021 targets by 2050 our Advanced WINEP is a Rainwater Management Programme which will unlock earlier, innovative investment and partnerships on rainwater management and storm overflows. It will focus on unlocking rainwater management solutions in AMP8 in catchment areas where storm overflows need to be improved in order to meet SODRP targets outside of the scope of where the delivery date is in AMP9, or later. This programme aims to invest in 'best value' and 'least regret' actions, with a focus on driving rainwater management interventions which will reduce or eliminate the future requirement of investing in grey storage to meet the government targets.

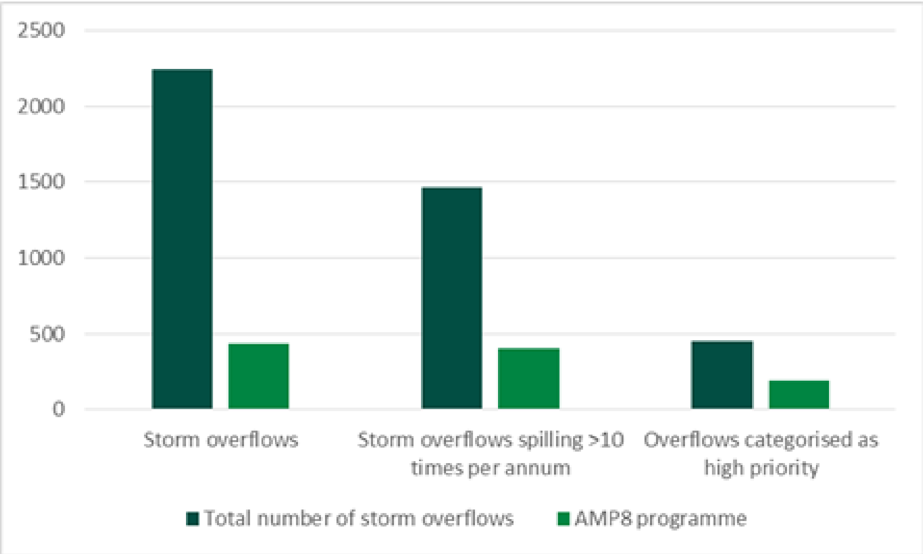
7.2.8 We have allocated enhancement expenditure to meet the needs of the AMP8 WINEP drivers and the Advanced WINEP associated with UUW's Wastewater Price Control. This programme of enhancement investment is driven by statutory environmental obligations which arise from legislative requirements (as shown above in Table 7).

7.2.9 Detail on cost assurance is included in Section 7.15 cost efficiency.

7.3 Developing our storm overflow programme

7.3.1 We have categorised all 2,182 of our permitted storm overflows in line with the criteria in the SODRP and reviewed this with the Environment Agency and Natural England. In doing this we have been able to rely on our extensive integrated catchment modelling capability along with our full coastal modelling capability. Figure 29 below shows a summary of the categorisation of all our storm overflows compared to the number we plan to address in AMP8.

Figure 29: UUW's proposed AMP8 storm overflow programme compared with total number of overflows by SODPR category



Source: UUW Storm Overflow Discharge Reduction Plan.

7.3.2 In developing the proposed programme for AMP8 we have set out to develop a plan that achieves the following:

- Delivers at least the trajectory set out in the SODRP by improving more than 38 per cent of high priority overflows;
- Addresses Reasons for Not Achieving Good (RNAGs) associated with storm overflows wherever we have been able to identify the best value solution;
- Improves 437 storm overflows to achieve a reduction in spill frequency across UUW of around 20 spills per annum by 2030;
- Proposes strategic investigations to identify the best overall plan for the more challenging parts of the North West: Mersey Estuary, River Irwell catchment, Davyhulme WwTW drainage areas and parts of the Wigan WwTW drainage area impacting Pennington Flash (further detail on these investigations is included in Ww3 Investigations.) This will involve working with partners to understand opportunities for better integration of water management;
- Includes an Advanced WINEP that will enable us to work more flexibility to deliver the rainwater management solutions required as part of the long-term adaptive plans required for our sewerage systems, as well as advancing the techniques, relationships and approaches to mainstream these solutions;

- Includes adequately sized screens and chambers for all overflows in the programme that require one, irrespective of whether the solution is sustainable drainage, hybrid or grey only; and
- Starts early on our plan following the submission and acceptance of an accelerated programme[15] that enables us to commence the delivery of this substantial programme ahead of AMP8, as well as delivering earlier benefits and economic activity. Expenditure identified in the accelerated programme is included within this enhancement case.

7.3.3 For UUW, this programme will require us to use every tool and option available to us as we transform our systems to meet this new ambitious standard. The scale of transition required is driven by a range of factors including: the extent of the existing combined sewer system in the North West, the high levels of rainfall in key urban areas such as Greater Manchester and East Lancashire, and the poor soil permeability in much of the region.

7.3.4 UUW has a history of investing in storm overflow improvements where impacts had been identified; however, these have been to meet The Water Environment (Water Framework Directive) Regulations 2017 standards, which can typically can still leave an overflow spilling around 40 times a year and thus a new requirement to get to 10 spills per annum on average at each overflow represents a very substantial additional change in compliance standard.

7.3.5 The proposed plan is slightly faster than the minimum Defra trajectory targets of 14% of overflows improved and 38% of high priority overflows as shown in Table 8. The programme is appropriate in the context of the overall targets we need to meet over the next 25 years and the associated drive to deliver a substantial reduction in spill frequency as soon as possible. The programme has been designed to offer customers the best blend of costs and benefits by meeting the Defra trajectory targets, addressing proven harm where we have been able to identify the best value solution and achieving a reduction in spill frequency to around 20 spills per annum in the most cost-effective way possible.

7.3.6 As we move through the 25-year programme we will have to intervene with some very challenging trunk sewer overflows which will require multi-AMP programmes to address them and the unit cost per spill reduction is going to increase as we tackle these overflows. We therefore envisage future AMPs will contain lower numbers of overflow schemes, but still require similar levels of expenditure to AMP8. We will be using AMP8 to plan for some of this major investment.

Table 8: UUW proposed storm overflow programme compare with SODRP targets

Overflow category	No of overflows requiring upgrade by 2050	Minimum AMP8 target no of overflows	UUW WINEP no of overflows	Minimum AMP8%	UU WINEP %
EnvAct_IMP2 high priority	451	171	198	38%	44%
EnvAct_IMP4 other	1462	205	404	14%	28%

Source: UUW data

7.3.7 In optimising our programme for AMP8 we have aimed to strike a balance between addressing as much of the proven harm as possible whilst also reducing spill frequency significantly in line with the expectations outlined in the SODRP.

7.4 New designations of inland bathing waters

7.4.1 Within our plan we have included schemes to make improvements to WwTWs and overflows which impact on bathing waters where applications have been made for bathing water designations, but where designations have not yet been made. Although currently not statutorily designated, it is our understanding following liaison with the applicants that they intend to re-apply for designation

[15] https://www.ofwat.gov.uk/wp-content/uploads/2023/04/2023-04-24-UUW-Response-to-Ofwat-draft-decisions-on-accelerated-infrastructure-Final.pdf

following clarification by Government on the criteria for a successful application. Applications were submitted to Defra to designate bathing waters at Coniston Water and Edisford Bridge on the River Ribble ahead of the 2023 bathing season. At the time these were assessed by Defra as not being suitable for designation and the applications rejected. Following consultation Defra have recently provided updated guidance on the application process and information and criteria required for a successful bathing waters designation application.

7.4.2 We have therefore included schemes in our plan to reduce spills from storm overflows associated with these potential bathing waters (detail of microbiological schemes on continuous discharges are detailed in Ww1 Final effluent limits) at Coniston WwTW storm tanks which discharges to Coniston Water and to 3 overflows which discharge to the River Ribble upstream of Edisford Bridge. These overflows are included in our storm overflows price control deliverable to return funding to customers if these sites are not designated as bathing waters before or during AMP8. We have also had confirmation from Coniston Parish Council and Ribble Rivers Trust that they do intend to reapply for bathing waters status.

7.4.3 Including these sites within our adaptive plan, although not currently statutory requirements, will allow enhancements to be made at these overflows to meet public health drivers in the event that the sites are designated as bathing waters within AMP7 or AMP8. If these sites were excluded from our plan and bathing waters designated ahead of the 2024 or 2025 bathing season they could have the potential to be de-designated due to 5 years of poor bathing water status before any investment to make improvements can be made.

7.5 Experience of developing rainwater management solutions

7.5.1 UUW has been at the forefront of pioneering how catchment and nature-based solutions can be designed and delivered to meet regulatory outputs within the sector through previous Price Reviews. This can be evidenced through some of the projects our Catchment Systems Thinking approach has enabled such as:

- Our pioneering SCAMP programme which started 20 years ago and led the way with peatland restoration for the benefit of not just water quality but also carbon and biodiversity;
- Development of the first catchment flexible permit in the Petteril which has influenced policy nationally;
- Delivery of the second catchment permit in England covering half of Greater Manchester;
- Playing a key role in initiating the Wyre catchment market to deliver natural flood risk management; and
- Installation of a wetland solution for storm spills at Southwaite WwTW.

7.5.2 We have also been building our experience of using a range of rainwater management solutions to address storm overflows and flood risk. Major investment into separation of surface water from combined systems to improve the environment was kick started through the Blackpool South surface water separation project in AMP6, which delivered sustainable drainage solutions (SuDS) having addressed multiple challenges in the development and delivery of the scheme. This provided useful learning that helped shape the way in which UUW has developed guidance for developers to design and construct SuDS so they are eligible for adoption under the Design and Construction Guidance legislation.

7.5.3 Further schemes that have been delivered by UUW include blue green infrastructure in partnership with Cumbria County Council and Wyre Rivers Trust to manage surface water, in addition to the regional SuDS for Schools programme which was a highly commended large-scale SuDS retrofit scheme at the Susdrain Awards in 2022.

7.5.4 As part of the Green Recovery programme we are currently pursuing a programme of Natural Flood Risk Management (NFM) and SuDS to kick-start partnerships across strategic catchments in the North West (Greater Manchester, Fylde and Eden) to expand the use of natural capital benefit to value and subsequently deliver partnership projects. The learning gained by delivering at a larger scale with a wide variety of partners not only has informed and matured the systems, processes and tools within the organisation to deliver rainwater management, but also provided real-life cases on the barriers for PR24 and what the most effective and efficient ways of delivering these types of solutions at scale are. What we have experienced already through Phase 1 and 2 is the importance of lead-in time to mature partnerships, create an opportunities pipeline and drive ideas through to feasible projects.

7.5.5 Using our experience of rainwater management solutions we have taken the approach for AMP8 to integrate this as far as possible into our solution development for intermittent discharges. Traditionally spill reduction has been achieved by the construction of a concrete tank appropriately sized to achieve the required spill frequency reduction. The volume of the tank required is defined using wastewater modelling techniques at the time and the model demonstrates the spill frequency reduction achieves the required environmental compliance on average, over a 10 year period. In AMP8 we are using models to enable us to develop solutions which incorporate green solutions in with a tank construction. Green solutions in this context refer to interventions that stop the rainwater entering the sewer, slowing the flow and therefore allowing the tank requirement to the smaller or not be constructed at all. An example of a proposed hybrid solution at High Bentham WwTW is outlined below. In many cases, a storage tank of reduced volume and/or an increase in flow to full treatment through the receiving WwTW is also required and this is known as a hybrid solution as it will include both grey and blue-green elements.

Case Study 1 - High Bentham WwTW Storm Overflow and Storm Tank (017260004SO and 017260004ST)

7.5.6 High Bentham WwTW in Lancashire discharges to the River Wenning. At this WwTW there is both an inlet overflow and a storm tank discharge, both of which spill on average over 100 times per year. These are included within the AMP8 programme under the EnvAct_IMP4 driver to achieve a 10 spill per year solution. The verified hydraulic model ran a simulation period of four years, which corresponds with the length of time EDM data was available. The model correlated well with the observed data from the EDMs, and therefore we were confident to use the model for development of solutions for WINEP at this location.

7.5.7 The baseline model with a 2050 design horizon (including estimated growth and climate change) was used to estimate the storage volume required to reduce the number of spills at each of the two overflows to 10 spills. The 10 spills storage volumes derived from model outputs were 1,350m^3 for the Storm Overflow and 1,200m^3 for the Storm Tank.

7.5.8 The same model was used to estimate the impact on the number of annual spills if surface water was removed from the combined system, whilst in a parallel exercise, rainwater management solutions (RMS) were identified and screened based on likely success factors for implementation e.g. land ownership. In total 0.9 ha of RMS were identified which primarily consisted of attenuating rain gardens, permeable block paving and swales. The RMS resulted in reduced tanks sizes of 1000m^3 for the Storm Overflow and 945m^3 for the Storm Tank, and went forward to cost benefit analysis as the hybrid option, and consequentially selected as the cost beneficial option.

7.5.9 The implementation of this option significantly reduces the size of additional storage tanks and therefore reduces the amount of concrete required and consequently the amount of carbon from this solution. There is also an additional benefit of this solution, namely the provision of habitats in rain gardens, ponds and swales. Potential locations within the High Bentham catchment have been identified.

7.6 WINEP Options Development

7.6.1 We are ambitious about significantly scaling up the use of rainwater management solutions across the North West through the WINEP submission and more broadly and have taken every opportunity to explore options to deliver source control of rainwater through our SuDS Methodology. As a result of this an option including SuDS has been developed for 405 of the overflows in the programme with the only exceptions being the overflows that require improvement to meet The Water Environment (Water Framework Directive) Regulations 2017 standards In these cases, we have focused on meeting these standards and may implement rainwater management solutions in subsequent AMPs to meet the 10 spills per annum standard. We have done this because this cohort of overflows tend to require substantial change to meet the standards and capturing the first flush of the sewer system after rainfall is a proven solution that addresses the harm caused by the overflow as measured by The Water Environment (Water Framework Directive) Regulations 2017 standards.

7.6.2 In our options development, we have considered the impact of options on the receiving wastewater treatment works and where relevant we have included costs for any necessary upgrades and increase in ongoing treatment costs if we need to increase the permitted flow to full treatment to manage the additional storm water.

7.6.3 Following options selection the preferred option for 41% of the overflows in our proposed programme is a hybrid solution which combines rainwater management solutions with more conventional engineering. The types of rainwater management solutions considered during our options development are shown in Figure 30below.

Figure 30: Rainwater Management options considered during options development

1. Greenfield – new development where the surface water discharges to the combined / “foul” sewer as a result of ‘no alternative’.
2. Brownfield – re-development where the surface water discharges to the combined / foul sewer as a result of ‘no alternative’.
3. Residential retrofit – where property measures are installed on a domestic customer property within their curtilage. Property may be owned or rented and be freehold / leasehold.
4. Street side retrofit – retrofit of measures in the highway to intercept flows currently discharging through gullies (ultimately) to the combined or surface water sewer.
5. Urban realm retrofit – retrofit of measures within an urban space (hard or soft landscaped) that may or may not directly discharge flows to the combined or surface water sewer.
6. Business retrofit - where property measures are installed on a non-residential customer property within their curtilage. Property may be owned or rented and be freehold / leasehold.

7. Surface water disconnection - where a surface water sewer or highway drain is connected to the combined sewer and it can be discharged to an alternative receptor.

8. Watercourse - disconnection – where there is inflow from a watercourse that is connected to the combined sewer and it can be discharged to an alternative receptor.

7.6.4 Surface water disconnection (above bullet) represents an important opportunity for reducing storm water within the sewer network. This has been exploited within our options development in specific areas of interest including the Tame catchment and for the Advanced WINEP plan. When further developing the delivery plan in AMP8, we will consider the potential for surface water and highway drainage disconnection more broadly as options development for these types of solutions requires very detailed analysis of impacts such as consequences for flood risk. The focus of options development so far has been on opportunities for sustainable drainage. Opportunities for residential retrofit will also be explored further in design development within AMP8.

7.6.5 Prior to the work completed for PR24, we completed a project with Atkins in 2018, referred to in this report as SuDS StudioTM. This work provided us with opportunity maps in geographic information system (GIS) format for all catchments at an individual opportunity level with various additional attributes including type of SuDS, sizing, costs, carbon and wider benefit DWMP work, and it was taken as the starting point for WINEP options development. We then commissioned Jacobs to review the outputs of the Atkins SuDS StudioTM work and following review of information available, it was agreed that the limitation of the SuDS StudioTM work was that it provided every possible SuDS opportunity. Prioritising the SuDS opportunities based on their deliverability would therefore be beneficial to identify opportunities that were more likely to be achievable in AMP8 and could therefore be built into the PR24 programme.

Case Study 2 – Millom and Haverigg Pumping Station (COP0049 Kings Street PS and BRW0005)

7.6.6 Through the WINEP and in partnership with Cumberland County Council we are proposing a catchment solution plus storage tank for Millom and Haverigg Pumping Station (COP0049 Kings Street PS and BRW0005). These overflows are located at the northern entrance to the Duddon Estuary, approximately 10km directly north of Barrow-in-Furness in Cumbria. The driver from the local council follows extensive flooding of the area in September 2017 and further flooding July 2019. The proposed catchment partnership project will reduce the frequency of storm activations from these pumping stations and reduce catchment flood risk pluvial, tidal and fluvial for c.200 properties and flood risk from the sewer network.

7.6.7 The partnership solution focuses on large scale separation of surface water from the combined sewers including the construction of a new surface water pumping station to pump the surface water to the sea which will be owned, operated and maintained by Cumberland County Council. The proposals for this partnership solution align with the National Infrastructure Commission who have advised government that water companies should be doing more to tackle surface water flooding and build sustainable drainage systems. The Storm Overflow Discharge Reduction Plan includes that water companies should actively be taking rainwater out of sewers. Due to the additional benefits of the partnership project, when assessed using our value tool the partnership contribution solution provides the best value solution. Table 9 shows the project Capex and Totex (30 year NPV) used for decision making against these two options. This shows that the best value solution comes from the partnership contribution solution.

Table 9: Value tool comparison for Millom and Haverigg pumping station

Option	Project capex	Project opex	Totex (30 yr NPV)	Best value score
		PR24 notional solution		
Haverigg BRW00S0	£6,401,377	£11,013	£3,114,279	6.96

Option	Project capex	Project opex	Totex (30 yr NPV)	Best value score
King Street COP0049S0	£6,659,543	£19,346	£3,506,723	5.76
Partnership contribution solution				
Haverigg BRW00S0	£5,742,004	£9,893	£2,632,961	7.67
King Street COP0049S0	£13,713,798	£17,654	£2,860,473	7.07
variance	£6,394,882	-£2,812	-£1,127,568	

Source: UUW data

7.6.8 This is a good example of where working in partnership with the local council provides longer term value than working separately.

7.7 Risks of Rainwater Management Delivery

7.7.1 There are significant risks that must be considered when planning, delivering and managing rainwater management solutions, or solutions delivered in public/private partnerships. These range in influence and can jeopardise selection as an option due the time required to plan and deliver to inflexible regulatory dates, the geography in which the WINEP programme is constrained to and dependencies on local authority capacity, skills and funding to support such a programme with regards to management and maintenance of interventions. Some of the key risks are set out in Table 10.

Table 10: Key risks and constraints impacting rainwater management solution

Barrier/constraint	Description of the issue
Opportunity Identification – Certainty of conversion	Desktop-based surveys completed for WINEP development use numerous factors to establish where the most likely opportunities that can be converted are.
Securing an appropriate discharge	However, installation is highly dependent on localised ground conditions and existing infrastructure especially within footways that place high uncertainty on the opportunity conversation rates.
Adoption, Management and Maintenance	WaSCs do not currently have the right to discharge surface water from their networks into watercourses without permission from the riparian owner, in addition to any permissions required with regards to volumetric consents from the appropriate authority. e.g. no right of a sewerage undertaker to connect a new outfall to an existing private water body (e.g. canal) (MSC v UU, 2014). Previous implied right established through Durrant v Branksome (1897) existed at least until 1989. Discharge and consent can only be through negotiation.

Source: Considerations that may impact on the delivery of the surface water management approaches (adopted from UKWIR Cost Effectiveness of Surface Water Removal, 2022, p.73).

7.7.2 We are ambitious about continuing to scale up the use of rainwater management solutions to address storm overflows and, as such, we have also developed an Advanced WINEP, which creates the flexibility to drive a scale up in their use, to drive rainwater management solutions ahead of future AMPs post AMP8. This is further described below.

7.8 Scaling-up delivery of rainwater management solutions within the Advanced WINEP

7.8.1 Our proposals set out in the separate Advanced WINEP (Rainwater Management) document[16] aim to enable the implementation of the rainwater management element of hybrid solutions ahead of any conventional solutions thereby maximising uptake and efficiency. Driven by the targets in the Environment Act, the legislative impact and investment required in the North West by 2050 is substantial.

[16] 2023 (UUW) Advanced WINEP (Rainwater Management), submitted to Ofwat August 2023

7.8.2 This proposal will drive innovative investment and partnerships on rainwater management and storm overflows. It will focus on unlocking rainwater management solutions in catchment areas where storm overflows need to be improved in order to meet Storm Overflow Discharge Reduction Plan (SODRP) targets after completion of the AMP8 WINEP. This programme aims to invest in 'best value' and 'least regret' actions, with a focus on driving rainwater management interventions which will reduce or eliminate the future requirement of investing in grey storage to meet the government targets.

7.8.3 UUW's Advanced WINEP is a flexible £249 million (FY21 prices) AMP8 investment programme in rainwater management solutions to start on delivering this element of the adaptive plan for those overflows that will need improvement in subsequent AMPs. £199 million of this investment is enhancement cost allowance and the remaining £50 million leveraged from partnership funding to deliver wider benefits, enabled by removing conventional regulatory barriers of timeframes, geography and penalties to allow us to flexibly co-plan and co-deliver with stakeholders. If we achieve higher leveraged funding for direct benefit, we will reinvest the surplus in delivery of further interventions. This will enable rainwater management opportunities to be optimised before the scope of any conventional element of scope needs to be fixed.

7.8.4 Our proposal commits to the delivery of 57,796m^3 of storage avoided on overflows requiring improvement under the government's SODRP. The interventions will vary but examples include rainwater gardens, swales, permeable paving, as well as natural flood risk management to attenuate flow upstream. Customers are protected by a price control deliverable linked to this benefit.

7.8.5 These proposals provide a focus on urban areas in the southern part of our operational region particularly Greater Manchester with the personal support for the proposal pledged by the Mayor of Greater Manchester. This area requires substantial investment over the next 25 years to address SODRP targets for storm overflows and increase resilience to climate change. The programme is flexible enough, however, to include other areas such as Northwich, Warrington and Liverpool, if the criteria are met.

7.8.6 The programme is comprised of seven 'named' storm overflow schemes which have been developed, and an 'Agile Opportunity' category which allows us to work in a more agile way with stakeholders. We assume that 20% of the overall programme will be funded through partnership co-funding with the remaining 80% being supported through an enhancement cost allowance. The co-funding assumption is at a programme level and will vary scheme by scheme.

7.8.7 By creating more flexibility around this element of the WINEP, it will allow us to maximise uptake and attract more co-funding, which in turn, means we will be able to deliver wider benefits for society without customers necessarily needing to support the greater cost of delivering rainwater management solutions. Figure 31 shows an indicative view of the AMP8 WINEP where 41% of storm overflows have hybrid solutions selected as the preferred option, whereas as we move forwards the Advanced WINEP proposal aims to drive a greater use of rainwater management by having the time to do it first. By delivering rainwater management component of overflows solutions an AMP ahead of implementing the conventional element of scope for an overflow (if any is required), we allow greater time to secure the detailed implementation plan for rainwater management options (including partnerships) before the scope of the conventional solutions needs to be locked-down and put into delivery. We believe this will help to mitigate some of the key risks around scaling up the use of rainwater management options which are set out in Table 11

Figure 31: Comparison of AMP8 approach to rainwater management v Advanced WINEP proposal

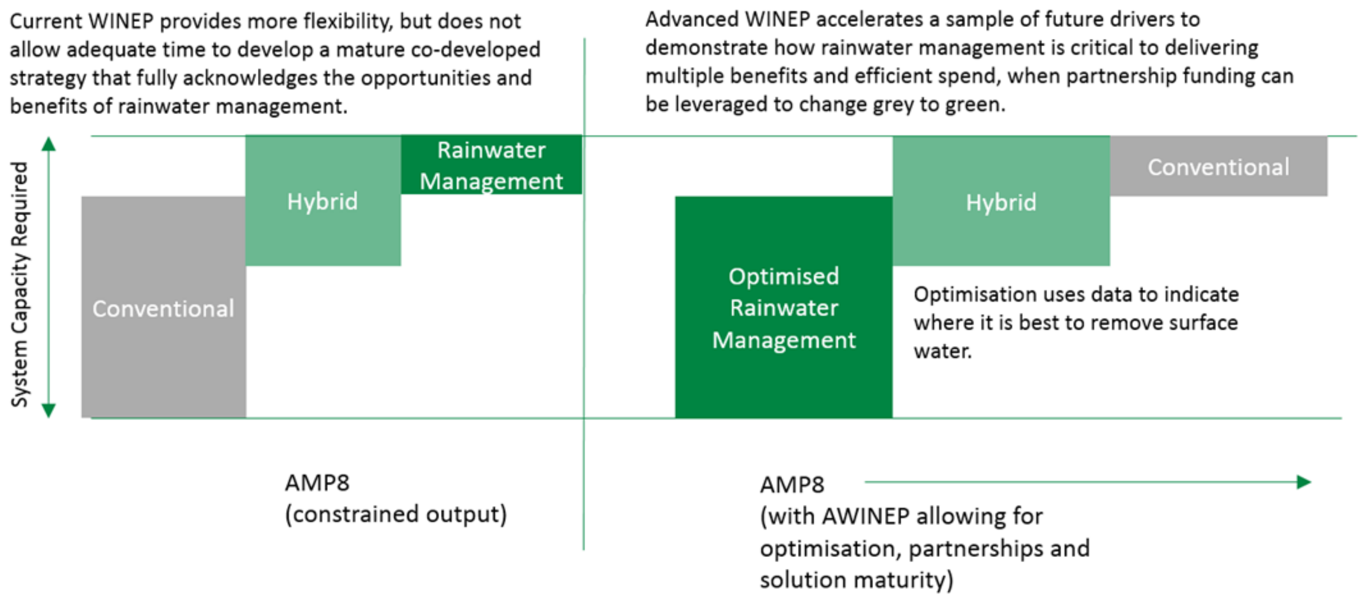


Table 11: Mitigation of WINEP barriers to rainwater management solutions addressed by the Advanced WINEP

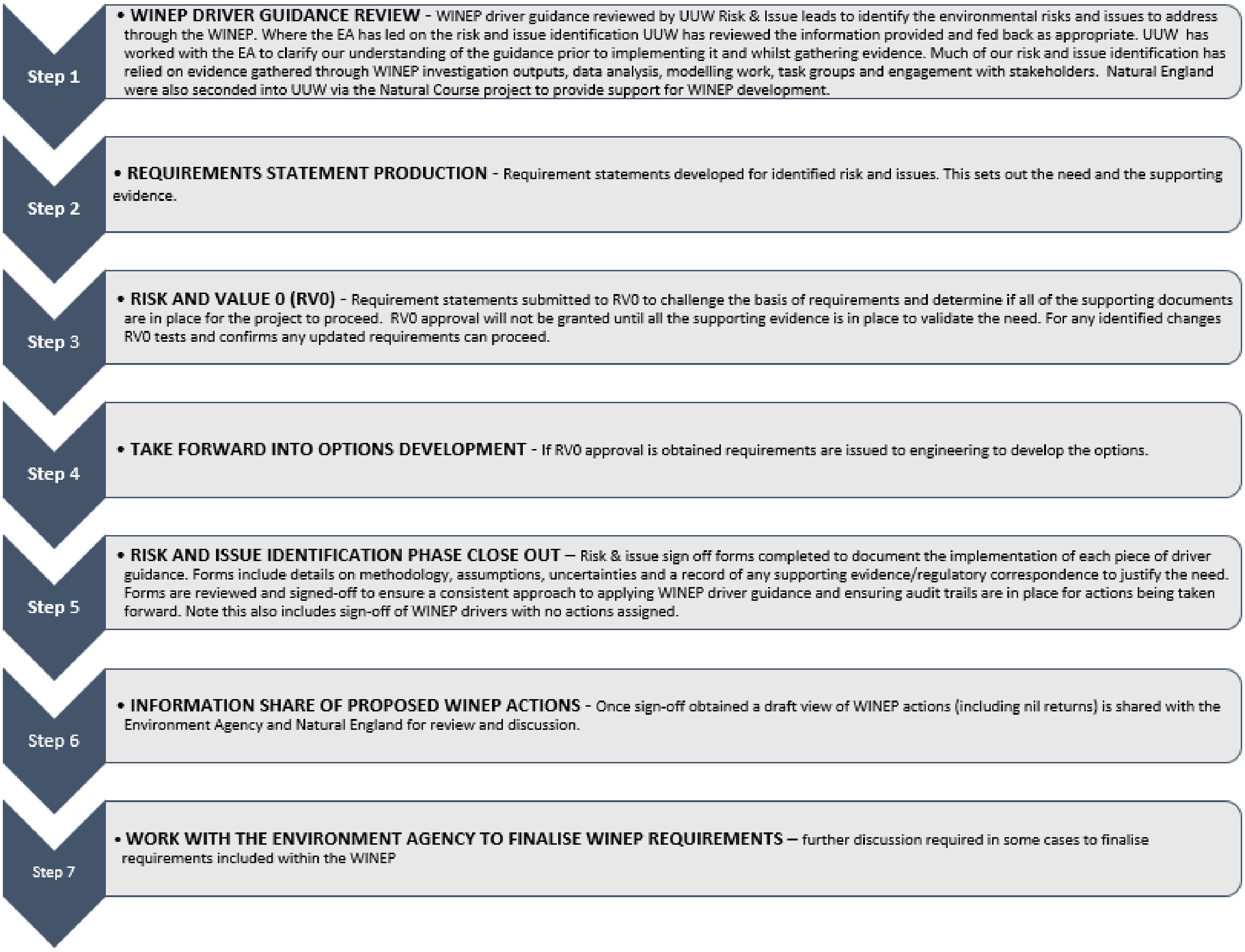
Existing WINEP Barrier	Why this is an issue?	Our Advanced WINEP Solution	How customers are protected	Best value delivered because
Limited flexibility to deliver	Fixed regulatory dates can reduce opportunities for nature-based solutions. This is because their development and delivery timelines are usually longer than conventional solutions and there may be misalignment between partner timelines and funding cycles.	Delivers catchment level drainage improvements as a baseline position so as to reduce the scale of future drivers through adaptive and phased investment. The nature of interventions promotes nature-based solutions.	Investment through the Advanced WINEP proposal will improve overflows that have SODRP drivers in future AMPs and reduce the potential scale of other driver solutions, due to reduced network flow and variability and reduced downstream cumulative impacts. Reducing flows rather than building storage is inherently more resilient to climate change.	We will model optimised interventions and assess against conventional solutions and wider benefits to deploy best value solutions. We will track performance and benefits to inform future approaches and right size subsequent investment steps.
Lack of time and timing to collaborate and plan with partners	Developing options in a short space of time to tight regulatory dates increases the likelihood of conventional solution design and reduces the potential to develop partnership solutions with others.	Accelerates strategic partnership across GMCA to deliver an Integrated Water Management Plan and realise partnership opportunities for rainwater management solutions.	Use data from partners to co-identify areas where solutions reduce spill frequency and bring wider environmental outcomes.	We will deliver interventions where there is greatest need and allow for flexibility in delivering opportunities within the wider programme. This increases the likelihood of partnership co-funding.

Existing WINEP Barrier	Why this is an issue?	Our Advanced WINEP Solution	How customers are protected	Best value delivered because
Volume of solutions	Submitting large programmes increases the likelihood of conventional solution design reducing resource to focus on creating co-funding opportunities.	Identifies and assesses opportunities in greater detail to support where co-funding can be secured. This ensures we only progress high confidence options for detailed design.	Cost and benefits are built into gateways so projects not meeting thresholds will not be progressed. We will identify direct drainage and wider benefits in total and separately.	Ensures that customers do not pay for unnecessary wider benefit where this does not support material drainage benefits to wastewater service provision.
Quantification of best value	Accurate assessment of wider environmental outcomes is best carried out on schemes that have been through detailed design and using valuation tools aimed at rainwater management solutions.	Uses alternative (multi-capitals) methods to quantify best value once detailed design is available, so recommendations can be made at PR29.	Schemes will only be progressed once it can be demonstrated that they are part of a best value solution. Natural capital quantification has been agreed at previous price reviews.	Ensures solution development for PR29 maximises the identification of best value rainwater management solutions.

7.9 Approach to risk and issue identification

7.9.1 For the storm overflows programme within the PR24 plan the approach UUW has taken to identify WINEP actions is in line with Stage 2 of the Environment Agency's WINEP methodology. This approach ensures that we identify the environmental risks and issues appropriate to the development of this programme. The way we approached this has been to collaboratively identify environmental issues that need addressing and risks that require further monitoring/investigation through the WINEP. Our Risk and issue identification process follows a stage approached, shown in Figure 32, which has enabled us to identify where action is required to deliver compliance with our environmental obligations.

Figure 32: Risk and issue identification process



7.9.2 This collaborative process has ensured that we are prioritising and investing in areas which have a well evidenced environmental need, and that we are meeting those needs in the most efficient way. Where evidence of environmental impact is uncertain, we have proposed AMP8 investigations to ensure that any interventions are based on good evidence. This is the case for the 11 proposed EnvAct_INV4 driven investigations where we are investigating to ensure the best long term solution for these catchments is fed into PR29. Further detail on the investigations is available in the enhancement case Ww3 Investigations. We have also sought to identify opportunities for partnership working, such that the best value for customers and the environment is secured.

7.10 Customer support

7.10.1 Customer research indicates protecting the environment is a key priority. Research for the DWMP and WRMP carried out in April 2021 showed that 21% of those customers surveyed ranked removal of wastewater in the top 3 greatest long-term challenges. It was also noted that aspects such as maintaining the network and wastewater treatment are often fairly easy for people to envisage, but happen in the background. When asked what people themselves feel is important; 'the impact on the environment is a constant concern' and customers 'love living in an area with lots of countryside and green space (perhaps heightened by Covid) and want this to be preserved'. We consider this to be evidence that customers support UUW's continued compliance with its environmental obligations.

7.10.2 There is also increasing customer and stakeholder concern over spills from storm overflows. Our plan seeks to reduce the number of storm overflow spills with a performance commitment level of 19.60 spills as regional average by 2030.

7.11 Management Control

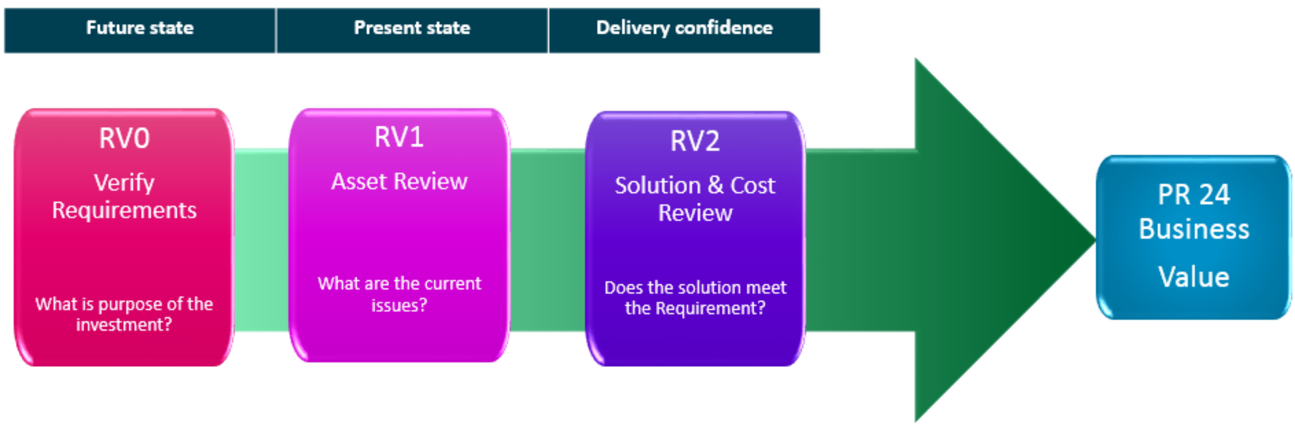
7.11.1 The enhancements needs for overflows included in the WINEP are outside of management control and driven by new statutory requirements. Botex allowance maintains compliance with current permits. To enable compliance with new, more onerous requirements and permits, investment to enhance current assets or to deliver new assets is required. Unlike WwTWs, there are no opportunities to optimise performance of intermittent assets to achieve intermittent standards. These assets have been modelled as operating to their full capacity to give a baseline performance - any improvement from this requires enhancement investment.

7.12 Best option for customers

Options development

7.12.1 PR24 options development followed the fundamental principles of the UUW defined value management process. Risk and Value for PR24 (RV) was a three stage process (shown in Figure 33 below), aimed at positively challenging our projects to ensure we have sufficient evidence behind decisions. It provides UUW with confidence that we are proposing the right projects for the AMP8 Programme and therefore managing and maximising the value for customers from their investments. It also ensures that we adopt the correct approach to option identification, development and selection to maximise the realisation of benefits associated with these investments.

Figure 33: Options development process



7.12.2 Once the requirements have been clearly verified RV1 was completed in order to understand the current asset condition and performance. Without this understanding there is significant risk that proposed solutions will fail to deliver the value intended and may even fail to satisfy the requirements. This initial baselining was essential in order to allow identification of possible options against the generic high level solutions (GHLS), see Table 12 below.

7.12.3 Options to address PR24 requirements passed through a series of stages before the agreed solution was confirmed, from an initial ‘un-constrained’ list of options through to confirmation of the defined and estimated scope associated with a preferred solution.

7.12.4 Within the options development process, un-constrained options were identified against a list of GHLS categories. If un-constrained options were deemed viable then additional screening was carried out to identify ‘constrained’ options, with further screening taking place to refine the feasible solutions and determine those to be progressed to detailed scope development and estimating. In developing feasible options the engineer will always have taken which solution could represent the best value to the customer into consideration.

Table 12: Generic high level solutions

GHLS	Description
Monitor & Respond	Accept risk with agreed contingency plan
Operational Intervention	Solve need by identifying targeted maintenance to restore performance
Optimise Asset	Solve need by improving performance of existing equipment
Partnership	Solving need by assistance of third parties, i.e. assisting farmers reduce pollution of watercourses
Refurbish Asset	Major asset refurbishment to restore asset life and performance
Replacement	Replace asset(s) on like for like basis
New Asset	Build new asset when all other options are not possible (this could be a NBS)
Integrated Approach	Integrated solution across asset boundaries e.g. network, process, bio-resources or catchment level solutions. An integrated solution is a Systems Thinking response and could be a combination of the above solution types.
Combination of generic high level solutions	Example - SuDS and a storage tank to address CSOs

7.12.5 Should a refurbishment, replacement or new asset solution be identified, a number of design tools were used to develop the requirement through to an estimated solution. Base design data was gathered from UUWs corporate modelling systems to inform the design, a 2050 design forecast was used.

7.12.6 A detailed engineered design was then developed for all the feasible solutions identified in order to provide comprehensive cost and carbon data. For the storm overflow programme the volume of storage was calculated from the modelling and this was looked at as both a 'grey only' solution, this was either a storage tank or if the volume required would not be drained back to the network or treatment works with the appropriate time period (48 hours) then an alternative of increase in the WwTW flow to full treatment was identified as the preferred option. The potential for blue-green (e.g. SuDS) only and hybrid (grey and blue-green) solutions were also explored for each overflow.

7.12.7 It is at this stage that the options were also assessed for deliverability. A review was undertaken by the Planning, Land and Environmental Team and UUW Construction Services which allowed identification of risks and potential mitigation measures. This included access roads to any proposed tank and if any land purchase would be required. This therefore improves the cost accuracy associated with implementing the PR24 solution, it also allowed elimination of options which are not deliverable thereby confirming feasibility.

7.12.8 To achieve the requirements of the Environment Act 2021 over the 25-year time scale we need to start on this journey in AMP8. As discussed in Section 3 UUW has three factors which distinguish us from other water companies and are the reason why we have a proposal for such a large investment programme in AMP8:

- The extent of the existing combined sewer system (legacy assets) in the North West;
- High levels of rainfall in key urban areas; and,
- Poor soil permeability in much of the region which leads to increased run off into the combined sewer system.

7.13 Innovation

7.13.1 Throughout AMP7 UUW has taken learning from AMP6 innovation roll out (such as that demonstrated with Nereda and Typhon) to deliver a new Technology Approval Process. This process identifies opportunities for innovative technologies and nature-based solutions and provides a methodical approach to due diligence, innovation risk identification and mitigation planning. The approved technologies/solutions include:

- Those we have identified ourselves;
- Those suggested by our construction partners;
- Those identified by other WASCs but not yet progressed by UUW in AMP7 i.e. I-PHYC Algal bioreactors; and,
- Global innovation insights such as that secured through our engineering service provider Jacobs and other consultants such as Stantec.

7.13.2 Our Technology Approval Process has allowed us to progress technologies into approval without the need to trial, for example the Mobile Organic Biofilm technology approved and now in detailed design and construction for our Macclesfield AMP7 scheme. This approach highlights UUW credentials as a fast adopter of new technology but with deeper awareness of the inevitable innovation risks that need to be managed. We have also installed a wetland for treatment of an overflow at Southwaite WwTW rather than the construction of storage tank.

7.13.3 To develop our PR24 submission we have incorporated the technologies that have now secured 'Approved' status into our Process Decision Support Tool which was used to identify innovation opportunities by driver and site details. Where these innovation opportunities present the best value solutions they have been selected to be taken forward as the preferred solution. For storm overflows we have maximised the amount of SuDS solution which have been put forward as the preferred option as well as including a partnership solution at Millom and Haverigg PS which creates more value. More detail on this is available in section 7.6.6.

7.13.4 If, when assessing this, the value of these novel and less well understood solutions cannot be determined with sufficient certainty they have been identified as an opportunity for UUW to pursue in the period between submission and delivery. Alongside this we will continue to review those innovations / solutions not yet approved but relevant to AMP8 drivers and progress these through our Technology Approval Process and, where found to be necessary, deliver specific Innovation trials.

7.13.5 UUW are also leading a trial in this area through the Ofwat Innovation Fund. The Mainstreaming nature-based solutions to deliver greater value[17] seeks to bring together multi-sectoral expertise and leadership to collaboratively create and test new solutions to surface water management through real-life case studies and to facilitate and enable transition of nature-based solutions into business as usual to deliver greater value for customers, society and the environment. This will enable the exploration of lower cost options for nature-based solutions to deliver wider environmental outcomes and include customers in decision making which we can feed into our AMP8 plans.

7.13.6 Also, as detailed in Section 7.8, our Advanced WINEP programme is an innovative approach to achieve the long term SORP targets. This, along with the mainstreaming nature-based solutions to deliver greater value trial, are important regulatory innovations to enable the delivery of wider environmental outcomes and resilience.

7.13.7 We believe this sets UUW in good standing in terms of understanding the key opportunities that innovation can deliver within our PR24 submission but will also allowing for further efficiency driven by our Innovation programme.

7.14 Options selection

7.14.1 The water sector is moving towards a "best value" approach, promoted by the regulators, with a best value option being one which drives the best outcomes for the environment, society and UUW over the long term.

7.14.2 The value associated with the various options was assessed using the value assessment tool developed by UUW specifically for this purpose. This tool lists intervention type and pulls through the associated

[17] https://waterinnovation.challenges.org/winners/mainstreaming-nature-based-solutions/

benefits and value. It assesses value against a number of benefits including all the wider environmental outcomes as requested in the EA WINEP Options Development Guidance. The benefits were drawn from the MyRisk Risk Breakdown Structure (RBS), currently widely used in UUW. The wider value element, was also taken from the EA's WINEP guidance on Wider Environmental Outcomes.

7.14.3 The inputs to the value tool included costs (capex, opex and whole life), carbon (embedded, operation and whole life), data on biodiversity plus risks and benefits as described above. The outputs from the tool included a cost benefit analysis and allowed the selection of the preferred solution based on the comparison of value between the various options (RV2). The option selected was therefore that which provides the best value to our customers.

7.14.4 To ensure consistency and oversight, the WINEP Programme Scenario Development Group has reviewed the overall programme summary in terms of cost, value, benefits and carbon to ensure decisions on preferred options are well evidenced and in customers' interests. The group has focused on reviewing where the outcome of the best value assessment has led to marginal differences between options. A summary of the decisions made and programme metrics including value were then provided to the UUW Executive WINEP Steering Group. The case study of Millom and Haverigg PS is a good example of where best value has driven the selected partnership solution, even though the initial cost is greater than the standard solution, it drives greater value over the long term. Further detail on this is available in 7.6.6.

7.15 Cost efficiency

7.15.1 As discussed in section 5.5 the way we approached the cost build for the WINEP storm overflows programme began with the use of our extensive wastewater network models. Using these we modelled the storage volume required to limit spills to the future design requirements. In some cases a conventional tank only was not an option as the model showed that the volume of storage required to reduce spills could not be returned to the network, or to the treatment works if a storm tank, within an appropriate drain down period usually 48 hours. The drain down period is important as it reduces the risk of stored wastewater turning septic and producing odours. It also allows the storage to be available for the next storm. In these cases a storage volume plus an increase in the receiving WwTW flow to full treatment was included as the grey solution.

7.15.2 Once a storage tank volume had been determined numerous other site-specific factors were identified and used to build the individual direct capital costs for each grey overflow solution including:

- Storage tank volume;
- Excavation volume;
- Volume of the storm overflow chamber;
- Peak spill volume of screen;
- Power requirement;
- Access road;
- Land purchase required;
- Ecological surveys or others which may delay construction;
- Assessment of ground conditions including:
  - the proportion of excavation that is estimated to be rock which is more difficult and therefore costly to excavate than soil;
  - proportion of excavated material which is inert; and
  - proportion of excavated material that required landfill or specialist disposal based on known land conditions.

- Third party impacts on the location such as rail, canal or in highway working.

7.15.3 Our PR24 capital cost estimating approach is then based on data collected over a number of AMPs (AMP3 to AMP7) updated to reflect the present market conditions under which UUW and the UK Water Industry are operating. Mott Macdonald (MM) have provided an estimating service to UUW over AMP6 and AMP7. MM also provide an estimating service to a number of other UK Water Companies, which allows them to provide a benchmarked approach to UUW's PR24 capital cost estimates. An example of how direct costs are built up is detailed in Table 13 below, the figures presented are pre-efficiency and have been subject to further optimisation ahead of business plan submission.

Table 13: Example of contractor direct cost build up for CRE0043 Church Lane CSO

Element	Quantity	Discipline	Cost (£)
Modelled storage volume	2,000m^3	Civil	[✂]
Caisson shaft construction		Mechanical	[✂]
Excavation volume	5,593m^3	Electrical	[✂]
Chamber volume	150m^3	Civil	[✂]
Peak spill volume of powered screen	2,170 l/s	Mechanical	[✂]
		Electrical	[✂]
Excavated material to landfill	117m^3	Civil	[✂]
Excavated Rock	2,405m^3	Civil	[✂]
Dewatering required	yes	Civil	[✂]
Ground issues		Civil	[✂]
Permanent Access Road	224m^2	Civil	[✂]
Access road length	50m	Electrical	[✂]
Electrical supply needed	yes	Electrical	[✂]
Kiosk	Kiosk	Civil	[✂]
		Electrical	[✂]
		Mechanical	[✂]
Fencing	Fencing	Civil	[✂]
Outfall		Civil	[✂]
Monitors	Event monitor and chamber	Electrical/Civil	[✂]
Enabling work, surveys, service diversions			[✂]
Landscaping			[✂]
Total Direct costs			**[✂]**

7.15.4 The total capital costs are made up of these Contractor Direct Costs (CDCs), Contractor Indirect Costs (CICs), UUW Risk, UUW Costs to Serve and UUW Corporate Overhead. MM have benchmarked UUW's direct costs and cost curves and assessed the water industry construction inflation based on their Construction Industry Basket of Goods (CIBOG) index. The CIBOG approach is important as it has been considerably higher than CPI(H) over the last few years due to post-COVID infrastructure growth and activity.

7.15.5 We have then challenged these costs by looking at alternative procurement methods such as free issue of materials to contractors (we have estimated a 25% saving on direct costs) and the appointment of smaller more local contractors who are able to be more dynamic in the delivery of these schemes. For the CRE0043 Church Lane example we have challenged the direct costs and made an assessment that these could be procured for less using the above methods bringing the direct costs down to £2,567,147. Table 14 below shows the post-efficiency view.

Table 14: Total capex cost breakdown for CRE0043 Church Lane in 2020/21 prices

Cost element	Cost (£)
Contractor direct costs	[✂]
Contractor indirect costs	[✂]
Project risk	[✂]
Procurement of materials	[✂]
Logistics (storage, preservation and delivery)	[✂]
Design	[✂]
Delivery management	[✂]
Land purchase	[✂]
Insurance	[✂]
UU capital overhead	[✂]
Programme Risk	[✂]
Transformation	[✂]
Total	**[✂]**

7.15.6 Contractor Indirect Costs (CICs) cover design costs, construction staff costs, risk, fee and profit margin. These indirect costs have been increasing over the last four AMPs and this has been due to more risk being transferred to contractors, more refurbishment work on existing plant and equipment, more optioneering and value engineering to minimise CDCs and a more risk averse approach post the collapse of Carillion. MM have benchmarked CICs across UUW's supply chain, the UK Water Industry and UK Transport Industry and have seen the increase accelerate in AMP7, which has been due to the reasons mentioned above and also the large increase in post-COVID infrastructure spend, which has driven significant growth into resource wages. Contractors are also actively picking sectors and work type to maximise profit returns and this means that some have reduced their work in the water sector or exited completely. In order to mitigate these potential cost increases due to the current market conditions the planned procurement route is to use smaller local contractors who will carry lower overheads. The client delivery costs are based on the Operating Delivery Model (ODR). The ODR are based on the proposed AMP8 delivery model, which will select the chosen runway based on risk management and level of design between UUW and its extended supply chain.

7.15.7 Similarly to the capex costs we have also challenged our assumptions on the opex costs for overflow schemes. Continuing with the CRE0043 Church Lane example, Table 15 below shows the breakdown of opex costs and how we have challenged our assumptions to drive down cost. The biggest differences in this example are the staff costs which have reduced to be proportionate to the attendance required at a network overflow including reflecting a more appropriate level of maintenance andlandscaping of the site. This review of our opex costs for the CRE0043 Church Lane CSO example has reduced the opex costs by 28%.

Table 15: Opex costs for CRE0043 Church Lane CSO in 2020/21 prices

Cost element	Original cost (£)	Revised Cost (£)
Power	[✂]	[✂]
Staff	[✂]	[✂]
Maintenance	[✂]	[✂]
Landscaping	[✂]	[✂]
Business rates	[✂]	[✂]

Cost element	Original cost (£)	Revised Cost (£)
Biodiversity net gain	[✄]	[✄]
Cost to treat (additional flow needing to be treated at the receiving WwTW)	[✄]	[✄]
Total	[✄]	[✄]

7.16 Approach to challenging our assumptions

7.16.1 There are several aspects of project costs which are impacted by the scale of the programme and thus as the AMP8 programme matures, they may be subject to change. At the moment the following assumptions are included in our costs Corporate Overhead: we have currently estimated 7% allowance for Corporate Overhead. This is estimated on anticipated high level organisational structures to support the programme. This has been calculated based on current delivery assumptions, which is a largely outsourced design and build basis.

7.16.2 UUW's AMP8 WINEP is substantially larger in cost than that seen previously, and larger than the whole WINEP for England in AMP7. Additionally, we also expect the AMP9 WINEP to be substantial in scale given the longer-term environmental requirements that are already visible today. As a result of this, it is more important than ever that we can give regulators, customers and stakeholders' confidence around the development of the WINEP and so we commissioned Arup to run an independent scrutiny and challenge process on the development of the PR24 WINEP. Arup spent time working with specialists across UUW to understand how we had arrived at the scope, the approach to developing costs and whether the programme had been appropriately optimised.

7.16.3 Feedback from Arup included: *'Overall, we note the very significant amount of work that was done by UUW in the short time between our reviews… We found that UUW responded positively to the challenge and scrutiny applied to it from Arup and the Panel members, with a very significant amount of work undertaken after our initial review. We observed that progress had been made by UWW in many areas that we highlighted in our original review. As part of this, we also noted a strong push across the leadership and the operational teams on trying to ensure that the programme achieves a balance of solutions across traditional engineered approaches and alternative measures where these are feasible and appropriate.'*

7.16.4 The WINEP scrutiny and challenge panel consisted of: Trevor Bishop (Independent, Panel Chair), Bernice Law (Independent (and Chair of UUW's YourVoice ICG panel), Alastair Chisholm (Director of Policy, CIWEM), Simon Wright OBE (Independent) and Ryan Harris (Senior Commercial Director, Arcadis). The panel concluded:

"It is reassuring to see the company embracing and positively responding to the key challenges set by the panel of independent experts on its WINEP programme. Whilst the company's WINEP programme is, by necessity of the environmental issues to be resolved in the North West, both substantial and complex the panel is encouraged to see a carefully balanced programme being developed. The use of adaptive planning was noted by the panel who strongly supported the approach to ensure further optimisation of value for money and reductions in carbon as solutions are refined through experience."[18]

7.16.5 Following the initial review by Arup we incorporated their feedback into our plan. Particularly relevant to this case is the cost estimating methodology which following the second review they concluded that UUW costing methodologies largely comply with the requirements of WINEP guidance as well as standard industry practice. However, they did raise concern that "across a broad programme the level of risk allowance is at the lower end of the range we would expect' and we have further developed our plan to ensure concerns raised are addressed within the final estimates.

[18] 2023, Arup, WINEP Scrutiny and challenge Independent review report – Final

7.17 Third party assurance

7.17.1 We commissioned two specific pieces of third party work to assure the cost efficiency of our enhancement cases:

- A bottom-up benchmarking exercise (Faithful and Gould); and
- Assurance on top-down benchmarking carried out by UUW (Deloitte).

7.17.2 We consider that the complementary and independent output of these pieces of work demonstrates that our cost estimates are efficient and represent excellent value for money for our customers.

7.17.3 We provide a description of each below.

Bottom-up benchmarking (Faithful and Gould)

7.17.4 Faithful and Gould undertook a bottom-up deep dive into the cost efficiency of our enhancement cases. This involved a close examination of our cost base relating to a sample of our enhancement programme, with comparisons made to similar activity carried out by third party companies across a variety of sectors.

7.17.5 F&G looked at our direct costs across each of the following categories:

(a) Staff including site supervision

(b) Mobilisation and site set up, running and removal of site offices and welfare

(c) Temporary services for general site use, such as water to wash out concrete skips

(d) Attendant plant and equipment, such as cranes, forklift for unloading deliveries etc

(e) Attendant labour, defined as hourly paid operatives not involved in productive works

(f) Site consumables, such as waste skips

(g) Set-up site compounds, erecting hoardings etc

(h) O&M manuals

(i) Health and safety

7.17.6 It also looked at the contractor's indirect costs (e.g. overhead and design costs) and UUW's indirect costs (e.g. land acquisition costs). Due to the size of the programme, F&G examined a sample of our enhancement cases. However, this sample included projects from each of our enhancement categories and covered £1.246bn of expenditure. Therefore, we consider this sample to representative of our overall enhancement programme.

7.17.7 F&G noted the effectiveness of UUW's cost estimation process:

"In addition to the benchmarking data held by Faithful+Gould we understand that UUW has applied multiple internal and external challenges to progressively refine the cost estimation undertaken to date. In particular we note UUW's use of its Investment Programme Estimating System (IPES) which is a bespoke parametric estimating tool containing data from AMP3 to AMP7, to provide historical cost curves alongside estimated data from third party organisations."

7.17.8 F&G found that our proposed costs are in line with rates typically seen across the industry:

"Overall, UUW's approach of utilising historic cost curves, market testing and obtaining specialist third party quotations demonstrates a sound proactive approach to cost planning. In total £1.2bn of schemes underwent targeted cost assessment with £573m making up the construction works element.

After presenting our initial findings it was encouraging to see UUW's commitment to addressing our findings and applying these to the wider enhancement estimates, charting a strategic route towards greater efficiency and scope clarification.

In light of this Cost Assurance work and evidence of UUW's responsive actions we have concluded that the data we have benchmarked is within a reasonable alignment with anticipated market rates."

Assurance on top-down benchmarking (Deloitte)

7.17.9 As part of our business plan submission, UUW carried out top-down benchmarking, which took two distinct forms:

- Unit cost analysis using recent data from the industry's APR datashare and other publications (e.g. Drainage and Wastewater Management Plans); and
- Where possible and feasible, econometric analysis based upon Ofwat's PR19 model suite.

7.17.10 As we discuss in *Chapter 8 – Delivering at efficient cost* and supplementary document *UUW46 – Cost Assessment Proposal,* recent supply-side shocks mean that the relationship between cost and cost driver reflected within the econometric models used to assess enhancement expenditure at PR19 is no longer appropriate. As such, we consider benchmarking carried out using more recent data to be more effective at assessing AMP8 enhancement costs. As such, we do not consider comparisons to cost estimates derived using the coefficients estimated at PR19 to be relevant.

7.17.11 In general, where recent and comparable data was available, our benchmarking analysis found our business plan costs align to similar comparator companies. This is reflected in Deloitte's findings:

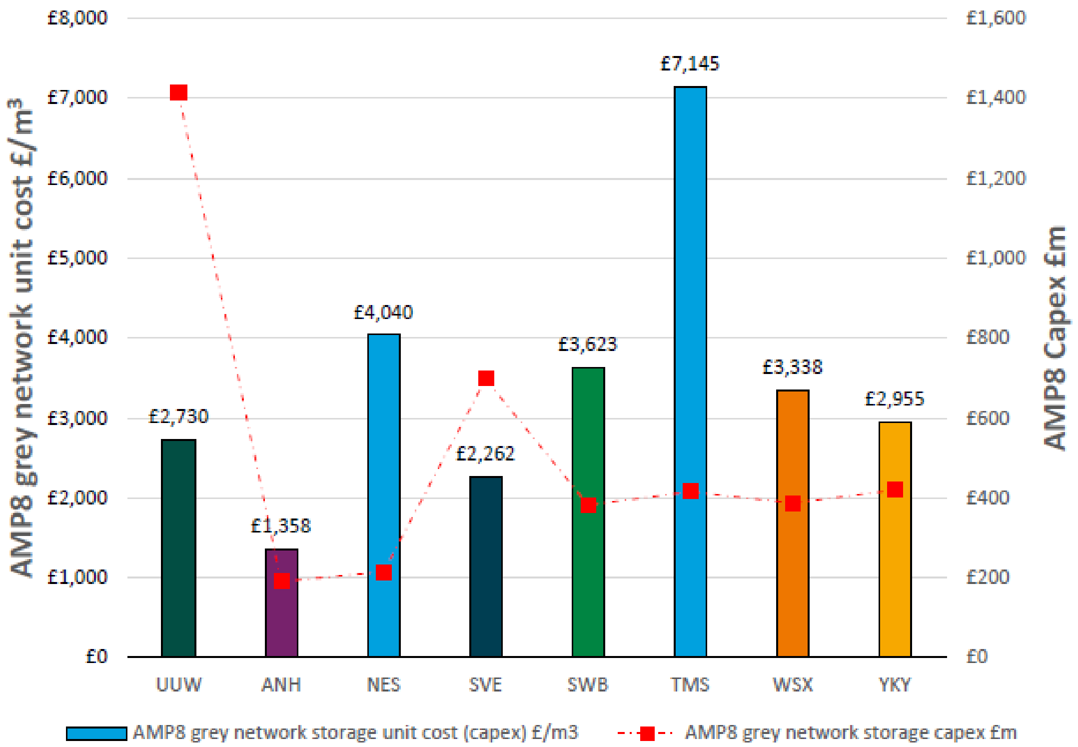
"Overall, UUW has performed econometric benchmarking on programmes totalling £3,908m in enhancement case costs. We did not find any material errors in this econometric benchmarking…UUW's other top-down benchmarking based on more recent data submitted by peer companies indicates that UUW PR24 costs are generally in line with expected costs."

7.18 Industry comparison

7.18.1 To ensure comparable costs for our storm overflows programme we have benchmarked our costs against available data from published DWMP and APR23 data. Although this data has limitations, what it suggests is that the UUW PR24 costs are not an outlier.

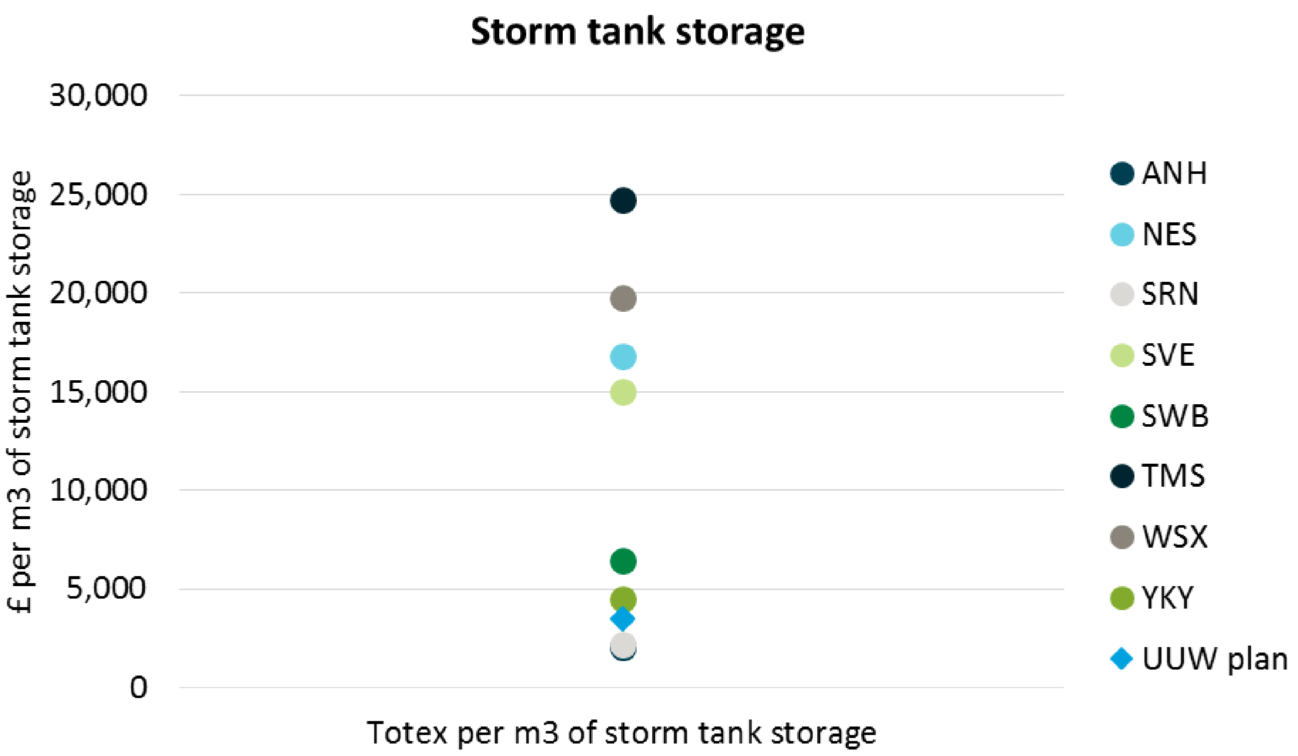
7.18.3 Figure *34* below shows that our AMP8 DWMP unit cost for network storage are in line to those of other companies. As these costs are from DWMP they cannot be directly compared to PR24 costs, however it does suggest that the UUW costs are not an outlier in the sector on a comparable unit cost basis.

Figure 34: Benchmarking to DWMP data



7.18.4 We have also undertaken an efficiency assessment using APR23 data (Figure 35 below). This uses AMP7 network storage project outturn costs and is using a relatively small data set, as the majority of AMP7 storage schemes complete at the end of the AMP. However, these data do suggest that our proposed plan, when calculated at a unit rate per m3 of storage, is at the lower end of other companies' costs.

Figure 35: Unit cost assessment using APR23 data



Source: APR 23 data

8. Defining spills

8.1 Summary

8.1.1 All spills will be counted using the Environment Agency's standard 12/24 counting rule. However, spills reported under the AMP8 storm overflows performance commitment will differ from that reported in the Environment Agency's EDM annual return. There are clear differences within the two reporting assessments which makes comparison of historic data and future performance commitments more difficult. We observe that a common performance commitment for storm overflows would be insufficiently stretching for some companies and unachievable for other. Such an approach would be inconsistent with the performance commitment design principals.

8.2 Spill Reporting

8.2.1 The approach taken by Ofwat in counting the number of spills from storm overflows is different from that of the EA. The AMP8 storm overflows performance commitment is therefore not comparable to past spill frequencies reported within the EA's EDM annual return. There are three key differences when comparing these data:

- The EA's EDM annual return reports the total number of spills recorded within the year based on measured data and only includes spill data for storm overflows that is measured by an EDM;
- The AMP8 performance commitment reports the average number of spills reported within the year by dividing the total spills by the number of storm overflows; and
- The AMP8 performance commitment uplifts the spills recorded based on the availability of data within the reporting period.

8.2.2 The EA count the number of spills using their 12/24 counting methodology which is detailed within the guidance document 'Water companies: environmental permits for storm overflows and emergency overflows'[19]. Any spill that occurs within the first 12 hours is counted as a single spill, any discharges in the next and subsequent 24 hours are counted as additional spills. This continues until there is a 24 hour period without any spills and the sequence will start again.

8.2.3 Within the EDM annual return, companies are required to report the number of spills recorded based on the 12/24 hour rule - where data is not available, or identified as erroneous, this is reflected within the percentage of reporting period that the EDM was operational. Where a storm overflow is not monitored, this is identified within the EDM return as 'EDM to be installed' and no spill data or operability is reported. Where an EDM is installed part way through a year, the operability is calculated from the date of installation, the month or year of installation is also reported with this return.

8.2.4 Ofwat has defined the AMP8 storm overflows performance commitment as the average number of spills recorded within a calendar year and is calculated using the following formula[20].

$$\frac{Number\ of\ monitored\ spills}{Number\ of\ storm\ overflows} + Unmonitored\ storm\ overflow\ adjustment$$

8.2.5 Where:

- Number of monitored spills is the total number of spills recorded within the year based on measured data (this is the same as the EDM annual return);

[19] Water companies: environmental permits for storm overflows and emergency overflows, published 2018: https://www.gov.uk/government/publications/water-companies-environmental-permits-for-storm-overflows-and-emergency-overflows/water-companies-environmental-permits-for-storm-overflows-and-emergency-overflows

[20] https://www.ofwat.gov.uk/wp-content/uploads/2022/12/Storm_overflows_PC_definition.pdf

- Number of storm overflows is the total number of combined sewer overflows on gravity sewers, pumping stations or sewage treatment works (including settled storm overflows). Overflows should be included regardless of permit status; and
- Unmonitored storm overflow adjustment is an uplift applied to the reported data to take into account the percentage of time that monitors are available and providing reliable data multiplied. This adjustment is calculated as:

  (1 – A) * B

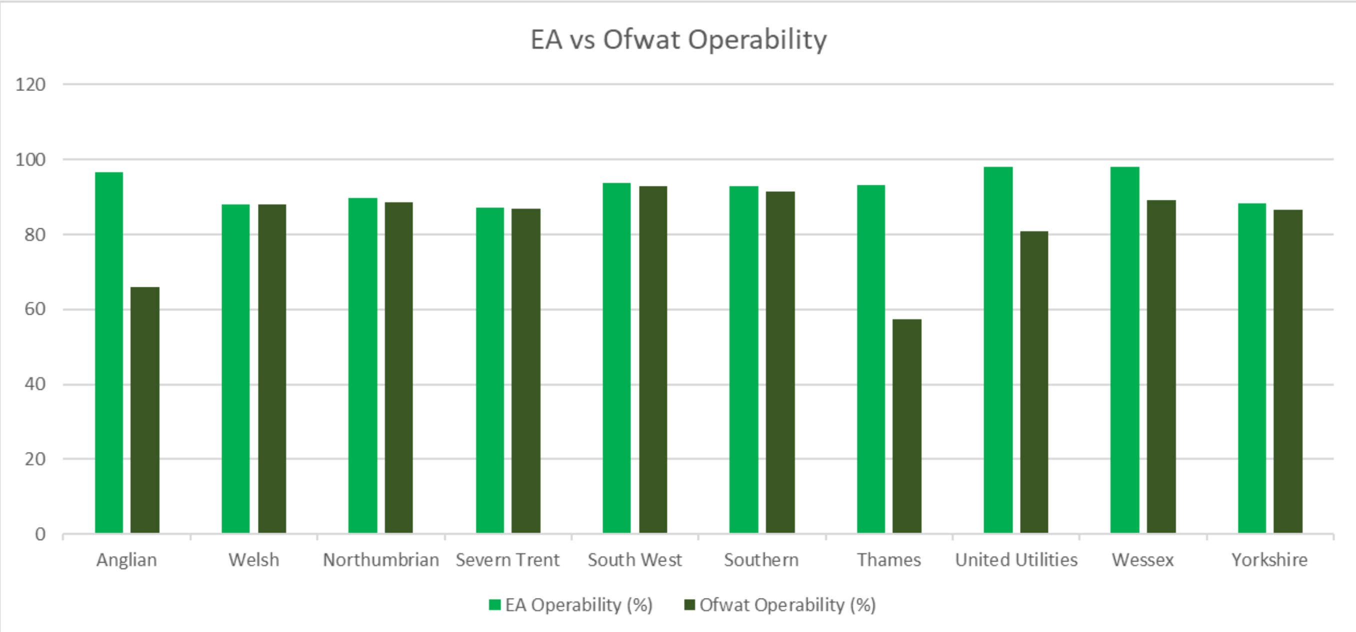
8.2.6 Where:

- **A** is uptime or the percentage of time that monitors are operational and reporting accurate data. This is reported from 1 January to 31 December regardless of when the monitor is installed, storm overflows that are unmonitored will be given an operability of zero percent.
- **B** is a constant and is set at 100.

8.2.7 Figure 36 below shows how the operability reported within the EDM annual return differs from that reported using the AMP8 storm overflow performance commitment. The variability within the two data sets is reflective of the difference in the number of storm overflows reported and the number of storm overflows monitored.

8.2.8 In the latest EDM annual return UUW reported that 89% of all storm overflows had spill monitoring leaving 11% to be installed by the end of 2023. Therefore 2024 will be the first full reporting year with 100% of storm overflows monitored. Using the AMP8 performance commitment methodology, these unmonitored sites are given a spill frequency of 100, this is reflected within Figure 36 below.

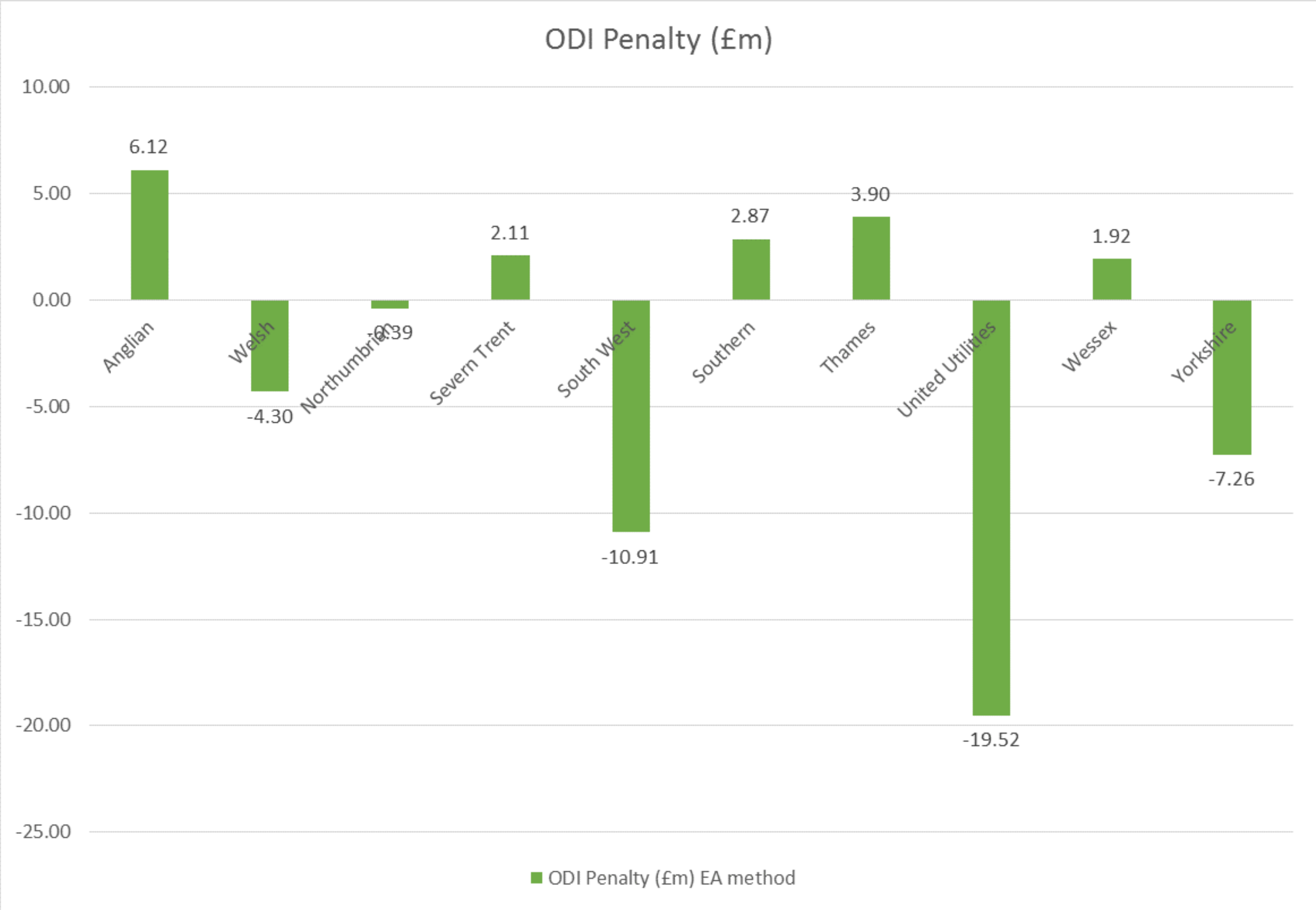
Figure 36: Comparing EDM operability (or uptime) reported in the 2022 EA's EDM annual return and the value calculated using Ofwat's storm overflow performance commitment methodology



Source: UUW analysis of Environment Agency's EDM Annual Return data

8.2.9 Within the final methodology Ofwat identified the AMP8 storm overflows performance commitment for a common target across the industry starting at 20 by the end of AMP7. Using the 2022 EDM annual return and UUW's ODI rate we have reviewed performance against a common target to understand the range of underperformance and outperformance opportunity. This analysis identified an ODI range of £6.12m to -£19.5m per year. This data, presented in Figure 37, demonstrates how a common target would be unachievable for some companies and easy for others. Based on this analysis UUW would receive a penalty of £19.5m whereas some companies would be in reward.

Figure 37: ODI range if industry performance in 2022 was assessed against a common target of 20 spills (average per annum)



Source: UUW analysis of Environment Agency's EDM Annual Return data

8.2.10 In addition to the reporting variance, the targets presented by the government and Ofwat are also different. The Government's Storm Overflow Discharge Reduction Plan (SODRP)[21] sets out long-term targets to improve these discharges to ensure no storm overflow has an adverse ecological impact, that improvements are made to sites discharging near designated bathing waters and ultimately to ensure that no storm overflow spills more than 10 times a year on average, over a 10-year period. These improvements have been translated into environmental enhancement drivers for inclusion within the WINEP for AMP8 and beyond. Improvement criteria and compliance assessment will be managed through the permit issued by the EA.

8.2.11 Ofwat's storm overflow performance commitment will use an annual average spill frequency to determine performance. The performance commitment target does not take into account variability in rainfall or operational differences between companies but will take into account any spill reduction schemes being delivered from enhancement expenditure. Within the final methodology for PR24, appendix 9, Ofwat states:

"Companies should set themselves a stretching company specific performance level, where appropriate, going beyond the initial 2025 target of 20 spills per overflow we proposed in our draft methodology. Companies should provide compelling evidence if they do not consider that they can meet this target by 2025."[22]

[21] Storm overflow discharge reduction plan published 26 August 2022. Available here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1101686/Storm_Overflows_Discharge_Reduction_Plan.pdf

[22] https://www.ofwat.gov.uk/wp-content/uploads/2022/12/PR24_final_methodology_Appendix_9_Setting_Expenditure_Allowances.pdf

8.2.12 We believe, given the differences highlighted above and the issues around regional rainfall variance, that the performance commitment level should reflect company-specific circumstances. The analysis carried out by Stantec for the Storm Overflow Evidence Project identified that 35 per cent of the investment required to meet the long term target of 10 spills per annum would fall in UUW's area. We recognise that there is still a lot to do and we have developed our storm overflow programme; a programme to deliver the maximum spill reduction benefit in AMP8. Although significantly larger in scale than any programme we have implemented in previous AMPs, we are putting in place delivery plans to enable UUW to meet the regulatory requirements set out in WINEP. The performance commitment should reflect the challenge faced by companies to achieve the long term spill target and the deliverability of the programme to achieve this. Therefore, UUW considers that a common performance commitment is not appropriate and have proposed a company specific-target, as outlined in section 9 below.

9. Performance commitment level

9.1 Summary

9.1.1 Storm Overflows is a new common performance commitment in AMP8. UUW proposes a company-specific performance commitment level (PCL) for the business plan period 2025-2030. The PCL takes into account the benefits that will be delivered though the base programme and the WINEP enhancement programme and will deliver a 60% reduction in storm overflow discharges from our 2020 position. This is likely to be the largest spill reduction programme in the sector delivering the biggest improvement in performance.

9.1.2 More information regarding this performance commitment can be found in Chapter 5: Delivering great service and UUW30 Performance commitment technical document.

9.2 Our Proposed PCL

9.2.1 UUW recognises that the PCL for this measure needs to take into account the benefits that will be delivered though base and the WINEP enhancement programme. In general, the base programme will deliver gradual improvements in performance, focused on avoiding maintenance or operational failures; while the enhancement programme will deliver a step change in performance, in line with the government's long-term ambition for spill reduction. To ensure that UUW is delivering the most benefit in AMP8, our enhancement programme targets high priority and high spilling storm overflows. In addition UUW is challenging our delivery expectations and promoting early delivery of our storm overflow reduction programme in AMP8 to enable early delivery against the WINEP regulatory date. Our acceleration of the WINEP enhancement programme is reflected within our storm overflow reduction plan (SODRP) and AMP8 performance commitment.

9.2.2 The PCL sets an even more ambitious delivery target than our enhancement plan, this will be met through delivery of short-term mitigation measures to reduce storm discharges during the delivery of the permanent enhancement solutions to increase capacity. The mitigation measures will deliver spill reductions during the design and construction of the long-term permanent solution.

9.2.3 The proposed performance commitment is summarised in Table 16. Failure to meet the performance commitment will result in outcome delivery incentive (ODI) payments.

Table 16: AMP8 storm overflows performance commitment level, caps and collar

	2025	2026	2027	2028	2029
UUW PCL	26.2	25.6	24.2	22.4	19.6
Outperformance collar	34.06	33.28	31.46	29.12	25.48
Underperformance cap	18.34	17.92	16.94	15.68	13.72

9.3 Our plan

9.3.1 The proposed storm overflows PCL incentivises an already ambitious plan to reduce the number of spills to the environment from storm overflows as soon as possible. The level of spill frequency reduction takes into account the benefits from:

- Early investment and acceleration of AMP8 enhancement programme to deliver ahead of the WINEP regulatory dates;

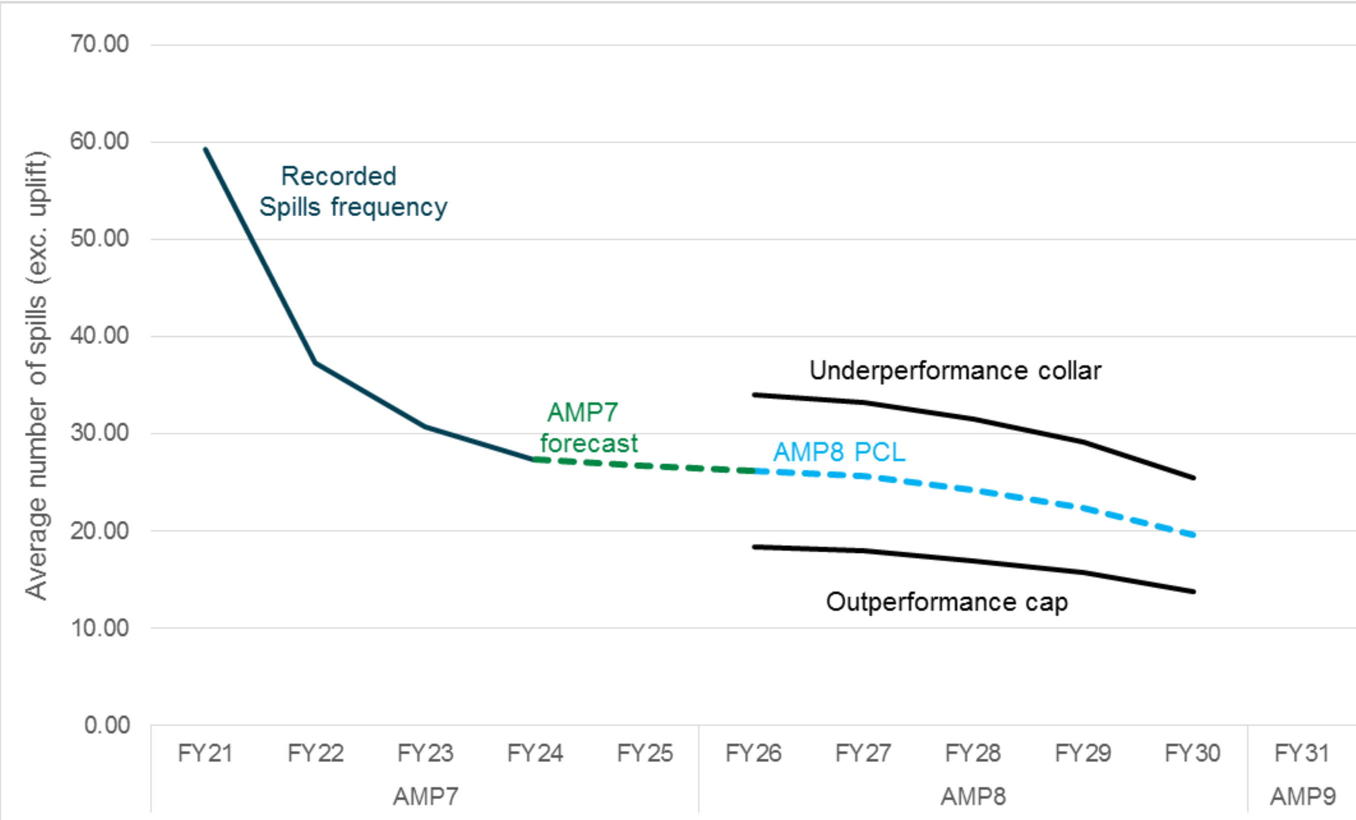
- Short-term benefits from short-term mitigation measures to reduce spill frequency during design and delivery phases of permanent WINEP schemes; and
- Advanced WINEP initiative to deliver rainwater management schemes in partnership, unlocking funding, innovation and harnessing expertise in order to meet long term SODRP targets.

9.3.2 In section 6 we identify the actions that UUW is taking in order to reduce spills from storm overflows as soon as possible. We demonstrate how the acceleration of the AMP8 enhancement programme will deliver an annual modelled spill reduction of over 28,000 spills faster than the regulatory profile (based on modelled spill data), and identify how the short-term mitigation measures we are taking now will deliver environmental spill reduction benefits earlier than we can achieve through the WINEP enhancement programme alone.

9.3.3 Our Advanced WINEP proposal has been approved by the Environment Agency and has been built into our business plan submission. This plan, if accepted, will deliver £249 million (FY21 prices) of investment in rainwater management solutions which will unlock earlier, innovative investment and partnerships on rainwater management for storm overflows. In AMP8, the Advanced WINEP will focus on unlocking solutions in catchment areas where storm overflows need to be improved in order to meet long term SODRP targets. Detail of this is available through the Advanced WINEP (rainwater management) submission document August 2023.

9.3.4 Figure 38 shows our past performance, future forecast performance and proposed AMP8 PCL. The plan will deliver a 60% reduction from our FY21 reported performance and a 32.9% reduction over AMP8. It is important to consider than some of the benefit from our WINEP enhancement programme will be delivered in AMP7.This is reflected within the performance commitment target and included within the AMP7 performance forecast.

Figure 38: Proposed AMP8 storm overflows performance commitment in the context of past performance



Source: PR24 Data Tables and supporting and supporting calculations.

9.4 Why a Common PCL is inappropriate for UUW

9.4.1 As discussed in section 3 past improvement to increase wastewater capacity has been driven by legislation to prevent adverse impacts from storm overflows. These past requirements have not required companies to meet a level of spill reduction and have therefore resulted in differing levels of spill reduction being delivered as a result of differing levels of spill reduction being needed to remove harm (wetter areas having higher residual spills than dry areas once harm has been removed).

9.4.2 UUW disagrees with the application of a common PCL for this performance commitment. In the case of discharges from storm overflows we have set out how our ability to influence the number of spills to date has been limited by:

- Past legislation;
- Greater than average rainfall within our region; and
- Our legacy asset base including the proportion of combined sewers.

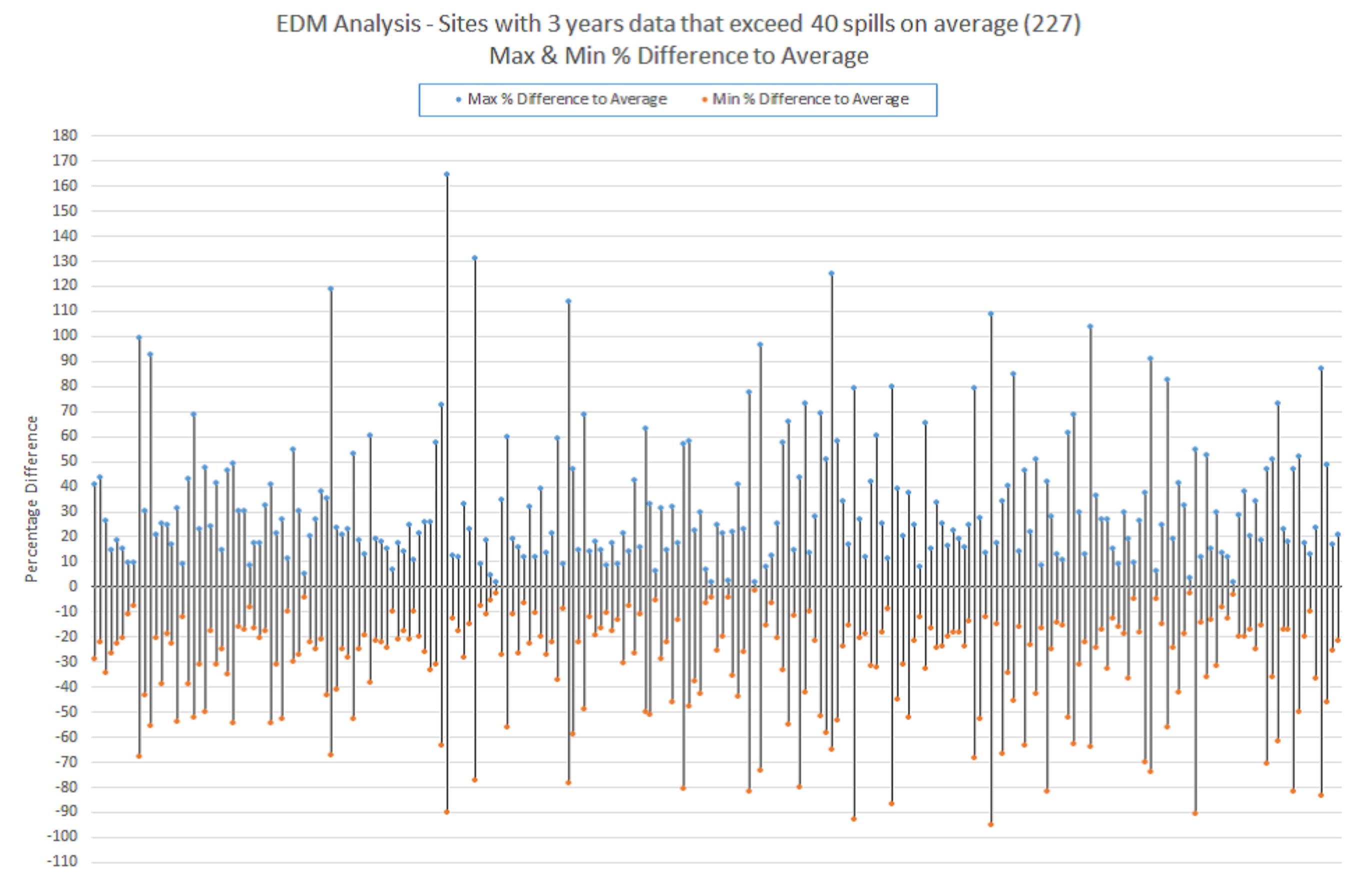
9.4.3 We observe that long-term, step-changes in performance can only be achieved with significant investment within our wastewater system to increase storage and treatment capacity. In the development of our AMP8 WINEP we looked for the lowest cost and best value solutions to reduce spill frequency and meet the requirements of SODRP – this has resulted in the largest enhancement investment programme in our history at a cost of £3,089 million. This is more than the botex allowance for the entire wastewater price control which demonstrates the size and scale of the challenge in the North West and step-change in performance requirements driven by the SODRP.

9.5 Application of Cap and Collar

9.5.1 UUW agrees with Ofwat's proposal to apply a cap and collar for this new common performance commitment as the solutions designed spill performances are based on an average from a 10-year time-series of rainfall. Actual annual rainfall will have a significant impact on this measure so it is appropriate to protect against large annual variations from the designed solution due to rainfall alone.

9.5.2 Analysis conducted by UUW in 2018 looked to identify annual variations in performance due to rainfall. The analysis was carried out at storm overflows where both EDM and modelled data was available at the time of completion. Three years of EDM data was assessed from 227 overflows and the data plotted to review the variation. Figure 39 below shows that there is significant annual variation in data as rainfall is the most significant factor affecting spill frequency.

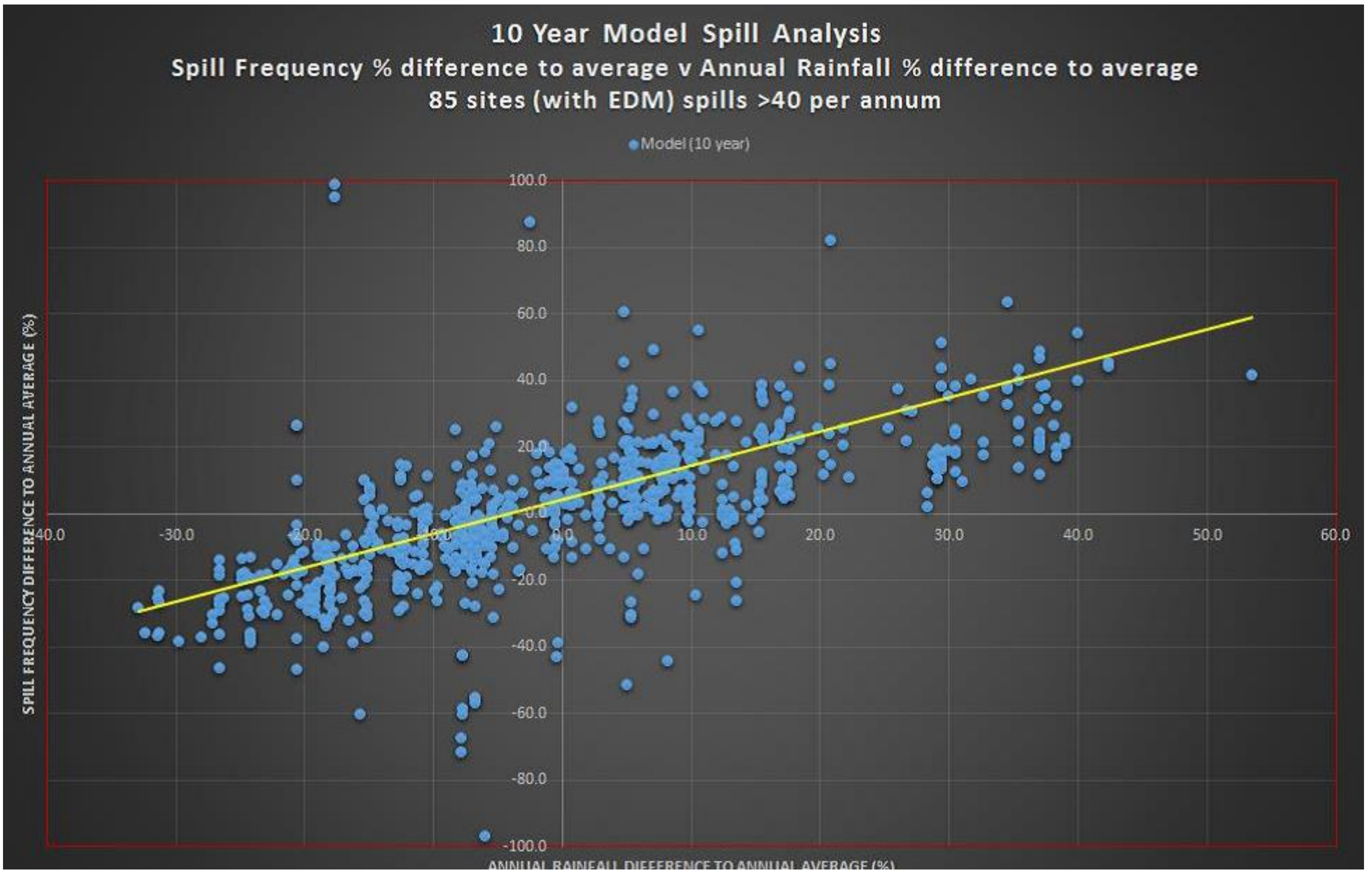
Figure 39: Annual variation in EDM data where spill frequency exceed SOAF threshold of 40 spills per annum. Analysis based on three years of data



Source: UUW analysis of EDM data

9.5.3 Similar analysis was undertaken using modelled data; a sample of 82 sites were run through hydraulic network models using 10 years' time series rainfall data. Variation in rainfall data resulted in an observed annual spill frequency deviation of +/- 30% when compared to the average, see Figure 40 below. To protect from extreme variations in rainfall, UUW propose a cap and collar to prevent ODI payments purely as a result of the weather.

Figure 40: Percentage variation in modelled spill frequency (based on 10 years of rainfall data) vs the percentage variation in rainfall compared to the average



Source: UUW analysis of modelled data.

9.6 Dependencies or overlaps with other PCs

Bathing waters

9.6.1 All storm overflows with a bathing water or shellfish water driver have been taken into account when setting the storm overflow baseline. Six bathing water schemes have been identified in AMP8, and these spill reduction schemes are modelled to achieve an in-class benefit and therefore will not impact the overall bathing water classification nor the performance commitment baseline.

Pollutions

9.6.2 Reducing the number of discharges to the environment could reduce the risk of a pollution occurring, however pollution incidents caused by hydraulic capacity are a very small proportion of our overall incidents accounting for 2% of total pollutions since 2018 and therefore the risk reduction benefit is limited. In addition UUW has proposed a stretching target for pollution performance, relative to our frontier position on pollution incidents. This reflects our desire to protect and enhance the North West's rivers and wider environment.

WINEP

9.6.3 All WINEP enhancement schemes for spill frequency reduction have been taken into account when developing the performance commitment target for storm overflows. To ensure that we are delivering the spill frequency reduction that customer's expect, we intend to deliver short-term mitigation measures from base during the implementation of our enhancement programme. In addition, Ofwat accepted our ambition to accelerate delivery of 154 AMP8 storm overflow projects, this funding will enable the detailed design to be developed in AMP7 so that delivery can start in early AMP8 therefore delivering spill reduction sooner. The benefit of the accelerated programme has been taken into account when developing the storm overflow PCL, we have assumed early delivery of the AMP8 enhancement programme to deliver spill reduction as soon as possible, the performance commitment reflects our very ambitions delivery plan and commitment to reducing storm overflow discharges.

Advanced WINEP

9.6.4 Our Advanced WINEP accelerates work on future overflow drivers into AMP8 to allow time to deliver the rainwater management component of solutions. This approach is critical to delivering multiple benefits and efficient spend, when partnership funding can be leveraged to change grey solutions to blue-green. The programme is therefore entirely comprised of hybrid or blue-green solutions and is specifically targeted at delivering wider environmental outcomes alongside spill reduction. A small benefit in average spill reduction has been identified in AMP8 as a result of Advanced WINEP, this is shown in Figure 23 and has been taken into account when setting the PCL.

10. Customer protection

10.1 Introduction

10.1.1 This section outlines how customer are protected from non-delivery of schemes including the impact on Outcome Delivery Incentives and Price Control Deliverables.

10.1.2 Several mechanisms are in place to ensure UUW deliverS upon its commitments to reduce storm overflow discharges including:

- Environmental Performance Assessment;
- Storm overflows performance commitment; and
- Price Control deliverable (PCD).

10.1.3 The EA's annual assessment of environmental performance includes a metric on the delivery of WINEP schemes. All storm overflow enhancement schemes are named schemes within UUW's WINEP and therefore delivery will be assessed by the Environment Agency. Failure to deliver by the regulatory date will result in the WINEP metric being scored as 'amber' or 'red' limiting the performance rating. In addition, the EA will update the asset permit to reflect the tighter requirement (spill frequency reduction) as a result of the enhancement expenditure. Failure to comply with our environmental permit will be subject to EA scrutiny and where appropriate further measures may be taken such as prosecution.

10.1.4 In AMP8 the storm overflow performance commitment will report on the average spill frequency from storm overflows. This is a combination of measured data and an uplift based on EDM data availability as detailed within Ofwat's performance commitment definition. The PCL takes into account short term benefits and long-term protection of current performance (no-deterioration) delivered from base and long-term improvements in performance delivered through the WINEP. The performance commitment is reflective of an accelerated WINEP programme to demonstrate our ambition to deliver benefit as soon as possible and to reduce spill from storm overflows within the North West. Failure to meet the performance commitment will result in outcome delivery incentive (ODI) payments.

10.1.5 It is important that customers have confidence that we will deliver the schemes that get included in the Environment Agency's final WINEP and they are suitably protected if any outcomes are not delivered (except where delivery dates are moved or changed through the EA alteration process). Ofwat proposes that, if companies fail to deliver improvements to customers, then price control deliverable (PCDs) payments, together with any related ODI underperformance payments and cost sharing arrangements, should return to customers more than the allowed cost of the enhancement. This mechanism will protect customers in the event that requirements are no longer needed or the delivery date has been moved to ensure that customers are not paying more than was committed. The proposed storm overflow PCD is discussed in more detail below.

10.1.6 Customers are protected from non-delivery through the Storm Overflows performance commitment - the overflows programme is built into the baseline performance commitment level (PCL) for this performance commitment. Therefore if improvements are not delivered the overflow will not achieve the required spill frequency reduction and we will incur an underperformance payment through this ODI.

10.1.7 Additional consequences of non-delivery include:

- Potential for prosecution and fines in the event of non-compliance with permits;
- Reputational impact of reducing Environmental Performance Assessment ratings;
- Loss of trust with customers and stakeholders; and

- Loss of trust with the EA leading to less support for innovative approaches to delivering environmental improvement.

10.2 Managing change

10.2.1 Customers should only pay for environmental enhancement outcomes that are actually delivered. The overflows programme requires some flexibility for delivery given the pace at which the regulatory requirements and associated region-wide programme were developed, and complexities of planning, access and land needs. Focusing on outcomes allows for in-programme flexibility to refine deliverables. For example, the exact location and scope of a scheme within the programme continues to evolve at the time of this submission. Price Control Deliverables have therefore been constructed on this basis, looking at the overall outcome of the schemes and not individual outputs.

10.2.2 Any changes to our programme will be made in agreement with the EA (managed through the WINEP alteration process where needed) and Your Voice to provide confidence that we are only working on improvements that are fully justified and the WINEP programme is kept up-to-date and delivered.

10.2.3 In reconciling performance at PR29, our 'Output in use certificate' (or equivalent documentation once formalised) would be used as appropriate evidence for the Price Control Deliverable that the scheme has been delivered. The delivery of schemes is also reported by the EA on the Defra SharePoint site that is used for WINEP development. If, at the time of submission for PR29, this documentation had not been received, we would provide the appropriate evidence and assurance that delivery would be achieved before 31 March 2030 or the Price Control Deliverable would take effect and return the allowance to customers.

10.2.4 We propose to apply the same level of assurance to this Price Control Deliverable as we propose for the AMP8 Outcome Delivery Incentives, which we also expect to be in line with our AMP7 assurance framework.

10.3 Price control deliverable (PCD)

10.3.1 It is important that customers have confidence that we will deliver the enhancement schemes that get reflected in our PR24 final determinations and they are suitably protected in the event of non-delivery, or if there are material changes to deliverables (including changes to dates), which leads to a change in cost (including changes in the timing of required expenditure). Ofwat proposes that, if companies fail to deliver or are late delivering improvements to customers, then price control deliverables (PCDs) should, where appropriate, be used to compensate customers. In our PR24 *Chapter 8 – Delivering at Efficient Cost, section 8.8.9* we have proposed an approach to PCDs that aims to provide customer protection, such that customers are fairly compensated for non-delivery (such as due to a change in regulatory requirements) or late delivery (including as a result of a change to a regulatory date), between PCDs, any related ODI underperformance payments, and cost sharing arrangements.

10.3.2 We have considered PCDs in three areas (£3089,431m):

(a) Overflows spill reduction (£2,375,831m AMP 8 totex)

(b) Overflows screens (£484,191AMP 8 totex)

(c) Advanced WINEP (£198,856m AMP 8 totex)

10.3.3 We have excluded [✄] from (a).

(a) WINEP overflows spill reduction

10.3.4 We have set out analysis of our overflow spill reduction schemes in Ofwat's PCD template in *UUW33 Storm Overflows PCD template*. In our proposed PCD we have used modelled spill reduction, as we believe that this provides the best balance of customer protection and incentivising innovation and efficiency:

- Customer protection – using modelled spill frequency within the PCD will ensure that a project is delivered to meet the spill reduction set out within the WINEP, rather than risking 'delivery' being overstated (or understated) due to annual variations in rainfall. All WINEP outputs will subject to review and agreement by the Environment Agency.
- Incentivising innovation and efficiency – this 'outcomes focused' approach to the PCD will focus on delivery of the long term driver to reduce discharges from storm overflows to the receiving environment (rather than on delivering specified interventions). This is the most appropriate mechanism and allows flexibility within the programme for more efficient or alternative delivery routes, including exploring more sustainable delivery options by grouping projects or introducing more nature based solutions. As such it would not be appropriate to have a PCD focussed on the input (e.g. a particular amount of storage) as this would restrict innovation and potential opportunities within the programme to deliver a more wholesome and/or more efficient solution (e.g. in partnerships).

Table 17: PCD summary

Scheme delivery expectations	
Description of deliverable	Delivery of storm overflows spill reduction programme (for both network and STW) in line with our AMP8 WINEP, which entails delivering projects that contribute to a modelled expectation value of spill reduction of 22,063 per annum by the end of AMP8. [✂]
Output measurement and reporting	This metric reflects the modelled overflow spill reduction from each scheme delivered, with the target being in line with the profile of delivery in the company's PR24 business plan, to deliver AMP8 WINEP requirements. These are set out in the table below. WINEP will be subject to a change control process through application to the Environment Agency - any variation in scheme will have its own modelled/expected spill reduction, which will count against delivery of this PCD.
Assurance	Successful completion of WINEP Enhancement schemes is assured internally through review of evidence compiled by delivery partner / Engineering and External assurance is by the Environment Agency confirming completion and updating the WINEP Tracker to reflect the date the output was claimed. Generation of an associated output in use (OIU) certificate and evidence pack will include the modelled spill prior to the scheme and post scheme completion. The evidence pack is provided to the Environment Agency for their sign off that the scheme has been completed
Conditions on scheme	None
Impact on PCs	In the event on project non-delivery, the expected spill frequency will be higher than target, and hence we will also be penalised via the associated PCL and ODI - this PCD therefore relates directly to the storm overflows performance commitment (expected performance, before the impact of any weather related variability). To avoid double counting, the associated ODI impact should be deducted from the PCD rate. ODI impact = ODI rate £1,292,778 / 2280 = £567

10.3.1 In our PCD template *UUW32-PCD Excel Sheet* we have assumed a wholesale WACC of 3.23%, in line with Ofwat's guidance. We have assumed a 50% totex cost sharing rate, which is applied before calculating PCDs. We have applied a further 50% for Bioresources (where applicable), to ensure that only 25% of Bioresources totex is at risk from PCDs, given the lack of RCV guarantee, and general uncertainty in cost recovery from future Bioresources price controls. For late delivery we have applied a proportionate value of annual opex, and assumed 3.5% of capex, which provides a fair reflection of the time value of money of any related deferred capital spend.

Table 18: PCD delivery profile

	Unit	AMP8	2024	2025	2026	2027	2028	2029	2030	Ultimate delivery
Cumulative delivery target for PCD	modelled reduction in total spills		130	473	3,268	7,603	19,819	28,805	29,639	29,639
AMP8 Capex (22/23 pb)	£	2,339,849,668	50,941,673	132,561,148	369,451,249	573,676,163	647,102,266	472,623,940	93,493,229	
AMP8 Opex (22/23 pb)	£	35,981,563	-	33,919	135,652	707,776	4,605,659	10,832,545	19,666,012	
ODI impact per unit of PCD volume	£/modelled reduction in total spills	567.00								

Table 19: Price Control Allocation

Price Control	Unit	Price Control Allocation
Water resources	%	0.00%
Water network+	%	0.00%
Wastewater Network+	%	100.00%
Bioresources	%	0.00%

Table 20: PCD Incentive rates

	Unit	WR	WN+	WwN+	BR
Overall delivery	£/modelled reduction in total spills	0	0	39,513	0
Time value rate	£/modelled reduction in total spills	0	0	1,276	0
Late delivery	£/modelled reduction in total spills	0	0	2,313	0

(b) WINEP overflow screens

Table 21: PCD summary

Scheme delivery expectations	
Description of deliverable	Number of overflows where the aesthetic impact of storm overflow discharges has been reduced through the installation of screens
Output measurement and reporting	Number of storm overflows screened
Assurance	We will report screens installations through the APR. EA/OIU process will confirm project delivery
Conditions on scheme	None
Impact on PCs	None

Table 22: PCD delivery profile

	Unit	AMP8	2024	2025	2026	2027	2028	2029	2030	Ultimate delivery
Cumulative delivery target for PCD	screens		-	3	14	54	111	246	351	351
AMP8 Capex (22/23 pb)	£	478,415,441	7,857,612	20,723,758	80,626,356	93,046,061	140,901,228	112,044,657	23,215,770	
AMP8 Opex (22/23 pb)	£	5,775,475	-	9,046	41,414	206,354	718,479	1,602,029	3,198,152	
ODI impact per unit of PCD volume	£/screens	0.00								

Table 23: Price Control Allocation

Price Control	Unit	Price Control Allocation
Water resources	%	0.00%
Water network+	%	0.00%
Wastewater Network+	%	100.00%
Bioresources	%	0.00%

Table 24: PCD Incentive rates

	Unit	WR	WN+	WwN+	BR
Overall delivery	£/screens	0	0	689,731	0
Time value rate	£/screens	0	0	22,278	0
Late delivery	£/screens	0	0	50,126	0

(c) Advanced WINEP

Table 25: PCD summary

Scheme delivery expectations	
Description of deliverable	Our proposed PCD metric is the equivalent cubic metres of conventional storage avoided through interventions delivered in AMP8.
Output measurement and reporting	Equivalent hectares disconnected (Ha) multiplied by the volume that 1 Ha of SuDS saves (m3/Ha) us from building as conventional storage = equivalent conventional storage avoided (m3). This will be reported annually via the APR.
Assurance	In line with our APR process, independent assessment and assurance of completed milestones and forecast of likely outturn position at the end of March 2030.
Conditions on scheme	None
Impact on PCs	Assume zero because benefits will be realised over the long-term, with only a minor impact in AMP8.

Table 26 - PCD delivery profile

	Unit	AMP8	2024	2025	2026	2027	2028	2029	2030	Ultimate delivery
Cumulative delivery target for PCD	**m3 equivalent storage**		**-**	**-**	**8,086**	**19,682**	**36,476**	**49,517**	**57,796**	**57,796**
AMP8 Capex (22/23 pb)	£	197,422,463	-	3,259,593	26,668,208	40,147,986	55,419,172	44,740,421	27,187,083	
AMP8 Opex (22/23 pb)	£	1,433,835	-	-	-	43,671	47,831	264,899	1,077,433	
ODI impact per unit of PCD volume	£/m3 equivalent storage	0.00								

Table 27: Price Control Allocation

Price Control	Unit	Price Control Allocation
Water resources	%	0.00%
Water network+	%	0.00%
Wastewater Network+	%	100.00%
Bioresources	%	0.00%

Table 28: PCD Incentive rates

	Unit	WR	WN+	WwN+	BR
Overall delivery	£/m3 equivalent storage	0	0	1,720	0
Time value rate	£/m3 equivalent storage	0	0	56	0
Late delivery	£/m3 equivalent storage	0	0	120	0

Appendix A

[✂

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Water for the North West

UUW64

WINEP Flow and EDM

October 2023

Enhancement Case 14

United Utilities

Water for the North West

Contents

Appendices

1. Enhancement submission

<table>
<tr><th colspan="2">Enhancement submission</th></tr>
<tr><td>Title:</td><td>Ww4 WINEP Flow monitoring and event duration monitors</td></tr>
<tr><td>Price Control:</td><td>Ww Network Plus</td></tr>
<tr><td>Enhancement headline:</td><td>The expenditure covered by this document is to meet needs in the Water Industry National Environment (WINEP) which sets out where the Environment Agency require us to enhance service standards in order to deliver environmental benefits which they will enforce through by varying our Environmental Permits.

This enhancement investment is driven by the following statutory drivers:
• Urban Wastewater Treatment (England and Wales) Regulations 1994
• Environment Act 2021

Within the Water Industry National Environment (WINEP) the Environment Agency have defined new statutory drivers for monitoring. These are:
• U_MON3
• U_MON4
• U_MON6
• EnvAct_INV1
• EnvAct_INV2
• EnvAct_INV3
• EnvAct_MON4</td></tr>
<tr><td>Enhancement expenditure

(FY23 prices)</td><td>
<table>
<tr><th></th><th>AMP8 Capex inc TI (£m)</th><th>AMP8 Opex (£m)</th><th>AMP8 Totex (£m)</th></tr>
<tr><td>Pre RPE and Frontier Shift</td><td>160.532</td><td>7.398</td><td>167.929</td></tr>
<tr><td>Post RPE and Frontier Shift</td><td>156.979</td><td>7.202</td><td>164.181</td></tr>
</table>

The table above shows the total expenditure, inclusive of accelerated programme and transitional investment, on both a pre-efficiency (i.e. pre frontier shift and real price effects basis, consistent with the cost data tables), and a post efficiency and RPE basis (i.e. consistent with the value we propose to be recovered from price controls). All numbers referenced hereafter in this enhancement case are on a post efficiency and RPE basis.</td></tr>
<tr><td>This case aligns to :</td><td>Table CWW3, CWW9 and CWW20.

For full reconciliation between enhancement costs and data table lines, see enhancement mapping tabs in UUW117 – Project allocations CW3 and CWW3.</td></tr>
<tr><td>PCD</td><td>None</td></tr>
</table>

2. Enhancement case summary

Gate	Summary	Location reference
Need for enhancement investment	Our base cost allowance only covers the cost of meeting current Environmental Permit requirements. The expenditure covered by this document is to meet needs in the Water Industry National Environment (WINEP). This sets out where the Environment Agency require us to enhance service standards in order to deliver environmental benefits which they will enforce through by varying our Environmental Permits. This enhancement investment is driven by the following statutory drivers: • Urban Wastewater Treatment (England and Wales) Regulations 1994 • Environment Act 2021	*Section 3*
Best option for customers	Our programme builds upon investigations carried out in AMP7 under driver code U_INV2 to identify whether existing mid-point or final effluent flow meters could be used for accurate flow measurement. The ability to use existing assets is more cost effective and follows our asset management principal that we do not default to building new assets. Where our investigation identified that this was possible we delivered MCERTS flow measurement capability in AMP7. Where the investigation identified that significant investment would be required to deliver MCERTS certified flow measurement then the delivery was moved into AMP8 where information from the investigations were used to inform the solution and develop accurate costs. In recognition of the Environment Agency's ambition for MCERTS certification of event duration monitors used within the assessment of flow compliance, in AMP7 we have installed monitors that, with some minor modification, are suitable for MCERTS certification. By doing this we have the ability to ensure MCERTS inspections can be carried out in the most efficient way by only visiting sites once for both flow meters and event duration monitors and we are able to group nearby site inspections where appropriate.	Section 4
Cost efficiency	The use of a risk and value (R&V) assessment across all our major projects supports challenge of our expenditure requirements, including enhancements by better challenging both needs and solutions. This ensures that when we decide projects are necessary, we only do what we need to do, that our decisions are based on strong evidence, and the value of both business and customers is clear. The process ensures that we keep challenging and validating both the need for our projects and the way we deliver them.	Section 5
Customer protection	Customers are protected from non-delivery through the PCD. Additional consequences of non-delivery include: • Reputational impact of reducing Environmental Performance • Potential prosecution and fine due to non-compliance with permits • Loss of trust with customers and stakeholders • Loss of trust with the Environment Agency leading to less support for innovative approaches to delivering environmental improvement • Lack of detailed information to feed into PR29 development	Section 6

Price Control Deliverable	Price Control deliverables developed for this enhancement case: • WINEP Flow and monitoring price control deliverable.	Section 6

3. Introduction

3.1.1 This document set out the enhancement case of £164m to allow UUW to meet the requirements of the WINEP wastewater monitoring programme as a result of drivers in the AMP8 WINEP.

3.1.2 The Water Industry National Environment (WINEP) sets out where the Environment Agency require us to enhance service standards in order to deliver environmental benefits. This document covers the enhance expenditure related to the delivery of MCERTS certified flow measurement, MCERTS certified event duration monitoring and river water quality monitoring. The need for investment is driven by the Urban Wastewater Treatment (England and Wales) Regulations 1994 and Environment Act 2021, these are statutory drivers within the WINEP. Where there is some flexibility for additional/optional delivery we have not chosen to progress these in AMP8 to minimise, where appropriate, the size and scale of the AMP8 WINEP.

3.1.3 The development of the WINEP has been informed by the key regulatory guidance including; the WINEP methodology, WINEP options development guidance, WINEP options assessment guidance, WINEP driver and supporting guidance. Our approach reflects the specific context within which we operate in the North West of England

3.1.4 Where possible we are making use of phasing and adaptive planning to ensure we meet statutory requirements in a way that balances costs across the AMPs and prioritises delivery of least- low- or no-regret measures first. This is particularly the case for continuous water quality monitoring, which is a new requirement for AMP8 and has been agreed as a phased approach across AMP8 and AMP9.

3.1.5 The AMP8 totex requirement to deliver wastewater monitoring enhancements is £164.180 million, Table 1. Identified the cost breakdown by driver.

Table 1: Totex cost for flow monitoring and event duration monitoring in the WINEP

WINEP Driver(s)	Unit	Capex	Opex	Totex	Definition
UWW Monitoring at intermittent discharges (U_MON3)	£m	2.038	1.204	3.242	Expenditure under driver codes U_MON3
UWW Monitoring for flow compliance at WWTW (U_MON4)	£m	32.995	5.998	38.993	Expenditure under driver codes U_MON4
UWW Monitoring of emergency overflow operation on network SPS	£m	38.011	0.000	38.011	Expenditure under driver code U_MON6
Environment Act Continuous water quality monitoring	£m	72.568	0.000	72.568	Expenditure under driver codes EnvAct_MON4
Environment Act pilot for estuarine continuous water quality monitoring	£m	1.924	0.000	1.924	Expenditure under driver codes EnvAct_INV1
Environment Act pilot for complex inland continuous water quality monitoring	£m	4.721	0.000	4.721	Expenditure under driver codes EnvAct_INV2
Environment Act pilot for coastal continuous water quality monitoring	£m	4.721	0.000	4.721	Expenditure under driver codes EnvAct_INV3

WINEP Driver(s)	Unit	Capex	Opex	Totex	Definition
Total totex	£m	156.978	7.202	164.18	

3.1.6 Our cost estimate for this programme in AMP8 is a gross totex value of £164.18 million. This expenditure covers the enhancement costs associated with installing MCERTS certified flow measurement and event duration monitoring, increased data capture and logging from 15 minutes to two minutes, and the installation of river water quality monitors. These costs sit outside our base expenditure as they are new requirements which have been included in the WINEP. We have not made an assumption for maintenance within the enhancement programme. If upon site inspection, maintenance is required to enable installation of a monitor, this will be managed thought our internal maintenance escalations process. .

3.1.7 The successful delivery of these WINEP needs will be subject to a price control deliverable to ensure that customers are protected in the event that a scheme is not delivered or no longer required and therefore removed from the WINEP.

4. Need for enhancement investment

4.1.1 This section details the environmental driver and legislation which supports the need for investment and our approach to addressing these requirements.

4.1.2 We have followed the Environment Agency driver guidance to identify needs for enhancement investment for monitoring within the UUW area. We have developed the AMP8 WINEP proposal within the long-term context to ensure that our plan is balancing investment across the AMPs and intervening at the most appropriate time. Following this guidance we have identified requirements to put in place monitoring for:

- The accurate assessment of pass forward flow compliance at our WwTW and last in line PS;
- Identification of the number of discharges that occur in an emergency; and,
- Continuous river water quality monitoring to understand whether there is a measurable impact of discharges on the receiving waterbodies.

4.1.3 Our ability to gather this data is critical in the assessment of compliance against our environmental permits and to assess whether our assets perform in line with the requirements of the Urban Wastewater Treatment (England and Wales) Regulations 1994 and Environment Act 2021.

4.1.4 These requirements are statutory drivers in the WINEP which builds upon the existing environmental framework in AMP7. The WINEP driver codes and requirement description along with the quantity of needs is shown in Table 2.

Table 2: Statutory drivers and number of outputs required to be delivered

Driver	Requirement	Number of drivers
U_MON3	MCERTS certified event duration monitoring of the pass forward flow overflow operation at WwTW or last in line pumping stations. This is a modification of the existing AMP7 U_MON3 driver to include new requirements for MCERTS certification and increased logging frequencies. The U_MON3 driver has been spilt into two sub-categories to reflect the different investment needs: U_MON3a: MCERTS certification of an AMP7 U_MON3 driver output overflow operation monitor U_MON3b: MCERTS certified overflow operation monitor	273
U_MON4	MCERTS certified pass forward flow monitoring at wastewater treatment works or last in line pumping stations. This is a modification of the existing AMP7 U_MON4 driver to include a new requirement for increased logging frequencies where appropriate. The U_MON4 driver has been spilt into five sub-categories to reflect the different investment needs: U_MON4a: Move AMP7 U_MON4 driver output to 2-minute flow monitoring U_MON4b: Move AMP7 U_INV2 driver output to 2-minute flow monitoring U_MON4c: PR24 U_MON4 from U_INV2 investigation including civils U_MON4d: MCERTS certified Flow passed forward flow monitor (no civils) U_MON4e: MCERTS certified Flow passed forward flow monitor including civils	250
U_MON6	MCERTS certified monitoring of emergency overflows on network pumping stations. Where a pumping station has both a storm overflow and emergency overflow, MCERTs certified pass forward flow monitoring will be required to distinguish between compliant discharges made in wet weather, and those discharges made during emergency scenarios. Event duration monitoring and flow monitoring will be at 2 minute intervals.	25% of total spend – programme to be confirmed with Environment Agency

Driver	Requirement	Number of drivers
ENVAct_INV1	Estuarine: Undertaken a pilot to assess site suitability for continuous water quality monitoring in estuarine environments to assess any impact from storm overflows and wastewater treatment works discharge outlets.	1
ENVAct_INV2	Inland complex: Undertaken a pilot to assess site suitability for continuous water quality monitoring in complex inland environments (such as Lakes) to assess any impact from storm overflows and wastewater treatment works discharge outlets.	1
ENVAct_INV3	Coastal: Undertaken a pilot to assess site suitability for continuous water quality monitoring in coastal environments to assess any impact from storm overflows and wastewater treatment works discharge outlets.	1
ENVAct_MON4	Installation of continuous water quality monitoring of the receiving watercourse upstream and downstream of storm overflows and wastewater treatment works discharge outlets.	25% of total (~600 sites – programme to be confirmed with Environment Agency)

4.2 Option development

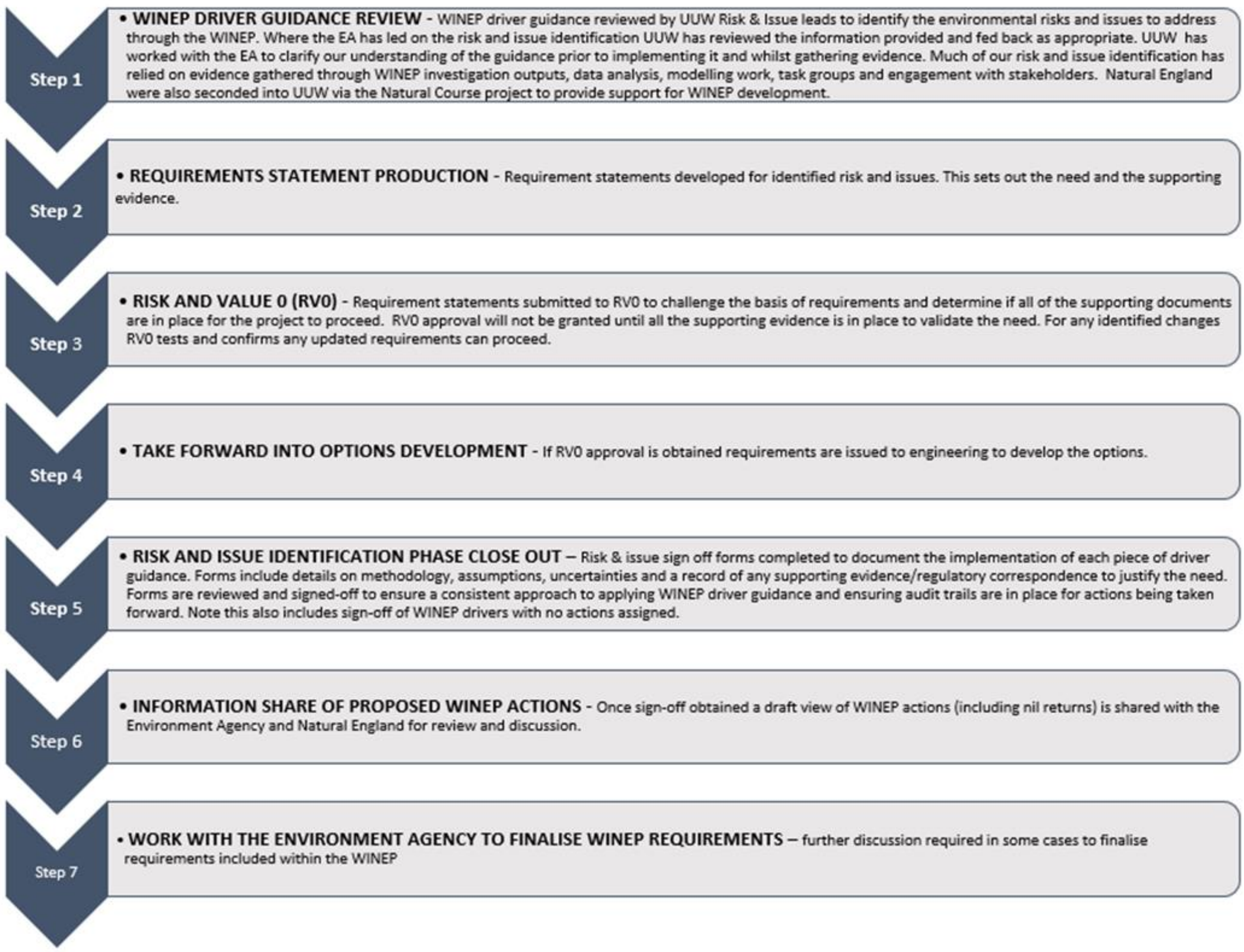
4.2.1 In most cases the requirements of the monitoring are quite prescriptive and therefore the range of options for consideration is not broad. In AMP7 we continue to deliver a programme to install pass forward flow monitoring and event duration monitoring to assess compliance at over 150 sites, as a result we are confident in our assessment of options and ability to deliver additional monitoring in AMP8.

4.2.2 All flow and event duration monitors will meet the Environment Agency's minimum requirements for self-monitoring which is required for the monitoring certification scheme (MCERTS). Continuous water quality monitors will meet the standard specified by the Environment Agency within the technical guidance for water quality monitoring issued in August 2023.

4.3 Approach to risk and issue identification

4.3.1 The approach we have taken to identify WINEP actions is in line with Stage 2 of the Environment Agency's WINEP methodology. This involves collaboratively identifying environmental issues that need addressing and risks that require further monitoring/investigation through the WINEP. Our Risk and issue identification process follows a stage approached, shown in Figure 1, which has enabled us to identify where action is required to deliver compliance with our environmental obligations.

Figure 1: Risk and issue identification process stages



4.3.2 This collaborative process has ensured that we are prioritising and investing in areas which have a well evidenced need, and that we are meeting those needs in the most efficient way. The monitoring programme is building on delivery in AMP7 to extend and enhance our ability to understand what is happening at our sites and the impact of our operation on receiving water courses. This information is vital for assessing compliance and providing data to inform future decisions.

4.4 Customer support

4.4.1 Customer research indicates protecting the environment is a key priority. Research for the Drainage and Wastewater Management Plan and Water Resources Management Plan carried out in April 2021 showed that 21% of those customers surveyed ranked removal of wastewater in the top 3 greatest long term challenges. It was also noted that aspects such as maintaining the network and wastewater treatment are often fairly easy for people to envisage, but happen in the background. When asked what people themselves feel is important; ‘the impact on the environment is a constant concern’ and customers ‘love living in an area with lots of countryside and green space (perhaps heightened by COVID-19) and want this to be preserved’. We consider this to be evidence that customers support UUW’s continued compliance with its environmental obligations.

4.5 Management Control

4.5.1 Enhancements to increase monitoring that are included in the WINEP are outside of management control. Base totex allowance maintains compliance with current permits. To enable compliance with the requirements of new permits, investment to enhance current assets or to deliver new assets is required. Appendix 1 includes a detailed list of capex, opex and totex costs associated with this enhancement case.

4.5.2 The Environment Act 2021 placed a duty on water companies to provide upstream and downstream monitoring of wastewater discharges (intermittent and continuous), this is a new requirement and not covered by the base allowance. Continuous river water quality monitors are short life assets that has a substantial opex associated with their delivery, maintenance, and quantification of data. To understand the impact of UUW operation on the receiving water course investment is required.

5. Best option for customers

5.1.1 In order to identify the best option for customers we ensured that all event duration monitors delivered in AMP7 are capable of MCERTS certification in the future. This has ensured that we do not need to replace our AMP7 installations with a new device in AMP8 to meet new requirements. This also allows for a more flexible approach to MCERTS inspections whereby inspections can be carried out in the most efficient way, by only visiting sites once for both flow meters and event duration monitors. This also enables efficient inspection by grouping, where appropriate, nearby site inspections.

5.1.2 Where we utilised existing pre-AMP7 event duration monitors in AMP7 which achieved the standard required at that time, will have included these in our plan to be replaced in AMP8. This will ensure that the devices are capable of MCERTS certification which they were not previously required to do. To minimise waste, existing devices removed as part of this process, which are still serviceable will be used within our spares stores for maintenance of our existing fleet of over 2000 event duration monitors. This strategy ensures compliance with revised requirements at the same time as reducing waste, providing a second life for these assets.

5.1.3 For flow meters (U_MON4) where we have existing flow measurement capability at treatment works we have utilised these existing assets. Where new flow monitors are required we ensure that they comply with the Environment Agency minimum requirements for self-monitoring, required for the monitoring certification scheme (MCERTS).

5.1.4 If we fail to have equipment to measure either flow to full treatment or storm spills from our assets we will be in breach of our permits. This is likely to lead to enforcement action from the Environment Agency and will result in loss of trust with customers and regulators.

5.1.5 A robust understanding of the role our discharges play in the wider ecosystem is important for the development of future environmental enhancement schemes. Monitoring of storm overflows was the first step in understanding how our assets are operating in periods of heavy or prolonged rainfall. Continuous water quality monitoring will identify any impact that these discharges may have on the receiving watercourse. This will help us to target improvements where they are needed most.

6. Cost efficiency

6.1.1 This section sets out how we have calculated the value of this enhancement case, how we have challenged our assumptions to develop efficient costs and how these costs have been assured.

6.2 Flow monitoring and event duration monitoring

6.2.1 Our cost have been developed following the successful delivery of our AMP7 Flow to full treatment monitoring (U_MON3 and U_MON4) programme where we delivered a range of solutions from the permitting of an existing flow monitor to major civil works for the installation of a new flow measurement device.

6.2.2 The AMP8 programme has been sub-divided into categories depending on the need and level of investment required. Where there is a shared need, such a moving to two minute monitoring, a standard unit rate has been applied based on common infrastructure and delivery timescales. This approach has enabled us to focus on areas where the expenditure is more variable subject to the level of intervention required.

6.2.3 Where a more onerous scope has been identified a detailed cost estimate has been carried out to identify site specific requirements and costs. This approach was not taken at PR19 and we've found that the delivery scope has be greater than expected, as a result we have improved our approach to estimating for these schemes for PR24 to provide a more robust and site specific estimate.

6.2.4 All U_MON3 and U_MON4 monitoring schemes include a cost to deliver the digital capability required of this programme, including hosting additional data on a platform and improved analytical capability, this is required due to the vast amount of data coming into the business. Utilising digital technologies to enable us to understand and use the data that we are receiving. The cost for increasing the digital capability has been taken from our dynamic network management programme where we host thousands of new monitors on a new third party platform.

6.3 Continuous water quality monitoring

6.3.1 UUW has a long history in the deployment of in river water quality monitors (Sonds) for the development and verification of our integrated catchment models. Integrated catchment models (ICMs) are sophisticated tools used to represent a watercourses' catchment hydrology and water quality. These models are used to identify areas or assets that are contributing to non-compliance of a water body. The ICMs are able to take data from multiple sources to test a range of scenarios or options for sustainable water management within a catchment

6.3.2 The Environment Agency have dictated the type of measurement device required to meet the WINEP requirement for continuous water quality monitoring. We have developed a standard unit rate for the delivery of these devices, for the cost of the sample pumps, sonds and kiosks. Additional costs have then been taken into account including land access, land purchase (if necessary), safe access to the river for regular maintenance and replacement of devices. For

6.3.3 River water quality monitors are short life assets that require regular maintenance. Safe access to these devices is critical for maintaining the integrity of the data and safety of those working on these assets.

6.3.4 The Environment Act 2021 identifies that the secretary of state may put in place a legal requirement for water companies to publish the data from these monitor, making this information available to the public will increase transparency regarding the operation and impact of storm discharges on receiving waterbodies.

6.4 Options costs

6.4.1 The requirements for monitoring are quite prescriptive and therefore a consideration of a range of options was not appropriate for this enhancement case. All flow and event duration monitors will meet the Environment Agency's minimum requirements for self-monitoring which is required for the monitoring certification scheme (MCERTS). Continuous water quality monitors will meet the type and specification set out by the Environment Agency. The programmes have been developed in line with the requirements and examples of the project breakdowns can be found below.

6.4.2 Our PR24 capital cost estimating approach is then based on data collected over a number of AMPs (AMP3 to AMP7) updated to reflect the present market conditions under which UUW and the UK Water Industry are operating. Mott Macdonald (MM) have provided an estimating service to UUW over AMP6 and AMP7. MM also provide an estimating service to a number of other UK Water Companies, which allows them to provide a benchmarked approach to UUW's PR24 capital cost estimates.

6.4.3 The total capital costs are made up of these Contractor Direct Costs (CDCs), Contractor Indirect Costs (CICs) and UUW indirect costs. MM have benchmarked UUW's direct costs and cost curves and assessed the water industry construction inflation based on their Construction Industry Basket of Goods (CIBOG) index. The CIBOG approach is important as it has been considerably higher than CPI(H) over the last few years due to post-COVID infrastructure growth and activity.

6.4.4 Contractor Indirect Costs (CICs) cover design costs, construction staff costs, risk, fee and profit margin. These indirect costs have been increasing over the last four AMPs and this has been due to more risk being transferred to contractors, more refurbishment work on existing plant and equipment, more optioneering and value engineering to minimise CDCs and a more risk averse approach post the collapse of Carillion. MM have benchmarked CICs across UUW's supply chain, the UK Water Industry and UK Transport Industry and have seen the increase accelerate in AMP7, which has been due to the reasons mentioned above and also the large increase in post-COVID infrastructure spend, which has driven significant growth into resource wages. Contractors are also actively picking sectors and work type to maximise profit returns and this means that some have reduced their work in the water sector or exited completely. MM and UUW have, therefore, reflected this benchmarking data into the WINEP estimating approach. The CICs applied to the cost estimates have been based on current market performance with adjustments for project size, complexity and Operating Delivery Model (ODR). The ODR and associated CICs' percentage is based on AMP7 market data and also the proposed AMP8 delivery model, which will select the chosen runway based on risk management and level of design between UUW and its extended supply chain.

6.5 Event duration monitoring (U_MON3)

6.5.1 The U_MON3 (installation of an MCERTS certified event duration monitor) costs were built up of 2 key elements:

(a) The cost of the EDM and associated ancillaries;

(b) The cost to certify the instrument

6.5.2 The cost for an independent auditor to certify the instrument was necessary for all installations to meet the U_MON3 criteria set out in the PR24 WINEP driver guidance. The cost of the EDM was only applied to those sites where the existing EDM wouldn't comply with the MCERT criteria, where an existing asset could be used this has been built into the programme and reflected as 'simple' installations within the PR24 data tables.

6.5.3 The scope and thus cost for these two alternatives were allocated against either the WINEP drivers U_MON3a (operational intervention) or U_MON3b (replace asset) requirements.

6.6 Flow monitoring

Installation of flow meter to measure pass forward flow compliance

6.6.1 In order to provide greater cost certainty on the U_MON4 programme, we used an industry expert in flow measurement to assess each of the U_MON4 sites.

6.6.2 The cost of the programme varies significantly by site due to the site specific nature of the requirements. In order to develop the programme and costs workshops we help with operational staff and multidisciplinary teams to develop the site specific requirements and cost estimates. As each site has a bespoke scoping exercise undertaken, there isn't much standardisation surrounding the solutions. Nevertheless, the scope was split up into the following 'Generic High Level Solution' categories:

- Operational Intervention
- Refurbish Asset
- Replace Asset
- New Asset

6.6.3 Typically, as you move up the hierarchy, the scale of the challenge increases, and as such the cost to meet U_MON4 compliance is greater.

6.6.4 In AMP7 UUW delivered an investigation programme to identify whether existing (predominantly final effluent flow meters) could be used to accurately measure pass forward flow compliance, the investigation involved a site visit and an assessment of data, the outcome of the investigation identified that the majority of sites would require a new flow meter installed at the inlet of the WwTW. These sites have been included within the AMP8 WINEP for a U_MON4 driver, as these sites were reviewed in more detail as part of the AMP7 investigation we have greater confidence in the solution and therefore cost to deliver the WINEP requirement.

6.6.5 Where the solution proposal identified an impact to the existing habitat, a Biodiversity Net Gain (BNG) assessment was undertaken, and the associated costs were applied to the project.

6.6.6 In AMP7 UUW has a programme of installing flow monitoring at 153 wastewater sites. The AMP7 requirement was for 15 minutes monitoring only therefore the AMP8 requirement for 2 minute monitoring was applied to all sites excluding those which are being delivered in AMP7 (sites with a pump to storm tanks) or sites with a final effluent flow meter. For these sites only the cost to move to 2 minute monitoring has been included within the AMP8 programme.

6.7 Event duration monitoring (U_MON6)

6.7.1 Under the PR24 WINEP driver U_MON6 companies are required to install MCERTS certified Event Duration Monitors (EDMs) on all Emergency Overflows. Defra have identified that 75% of U_MON6 actions should fall beyond 2030 and therefore 25% should be included within AMP8. UUW are working with the Environment Agency to confirm the sites that will now be included within the AMP8 WINEP.

6.7.2 The U_MON6 requirements specify that each installation needs MCERTs certification. In order for an independent auditor to certify an EDM on a spill point, the auditor will need to confirm the

- RADAR is reading accurately
- The spill (or datum) is in the right place
- Undergoing the necessary maintenance plans

6.7.3 In order to do this, each application requires the following:

- A datum plate to be installed at the spill point
- Access into the pumping station immediately above the spill point

- Likely over-pumping to allow the above works to be done

6.7.4 As a result of these requirements each EDM application has an element of civils works priced. Due to the timeframes and the scale of the programme we were not able to complete a site specific review to identify the full scope of civil intervention required, therefore an element of civil work has been applied to all installations.

6.7.5 In addition to the installation of EDM, the PR24 WINEP driver specifies that all emergency overflows with both an emergency discharge and storm discharge require MCERTSs certified flow measurement. This will be used to differentiate between a discharge in an emergency and a discharge during high rainfall events. The flow meter will be installed on the rising main from the pumping station and is required at 361 of 948 sites identified for U_MON6. Due to the phasing requirement, 90 are included within the AMP8 programme.

6.7.6 To identify the scope of civil intervention require, UUW has proposed:

- Installation of kiosk
- Installation of a manhole
- Installation of a flow meter

6.7.7 A programme level approach was applied across all applications, where the following scope items were standard:

- EDM
- Datum Plate
- Panel and Kiosk
- Overpumping
- Installation of opening
- Ducting
- Certification
- Telemetry
- UPS
- Flow meter (where applicable)

6.7.8 Whist UUW were unable to undertake a site survey to identify specific site requirements, ArcGIS was used to identify some constrains, these include:

- Land purchase
- Working in roads
- Whether in an area of AONB / National Park / SSSI etc.
- Whether in a flood zone
- Rising main pipeline diameter

6.7.9 The requirement for MCERTs certified EDM and flow meters drives a significant proportion of the cost and therefore the costs for installing EDM are not comparable to previous installations and they did not required external certification. To comply with MCERTs criteria instrumentation must meet a minimum standard – these are more costly than other EDM equipment also available that do not meet this minimum standard of accuracy. In addition the requirement for MCERTs requires improved access for regular inspection which in turn requires structural interventions such as the creation of manholes to provide this access which is more costly to deliver.

6.8 Continuous water quality monitoring

The continuous river monitoring programme was priced similarly to the U_MON6 programme, where both 'standard' scope items were applied to all installations, and an ArcGIS exercise was undertaken to understand some site specific scope items. The standard scope includes:

- Multi-parameter sonde
- Sample pump and tube
- Kiosk
- Battery power supply

6.8.1 For each outfall included in the programme, a GIS exercise was undertaken to identify the following site specific challenges:

- Land Purchase
- Working in roads
- Whether in an area of AONB / National Park / SSSI etc.
- Whether in a flood zone
- Rising main pipeline diameter
- Distance from major road for operator access
- Vegetation clearance

6.8.2 In order to improve our understanding on costs, we submitted a Prior Information Notice (PIN) to the market. Suppliers responded to the PIN with appropriate instruments and costs. These costs were used to support our estimates.

6.9 Continuous water quality monitoring investigations/pilots

6.9.1 Sonds have been used for many years to assess the water quality for inland rivers however we do not know whether these devices are suitable for assessing the impact of wastewater discharges within alternative environments. The Environment Agency have identified three new drivers to investigate and pilot continuous water quality monitoring at estuarine, coastal or complex inland waters. There is an expectation for companies to undertake these investigations to meet public expectation and increase data transparency at important water bodies including designated bathing waters.

6.9.2 The trails will identify alternative monitoring equipment best suitable for monitoring in non-river environments and that can manage in tidal waters and lakes. UUW will agree with the Environment Agency the exact location of the trials but UUW are proposing a trial at three sites selected for their importance and where water quality data can be used to inform long term planning and partnerships. The areas are Lake Windermere and Blackpool bathing water and Moor pool. The cost of these investigation and trials have been included within the totex plan.

6.10 Third party assurance of our cost estimates

6.10.1 We commissioned two specific pieces of third party work to assure the cost efficiency of our enhancement cases:

- A bottom-up benchmarking exercise (Faithful and Gould); and
- Assurance on top-down benchmarking carried out by UUW (Deloitte).

6.10.2 We consider that the complementary and independent output of these pieces of work demonstrates that our cost estimates are efficient and represent excellent value for money for our customers.

6.10.3 We provide a description of each below.

Bottom-up benchmarking (Faithful and Gould)

6.10.4 Faithful and Gould (F&G) undertook a bottom-up deep dive into the cost efficiency of our enhancement cases. This involved a close examination of our cost base relating to a sample of our enhancement programme, with comparisons made to similar activity carried out by third party companies across a variety of sectors.

6.10.5 F&G looked at our direct costs across each of the following categories:

(a) Staff, including site supervision

(b) Mobilisation and site set up, running and removal of site offices and welfare

(c) Temporary services for general site use, such as water to wash out concrete skips

(d) Attendant plant and equipment, such as cranes, forklift for unloading deliveries etc

(e) Attendant labour, defined as hourly paid operatives not involved in productive works

(f) Site consumables, such as waste skips

(g) Set-up site compounds, erecting hoardings etc.

(h) O&M manuals

(i) Health and safety

6.10.6 It also looked at the contractor's indirect costs (e.g. overhead and design costs) and UUW's indirect costs (e.g. land acquisition costs). Due to the size of the programme, F&G examined a sample of our enhancement cases. However, this sample included projects from each of our enhancement categories and covered £1.246 billion of expenditure. Therefore, we consider this sample to representative of our overall enhancement programme.

6.10.7 F&G noted the effectiveness of UUW's cost estimation process:

"In addition to the benchmarking data held by Faithful+Gould we understand that UUW has applied multiple internal and external challenges to progressively refine the cost estimation undertaken to date. In particular we note UUW's use of its Investment Programme Estimating System (IPES) which is a bespoke parametric estimating tool containing data from AMP3 to AMP7, to provide historical cost curves alongside estimated data from third party organisations."

6.10.8 F&G found that our proposed costs are in line with rates typically seen across the industry:

"Overall, UUW's approach of utilising historic cost curves, market testing and obtaining specialist third party quotations demonstrates a sound proactive approach to cost planning. In total £1.2bn of schemes underwent targeted cost assessment with £573m making up the construction works element.

After presenting our initial findings it was encouraging to see UUW's commitment to addressing our findings and applying these to the wider enhancement estimates, charting a strategic route towards greater efficiency and scope clarification.

In light of this Cost Assurance work and evidence of UUW's responsive actions we have concluded that the data we have benchmarked is within a reasonable alignment with anticipated market rates."

7. Customer protection

7.1 Introduction

7.1.1 It is important that customers have confidence that we will deliver the enhancement schemes that get reflected in our PR24 final determinations and they are suitably protected in the event of non-delivery, or if there are material changes to deliverables (including changes to dates), which leads to a change in cost (including changes in the timing of required expenditure). Ofwat proposes that, if companies fail to deliver or are late delivering improvements to customers, then price control deliverables (PCDs) should, where appropriate, be used to compensate customers. In our PR24 *Chapter 8 – Delivering at Efficient Cost, section 8.8.9* we have proposed an approach to PCDs that aims to provide customer protection, such that customers are fairly compensated for non-delivery (such as due to a change in regulatory requirements) or late delivery (including as a result of a change to a regulatory date), between PCDs, any related ODI underperformance payments, and cost sharing arrangements.

7.2 Price Control Deliverable

7.2.1 It is important that customers have confidence that we will deliver the enhancement schemes that get reflected in our PR24 final determinations and they are suitably protected in the event of non-delivery, or if there are material changes to deliverables (including changes to dates), which leads to a change in cost (including changes in the timing of required expenditure). Ofwat proposes that, if companies fail to deliver or are late delivering improvements to customers, then price control deliverables (PCDs) should, where appropriate, be used to compensate customers. In our PR24 *Chapter 8 – Delivering at Efficient Cost, section 8.8.9* we have proposed an approach to PCDs that aims to provide customer protection, such that customers are fairly compensated for non-delivery (such as due to a change in regulatory requirements) or late delivery (including as a result of a change to a regulatory date), between PCDs, any related ODI underperformance payments, and cost sharing arrangements.

7.2.2 We have considered PCDs in three areas (£164,181m AMP8 totex):

(a) Continuous river water quality monitors (£72,568m AMP8 totex)

(b) Flow monitors (£37,672m AMP8 totex)

(c) Other monitoring drivers (£53,941m AMP8 totex)

(a) Continuous river water quality monitoring

Table 3: PCD summary

Scheme delivery expectations	
Description of deliverable	Delivery of 600 continuous water quality monitors to continuous water quality monitoring of the receiving watercourse upstream and downstream of storm overflows and wastewater treatment works discharge outlets to help understand the impact of discharges on the receiving environment.
Output measurement and reporting	Company should deliver the number of monitors in line with the profiling of the WINEP. The PCD will report on the number of monitors delivered in year for continuous water quality monitors (excluding third party certification of meters).
Assurance	Successful completion of WINEP Enhancement schemes for wastewater monitoring is assured internally through review of evidence compiled by delivery partner / Engineering and External assurance is by the Environment Agency confirming completion and updating the WINEP Tracker to reflect the date the output was claimed. Generation of an associated output in use (OIU) certificate and evidence pack. This will also be reported through APR
Conditions on scheme	None
Impact on PCs	None

7.2.3 In our PCD template *UUW32-PCD Excel Sheet* we have assumed a wholesale WACC of 3.23%, in line with Ofwat's guidance. We have assumed a 50% totex cost sharing rate, which is applied before calculating PCDs. We have applied a further 50% for Bioresources (where applicable), to ensure that only 25% of Bioresources totex is at risk from PCDs, given the lack of RCV guarantee, and general uncertainty in cost recovery from future Bioresources price controls. For late delivery we have applied a proportionate value of annual opex, and assumed 3.5% of capex, which provides a fair reflection of the time value of money of any related deferred capital spend.

Table 4: PCD delivery profile

	Unit	AMP8	2024	2025	2026	2027	2028	2029	2030	Ultimate delivery
Cumulative delivery target for PCD	**monitors**		**-**	**-**	**120**	**240**	**360**	**480**	**600**	**600**
AMP8 Capex (22/23 pb)	£	72,567,612	-	-	14,513,522	14,513,522	14,513,522	14,513,522	14,513,522	
AMP8 Opex (22/23 pb)	£	0	-	-	-	-	-	-	-	
ODI impact per unit of PCD volume	£/monitors	0.00								

Table 5: Price Control Allocation

Price Control	Unit	Price Control Allocation
Water resources	%	0.00%
Water network+	%	0.00%
Wastewater Network+	%	100.00%
Bioresources	%	0.00%

Table 6: PCD Incentive rates

	Unit	WR	WN+	WwN+	BR
Overall delivery	£/monitors	0	0	60,473	0
Time value rate	£/monitors	0	0	1,953	0
Late delivery	£/monitors	0	0	4,070	0

(b) Flow monitors

Table 7: PCD summary

Scheme delivery expectations	
Description of deliverable	Delivery of 94 U_MON4 flow monitors capable of recording flows passed forward to treatment every 2 minutes and delivery of continuous water quality monitoring of the receiving watercourse upstream and downstream of storm overflows and wastewater treatment works discharge outlets to help understand the impact of discharges on the receiving environment.
Output measurement and reporting	Company should deliver the number of monitors in line with the profiling of the WINEP. The PCD will report on the number of monitors delivered in year for flow monitors (excluding third party certification of meters).
Assurance	Successful completion of WINEP Enhancement schemes for wastewater monitoring is assured internally through review of evidence compiled by delivery partner / Engineering and External assurance is by the Environment Agency confirming completion and updating the WINEP Tracker to reflect the date the output was claimed. Generation of an associated output in use (OIU) certificate and evidence pack. This will also be reported through APR
Conditions on scheme	None
Impact on PCs	None

7.2.4 In our PCD template *UUW32-PCD Excel Sheet* we have assumed a wholesale WACC of 3.23%, in line with Ofwat's guidance. We have assumed a 50% totex cost sharing rate, which is applied before calculating PCDs. We have applied a further 50% for Bioresources (where applicable), to ensure that only 25% of Bioresources totex is at risk from PCDs, given the lack of RCV guarantee, and general uncertainty in cost recovery from future Bioresources price controls. For late delivery we have applied a proportionate value of annual opex, and assumed 3.5% of capex, which provides a fair reflection of the time value of money of any related deferred capital spend.

Table 8: PCD delivery profile

	Unit	AMP8	2024	2025	2026	2027	2028	2029	2030	Ultimate delivery
Cumulative delivery target for PCD	**monitors**		**-**	**-**	**-**	**94**	**94**	**94**	**94**	**94**
AMP8 Capex (22/23 pb)	£	31,674,020	-	-	15,837,010	15,837,010	-	-	-	
AMP8 Opex (22/23 pb)	£	5,998,251	-	-	-	455,563	1,847,562	1,847,562	1,847,562	
ODI impact per unit of PCD volume	£/monitors	0.00								

Table 9: Price Control Allocation

Price Control	Unit	Price Control Allocation
Water resources	%	0.00%
Water network+	%	0.00%
Wastewater Network+	%	100.00%
Bioresources	%	0.00%

Table 10: PCD Incentive rates

	Unit	WR	WN+	WwN+	BR
Overall delivery	£/monitors	0	0	200,384	0
Time value rate	£/monitors	0	0	6,472	0
Late delivery	£/monitors	0	0	21,462	0

(c) Other monitoring drivers

7.2.5 We have not included a PCD for this area as each individual driver is small in size, and below Ofwat's indicated threshold.

Appendix A Schemes included within this enhancement case - Total inc TI (Post efficiency & RPE)

Table 11: Schemes included within this enhancement case

Project	No' of sites included	Completion date	Project driver	Requirement	Capex (£m)	Opex (£m)	Totex (£m)
U_MON3	273	31/12/2026	U_MON3	Installation of MCERTS certified EDM	2.038	1.204	3.242
U_MON4 2 Minute Monitoring	156	31/12/2026	U_MON4	Move existing MCERTs certified flow meters to 2 minute monitoring	1.321	0.000	1.321
U_MON4 Monitoring & Installation	94	31/12/2026	U_MON4	Installation of MCERTS certified flow measurement	31.674	5.998	37.672
Emergency Overflow Programme	25% (~237)	31/03/2030	U_MON6	Installation of MCERTS certified monitors at EOs	38.011	0.000	38.011
Continuous Water Quality Monitoring	25% (~600)	31/03/2030	EnvAct_MON4	Monitoring of river water quality	72.568	0.000	72.568

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